Operating Instructions

ECO GOLD

Heating and Cooling Thermostats with control head GOLD

Immersion thermostat
ECO GOLD

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

Cooling thermostats
RE 415 G, RE 420 G, RE 620 G, RE 630 G, RE 1225 G, RE 2025 G, RE 1050 G

Version 04/2010 b4
replaces version 02/2010 b3
YACE0088
Valid from:
Software Control System from Version 1.20
Software Safety System from Version 1.20
Software Chilling System from Version 1.20

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First some safety information

Before you put the device into operation, read all the instructions and safety information thoroughly. If you have any queries, please feel free to call us.

Follow the instructions about siting, setting up and operation as only then can improper handling of the device be eliminated and the full warranty coverage maintained.

- Transport the device with care.
- The cooling thermostats should never be tilted nor stood upside down.
- The device can be damaged:
  - by dropping,
  - by vibration.
- The device may only be operated by appropriately instructed persons.
  The operator must be of legal age. Persons not of legal age may only operate the device under supervision of an instructed and legal age person.
- Never operate the device without heat transfer liquid.
- Do not operate the device, if:
  - it is damaged,
  - it is leaking,
  - the mains cable is damaged.
- Switch off the device and withdraw the mains plug when:
  - carrying out service or repair work,
  - moving the device,
  - installing or removing modules or accessories.
- Empty the bath before moving the device.
- Do not make technical modifications to the device.
- Have service and repair work carried out only by specialists.

The operating instructions contain additional safety information which is identified with a triangle with an exclamation mark  . Read the instructions thoroughly and follow them. Ignoring the instructions can lead to severe consequences, e.g. damage to the device or other property, or to personal injury.

Technical modifications reserved.

Table of contents

Special symbols:

	Caution:	This sign is used when improper handling can lead to personal injury or damage to property.
	Note:	Here, something in particular needs the reader's attention. In certain circumstances this includes a note about a hazard.
	Reference	Refers to further information in other chapters.

1 Safety information

1.1 General safety information

A laboratory thermostat is used to heat, cool and circulate liquids as specified. Hazards arise from this due to high or low temperatures, fire and the general hazards due to the application of electrical energy.

The user is largely protected by the application of the relevant standards.

Further hazard sources can arise from the type of material for which the temperature is to be stabilized, e.g. with the exceeding or undercutting certain temperature thresholds or with the fracture of the container and reaction with the heat transfer liquid. It is not feasible to include all possible situations. They remain essentially subject to the judgement and responsibility of the operator.

The devices may only be used as intended, that is as described in this operating manual. This includes operation by instructed specialist personnel.

The devices are not designed for use under medical conditions according to DIN EN 60601-1 or IEC 601-1.

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 unfavourable network conditions interfering voltage variations can occur.

Class of protection for electrical operating equipment DIN EN 61140 (VDE 0140-1)	Class I
EMC requirements to DIN EN 61326-1 (corresponds to VDE 0843-20-1) applies to Europe	Class B
for Canada and the USA	Class A
EC directives	The devices conform to the directives of the European Parliament and of the Council: 2004/108/EC regarding electromagnetic compatibility (EMC) and 2006/95/EC relating to electrical operating equipment for use within certain voltage limits (Low Voltage Directive). The devices bear the CE label.

