

## Operating Instructions

### ECO SILVER

Heating and Cooling Thermostats with control head SILVER

#### Immersion thermostat

ECO SILVER

#### Heating thermostats

E 4 S, E 10 S, E 15 S, E 20 S, E 25 S, E 40 S,  
ET 6 S, ET 12 S, ET 15 S, ET 20 S

#### Cooling thermostats

RE 415 S(W), RE 420 S(W), RE 620 S(W), RE 630 S(W),  
RE 1050 S(W), RE 1225 S(W), RE 2025 S(W)

English  
Version 08/2011 a1  
YACE0087

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Software Control System from Version 1.31.00  
Software Protection System from Version 1.31  
Software Cooling System from Version 1.27



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## 1 Safety

### 1.1 Safety information



Type and source
<i>Consequences of non-compliance</i>
<ul style="list-style-type: none"> <li>Action 1</li> <li>Action ...</li> </ul>

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



Type and source
<i>Consequences of non-compliance</i>
<ul style="list-style-type: none"> <li>Action 1</li> <li>Action ...</li> </ul>

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



Type and source
<i>Consequences of non-compliance</i>
<ul style="list-style-type: none"> <li>Action 1</li> <li>Action ...</li> </ul>

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



Type and source
<i>Consequences of non-compliance</i>
<ul style="list-style-type: none"> <li>Action 1</li> <li>Action ...</li> </ul>

"**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 (⇒ 8.6).

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,
  - it is damaged,
  - if it is leaking,
  - 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.

Classes in the EMC standard DIN EN 61326-1.

Class A: Operation only on electrical supply networks without connected domestic areas.

Class B: Equipment for operation on electrical supply networks with connected domestic areas.

With unfavorable network conditions interfering voltage variations can occur.

EMC standard DIN EN 61326-1 (corresponds to VDE 0843-20-1) Devices for Europe Devices for Canada and the USA	Class B  Class A
<p><b><u>Usage restriction</u></b></p> For the EMC standard DIN EN 61326-1: Devices in <b>Class A</b> are only to be operated on electrical supply networks without connected domestic areas.	

**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).

« Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada ».

### 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 device 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 devices to earthed mains sockets which are freely accessible.
- At higher operating temperatures parts of the bath cover can take on surface 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.
- Secure hoses against slippage by using hose clips. Avoid kinking the hoses.
- 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.
- Toxic 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.  
Also unscrew the blind plugs from the pump outputs and inputs and blow through all pump outputs and inputs 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 steam forming.
- Have repairs carried out only by specialists.
- Keep to all the service and maintenance intervals according to VDI 3033 (⇒ 8.3.1).
- Take note of all safety labels.

Applicable only 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.

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 51   | • Therm 200         |
| • Kryo 20 | • Ultra 350 | • Therm 240         |
| • Kryo 30 | • Therm 180 | • 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:

- for medical/pharmaceutical applications
- in areas subject to explosion hazards
- when sited outdoors
- with combustible or highly flammable gases or liquids
- 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 EC conformity



The device conforms to the relevant fundamental requirements for safety and health of the following listed directives:

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Germany

- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

## 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 an S for the SILVER device variant.

Example: E 10 S is a heating thermostat with a maximum bath volume of 10 liters in the SILVER 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 an S for the device variant SILVER.

Example: E 6 S is a heating thermostat with a transparent bath with a maximum bath volume of 6 liters in the SILVER 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 an S for the device variant SILVER.

Example: RE 415 S is a heating thermostat with a maximum bath volume of 4 liters and a minimum temperature of -15 °C in the SILVER device variant.

Where applicable the type designations are supplemented by a W for "water-cooled" and/or N for "Natural refrigerant".

### 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 (⇒ D).

### 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 ( $\Rightarrow$  F) and are inserted.

The following modules are currently available:

1. **Analog 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 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 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 YAAD0020 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. 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 ( $\Rightarrow$  A.3).

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

The Cooling Thermostat RE 1050 S 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** ( $\Rightarrow$  10).

### 4 Operating and functional controls

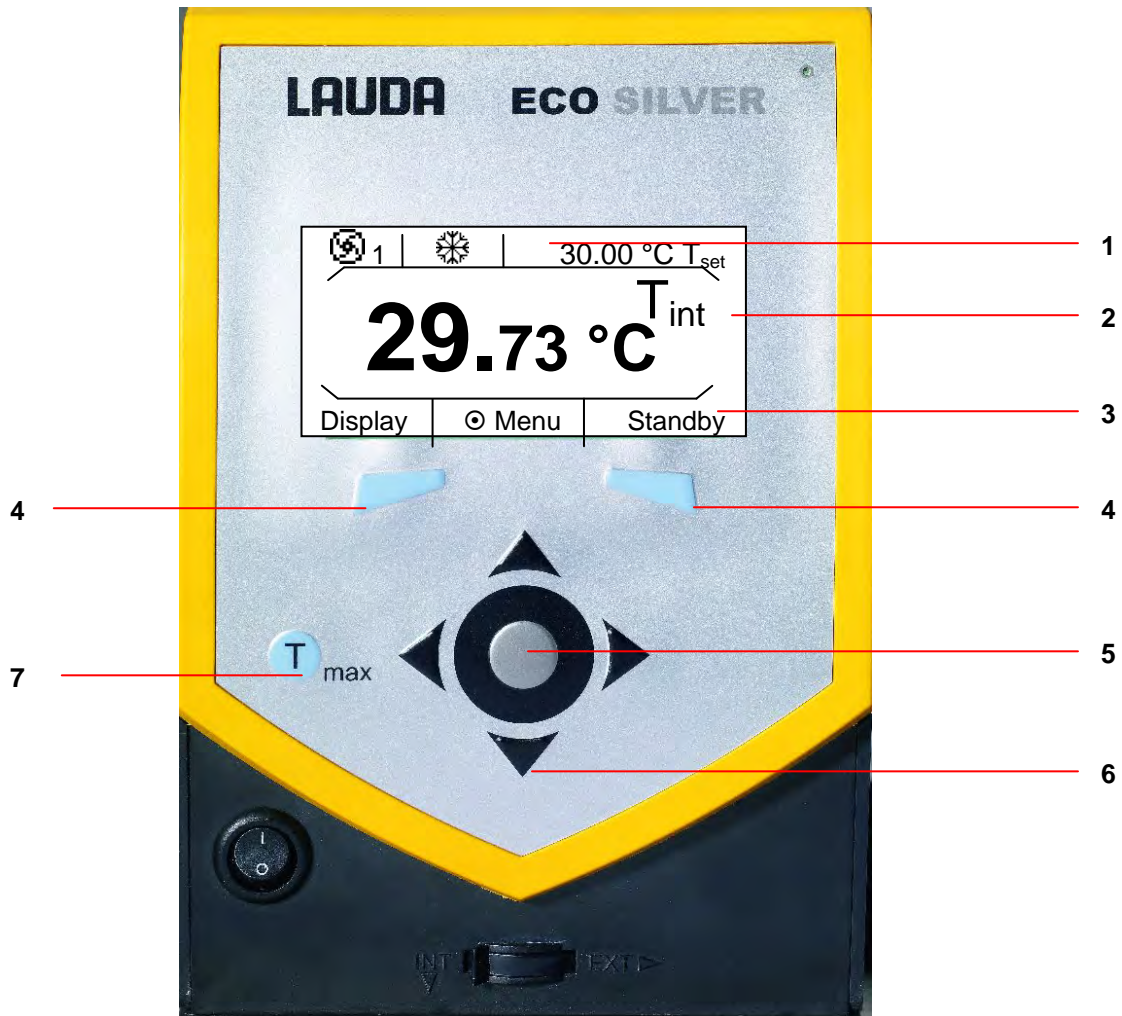
On the following pages the ECO SILVER control head, the control panel and the heating/cooling thermostat device types are presented.

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



- 1 Light sensor for automatic control of display brightness
- 2 Monochrome LCD 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 SILVER



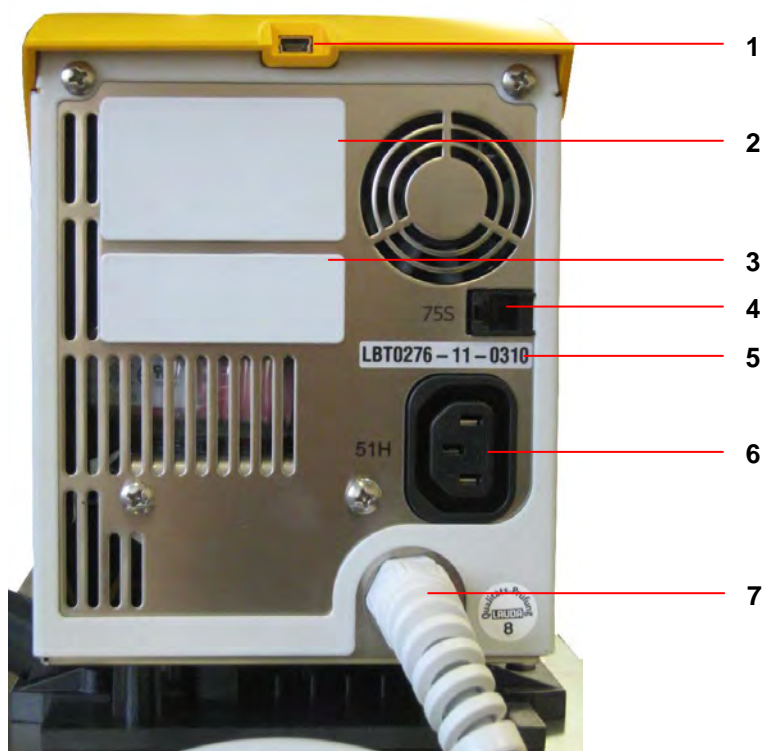
**Display**

- 1 Status display
- 2 Display of the internal or external temperature value ( $T_{int}$  or  $T_{ext}$ )
- 3 Soft-key bar

**Control panel**

- 4 Soft keys, left and right
- 5 Enter key
- 6 Cursor keys for Up, Down, Left and Right.
- 7 Taste  $T_{max}$ :  
Display and adjustment of the overtemperature switch-off point

### Rear view of Control Head ECO SILVER

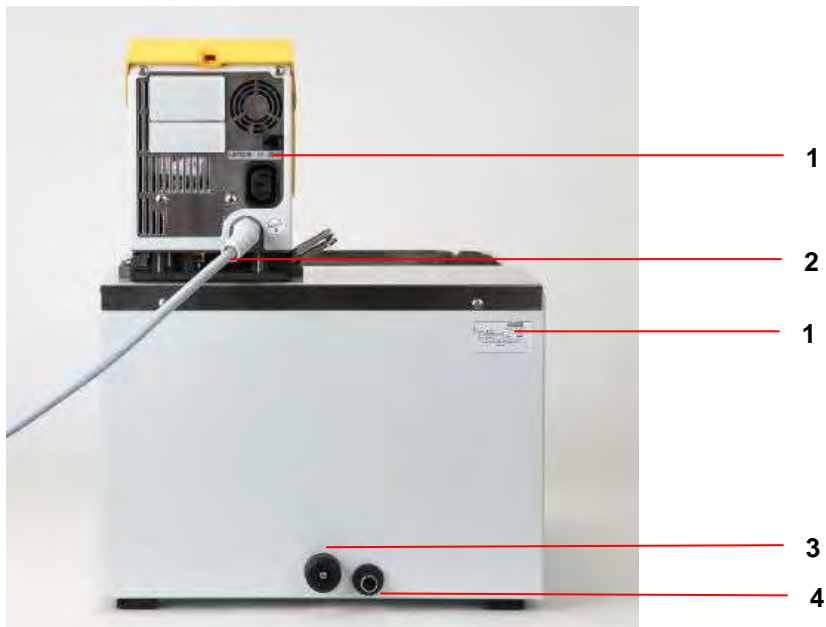


- 1 USB interface
- 2 Upper module receptacle approx. 51 mm x 27 mm for analog, RS 232/485, Profibus module and contact modules
- 3 Lower module receptacle approx. 51 mm x 17 mm for Pt100/LiBus module
- 4 Connection socket 75S for control cable of cooling underpart for RE 1050 S
- 5 Rating label
- 6 Connection socket 51H for power supply between the control head and cooling underpart
- 7 Mains connecting lead

Heating Thermostats ECO SILVER



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



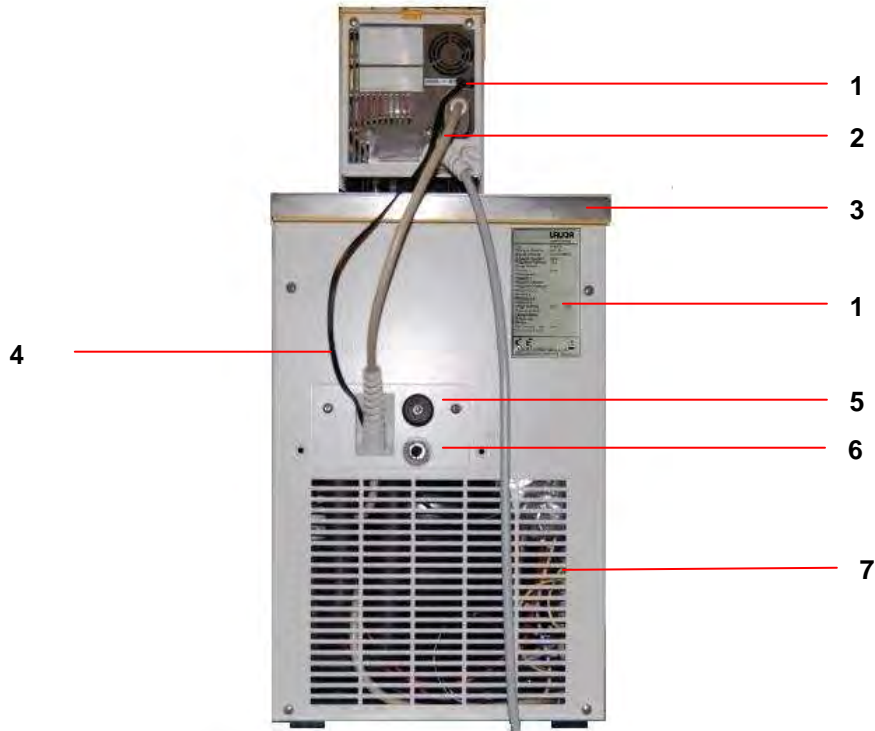
- 1 Rating label
- 2 Mains connecting lead
- 3 Bath draining tap
- 4 Bath drain point

### Cooling Thermostats ECO SILVER



- 1 Pump connection: Outflow and return with fittings 13 mm diameter (plastic)
- 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 Connecting lead between the control head and cooling underpart
- 3 Front grip recess
- 4 Bath cover of cooling underpart (only with RE 1050 S)
- 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.



<b>Shipping damage</b>
<i>Electric shock hazard</i>
<ul style="list-style-type: none"> <li>• Check the device carefully for shipping damage before putting into operation.</li> <li>• Never operate the device if you have found shipping damage.</li> </ul>



<b>Falling / toppling equipment</b>
<i>Crushing of hands and feet, impacts</i>
<ul style="list-style-type: none"> <li>• Use the handles. (With heating thermostats grasp the device underneath)</li> <li>• Site the device only on a level surface.</li> </ul>




<b>Falling / toppling equipment</b>
<i>Property damage</i>
<ul style="list-style-type: none"> <li>• Do not tilt the cooling device during transport and never turn it upside down.</li> </ul>

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.

Please immediately inform **LAUDA Service Constant Temperature Equipment** (⇒ 8.7).

## Standard accessories:

Catalogue number	Quantity	Description	Included with thermostat
HDQ 132	1	Bath Cover E 4	E 4 S
HDQ 127	1	Bath Cover RE 415, RE 420	RE 415 S and RE 420 S
HDQ 128	1	Bath Cover RE 620, RE 630	RE 620 S and RE 630 S
HDQ 129	1	Bath Cover RE 1050	RE 1050 S
HDQ 130	1	Bath Cover RE 1225	RE 1225 S
HDQ 131	1	Bath Cover RE 2025	RE 2025 S
LCZ 0716	1	Pump Connection Set	Cooling thermostats; E 4 S, ET 15 S
LCZ 0720	1	Cooling Coil	E 4 S, ET 6 S
LCZ 0721	1	Cooling Coil	E 10 S, E 15 S, E 20 S, E 25 S, E 40 S, ET 12 S, ET 20 S
EZB 260	1	Warning Label "HOT" 	All thermostats <b>Note:</b> With applications above 70 °C attach the warning label at an easily visible point.
YACE0087	1	Operating Instructions (this document)	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 period, 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:



<b>Falling / toppling equipment on sloping surfaces / table edge</b>
<i>Crushing of hands and feet</i>
<ul style="list-style-type: none"> <li>• Only site the device on flat surfaces, not near the edge of the bench or table.</li> </ul>

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 rail.
- Insert the thermostat with the screw clamp into the tempering vessel (⇒ 9) and screw it tightly to the bath edge by turning 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 control head is free.
- Keep a distance of at least 20 cm free on all sides of the device.



<b>Control head drops into bath</b>
<i>Electric shock hazard</i>
<ul style="list-style-type: none"> <li>• Make sure that the control head mounting is securely joined to the bath.</li> </ul>

**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 (refer to illustration).

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



Holed flange

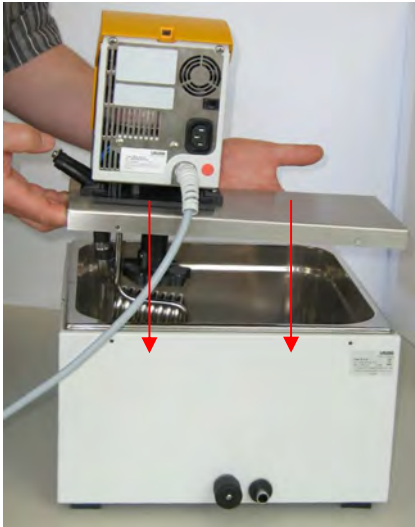


- With the two cross-head screws, mount the carrier plate of the cooling coil and the holed flange to the underside of the control head.

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).

### Connection of the cooling water

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

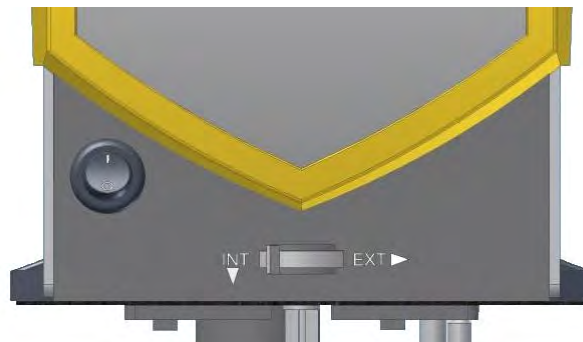
Cooling water pressure (feed - outlet)	max. 10 bar overpressure
Differential pressure (feed - outlet)	min. 3.0 bar
Cooling water temperature	10 to 15 °C recommended, 10 to 30 °C admissible with power restrictions)
Cooling water quantity	see Technical Data (⇒10)
Cooling water hose for connection to the 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). The adjustment is continuously variable and is also possible at any time during operation. .

The adjustment between internal and external circulation is only practicable with a connected external consumer. A pump connection set is needed to do this. This set is included as standard with cooling devices and with the heating devices E 4 S and ET 15 S. 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 4 S and ET 15 S.

<b>Notice</b>	<b>Confusing pump connector and cooling coil</b>
	<i>Environmental hazard from leaking heat transfer liquid</i>
	<ul style="list-style-type: none"> <li>• Follow the illustrations in this section.</li> </ul>
<b>Notice</b>	<b>Leaks from consumers, hoses and accessories</b>
	<i>Environmental hazard from leaking heat transfer liquid</i>
	<ul style="list-style-type: none"> <li>• Always secure the hoses with suitable safety devices.</li> </ul>

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 only 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: take out 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.



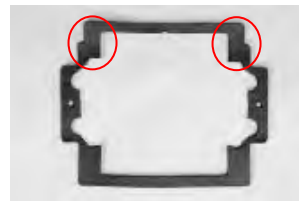
- Push the holed flange under the pump connections and fasten it with two cross-head screws to the underside of the control head.



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 with 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**

<b>Pump connections not closed off</b>
<i>Environmental hazard from leaking heat transfer liquid</i>
<ul style="list-style-type: none"> <li>• Fit sealing plugs to the pump connections when no external consumers are connected.</li> </ul>

**Notice**

<b>Thermostat overflow</b>
<i>Environmental hazard from leaking heat transfer liquid</i>
<ul style="list-style-type: none"> <li>• Do not position the thermostat above the consumer.</li> </ul>

## 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)).



<b>Contact with heat transfer liquid when filling / draining</b>
<i>Harmful when inhaled, damage to eyes and skin</i>
<ul style="list-style-type: none"> <li>• Pay attention to the safety data sheet for the heat transfer liquid.</li> <li>• Use CE gloves, protective clothing and eye protection during physical contact with heat transfer liquid.</li> <li>• Avoid splashing the heat transfer liquid.</li> <li>• Make sure that the drain tap is closed before filling.</li> </ul>



<b>Use of unsuitable heat transfer liquids</b>
<i>Explosion, burns, scalds, fire</i>
<ul style="list-style-type: none"> <li>• When selecting the heat transfer liquid, observe the admissible temperature range.</li> <li>• Only use LAUDA heat transfer liquids.</li> </ul>



<b>Overfilling containers, spilling heat transfer liquid</b>
<i>Environmental hazard from leaking heat transfer liquid</i>
<ul style="list-style-type: none"> <li>• Note the thermal volume expansion of the heat transfer liquid.</li> <li>• Where necessary, consider the displacement volume of the body being introduced.</li> <li>• Take the volume of external consumers into account.</li> </ul>

### 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)
- With the use of 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**



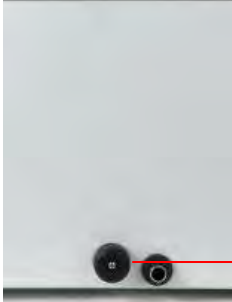
1

- 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 by opening 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).



**Caution !**

**Contact with hot / cold heat transfer liquid**

*Scalds, frostbite*

- Bring heat transfer liquids to room temperature before draining.
- Make sure that the drain tap is closed after draining.



**Caution !**

**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 may be unsuitable for operation 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 (Na<sub>2</sub>CO<sub>3</sub>, 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 designation	Viscosity (kin)	Viscosity (kin) at temperature	Fire point	Container size		
						Catalogue number		
	°C		mm <sup>2</sup> /s at 20 °C	mm <sup>2</sup> /s	°C	5 L	10 L	20 L
Kryo 51 ④	-50...120	Silicone oil	5	34 at -50 °C	> 160	LZB 121	LZB 221	LZB 321
Kryo 30 ②	-30...90	Monoethylene glycol / water	4	50 at -25 °C	--	LZB 109	LZB 209	LZB 309
Kryo 20	-20...180	Silicone oil	11	28 at -20 °C	> 230	LZB 116	LZB 216	LZB 316
Therm 180	0...180	Silicone oil	23	36 at 0 °C	> 288	LZB 115	LTB 214	LZB 314
Aqua 90 ①	5...90	Decalcified water ①	1	--	--	LZB 120	LZB 220	LZB 320
Ultra 350 ③	30...200	Synth. heat carrier	47	28 at 30 °C	≥ 240	LZB 107	LZB 207	LZB 307
Therm 240	50...240	Silicone oil	125	45 at 50 °C	≥ 378	LZB 122	LZB 222	LZB 322
Therm 200	60...200	Silicone oil	54	28 at 60 °C	≥ 362	LZB 117	LZB 217	LZB 317

- 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<sub>2</sub>CO<sub>3</sub> 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 128 °C). Check the mixing ratio using a hydrometer.
- ③ Do not use in conjunction with EPDM hose.

Never use silicone oil with silicone hoses.

EPDM hose is not suitable for Ultra 350 nor 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 carrier liquids and hoses are general figures which can be tightened due to the operating temperature range of the devices.
- Do not use any 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 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

pH – value	7.5 – 9.0
Sulfates [SO <sub>4</sub> <sup>2-</sup> ]	< 70 mg/L
Hydrocarbonates [HCO <sub>3</sub> <sup>-</sup> ]/ sulfates [SO <sub>4</sub> <sup>2-</sup> ]	> 1.0
Total hardness	4.0 – 8.5 °dH
Hydrocarbonates [HCO <sub>3</sub> <sup>-</sup> ]	70 – 300 mg/L
Conductivity	10 - 500 µs/cm
Chlorides (Cl <sup>-</sup> )	< 50 mg/L
Sulfites [SO <sub>3</sub> <sup>2-</sup> ]	< 1 mg/L
Free chlorine gas (Cl <sub>2</sub> )	< 1 mg/L
Nitrates (NO <sub>3</sub> <sup>-</sup> )	< 100 mg/L
Ammonia (NH <sub>3</sub> )	< 2 mg/L
Iron (Fe), dissolved	< 0.2 mg/L
Manganese (Mn), dissolved	< 0.1 mg/L
Aluminum (Al), dissolved	< 0.2 mg/L
Free aggressive carbonic acid (CO <sub>2</sub> )	< 5 mg/L
Hydrogen sulfide (H <sub>2</sub> S)	< 0.05 mg/L
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...120	For all LAUDA heat transfer liquids except Ultra 350 and mineral oils	RKJ 111
EPDM hose uninsulated	12	10...120	For all LAUDA heat transfer liquids except Ultra 350 and mineral oils	RKJ 112
EPDM hose insulated	12 External Ø approx. 35 mm	-60...120	For all LAUDA heat transfer liquids except Ultra 350 and mineral oils	LZS 021
Silicone hose uninsulated	11	10...100	Water water/glycol mixture	RKJ 059
Silicone hose insulated	11 External Ø approx. 35 mm	-60...100	Water water/glycol mixture	LZS 007
Viton	11	10...200	For all LAUDA heat transfer liquids	RKJ 091
Viton cold insulated	8.5 External Ø approx. 30 mm	-20...150	For all LAUDA heat transfer liquids	LZS 017
Viton cold insulated	11 External Ø approx. 32 mm	-20...150	For all LAUDA heat transfer liquids	LZS 018

#### Note:

- EPDM hose is **not** suitable for Ultra 350 **nor** for mineral oils.
- Never use silicone oil with silicone hoses.
- 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 diam. 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.

Temperatures above 20 °C: Cooling through the water supply. Ensure the lowest possible water consumption.

Temperatures below 20 °C: A LAUDA DLK 10, DLK 25 Through-Flow Cooler can be connected to the pump connections. Build the through-flow cooler into the return line from the consumer to the thermostat.

## 6.6 First switch-on

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

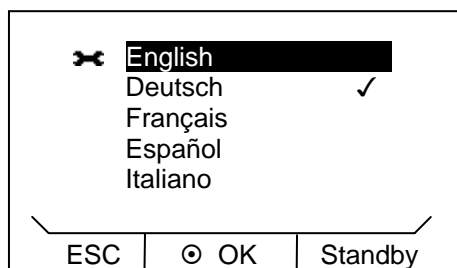
<b>Notice</b>	<b>Use of inadmissible mains voltage or frequency</b>
	<i>Property damage</i>
	<ul style="list-style-type: none"> <li>• Compare the rating label with the available mains voltage and frequency.</li> </ul>

### Note:

- The device mains plug is used as a mains disconnection component. The mains plug must be easily recognizable and easily accessible.
- Only connect the device to a socket with a protective 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 (⇒ 7.4.6).

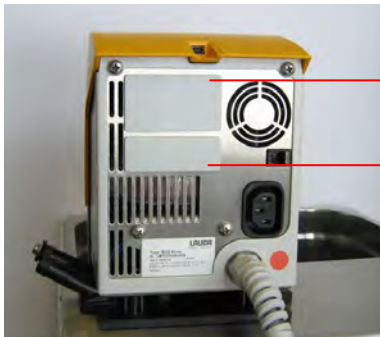
### 6.7 Installation of modules

When installing modules always follow this safety information:



<b>Live parts during module installation</b>
<i>Electric shock hazard</i>
<ul style="list-style-type: none"> <li>• Disconnect the device from the mains before module installation.</li> <li>• Have the installation carried out only by specialists.</li> </ul>

The ECO SILVER 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:



<b>Control head drops into bath</b>
<i>Electric shock hazard</i>
<ul style="list-style-type: none"> <li>• Make sure that the control head mounting is securely joined to the bath.</li> </ul>



<b>Introduction of low-boiling liquid (e.g. water into hot oil), change of liquid properties (reduction of fire point)</b>
<i>Explosion, burns, scalds, fire</i>
<ul style="list-style-type: none"> <li>• Site the device in suitable premises.</li> <li>• Avoid dripping water and condensation.</li> <li>• Do not position any small parts and liquids above the device.</li> <li>• Keep the cover on the thermostat (if present) closed.</li> <li>• Prevent the ingress of secondary liquids (e.g. from customer's heat exchanger).</li> <li>• Do not work with liquids in the direct vicinity of the device.</li> <li>• Check the heat transfer liquid at least every six months (e.g. mixing ratio with a hydrometer).</li> </ul>



<b>Skin contact with heat transfer liquid or hot / cold surfaces</b>
<i>Burns, scalds, frost bite, impacts, cuts, snagging</i>
<ul style="list-style-type: none"> <li>• Only operate the device with its housing.</li> <li>• Avoid splashes and hand contact with hot or cold heat transfer liquid.</li> <li>• Use CE gloves, protective clothing and eye protection.</li> <li>• Affix the symbol "Hot surface".</li> <li>• Do not touch the connecting and drainage points in the operating state.</li> </ul>



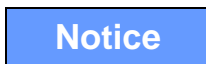
<b>Contact with vapors from the heat transfer liquid</b>
<i>Harmful by inhalation</i>
<ul style="list-style-type: none"> <li>• Use an extractor hood.</li> <li>• If possible, use a bath cover.</li> </ul>



<b>Bath overflow due to thermal expansion or immersion of objects</b>
<i>Burns, scalds, frostbite</i>
<ul style="list-style-type: none"> <li>• Take the volume of external consumers into account.</li> <li>• Take into account the increase in volume with a rise in temperature.</li> </ul>



<b>Hot vapor formation / discharge of boiling cooling-water on the cooling coil</b>
<i>Burns, scalds</i>
<ul style="list-style-type: none"> <li>• Filling of cooling coil with cooling water only admissible up to <math>T_{max}</math> of 100 °C!</li> </ul>



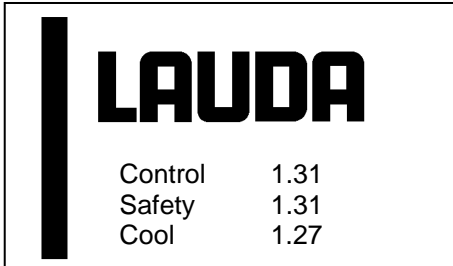
<b>Inadmissible operating temperatures; temperature difference between outflow and product too large</b>
<i>Property damage (consumers, external components)</i>
<ul style="list-style-type: none"> <li>• Note that an externally controlled bath temperature, especially during a transient response, may differ substantially from the set-point temperature.</li> <li>• Note the various limitation options (<math>T_{ih}</math>, <math>T_{il}</math>, <math>T_{max}</math>, correction limitation).</li> <li>• Set the overtemperature switch-off point <math>T_{max}</math> according to the heat transfer liquid (at least 25 K below the fire point/boiling point).</li> </ul>

7.1 Switching on



1 s

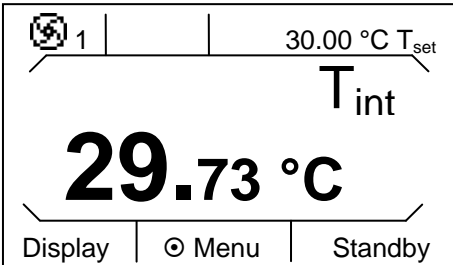
- Switch on the device with the mains switch at the front. An acoustic signal sounds.



According to the adjacent display the software version numbers (depends on device type and options) appear for approx. 5 seconds.

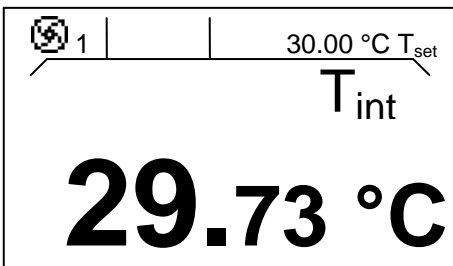
When making technical enquiries, please have the version numbers and device serial number (⇒ 8.2.5) at hand.

Further installed modules are displayed in **Settings** → **Device Status** → **Software version**.



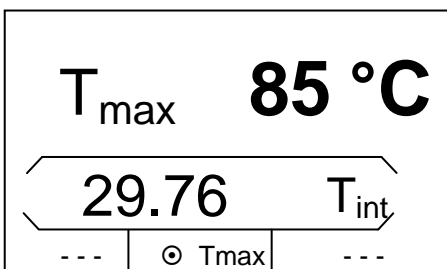
The current bath temperature ( $T_{int}$ ), pump level as well as the pump symbol, the set-point temperature  $T_{set}$  and the soft-key bar at the bottom edge of the display appear.

For the optimum use of the display representation, the soft-key bar disappears if no key has been pressed for at least ten seconds. The representation can be reactivated by pressing any key.