Usage restriction

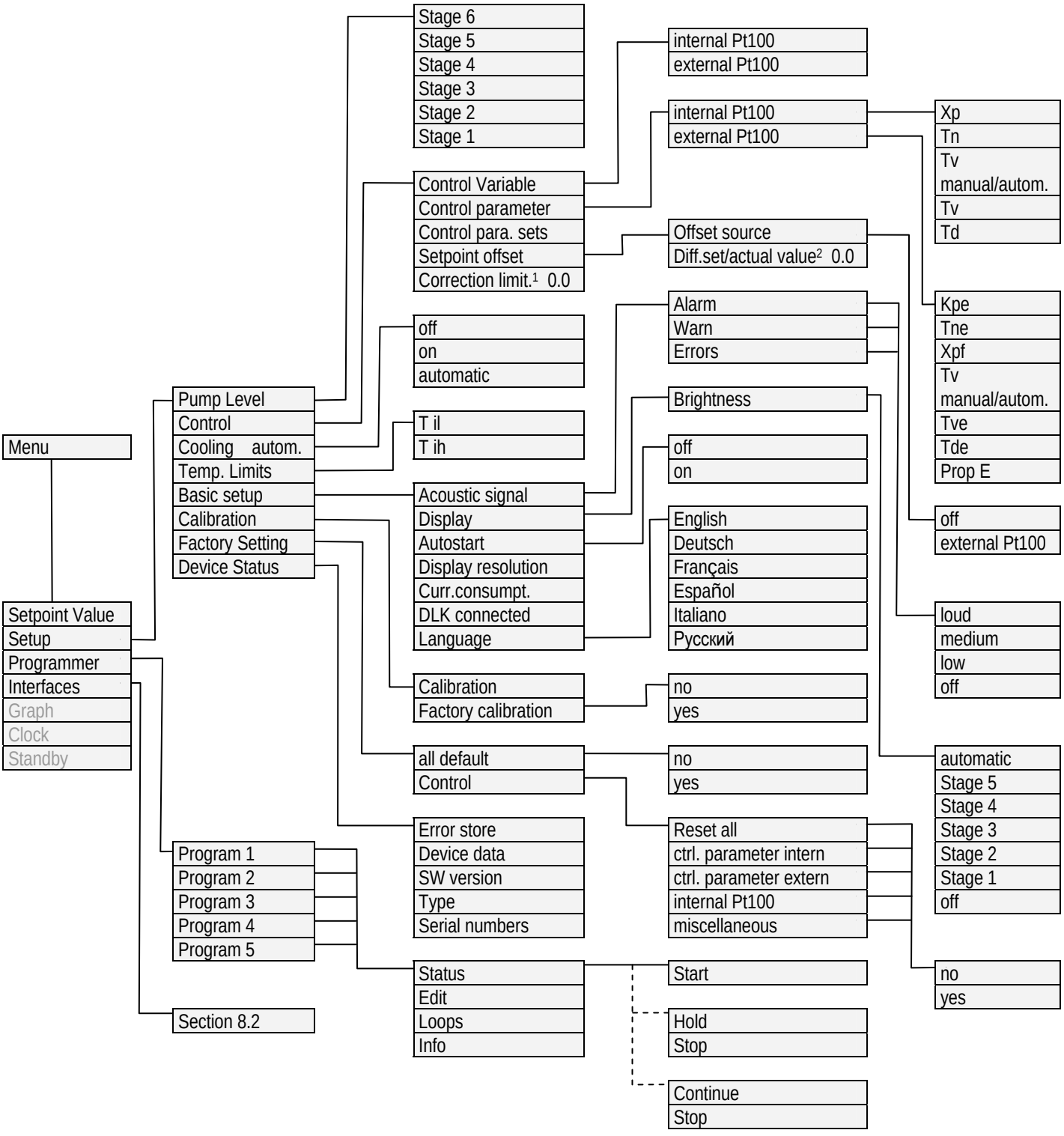
For the EMC standard DIN EN 61326-1:
Devices in **Class A** are only to be operated on electrical supply networks without connected domestic areas.