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

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



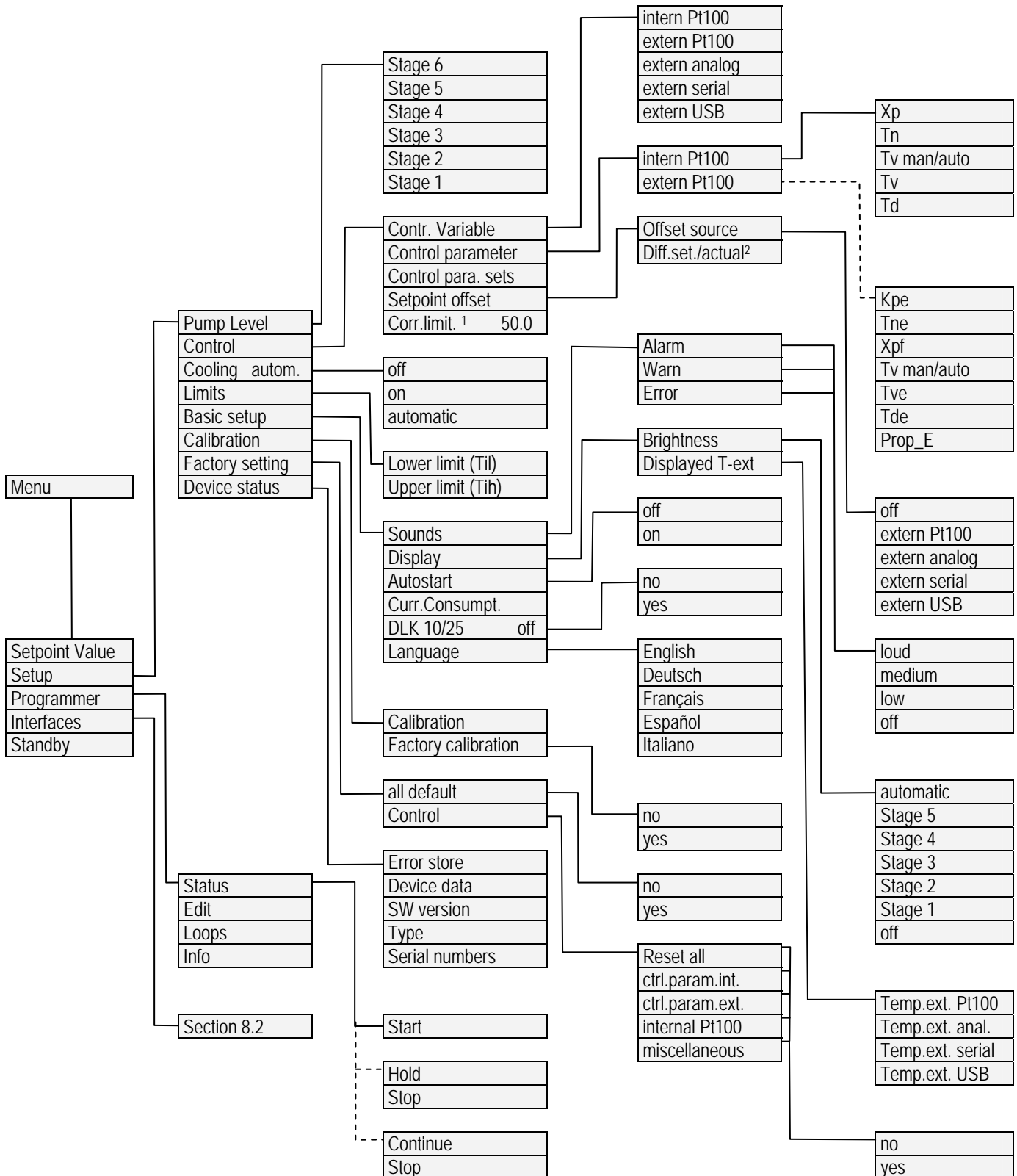
With the key  $T_{max}$  you check or change the overtemperature switch-off point:

- 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 SILVER control head:



<sup>1</sup> Correcting quantity limit

<sup>2</sup> Difference setpoint/actual value

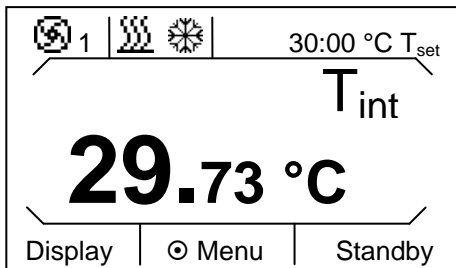


### 7.3 Display representation

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

Basic window in the **normal display**



The following information is displayed depending on the operating status:



Pump runs with displayed pump level;



Heater is active;



Chiller is active;

T<sub>set</sub> ;

Set-point temperature;

T<sub>int</sub>

Current bath temperature;

T<sub>ext</sub>

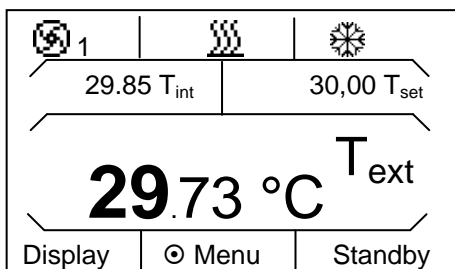
Temperature of the external application (if external temperature sensor is connected);

Display;  
 ◉ menu,  
 standby.

Soft-key bar; function call via associated keys;

Apart from the normal display of the basic window, there is another display. This includes in addition a further status display. With the soft-key bar activated changeover between the two display representations is obtained by pressing the left soft key. With both displays the soft-key bar disappears if no key has been pressed for at least ten seconds. The display of it can be reactivated by pressing any key.

Basic window in the **expanded display**



The following information is displayed depending on the operating status:



Pump runs with displayed pump level;



Heater is active;



Chiller is active;

T<sub>int</sub>

Current bath temperature;

T<sub>set</sub>

Set-point temperature;

T<sub>ext</sub>

Temperature of the external application (if external temperature sensor is connected);





Display,  
 ◉ Menu,  
 Standby

Soft-key bar; function call via associated keys;

With a connected external sensor and its selection as the control variable, the basic window with the expanded status display is always active.

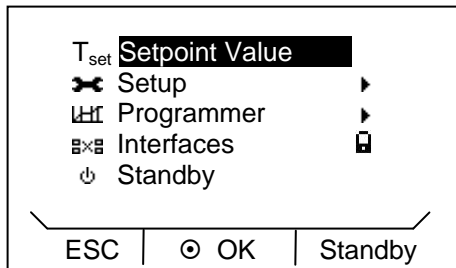
### 7.3.2 Menu window

The menu of the ECO SILVER thermostats consists of several menu levels. With the cursor keys ▲, ▼, ◀, ▶ you can call the individual menu points and select them with the enter key ●.

	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. (Possible reasons: No access rights or function deactivated by parameter settings).

Examples of display representation:

#### Main menu

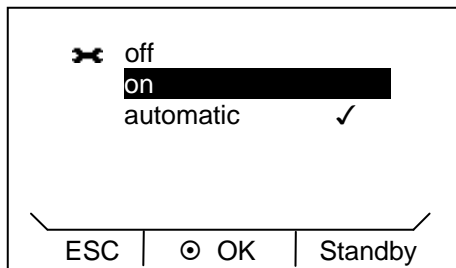


In the main menu selected menu points are displayed inversely.

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 ▶).
- Standby ▶ Standby is activated. If **Standby** is inversely highlighted, standby is active. If not, the device is in operation.

#### Submenu "Cooling"



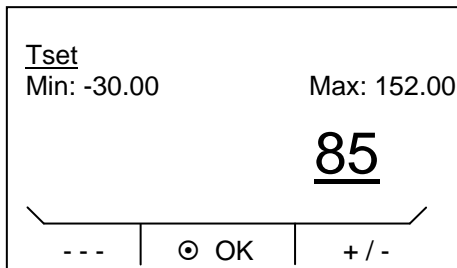
The following information is displayed in this window example:

- 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  $T_{set}$ ).

Min. and Max. 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  $\blacktriangle$  or  $\blacktriangledown$ . If you keep one of the two cursor keys pressed longer, input is speeded up.

By pressing  $\blacktriangleleft$  or  $\blacktriangleright$  you can also select numbers individually and change them with  $\blacktriangle$  or  $\blacktriangledown$ .

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

The enter key  $\bullet$  takes over the set value.

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

## 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 ( $\Rightarrow$  Other settings).

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

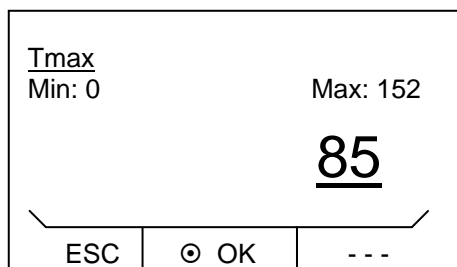


#### Overheating due to entering an incorrect $T_{max}$ and set-point temperature

*Burns, scalds, fire*

- Set  $T_{max}$  in each case according to the heat transfer liquid used (at least 25 K below fire point).

Hold the key  $\bullet_{max}$  pressed during the complete setting procedure:



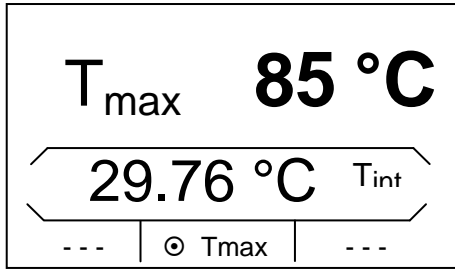
- Press the enter key  $\bullet$ .


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  $\blacktriangle$  or  $\blacktriangledown$ .

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

- Single figures can be selected by pressing  $\blacktriangleleft$  or  $\blacktriangleright$ .



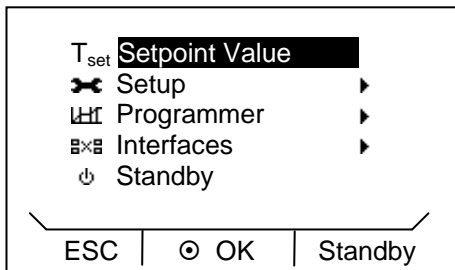
- Confirm your choice with the enter key .



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

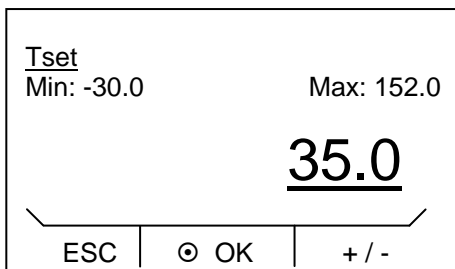
For T<sub>max</sub> the following applies: 5 K above desired bath temperature, but at least 25 K below the fire point of the heat transfer liquid used.

### 7.4.2 Setting the temperature set-point value







- You activate the soft-key bar by pressing any key.



- Access to the main menu level is obtained by pressing the enter key .
- Select the menu point highlighted in color **Setpoint Value** using the enter key .



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

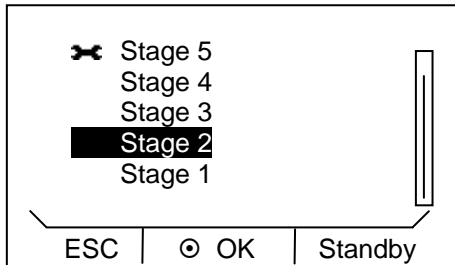
- Change the value with  or .
- Single figures can be selected by pressing  or .
- By pressing  (+/-), with appropriate equipment, the arithmetic sign can be changed.
- Confirm your choice with the enter key .

- 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 and the mechanical heat input. With small thermostats (e.g. E 4 S, RE 415 S, RE 420 S) without an external consumer power levels 1 to 3 are practicable and sufficient.

- You activate the soft-key bar by pressing any key.



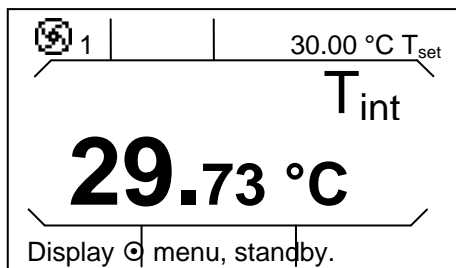
- Access to the main menu level is obtained by pressing the enter key **⏏**.
- The adjacent menu window appears by selecting and confirming → **Setup** → **Pump level**.
- The level can be selected with **▼** or **▲**. The selected level is immediately active without confirmation (in this example it is **Stage 2**).

- 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.

- You activate the soft-key bar by pressing any key.



There are two ways of selecting the standby mode:

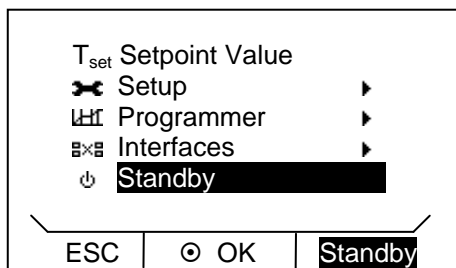
- 1. Activate "Standby" by pressing **▶** (right soft key).

- 2. Access to the main menu level is obtained by pressing the enter key **⏏**.

- Select "Standby" with **▲** or **▼** and confirm with **⏏**.

If "Standby" is active, it is highlighted in color in the soft-key bar: **Standby**.

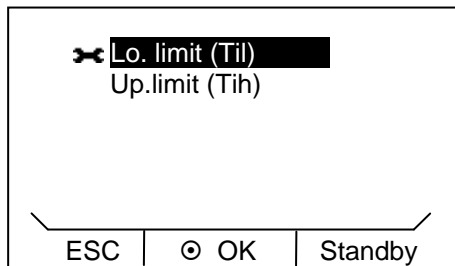
**Note:** By pressing the enter key **⏏** again you return to the active operating state.



### 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.

- You activate the soft-key bar by pressing any key.

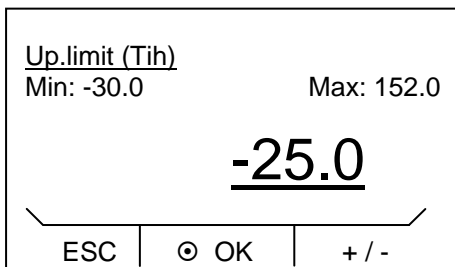


- Access to the main menu level is obtained by pressing the enter key **⏏**.

- 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.

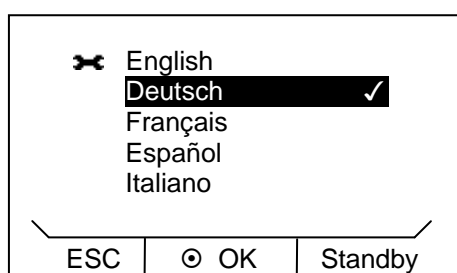
- Confirm your choice with the enter key **⏏**.

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

### 7.4.6 Selecting the menu language

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

- You activate the soft-key bar by pressing any key.



- 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

<b>Alarms:</b>	Alarms are relevant to safety. Pump, heating and chiller switch off.
<b>Warnings:</b>	Warnings are normally not relevant to safety. The device continues to run.
<b>Errors:</b>	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 (⇒ 8.6) 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 (⇒ B).

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




<b>Overheating due to entering an incorrect <math>T_{max}</math> and set-point temperature</b>
<i>Burns, scalds, fire</i>
<ul style="list-style-type: none"> <li>• Set <math>T_{max}</math> in each case according to the heat transfer liquid used (at least 25 K below fire point).</li> </ul>

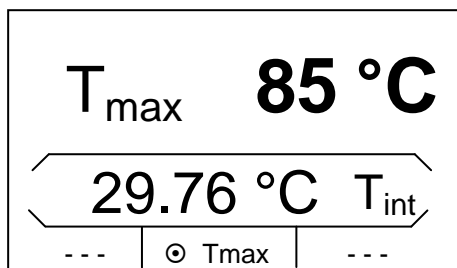
**Note:** The devices are rated for operation with flammable and non-flammable liquids according to DIN EN 61010-1 and DIN EN 61010-2-010.

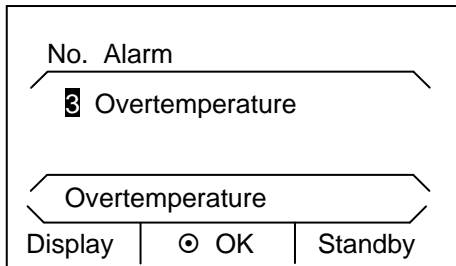
Set the overtemperature switch-off point as described in (⇒ 7.4.1). Recommended setting: 5 K above the desired maximum bath temperature (Remark: The overtemperature switch-off point  $T_{max}$  is controlled by a system which operates independently of the bath control).

Set the overtemperature switch-off point maximum 25 K below the fire point of the heat transfer liquid being used (⇒ 6.4, example:  $T_{max}$  Kryo 51 = 135 °C).



- The set overtemperature switch-off point is displayed on pressing  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 ●.

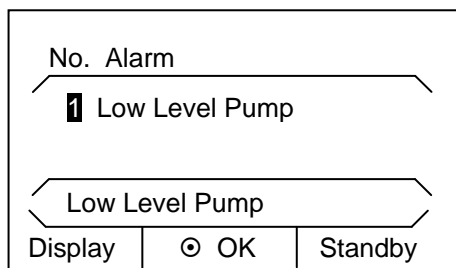
Before a longer unsupervised operation **check the overtemperature protection:**

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

An alarm message (step 1-2, see above) should follow.

- 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.

An alarm message (step 1-2, see above) should follow.

- 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.

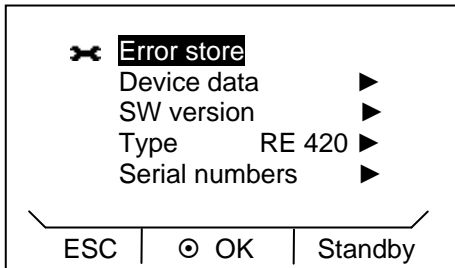
Contact LAUDA Service Constant Temperature Equipment (⇒ 8.7) or your local service.




## 8.2 Device status

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

- You activate the soft-key bar by pressing any key.



- 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.

No.	Source	Code	Type
11	Control	1	Alarm
10	Safety	53	Error
9	Safety	53	Error
Low Level Pump			

ESC | OK | Standby


- **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 (⇒ B).

### 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

✂	<b>Control</b>	<b>1.31.00</b>
	Safety	1.31
	Cool	1.27
	Ext Pt	1.21
	Analog	3.01
<hr/>		
ESC	⊙ OK	Standby

#### 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 "S" (SILVER) is shown in the menu.

#### 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 SILVER thermostat with a stainless steel bath  $T_{max} = 152\text{ °C}$ , for the ECO SILVER thermostat with transparent bath  $T_{max} = 102\text{ °C}$ .

Following this,  $T_{max}$  must be re-entered manually ( $\Rightarrow$  7.4.1), because otherwise the device goes into the error status (error message in ECO SILVER: "T max diff. C to S").

### 8.2.5 Displaying serial numbers

✂	<b>Control</b>	
		LCK1913-09-0002
	Cool	
		KTExy-08-9876
	Ext Pt	
<hr/>		
ESC	⊙ OK	Standby

#### 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.



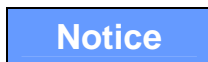
<b>Critical temperature of device parts, heat transfer liquid or accessories (hoses)</b>
<i>Burns, scalds, frostbite</i>
<ul style="list-style-type: none"> <li>• Bring the device parts, accessories and heat transfer liquid to room temperature before touching them.</li> <li>• Have repairs carried out only by a specialist.</li> <li>• Affix the symbol "Hot surface".</li> </ul>

#### 8.3.1 Cleaning



<b>Live parts in contact with cleaning agents</b>
<i>Electric shock hazard</i>
<ul style="list-style-type: none"> <li>• Disconnect the device from the mains before cleaning.</li> </ul>

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.



<b>Live parts in contact with cleaning agents</b>
<i>Property damage</i>
<ul style="list-style-type: none"> <li>• Disconnect the device from the mains before cleaning.</li> <li>• Water and other liquids must not enter the control head.</li> </ul>

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 it must be ensured that decontamination of the device is carried out if it has been in contact with hazardous materials.

### 8.3.2 Servicing intervals to VDI 3033

Device part	Mandatory for initial operation and before any longer unsupervised operation, then with recommended frequency	Section	Remarks
<b>Complete device</b>			
External condition of device	Monthly		
<b>Heat transfer liquid</b>			
Inspecting the heat transfer liquid	Every six months	(⇒ 8.3.3)	
<b>Bath vessel with drain tap</b>			
Sealing	Daily		External inspection
<b>External hoses</b>			
Material fatigue	Monthly		External inspection
<b>Chiller</b>			
Clean the air-cooled condenser	Monthly	(⇒ 8.3.4.1)	Cooling thermostat
Clean the plug-in sieve	Monthly	(⇒ 8.3.4.2)	Cooling thermostat, water-cooled
Decalcifying the cooling water circuit	Quarterly	(⇒ 8.3.4.2)	Cooling thermostat, water-cooled
<b>Electronics</b>			
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

If the heat transfer liquid becomes contaminated or degenerated, it should 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.



Critical temperature of the heat transfer liquid
<i>Scalds, frostbite</i>
<ul style="list-style-type: none"> <li>Bring the heat transfer liquid to room temperature for the analysis.</li> </ul>

**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) (⇒ 8.3.2).
- 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:**



<b>Contact with sharp-edged vanes on the condenser during cleaning</b>
<i>Cuts</i>
<ul style="list-style-type: none"> <li>• Clean the condenser with suitable tools (e.g. hand brushes, compressed air...).</li> </ul>

**8.3.4.2 Water-cooled condenser**

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

**Cleaning the plug-in sieve**

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

- Remove the water supply hose from the device.
- Unscrew the fitting from the device with a 17 AF open-ended wrench and remove the plug-in sieve from the fitting.
- Clean the plug-in sieve and then insert in back into the fitting.
- Mount the fitting and the water supply hose onto the device.



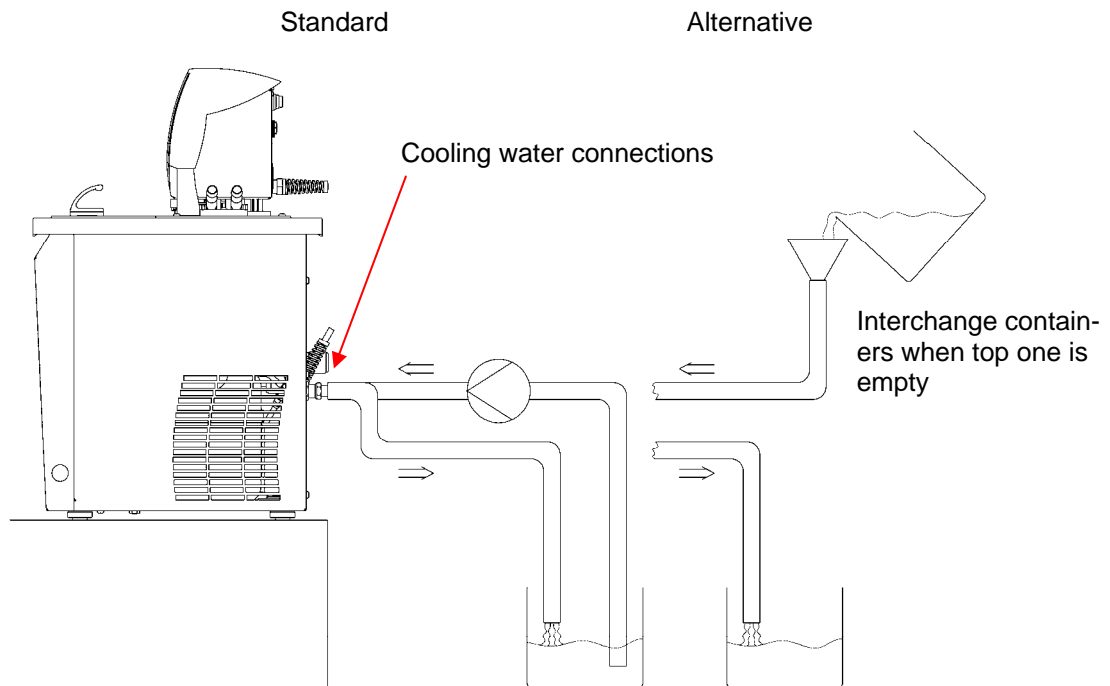
### Decalcifying the cooling water circuit

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 take effect (refer to table below). Drain the unit. Reconnect the device to the water supply and thoroughly flush out (refer to table below).

Acting time	Continue the pump stage until most of the foamy reaction, usually at the start, has decayed. Generally, this is achieved after about 20 to 30 minutes.
Decalcifier	LAUDA article number: LZB 126 (5 kg) 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:



<b>Live parts when fault finding</b>
<i>Electric shock hazard</i>
<ul style="list-style-type: none"> <li>• Disconnect the device from the mains before the repair (e.g. when changing components).</li> <li>• Have the repair carried out only by a specialist.</li> </ul>



<b>Rotating / live parts when removing the ventilator fan</b>
<i>Cuts, crushing, electric shock hazard</i>
<ul style="list-style-type: none"> <li>• Disconnect the device from the mains before the repair.</li> <li>• Have the repair carried out only by a specialist.</li> </ul>



<b>Uncontrolled start-up on release of jammed pump</b>
<i>Crushing, electric shock hazard</i>
<ul style="list-style-type: none"> <li>• Disconnect the device from the mains before the repair.</li> <li>• Have the repair carried out only by a specialist.</li> </ul>



<b>Critical temperature of device parts, heat transfer liquid or accessories (hoses)</b>
<i>Burns, scalds, frostbite</i>
<ul style="list-style-type: none"> <li>• Bring the device parts, accessories and heat transfer liquid to room temperature before touching them.</li> <li>• Have repairs carried out only by a specialist.</li> <li>• Affix the symbol "Hot surface".</li> </ul>

Fault	Possible remedy
Device does not cool	Dirty condenser → Clean condenser (⇒ 8.3.4). 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 to Europe: Disposal of the device may only be carried out by qualified specialists according to EC Directive 303/2008/EC in conjunction with 842/2006/EC.

The disposal is regulated by EC Directive 2002/96/EC.

#### 8.5.1 Disposal of the refrigerant

The refrigerant circuit is filled with a CFC-free HFC refrigerant. The type and amount used are stated on the rating label. Repair and disposal are only to be carried out by specialists.

The Global Warming Potentials (GWP) [cf. CO <sub>2</sub> = 1.0]	
Refrigerant	GWP <sub>(100a)</sub> *
R134a / HFKW-134a	1.300
R404A / HFKW-404A	3.784

\* Time horizon 100 years – according to IPCC II (1996) → Basis for Kyoto Protocol.

The following applies to Europe: The disposal of the refrigerant must be carried out according to EC Directive 303/2008/EC in conjunction with 842/2006/EC.

#### 8.5.2 Disposal of the packaging

The following applies to Europe: The disposal of the packaging must be carried out 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:



<b>Contact with hot / cold heat transfer liquid</b>
<i>Scalds, frostbite</i>
<ul style="list-style-type: none"> <li>• Bring the heat transfer liquid to room temperature before draining.</li> <li>• Drain the device and any accessories (e.g. hoses) before packing thoroughly.</li> </ul>



<b>Skin contact with hot / cold surfaces</b>
<i>Burns, frostbite</i>
<ul style="list-style-type: none"> <li>• Bring the surfaces to room temperature before touching them.</li> </ul>



<b>Uncontrolled escape of refrigerant / explosion</b>
<i>Crushing, impacts, cuts</i>
<ul style="list-style-type: none"> <li>• No disposal with cooling circuit under pressure.</li> <li>• Only a specialist is permitted to take the device out of service.</li> </ul>



<b>Falling / toppling equipment</b>
<i>Crushing of hands and feet, impacts</i>
<ul style="list-style-type: none"> <li>• Use the handles (grip heating thermostats underneath the device).</li> </ul>

## 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.

The serial number is composed as follows,  
e.g. **LCK1910-10-0001**

LCK1910 = Catalogue number  
11 = Year of manufacture 2011  
0001 = Incremental numeration

Your contact for maintenance and expert service support.



### **LAUDA Service Constant Temperature Equipment**

Phone: +49 9343/ 503-236 (English and German)

Fax: +49 9343/ 503-283

e-mail [service@lauda.de](mailto:service@lauda.de)

We are available at any time for queries and ideas!

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**Germany**

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e-mail [info@lauda.de](mailto:info@lauda.de)

Internet <http://www.lauda.de>

## 9 Accessories

Please take catalogue numbers for accessories from the following table.

- Immersion thermostats
- Heating thermostats
- Cooling thermostats
- For all devices

### Immersion thermostat

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

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

### Heating thermostats

Accessories	Suitable for	Catalogue number
Pump connection set (outflow and return nozzles) with fitting 13 mm (plastic)	All heating thermostats	<b>LCZ 0716</b>
Pump connection set (outflow and return nozzles) with thread M16 x 1 (stainless steel)	All heating thermostats	<b>LCZ 0717</b>
Bath cover in stainless steel	E 10 S, E 15 S	<b>HDQ 133</b>
Bath cover in stainless steel	E 20 S, E 25 S	<b>HDQ 134</b>
Bath cover in stainless steel (three-part)	E 40 S	<b>LCZ 0718</b>
Cooling coil set for ET 15	ET 15 S	<b>LCZ 0719</b>

### Cooling thermostats

Accessories	Suitable for	Catalogue number
Pump connection set (outflow and return nozzles) with thread M16 x 1 (stainless steel)	All cooling thermostats	<b>LCZ 0717</b>

### For all devices

Accessories	Catalogue number
<b>Upper module receptacle approx. 57 mm x 27 mm</b>	
Analog module	<b>LRZ 912</b>
RS 232/485 interface module	<b>LRZ 913</b>
Contact module with 1 input and 1 output	<b>LRZ 914</b>
Contact module with 3 inputs and 3 outputs	<b>LRZ 915</b>
Profibus module	<b>LRZ 917</b>
<b>Upper module receptacle approx. 57 mm x 17 mm</b>	
External Pt100/LiBus module	<b>LRZ 918</b>
Remote control unit Command*	<b>LRT 914</b>

\* 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 SILVER 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
Temperature measurement		
Absolute accuracy	K	±0.3 K and ±0.5 % of the relative measurement
Temperature stability	K	± 0.01
Pump type/number of power levels		Pressure pump/6
Discharge pressure, max.	bar	0.55
Discharge flow, max.	L/min	22
Viscosities of the heat carrier liquid	mm <sup>2</sup> /s	Heating range: maximum 150; Control range: ≤ 30
Display field		LCD display 3.0"; 128 x 64 pixel
Programmer		One program with a total of 20 temperature/time segments (⇒ D)
Standard interface		USB
Class of protection		IP 21
Classification		III
Labeling		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 SILVER			
		230 V	220 V	115 V	100 V
Working temperature range ①	°C	20...150			
Working temperature range with water cooling	°C	20...150			
Operating temperature range ②	°C	-20...150			
Heater rating / power consumption	kW	1.3/1.4	1.2/1.3	1.3/1.4	1/1.1
Heater surface loading	W/cm <sup>2</sup>	6.8	6.2	6.8	5.1
Bath depth	mm	At least 150			
Overall dimensions (W x D x H)	mm	130 x 135 x 325			
Weight	kg	3.0	3.0	3.0	3.0
<b>Mains connection</b>		<b>Catalogue number</b>			
<b>230 V ±10 %; 50/60 Hz</b>		<b>LCE 0227</b>	---	---	---
<b>220 V ±10 %; 60 Hz</b>		---	<b>LCE 2227</b>	---	---
<b>115 V ±10 %; 60 Hz</b>		---	---	<b>LCE 4227</b>	---
<b>100 V ±10 %; 50/60 Hz</b>		---	---	---	<b>LCE 6227</b>

① at Pump power level 1

② with extraneous cooling

Heating thermostats with stainless steel bath

		E 4 S	E 10 S	E 15 S	E 20 S	E 25 S	E 40 S
Working temperature range ①	°C	20...150					
Working temperature range with water cooling	°C	20...150					
Operating temperature range ②	°C	-20...150					
Temperature accuracy	K	±0,01					
Bath volume	liters	3...3.5	7.5...10	12...16	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 (W x D) with control head	mm	135 x 105	300 x 190	300 x 190	300 x 365	300 x 365	613 x 300
Bath depth	mm	150	150	200	150	200	200
Usable bath depth	mm	130	130	180	130	180	180
Height of bath edge without cover	mm	196	196	246	196	246	248
Overall dimensions (W x D)	mm	168 x 272	331 x 361	331 x 361	331 x 537	331 x 537	350 x 803
Overall height	mm	376	376	426	376	426	428
Weight	kg	6.6	8.6	10.3	11.8	13.1	17.2
Pump connection set Plastic fittings Ø 13 mm		Standard	③ Optional accessory				
<b>230 V; 50/60 Hz</b>							
Heater rating / power consumption	kW	1.3/1.4					
Weight	kg	6.6	8.6	10.3	11.8	13.1	17.2
<b>220 V; 60 Hz</b>							
Heater rating / power consumption	kW	1.2/1.3					
Weight	kg	6.6	8.6	10.3	11.8	13.1	17.2
<b>115 V; 60 Hz</b>							
Heater rating / power consumption	kW	1.3/1.4					
Weight	kg	6.6	8.6	10.3	11.8	13.1	17.2
<b>100 V; 50/60 Hz</b>							
Heater rating / power consumption	kW	1/1.1					
Weight	kg	6.6	8.6	10.3	11.8	13.1	17.2

Mains connection	Catalogue number					
	E 4 S	E 10 S	E 15 S	E 20 S	E 25 S	E 40 S
<b>230 V ±10 %; 50/60 Hz</b>	LCB 0736	LCB 0738	LCB 0740	LCB 0742	LCB 0744	LCB 0746
<b>220 V ±10 %; 60 Hz</b>	LCB 2736	LCB 2738	LCB 2740	LCB 2742	LCB 2744	LCB 2746
<b>115 V ±10 %; 60 Hz</b>	LCB 4736	LCB 4738	LCB 4740	LCB 4742	LCB 4744	LCB 4746
<b>100 V ±10 %; 50/60 Hz</b>	LCB 6736	LCB 6738	LCB 6740	LCB 6742	LCB 6744	LCB 6746

① at Pump power level 1

② with extraneous cooling

③ optional accessories

### Heating thermostats with transparent bath

		ET 6 S	ET 12 S	ET 15 S	ET 20 S
Working temperature range ①	°C	20...100			
Working temperature range with water cooling	°C	20...100			
Operating temperature range ②	°C	-20...100			
Temperature accuracy	K	±0,01			
Bath volume	liters	5...6	9.5...12	13.5...15	15...20
Bath vessels		Polycarbonate			
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 set Plastic fittings Ø 13 mm		③ Optional accessory		Standard	③ Optional accessory
<b>230 V; 50/60 Hz</b>					
Heater rating / power consumption	kW	1.3/1.4			
Weight	kg	4.1	6.4	6.4	7.6
<b>220 V; 60 Hz</b>					
Heater rating / power consumption	kW	1.2/1.3			
Weight	kg	4.1	6.4	6.4	7.6
<b>115 V; 60 Hz</b>					
Heater rating / power consumption	kW	1.3/1.4			
Weight	kg	4.1	6.4	6.4	7.6
<b>100 V; 50/60 Hz</b>					
Heater rating / power consumption	kW	1/1.1			
Weight	kg	4.1	6.4	6.4	7.6

Mains connection	Catalogue number			
	ET 6 S	ET 12 S	ET 15 S	ET 20 S
<b>230 V ±10 %; 50/60 Hz</b>	<b>LCM 0096</b>	<b>LCD 0286</b>	<b>LCD 0288</b>	<b>LCD 0290</b>
<b>220 V ±10 %; 60 Hz</b>	<b>LCM 2096</b>	<b>LCD 2286</b>	<b>LCD 2288</b>	<b>LCD 2290</b>
<b>115 V ±10 %; 60 Hz</b>	<b>LCM 4096</b>	<b>LCD 4286</b>	<b>LCD 4288</b>	<b>LCD 4290</b>
<b>100 V ±10 %; 50/60 Hz</b>	<b>LCM 6096</b>	<b>LCD 6286</b>	<b>LCD 6288</b>	<b>LCD 6290</b>