1.2 Other safety information

- Check the device carefully for shipping damage before putting into operation. The device should not be put into operation if shipping damage has been found.
- Only connect devices to earthed mains sockets.
- At higher operating temperatures parts of the bath cover can take on surface temperatures of over 70 °C. Be careful when touching the device.
- Use suitable hoses (⇨ 6.4).
- Secure hoses against slippage by using hose clips. Avoid kinking the hoses.
- Check the hoses from time to time for any material fatigue.
- Hoses with hot heat transfer liquid and other hot parts must not come into contact with the mains cable.
- When using the thermostat as a circulation thermostat, hot liquid can escape due to hose fracture and become a danger to personnel and materials.
- If no external load is connected, the feed nozzle must be sealed off (use the sealing plug) or short-circuit it to the return nozzle.
- Pay attention to the thermal expansion of the heat transfer liquid with increasing bath temperature.
- Toxic vapours may be generated depending on the heat transfer liquid used and the operating mode. Ensure adequate air extraction.
- Attach immersion thermostats carefully to the bath vessel.
- Only use bath vessels which are suitable for the intended operating temperatures.
- Always set the overtemperature cut-off point immediately according to the heat transfer liquid used when filling.
- 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 loads, otherwise there is a risk of scalding due to delay in boiling.
- Use cooling coils with cooling water only for operating temperatures below 100 °C, because with higher temperatures there is the risk of superheated steam forming.
- Withdraw the mains plug before cleaning, servicing, installing or removing modules or moving the thermostat.
- Have repairs to the control section carried out only by specialists.
- Keep to service and maintenance intervals according to VDI 3033 (⇨ 9.4.1).
- The figures in the technical data apply under standard conditions according to DIN 12876. Electromagnetic high frequency fields can in special cases lead to unfavourable values. Safety is not impaired.

2 Menu structure

Menu structure of Control Head GOLD



1 Correcting quantity limit
2 Difference setpoint/actual value

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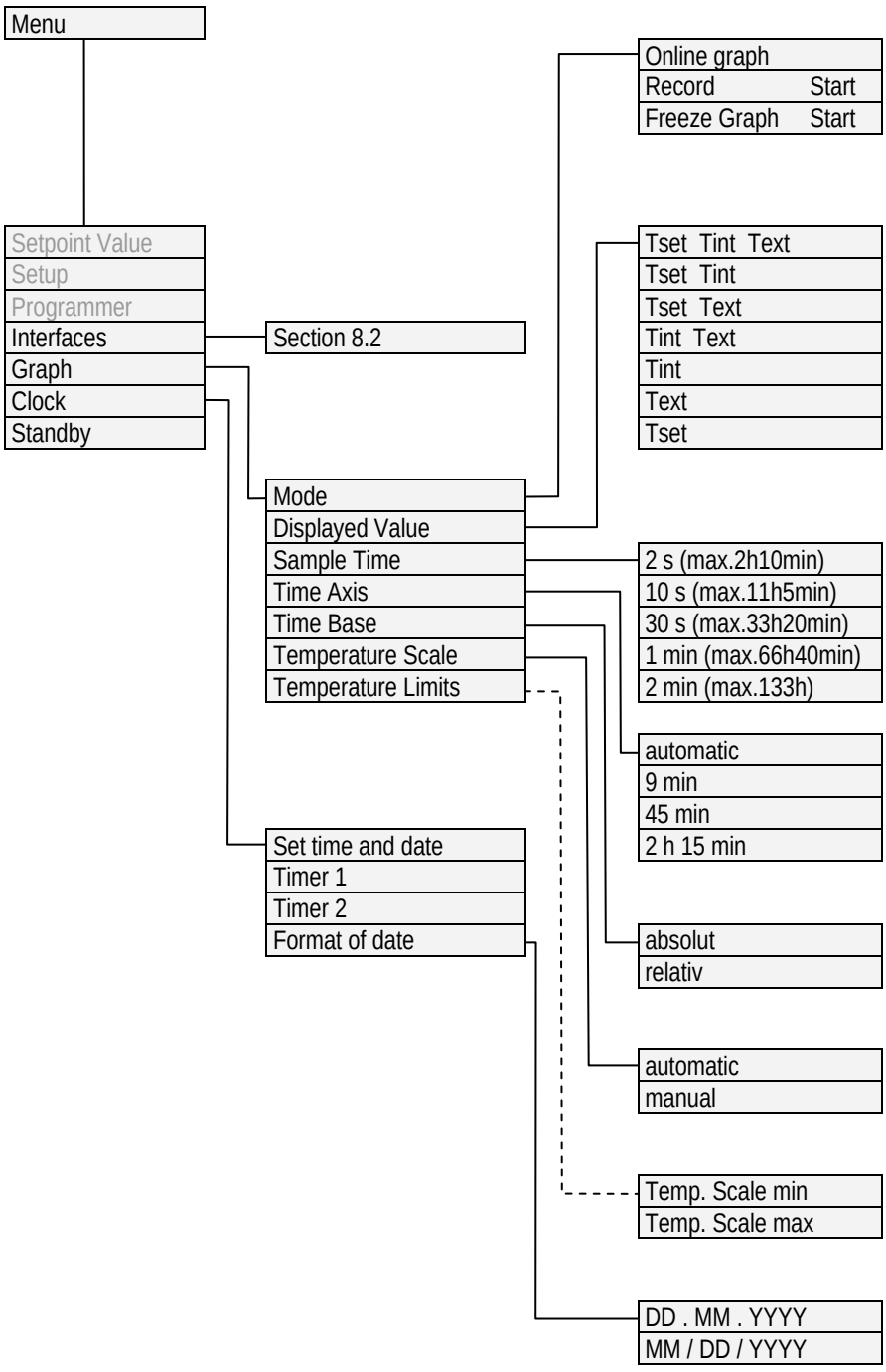