① for Pump Power Level 1

② with extraneous cooling

③ optional accessories



**Cooling thermostats (1)**

		RE 415 S	RE 415 S	RE 420 S	RE 420 SW	RE 620 S	RE 620 SW	RE 630 S	RE 630 SW
Operating temperature, ACC *	°C	-15...150		-20...150		-20...150		-30...150	
Ambient temperature range	°C	5...40							
Temperature accuracy	K	±0,02							
maximum storage temperature	°C	43 with water-cooled devices the evaporator must be completely drained							
Cooler		Air	Water	Air	Water	Air	Water	Air	Water
Refrigerant		R134a							
Cooling output at 20 °C ambient temperature, 15 °C cooling water temperature, 3 bar cooling water pressure and Pump Level 2	20 °C	W	180	200	200	300			
	10 °C	W	160	180	180	270			
	0 °C	W	120	150	150	240			
	-10 °C	W	80	100	100	190			
	-20 °C	W	30 ①	30	30	100			
	-30 °C	W	<del>30</del>		<del>30</del>		<del>30</del>		20
Bath volume	liters	3.3...4		3.3...4		4.6...5.7		4.6...5.7	
Overall dimensions (W x D)	mm	130 x 105		130 x 105		150 x 130		150 x 130	
Bath depth	mm	160		160		160		160	
Usable depth	mm	140		140		140		140	
Height to top edge of bath	mm	365		374		400		400	
Overall dimensions (W x D)	mm	180 x 350		180 x 396		200 x 430		200 x 430	
Overall height	mm	546		555		581		581	
Sound level (1 m)	dB(A)	50							
Pump Connection Set		Plastic fittings Ø 13 mm							
<b>230 V; 50 Hz</b>									
Heater rating / power consumption	kW	1.3 / 1.5						1.3 / 1.6	
Weight	kg	19.6	20.5	21.6	22.5	23.3	24.3	27.2	28.2
<b>220 V; 60 Hz</b>									
Heater rating / power consumption	kW	1.2 / 1.4						1.2 / 1.5	
Weight	kg	19.6	20.5	21.6	22.5	23.3	24.3	27.2	28.2
<b>115 V; 60 Hz</b>									
Heater rating / power consumption	kW	1.3 / 1.5						1.3 / 1.6	
Weight	kg	19.6	20.5	21.6	22.5	23.3	24.3	27.2	28.2
<b>100 V; 50/60 Hz</b>									
Heater rating / power consumption	kW	1 / 1.2						1 / 1.3	
Weight	kg	19.6	20.5	21.6	22.5	23.3	24.3	27.2	28.2

Mains connection	Catalogue number							
	RE 415 S	RE 415 SW	RE 420 S	RE 420 SW	RE 620 S	RE 620 SW	RE 630 S	RE 630 SW
<b>230 V ±10 %; 50 Hz</b>	LCK 1910	LCK 1924	LCK 1912	LCK 1926	LCK 1914	LCK 1928	LCK 1916	LCK 1930
<b>220 V ±10 %; 60 Hz</b>	LCK 2910	LCK 2924	LCK 2912	LCK 2926	LCK 2914	LCK 2928	LCK 2916	LCK 2930
<b>115 V ±10 %; 60 Hz</b>	LCK 4910	LCK 4924	LCK 4912	LCK 4926	LCK 4914	LCK 4928	LCK 4916	LCK 4930
<b>100 V ±10 %; 50/60 Hz</b>	LCK 6910	LCK 6924	LCK 6912	LCK 6926	LCK 6914	LCK 6928	LCK 6916	LCK 6930

\*ACC range (Active Cooling Control) according to DIN 12876 is the working temperature range for operation with an active refrigerating machine  
 ① bei Badtemperatur tb = -15 °C ②

### Cooling thermostats (2)

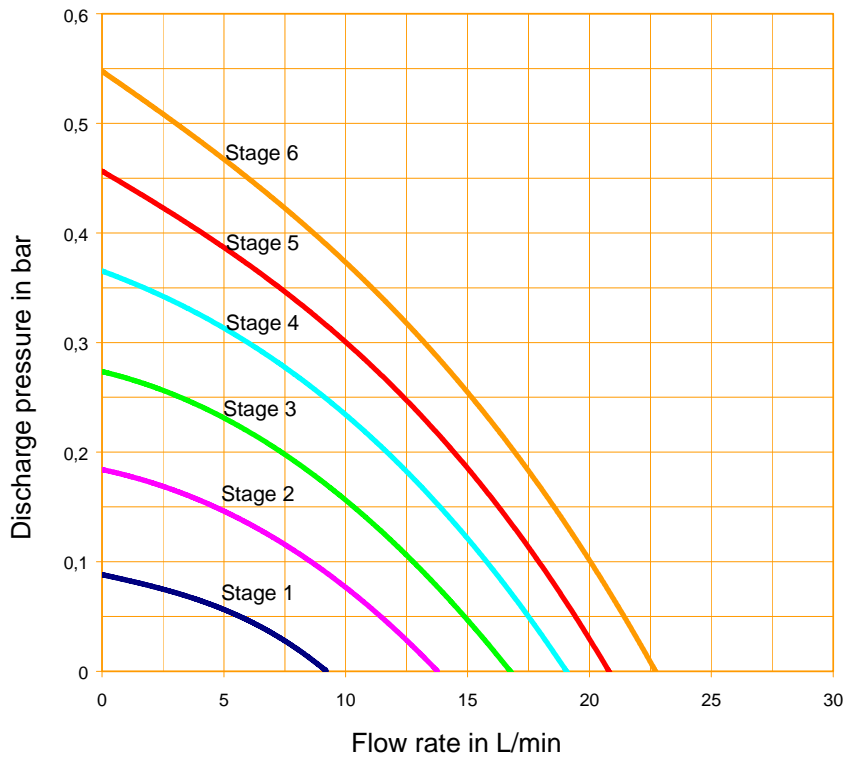
		RE 1225 S	RE 1225 SW	RE 2025 S	RE 2025 SW	RE 1050 S	RE 1050 SW
Operating temperature, ACC *	°C	-25...150		-25...150		-50...150	
Ambient temperature range	°C	5...40					
Temperature accuracy	K	±0,02					
max. storage temperature	°C	43 with water-cooled devices the evaporator must be completely drained					
Cooler		Air	Water	Air	Water	Air	Water
Refrigerant		R134a		R134a		R404A	
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		
	10 °C	W	270	260	660		
	0 °C	W	240	230	600		
	-10 °C	W	180	150	520		
	-20 °C	W	90	60	350		
	-25 °C	W	40	30	---		
	-30 °C	W				190	
	-40 °C	W				100	
					20		
Bath volume	liters	9.3...12		14...20		8...10	
Overall dimensions (W x D)	mm	200 x 200		300 x 350		200 x 200	
Bath depth	mm	200		160		160	
Usable depth	mm	180		140		140	
Height to top edge of bath	mm	443		443		443	
Overall dimensions (W x D)	mm	180 x 396		200 x 430		200 x 430	
Overall height	mm	624		624		624	
Sound level (1 m)	dB(A)	50		50		52	
Pump Connection Set		Plastic fittings Ø 13 mm					
230 V; 50 Hz							
Heater rating / power consumption	kW	1.3 / 1.6				1.3 / 2	
Weight	kg	30	31.2	37	38.4	34.6	35.6
220 V; 60 Hz							
Heater rating / power consumption	kW	1.2 / 1.5				1.2 / 1.9	
Weight	kg	30	31.2	37	38.4	34.6	35.6
115 V; 60 Hz							
Heater rating / power consumption	kW	1.3 / 1.6				1.3 / 2	
Weight	kg	30	31.2	37	38.4	34.6	35.6
100 V; 50/60 Hz							
Heater rating / power consumption	kW	1 / 1.3				1 / 1.7	
Weight	kg	30	31.2	37	38.4	34.6	35.6

Mains connection	Catalogue number					
	RE 1225 S	RE 1225 SW	RE 2025 S	RE 2025 SW	RE 1050 S	RE 1050 SW
<b>230 V <math>\pm</math>10 %; 50 Hz</b>	LCK 1920	LCK 1934	LCK 1922	LCK 1936	LCK 1918	LCK 1932
<b>220 V <math>\pm</math>10 %; 60 Hz</b>	LCK 2920	LCK 2934	LCK 2922	LCK 2936	LCK 2918	LCK 2932
<b>115 V <math>\pm</math>10 %; 60 Hz</b>	LCK 4920	LCK 4934	LCK 4922	LCK 4936	LCK 4918	LCK 4932
<b>100 V <math>\pm</math>10 %; 50/60 Hz</b>	LCK 6920	LCK 6934	LCK 6922	LCK 6936	LCK 6918	LCK 6932

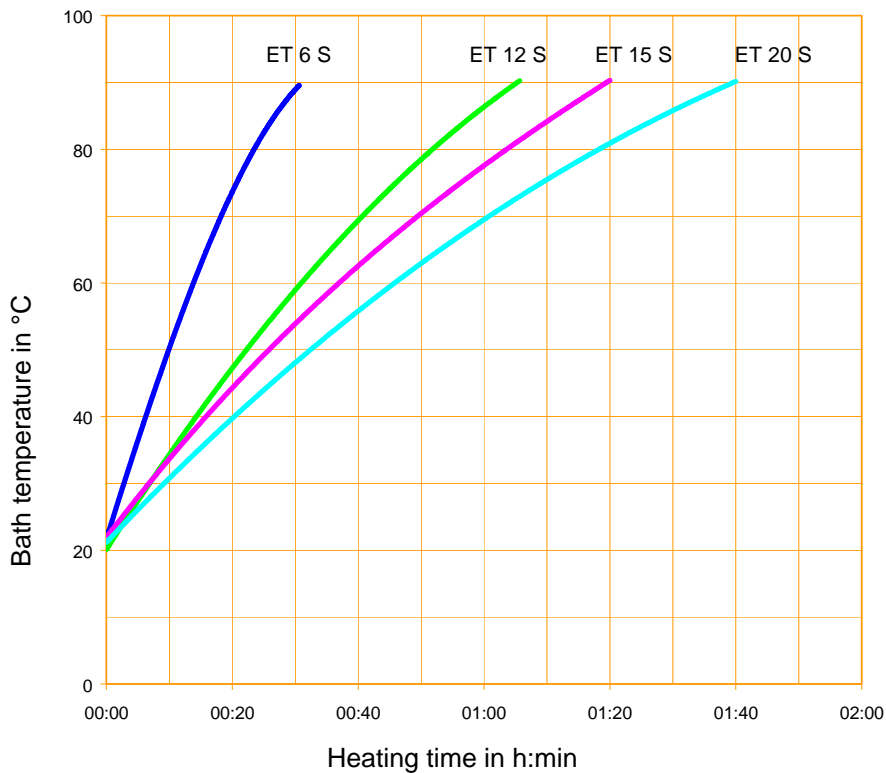
\*ACC range (Active Cooling Control) according to DIN 12876 is the working temperature range for operation with an active chiller

Technical modifications reserved

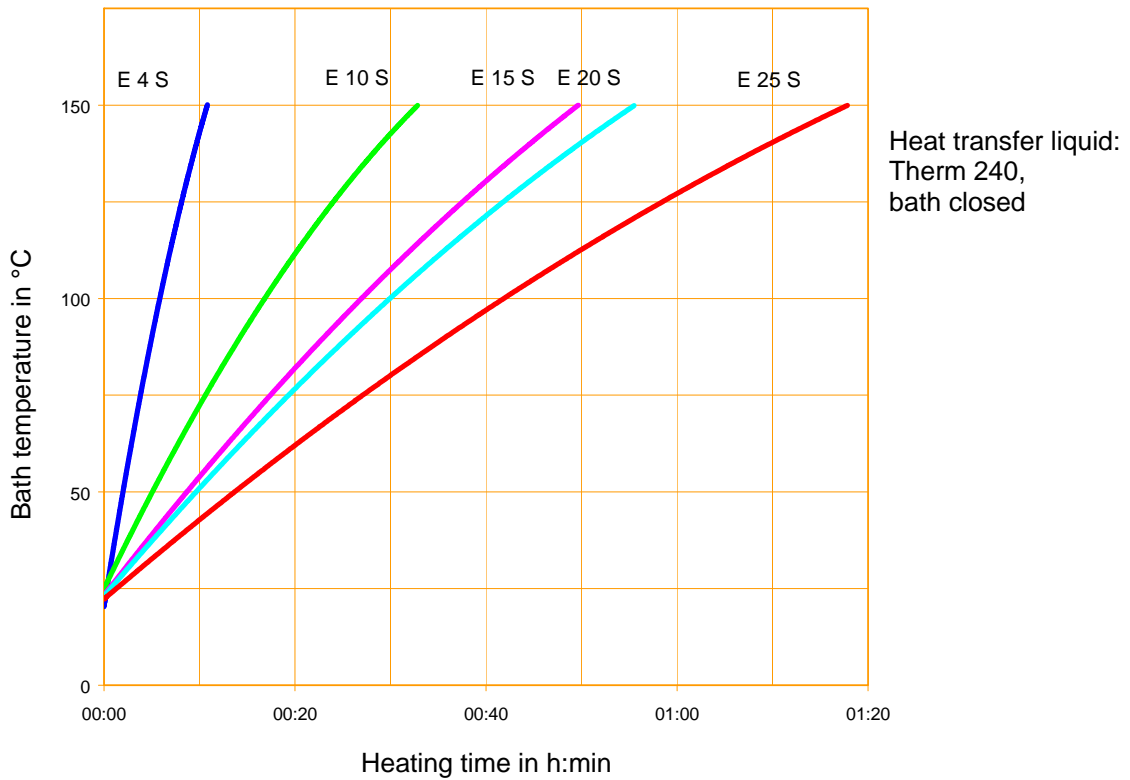
### Pump characteristic ECO SILVER



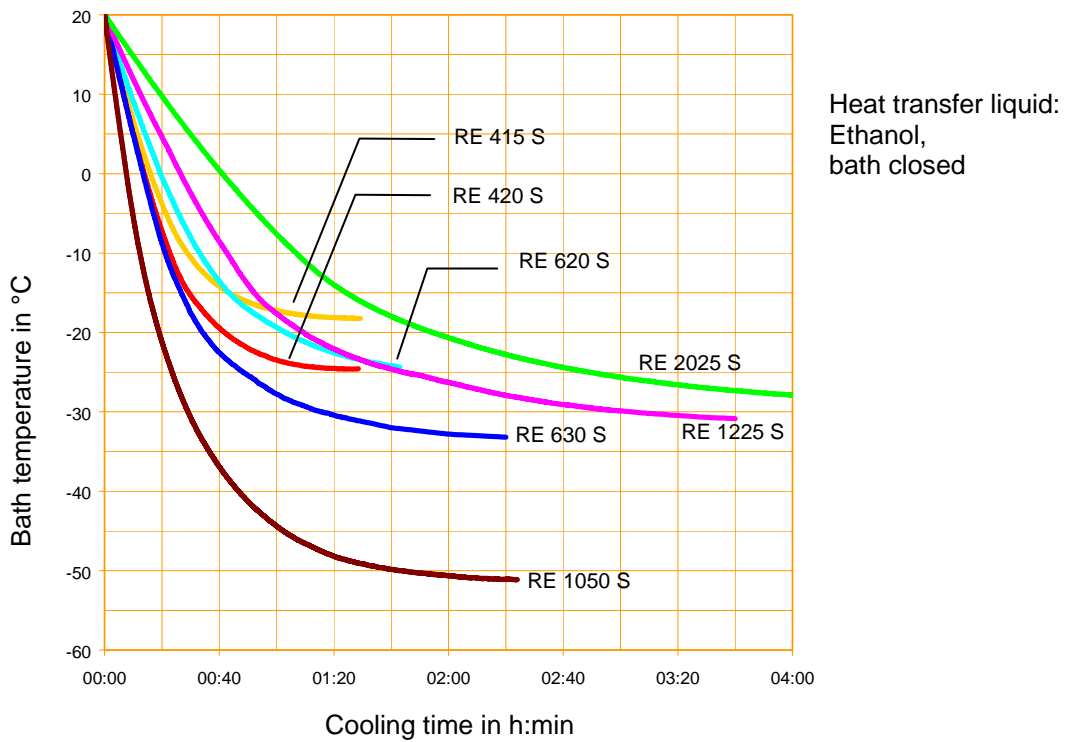
### Heating curve for ECO SILVER heating thermostats with transparent bath



Heating curve for ECO SILVER heating thermostats with stainless steel bath



Cooling curves for ECO SILVER cooling thermostats



### 11 Index

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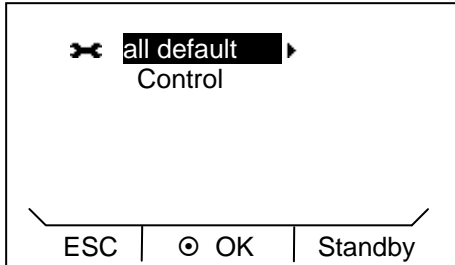
## Appendix with settings

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

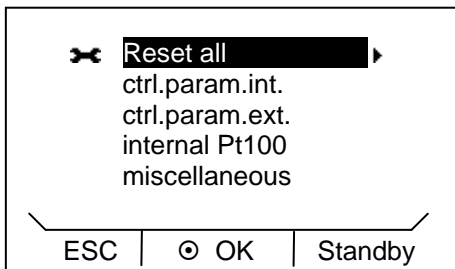
## A Other settings

### A.1 Resetting to factory settings

- You activate the soft-key bar by pressing any key.



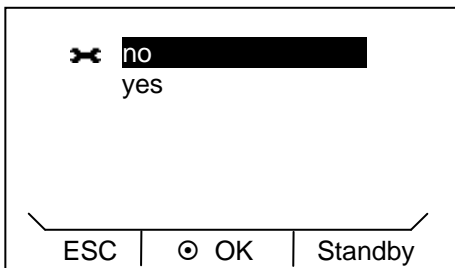
- Access to the main menu level is obtained by pressing the enter key **⏏**.
- Selection and confirmation of → **Setup** → **Factory Setting**. The adjacent menu window appears.
- If **all default**, you can choose between "no" and "yes".
- With **no** you return to the "Factory Setting" menu level without changes being made. With **yes** all settings are reset.



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

The parameters can be reset individually.

With "miscellaneous" the following can be reset: set value, pump level, max. current consumption, control to internal and autostart to "auto".



For all menu points under "Control" you can choose between "no" and "yes".

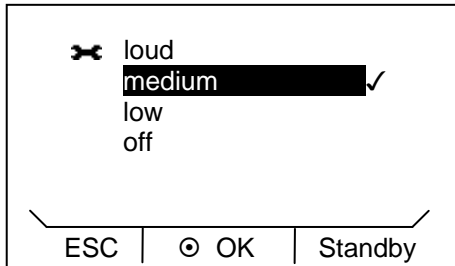
- With **▲** or **▼** select "yes" to reset the respective parameter.
- If "no" is selected, the parameters remains unchanged.

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

## A.2 Setting the volume of the acoustic signals

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

- You activate the soft-key bar by pressing any key.



- 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.

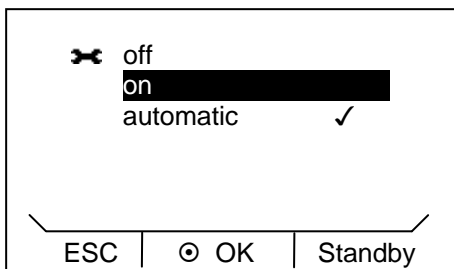
- The volume is selected with **▼** or **▲**. The selected level is immediately active without confirmation. (In this example the volume is **medium**)

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

## A.3 Setting the chiller

The chiller of the cooling thermostats is normally operated in the "automatic" operating mode. 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.

- You activate the soft-key bar by pressing any key.



- Access to the main menu level is obtained by pressing the enter key **⏏**.

- Selection and confirmation of → **Setup** → **Cooling**.

The adjacent menu window appears.

- 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 **✓**.

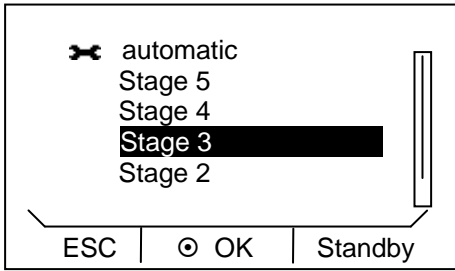
- By pressing **◀** or **▶** (ESC) you are returned to the menu level without any change.

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

### A.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.

- You activate the soft-key bar by pressing any key.



- 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.

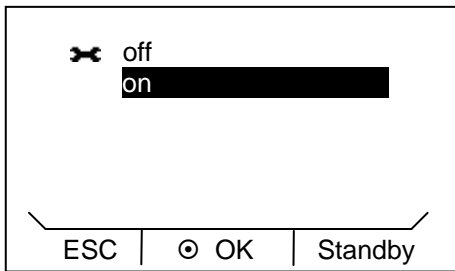
- Select "automatic", "level" or "off" with ▼ or ▲. The selected level is immediately active without confirmation.

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

### A.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.

- You activate the soft-key bar by pressing any key.



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

The adjacent menu window appears.

- Select the operating status "off" or "on" with ▲ or ▼ and confirm with ●.

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

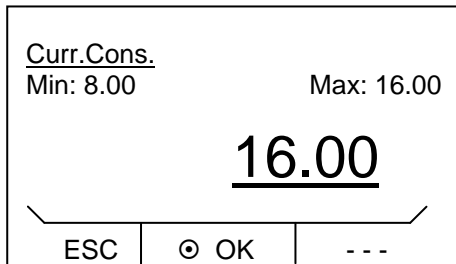
With the setting "on" the device continues running straight after the mains interruption.

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

## A.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.

- You activate the soft-key bar by pressing any key.



- Access to the main menu level is obtained by pressing the enter key **⏏**.
- Selection and confirmation of → **Setup** → **Basic setup** → **Curr.Consumpt.**.

The entry window appears.

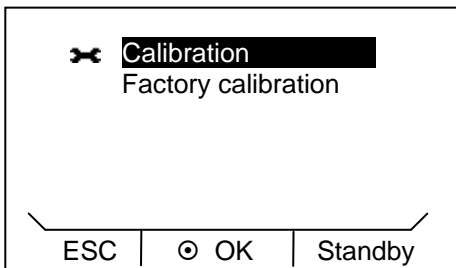
- Change the value with **▲** or **▼**.
- Single figures can be selected by pressing **◀** or **▶**.
- Confirm the input with the enter key **⏏**.

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

## A.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.

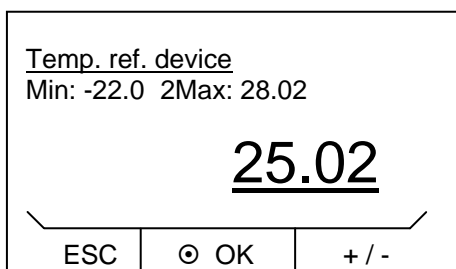
- You activate the soft-key bar by pressing any key.



- 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.

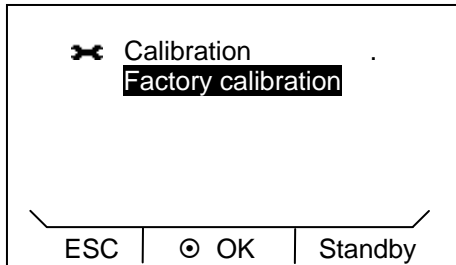
- Change the value with **▲** or **▼**.
- Single figures can be selected by pressing **◀** or **▶**.
- By pressing **➡** (+/-) the arithmetic sign can be changed.
- You confirm the set value by pressing **⏏**.

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

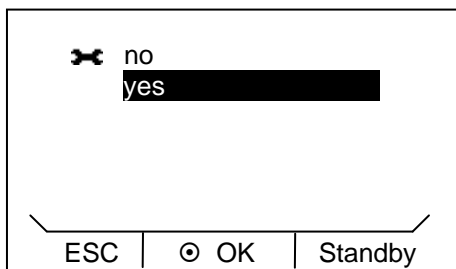
**A.8 Restoring the factory setting of the internal temperature sensor (factory calibration)**

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

- You activate the soft-key bar by pressing any key.



- Access to the main menu level is obtained by pressing the enter key **OK**.
- Selection and confirmation of → **Setup** → **Calibration**. The adjacent menu window appears.
- Select and confirm factory calibration with **▲** or **▼** and **OK**.



- The adjacent menu window appears.
- Select "yes" using **▲** or **▼** and confirm with **OK** to restore the factory settings.

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

## B 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 lmit active	3	adaption missing	No adaption run
4	T_ih limit active	tih lmit 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 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 RS232 too old	15	SW serial too old	Software version of RS232 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
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
			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 RS232 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 RS232 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 (RS232/485)	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 RS232 too old	15	SW serial too old	Software version of RS232 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	Code	7, 8, 9, 10, 11, 16XX Solenoid valve	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	3	No cooling liquid	No cooling liquid present (HTC)
10	SW Contr. too old	Software version of control panel too old	6	no unfill liquid too hot	No draining, because bath temperature is too hot (HTC)
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 Contr. 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 RS232 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 RS232 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
27	SW Ext Pt100 old	Software version of external Pt100 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 RS232 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

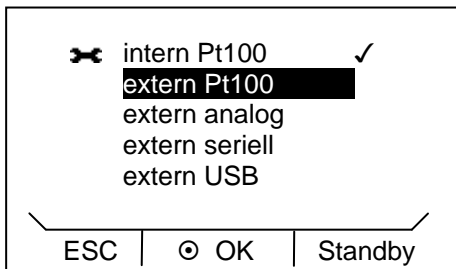
## C External control


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 (⇒ F) for external control. The module is available as an accessory (⇒ 9).

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






### C.1 Activating external control (external Pt100)

- You activate the soft-key bar by pressing any key.



- 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.

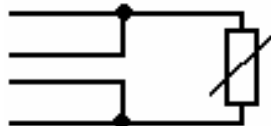
- The menu item **extern Pt100** only appears when the module for an external connection is available. A temperature sensor has to be connected to the module.
  - Select and confirm **extern Pt100** with  or  and .
- By pressing  or  (ESC) you are returned to the menu level without any change.

**Note:** To show the selected control variable on the display, carry out chapter (⇒ C.2).

#### Connection of the external Pt100 to Lemo socket 10S

Contact

1	+	I	Current path
2	+	U	Voltage path
3	-	U	Voltage path
4	-	I	Current path



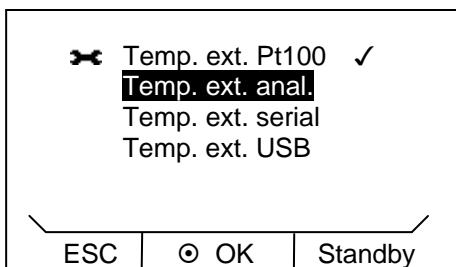
Pt100  
DIN EN 60751


4-pole Lemosa plug for Pt100 connection (catalogue no. EQS 022)

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

### C.2 Show the selected control variable (external temperature) on the display






- You activate the soft-key bar by pressing any key.



- 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**).

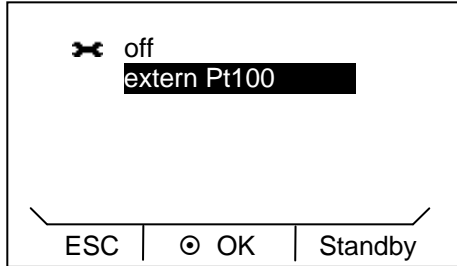
- Select and confirm **Temp. ext. Pt100** with  or  and .
- By pressing  or  (ESC) you are returned to the menu level without any change.

### C.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.

- You activate the soft-key bar by pressing any key.



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

The adjacent menu window appears.

- Select and confirm offset source with ▲ or ▼ and ●.

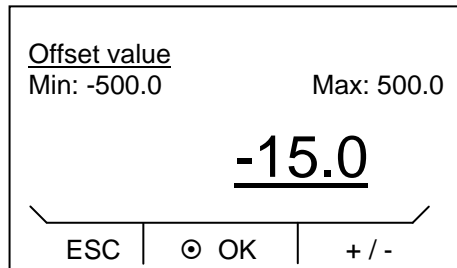
The setpoint offset is deactivated with "off".

- By pressing ◀ you are returned to the submenu.

- The entry window appears on selecting the menu point **Diff.set/actual**

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 ●.



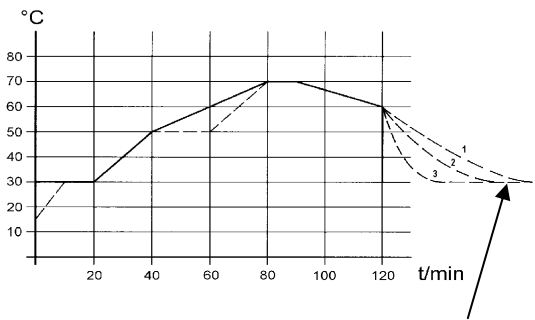
- By pressing ⇄ (ESC) you are returned to the menu level without any change.

## D Programmer

The programming function enables you to save a temperature/time programs. The program consists of a number of temperature/time segments and details about their repetition. The total number of freely programmable segments is 20. 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 "---").

### D.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.

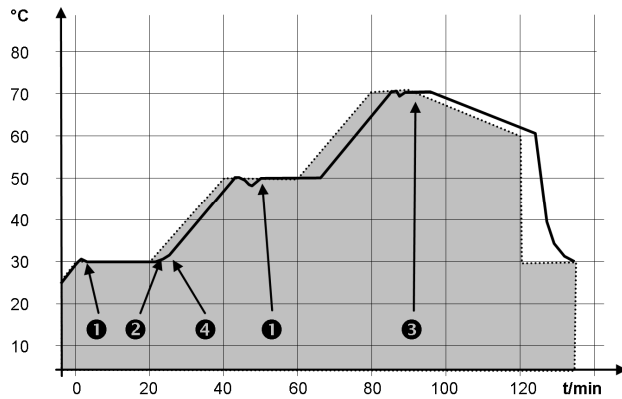
Example seg. no. 2: ➔ "reach 50 °C within 20 minutes"

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(⇒ D.2).

before (____)									
	Tend	hh:mm	Tol.		Pmp	S1	S2	S3	
1	30.00	----	0.1	1	2	off	off	off	
2	50.00	00:20	0.0	2	2	off	off	off	
3	70.00	00:40	0.0	3	3	off	off	off	
4	70.00	00:10	0.1	4	4	off	off	off	
5	60.00	00:30	0.0	5	2	off	off	off	
6	30.00	00:00	0.0	6	2	off	off	off	

after (----, edited)									
	Tend	hh:mm	Tol.		Pmp	S1	S2	S3	
1	30.00	----	0.1	1	2	off	off	off	
2	50.00	00:20	0.0	2	2	off	off	off	
<b>3</b> ①	<b>50.00</b>	<b>00:20</b>	<b>0.1</b>	3	3	off	off	off	
4	70.00	<b>00:20</b> ②	0.0	4	4④	off	off	off	
5	70.00	00:10	<b>0.8</b> ③	5	2④	off	off	off	
6	60.00	00:30	0.0	6	2	off	off	off	
7	30.00	00:00	0.0	7	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 (high-lighted 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.

## D.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 can be inserted and existing ones changed, 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:59 min, then this time must be spread over several consecutive segments.

Creating and editing a program:

Compare the programming example (⇒ D.1)

	Tend	hh:mm	Tol.
<b>1</b>	35.00	--:--	0.1
2	40.00	00:10	0.1
3	50.00	00:20	0.0
4	70.00	00:50	0.1

ESC	⊙ new	delete
-----	-------	--------

	Pmp	S1	S2	S3
1	<b>1</b>	on	---	off
2	1	on	---	off
3	2	on	---	off
4	2	on	---	off

ESC	⊙ OK	---
-----	------	-----

- You access the editor view of the programmer by selecting and confirming → **Programmer** → **Edit**. To view the complete window information go to the right with ▶.
- With the keys ▲, ▼, ◀ and ▶ you obtain access to the individual segment fields.
- If the cursor is located in the first column, the functions "new" and "delete" are visible in the soft-key bar. Program steps can be created or deleted in this way.
- With all other cursor positions the function "OK" is visible in the soft-key bar.
- Using ⊙ (OK) you can select the appropriate parameters and change them with ▲ or ▼.

- 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:

The segment number of the program is located in the first column.

**Tend:** Final temperature to be attained

**hh:mm:** Time in hours (hh) and minutes (mm) in which the specified temperature is to be attained.  
*If the value "0:00" is entered in the field "hh:mm", the set value is accepted immediately and the bath temperature approached as quickly as possible.*

**Tol.:** Defines how exactly the final temperature is to be attained before the next segment it processed.

If the tolerance range is selected too small in the "Tol." field, the program might not continue, because the required tolerance is not achieved.

**Pmp:** 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

	Tend	hh:mm	Tol.
<b>1</b>	35.00	--:--	0.1
2	40.00	00:10	0.1
3	50.00	00:20	0.0
4	70.00	00:50	0.1

ESC	⊙ new	delete
-----	-------	--------

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

### Deleting a segment

	Tend	hh:mm	Tol.
<b>1</b>	35.00	--:--	0.1
2	40.00	00:10	0.1
3	50.00	00:20	0.0
4	70.00	00:50	0.1

ESC	⊙ new	delete
-----	-------	--------

- With ▲ or ▼ go to the segment to be deleted.
- The new segment is removed on pressing → (delete).

### D.3 Starting the program

- You activate the soft-key bar by pressing any key.

⏏	<b>Status</b> ▶	
	Edit	
	Loops	
	Info	

ESC	⊙ OK	Standby
-----	------	---------

- The submenu **Status** appears by selecting and confirming → **Programmer**.

- With the menu **Status** you can carry out the following with the commands

<b>Start</b>	Start program
<b>Hold</b>	Hold program
<b>Continue</b>	Continue program
<b>Stop</b>	Terminate program

by pressing the enter key ⊙.

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

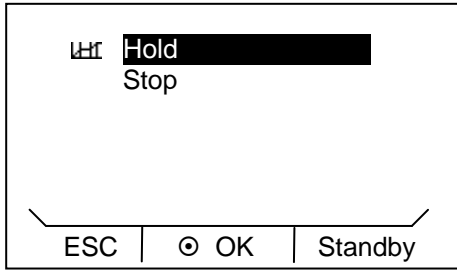
Instructions which cannot be executed due to the situation are not displayed. **Continue** therefore only appears if **Hold** has been activated.

⊙ 1	⏏	⊙
29.85 T <sub>int</sub>		30,00 T <sub>set</sub>
<b>29.73 °C</b> T <sub>ext</sub>		
Display	⊙ Menu	Prog.

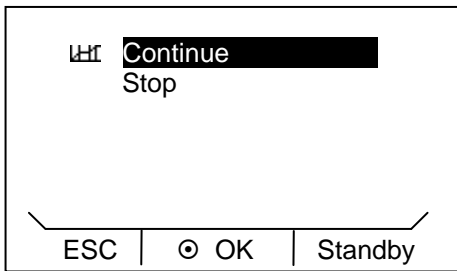
If the programmer is in operation, with an active soft-key bar this is indicated at the lower right.



**D.4 Interrupting, continuing or terminating the program**



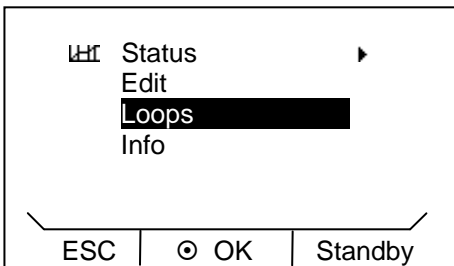
- After the program start the menu points **Hold** and **stop** are displayed.
- The options can be selected with ▲ or ▼.
- |             |                   |
|-------------|-------------------|
| <b>Hold</b> | Interrupt program |
| <b>Stop</b> | Terminate program |
- Confirm your choice with the enter key ●.



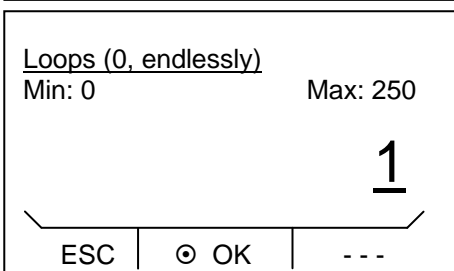
- To continue a program held by **Hold**
- Select the option **Continue** with ▲ or ▼.
  - Confirm your choice with the enter key ●.

- 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):

**D.5 Defining the number of program loops (Loops)**



- Programs can be processed many times.
- The submenu → **Loops** appears by selecting and confirming → **Programmer**.
  - 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.

## E 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.

### E.1 Internal control variable (internal temperature sensor)

If you have not connected any temperature sensor, read further here. For activated external control read (⇒ E.2).

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

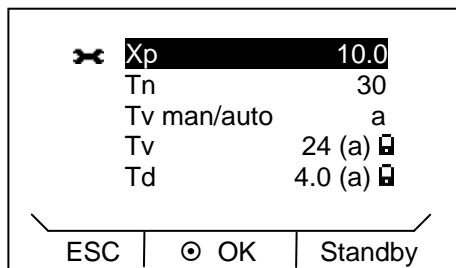
These control parameters can be set:

Description	Short form	Unit
Proportional range	<b>Xp</b>	K
Reset time	<b>Tn</b>	s
Derivative time	<b>Tv</b>	s
Damping	<b>Td</b>	s

If "**Tv manual/auto**" is set to "a" (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  $T_{ih}$  and  $T_{il}$  (⇒ 7.4.5) on the control.

- You activate the soft-key bar by pressing any key.

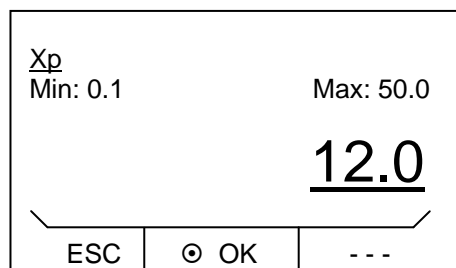


- Access to the main menu level is obtained by pressing the enter key **⏏**.
- Selection and confirmation of **→ Setup → Control → Contr.parameter → intern Pt100**.

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

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

The selection is indicated in the menu line by a (automatic) or m (manual). 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.

## E.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 C) 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. →

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

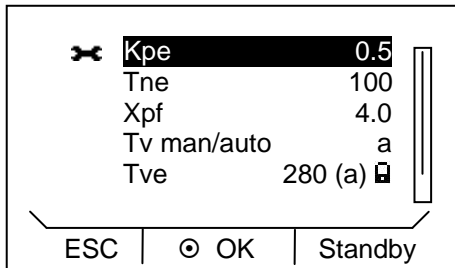
Description	Short form	Unit
Gain	<b>Kpe</b>	-
Proportional range	<b>Prop_E</b>	K
Reset time	<b>Tne</b>	s
Derivative time	<b>Tve</b>	s
Damping time	<b>Tde</b>	s

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

Description	Short form	Unit
Proportional range	<b>Xpf</b>	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.

- You activate the soft-key bar by pressing any key.



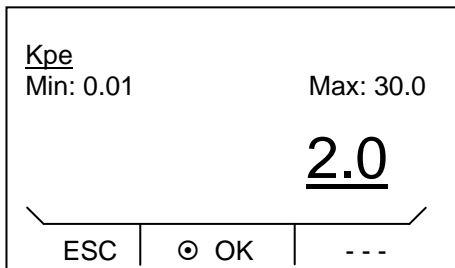
- Access to the main menu level is obtained by pressing the enter key **⏎**.
- Selection and confirmation of → **Setup** → **Control** → **Contr.parameter** → **extern Pt100**.

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

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

The selection is indicated in the menu line by "a" (automatic) or "m" (manual). If "automatic" is selected, the entry is blocked for the parameters Tv and Td.

- Select and confirm parameters with **▲** or **▼** and **⏎**.



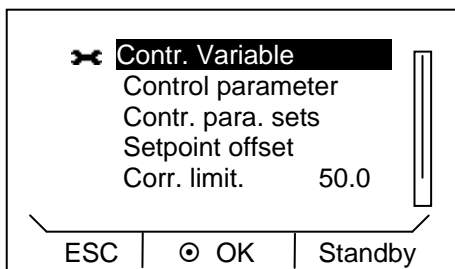
The respective edit window appears with Min and Max figures for the parameter values Kpe, Tne, Tve, Tde and Xpf.

- 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.

### E.2.1 Setting the correcting quantity limit

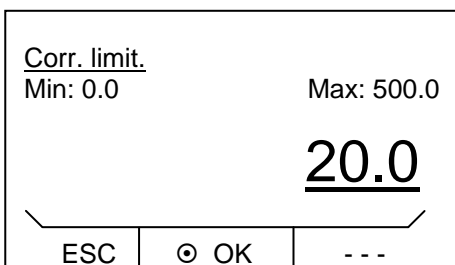
- You activate the soft-key bar by pressing any key.



- Access to the menu level is obtained by pressing **⏎**.
- Selection and confirmation of → **Setup** → **Control**.

The adjacent menu window appears.

- Select and confirm **Corr. 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.

**E.2.2 Procedure for setting the control parameters for external control**

1. Activating external control (⇒ C.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 temperature-stabilize → small (e.g. 0.2...0.7), 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 (⇒ E.2.1) and temperature limits (Til/Tih) (⇒ 7.4.5):
  - Set according to the physical boundary conditions.

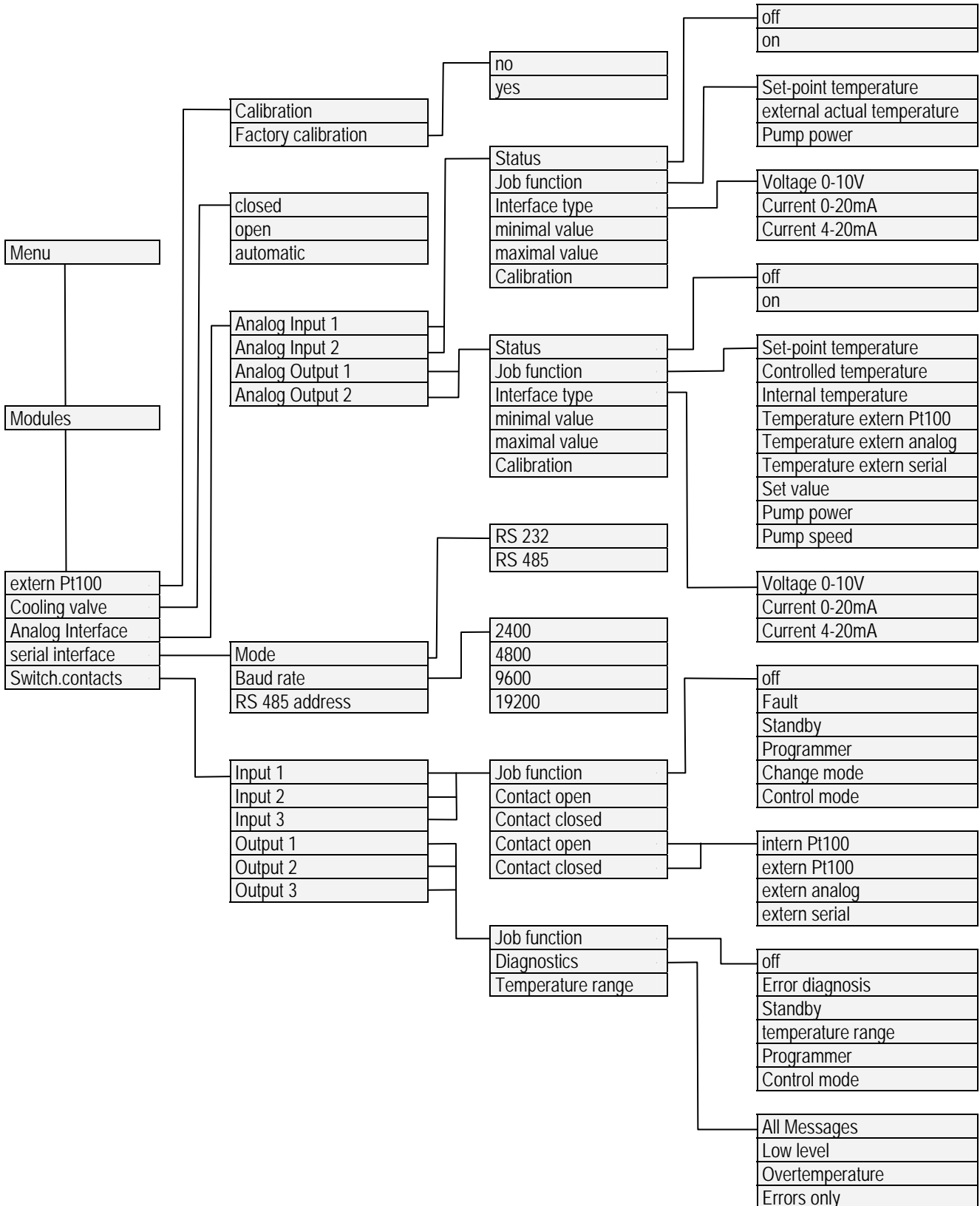
Example:

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

## F Interface modules

### F.1 Menu structure of the modules

All existing menu points are shown. Modules and menu points which cannot be realized are however masked out. More extensive information can be found in the following sections.



## F.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 and 4...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 analog 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

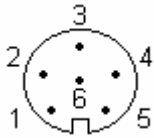
### Connection of analog inputs and outputs

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.

### F.3 RS 232/485 interface module



RS 232/485 Interface Module (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).

#### F.3.1 Connecting lead and interface test RS 232

Signal	Computer				Thermostat		Signal
	9-pole Sub-D socket		25-pole Sub-D socket		9-pole Sub-D socket		
	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: The operating mode "Without hardware handshake" must be set on the computer/PC.

- 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.

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 "Hyper Terminal".



Alternatives for Windows Vista and Windows 7:

- Download various freeware programs from the Internet.
- Copy program "Hyper Terminal" from an old operating system.

To do this copy hypertrm.exe from C:\Programs\Windows NT and both of the DLL files hypertrm.dll and hticons.dll from C:\WINDOWS\system32. All this can be packed into any directory and used as a port-able application. Now access can be obtained to the RS 232 interface.

**F.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.

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

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

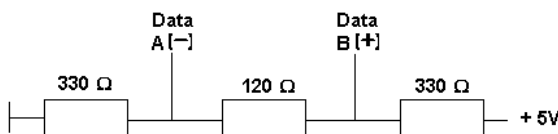
Computer	Thermostat
„OUT_SP_00_30.5“CRLF	⇒
⇐	„OK“CRLF

**F.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).

### F.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

**F.4 USB interface**

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

**F.4.1 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.

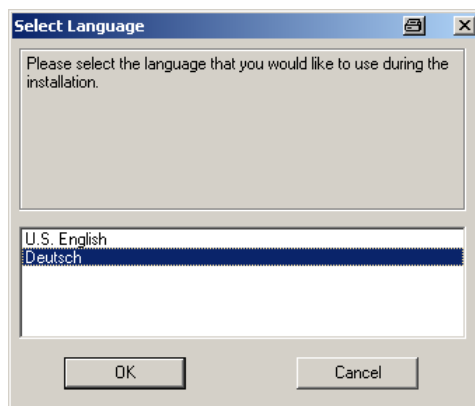


USB interface

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

**F.4.2 Installation of the USB driver**

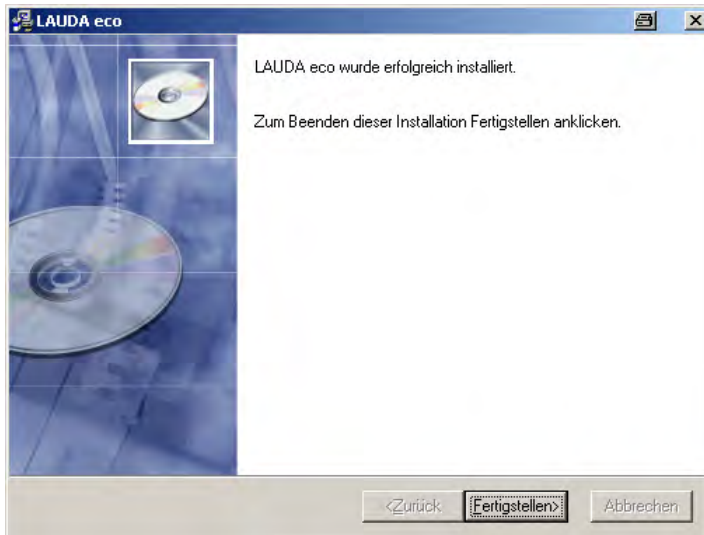
The driver is installed once per PC.  
Supported operating systems: Windows ME, Windows XP, Windows 2000, Windows VISTA.  
Execute the file "LAUDA\_ECO\_USB\_Driver.exe". The window below opens.



1. Select the language and confirm with  .



2. Key

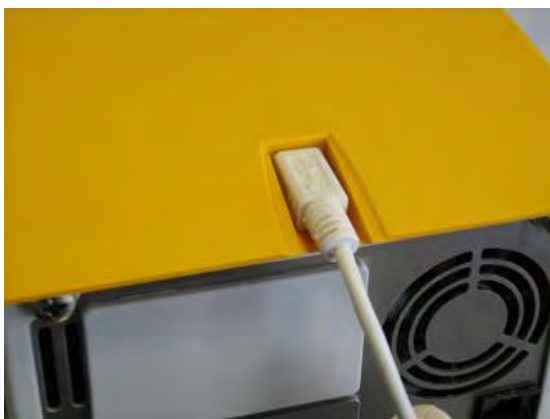


3. Key   
Driver installation is installed

### F.4.3 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.

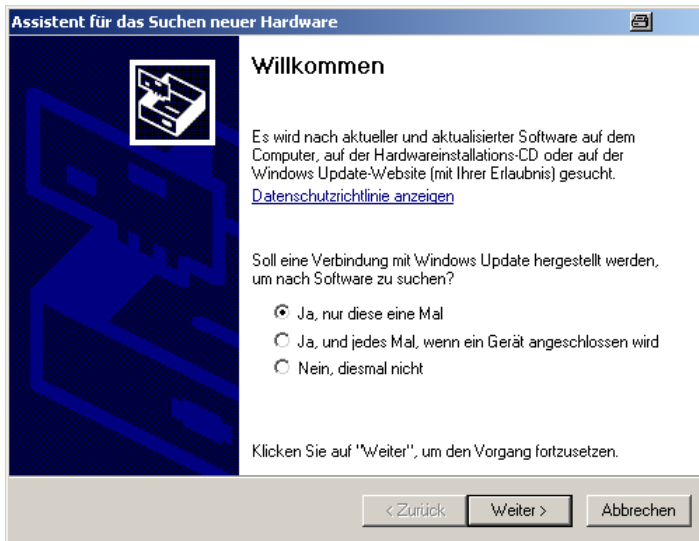


1. Plug the USB cable into the control head.

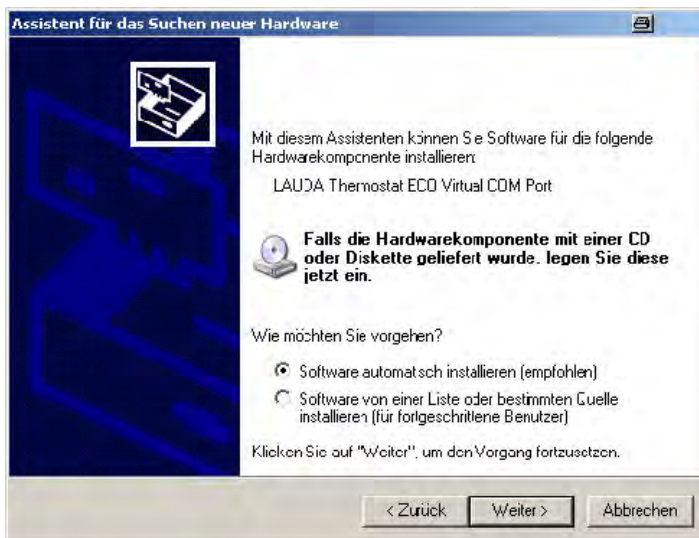


2. Switch on the thermostat at the mains switch.

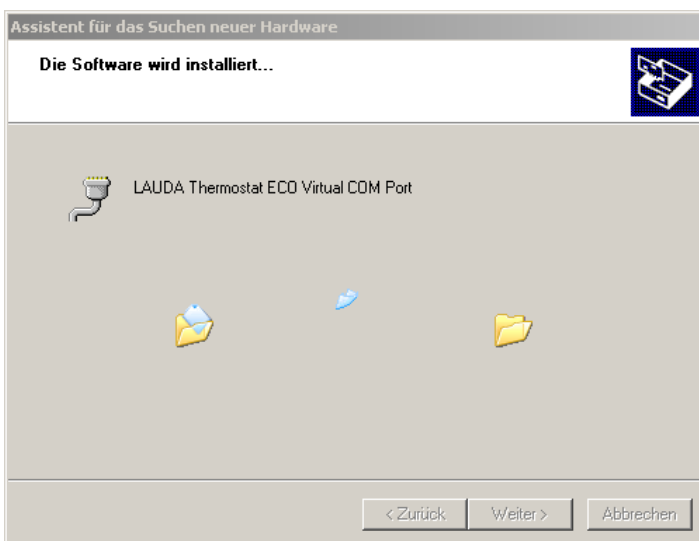
For the first time, after installation on the PC, a wizard opens to search for new hardware. Please follow the wizard instructions.



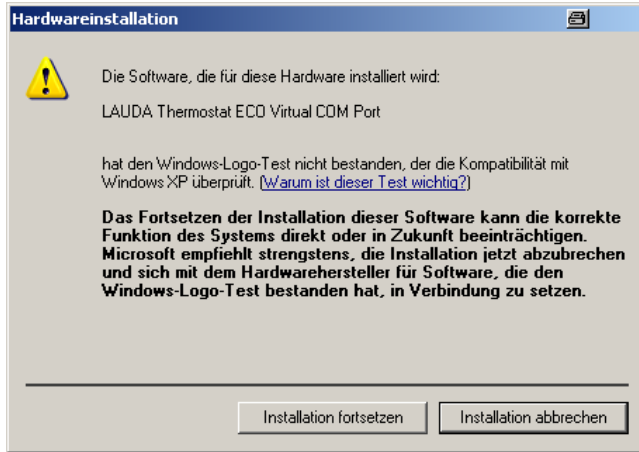
3. Key Continue



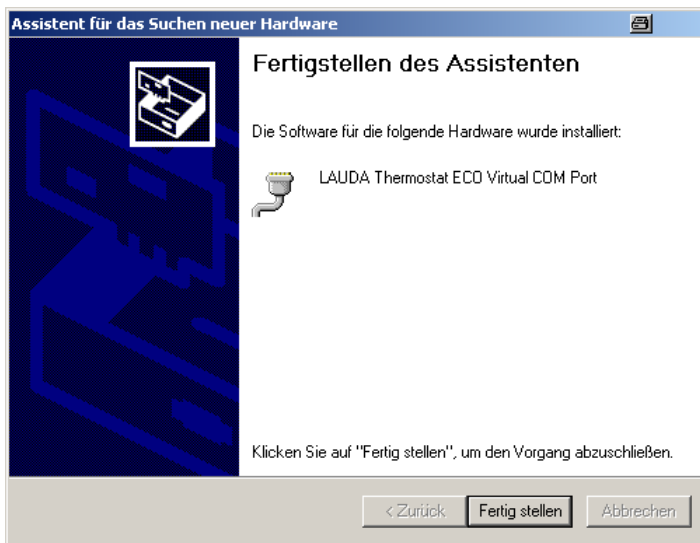
4. Key Continue



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



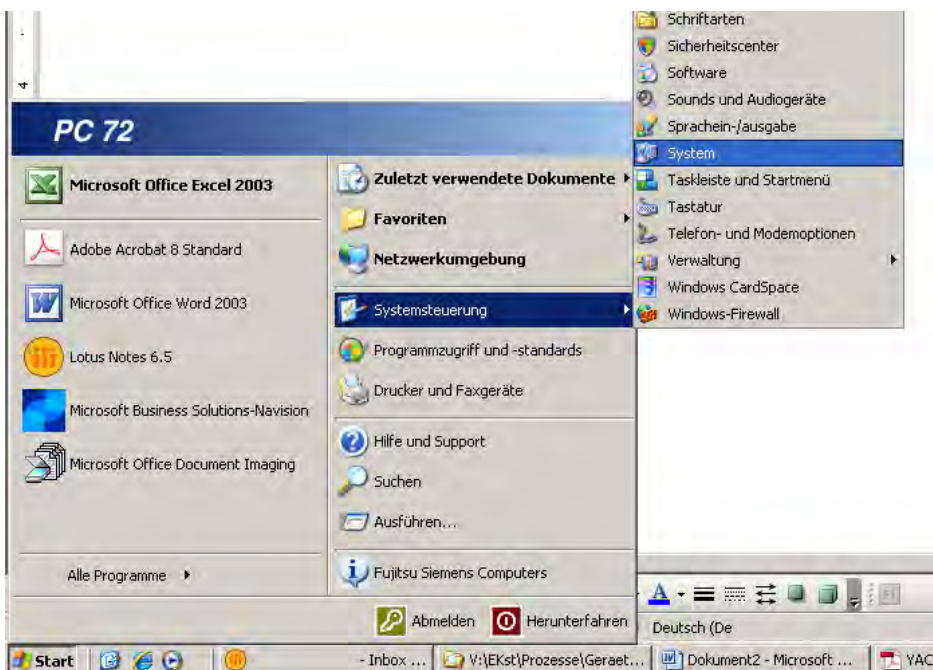
5. Click on **Continue installation** .

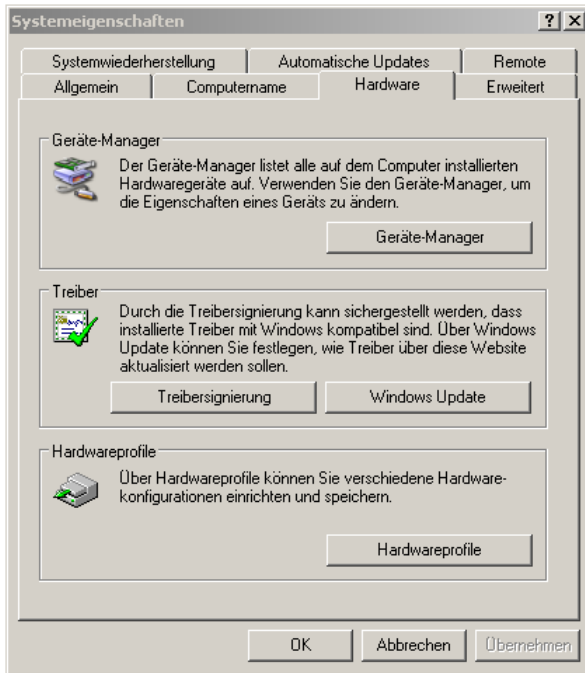


6. Click on the key **Finish** .

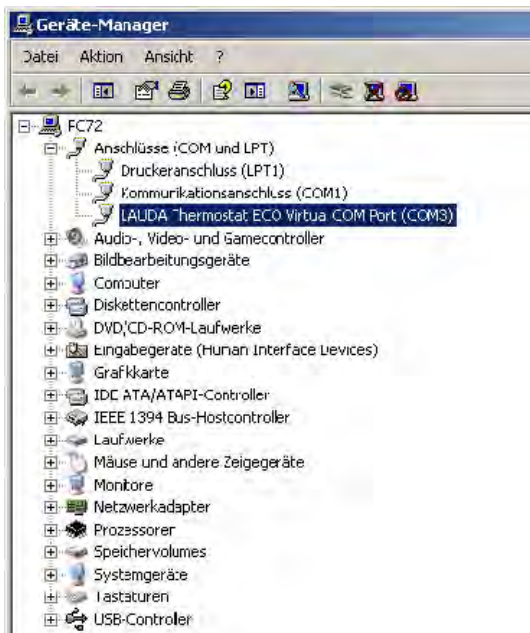
#### F.4.4 Where is the ECO Virtual COM Port?

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 .



## F.5 Commands and error messages applicable to the RS 232/485 interface module and to the USB interface

### F.5.1 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 of the max. 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.



- 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".)



**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				

**F.5.2 Interface read commands (data request from the thermostat)**

Command	Meaning
IN_PV_00	Interrogation of bath temperature (outflow temperature)
IN_PV_01	Interrogation of controlled temperature(int./ext., Pt/ext., Analog/ ext. serial).
IN_PV_03	Interrogation of external temperature TE (Pt100).
IN_PV_04	Interrogation of external temperature TE (Analog Input).
IN_PV_10	Interrogation of bath temperature (outflow temperature) <b>in 0.001 °C.</b>
IN_PV_13	Interrogation of external temperature TE (Pt100) <b>in 0.0001 °C.</b>
IN_SP_00	Interrogation of temperature set value.
IN_SP_01	Interrogation of pump power level.
IN_SP_02	Interrogation of cooling mode (0 = OFF / 1 = ON / 2 = AUTOMATIC).
IN_SP_03	Interrogation of overtemperature switch-off point.
IN_SP_04	Interrogation of outflow temperature limit TiH.
IN_SP_05	Interrogation of outflow temperature limit TiL.
IN_PAR_00	Interrogation of the control parameter Xp.
IN_PAR_01	Interrogation of the control parameter Tn (181 = OFF).
IN_PAR_02	Interrogation of the control parameter Tv.
IN_PAR_03	Interrogation of the control parameter Td.
IN_PAR_04	Interrogation of the control parameter KpE.
IN_PAR_05	Interrogation of the control parameter TnE (response: XXXX; 9001 = OFF).
IN_PAR_06	Interrogation of the control parameter TvE (response: XXXX; 5 = OFF).
IN_PAR_07	Interrogation of the control parameter TdE (response: XXXX.X).
IN_PAR_09	Interrogation of the max. correcting quantity limit.
IN_PAR_10	Interrogation of the control parameter XpF.
IN_PAR_14	Interrogation of setpoint offset.
IN_PAR_15	Interrogation 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: 0 = NO contact open/ 1 = NO contact closed.
IN_DO_02	Status of Contact Output 2: 0 = NO contact open/ 1 = NO contact closed.
IN_DO_03	Status of Contact Output 3: 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.

Command	Meaning
TYPE	Interrogation of the device type (response = "ECO")
VERSION_R	Interrogation of the software version number of the control system.
VERSION_S	Interrogation of the software version number of the protection system.
VERSION_B	Interrogation of the software version number of the Command remote control.
VERSION_T	Interrogation of the software version number of the cooling system.
VERSION_A	Interrogation of the software version number of the analog module.
VERSION_V	Interrogation of the software version number of the RS232/485 module.
VERSION_D	Interrogation of the software version number of the digital module.
VERSION_M_0	Interrogation of the software version number of the solenoid valve (cooling water).
VERSION_M_3	Interrogation of the software version number of the solenoid valve (shut-off valve 1).
VERSION_M_4	Interrogation of the software version number of the solenoid valve (shut-off valve 2).
VERSION_M_5	Interrogation of the software version number of the high temperature cooler.
VERSION_E	Interrogation of the software version number of the external Pt100 module.
STATUS	Interrogation of the device status 0 = OK, -1 = Error.
STAT	Interrogation of the error diagnosis response: XXXXXXXX → X = 0 no error, X = 1 error 1st character = Error 2nd character = Alarm 3rd character = Warning 4th character = Overtemperature 5th character = Low Level 6th character = 0 7th character = External control value missing
RMP_IN_00_XXX	Interrogation of a program segment XXX (Response: e.g. 030.00_00010.00_005.00_001.00 => Set-point temperature = 30.00 °C, Time = 10 min, Tolerance = 5.00 °C, Pump stage = 1).
RMP_IN_01	Interrogation of the current segment number.
RMP_IN_02	Interrogation of the set program loops.
RMP_IN_03	Interrogation of the current program loops.
RMP_IN_04	Interrogation of to which program further commands refer.
RMP_IN_05	Interrogation of which program is currently running (0 = none).

**Note:**

- For " \_ " (space character) is also admissible.
- Unless otherwise stated with the command, the response from the thermostats is always in the fixed-point format "XXX.XX" or "-XXX.XX" for negative values or "ERR\_X". (RS 485 interface e.g. "A015\_XXX.XX" or "A015\_-XXX.XX" or "A015\_ERR\_X").

### F.5.3 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.

### F.5.4 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>.

## F.6 Contact module

### F.6.1 Contact module LRZ 914 with 1 input and 1 output



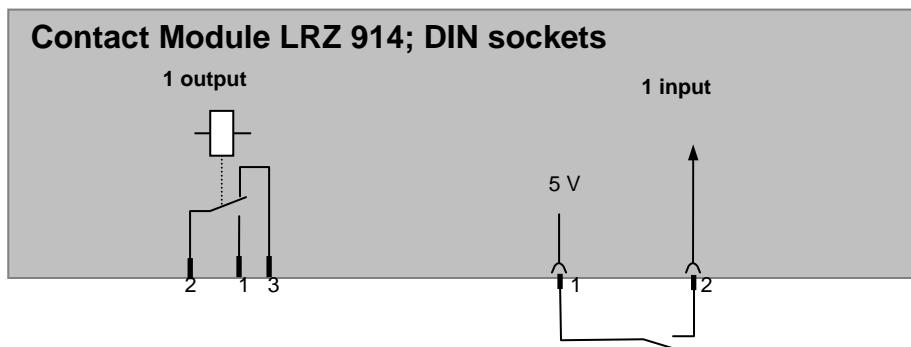
Contact module (catalogue no. LRZ 914) with connectors to NAMUR NE28, with 1 output and 1 input on each of 2 DIN sockets.

The inputs provide the following functions:

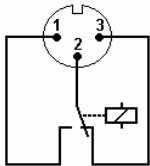
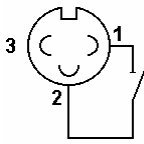
- **Error** Set error
- **Standby** Set standby
- **Control programmer** Control programmer (Input 1 activates the programmer. The programmer is started on the first "closed" and is put into "hold" on "open". The next "Close" triggers "Continue") with the function.
- **Change mode** Control change mode (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 2 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**

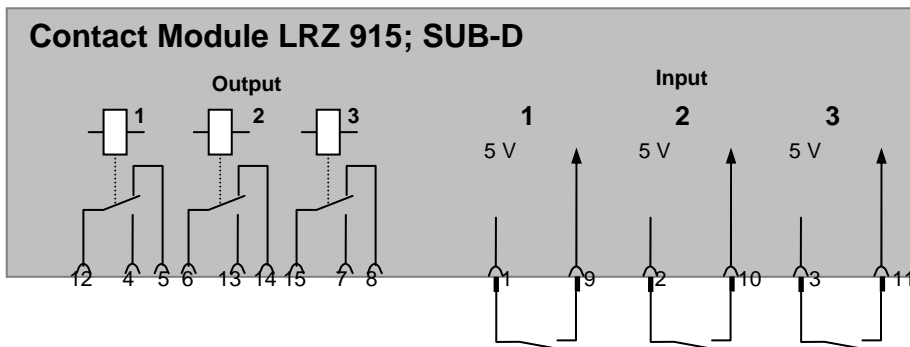
Output	Input
<ul style="list-style-type: none"> <li>– View of flanged plug (front) or coupling-socket solder side</li> <li>– Max. 30 V; 0.2 A</li> </ul> <p>Coupling socket catalogue no. EQD 047</p>	<ul style="list-style-type: none"> <li>– View of socket (front) or solder side of plug</li> <li>– Signal approx. 5 V, 10 mA, do not assign Contact 3.</li> </ul> <p>Coupling plug catalogue no. EQS 048</p>
	
<p>1 = NO contact 2 = Center contact 3 = NC contact</p>	

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

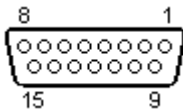
**F.6.2 Contact module LRZ 915 with 3 inputs and 3 outputs**



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. 30V/0.2A) 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).

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**An / To / A:**

LAUDA Dr. R. Wobser • LAUDA Service Center • Fax: +49 (0) 9343 - 503-222

**Von / From / De :**

Firma / Company / Entreprise: \_\_\_\_\_

Straße / Street / Rue: \_\_\_\_\_

Ort / City / Ville: \_\_\_\_\_

Tel.: \_\_\_\_\_

Fax: \_\_\_\_\_

Betreiber / Responsible person / Personne responsable: \_\_\_\_\_

Hiermit bestätigen wir, daß nachfolgend aufgeführtes LAUDA-Gerät (Daten vom Typenschild):

We herewith confirm that the following LAUDA-equipment (see label):

Par la présente nous confirmons que l'appareil LAUDA (voir plaque signalétique):

Typ / Type / Type :	Serien-Nr. / Serial no. / No. de série:

mit folgendem Medium betrieben wurde

was used with the below mentioned media

a été utilisé avec le liquide suivant

---



---



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---

**Darüber hinaus bestätigen wir, daß das oben aufgeführte Gerät sorgfältig gereinigt wurde, die Anschlüsse verschlossen sind, und sich weder giftige, aggressive, radioaktive noch andere gefährliche Medien in dem Gerät befinden.**

**Additionally we confirm that the above mentioned equipment has been cleaned, that all connectors are closed and that there are no poisonous, aggressive, radioactive or other dangerous media inside the equipment.**

**D'autre part, nous confirmons que l'appareil mentionné ci-dessus a été nettoyé correctement, que les tubulures sont fermées et qu'il n'y a aucun produit toxique, agressif, radioactif ou autre produit nocif ou dangereux dans la cuve.**

Stempel Seal / Cachet.	Datum Date / Date	Betreiber Responsible person / Personne responsable

Formblatt / Form / Formulaire:

Unbedenk.doc

Erstellt / published / établi:

LSC

Änd.-Stand / config-level / Version:

0.1

Datum / date:

30.10.1998

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