3 Operating and functional controls

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

1 Mains switch

2 Light sensor for automatic control of display brightness

3 Colour TFT display

4 Control panel (refer to page 16)

5 Selector switch for dividing up the external and internal pump flow

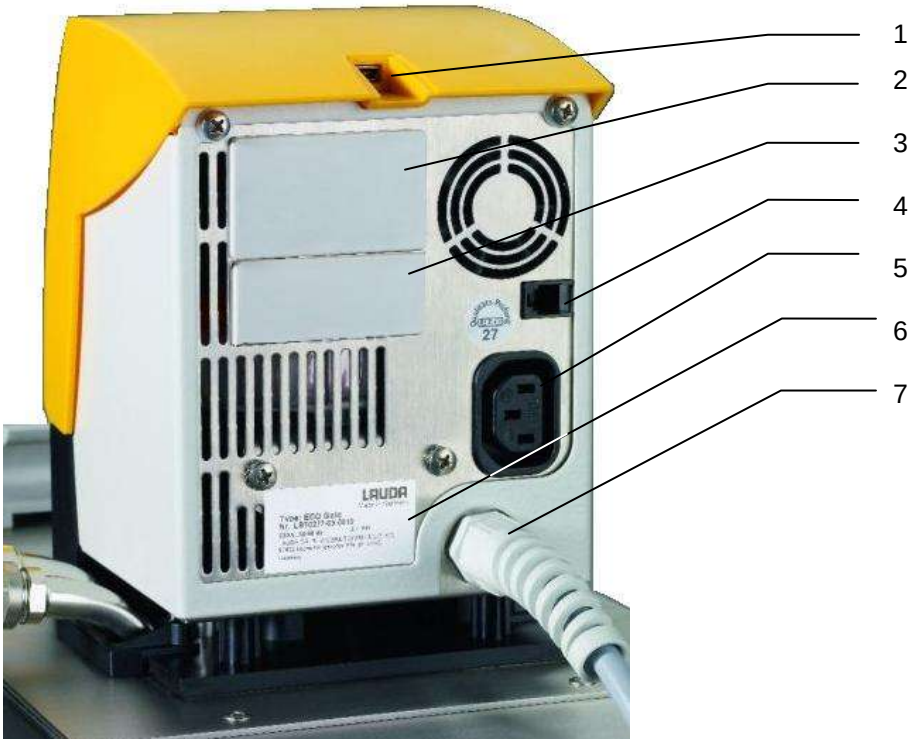
6 Pump output for internal bath circulation

7 Pump output for bath circulation or connection to the pump connection set

8 Pt100 temperature sensor

9 Heater

Rear view of Control Head ECO GOLD



1 Mini-USB interface (⇨ 4.6)

2 Upper module receptacle approx. 51x27 mm for analogue, RS 232/485, Profibus module and contact modules

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

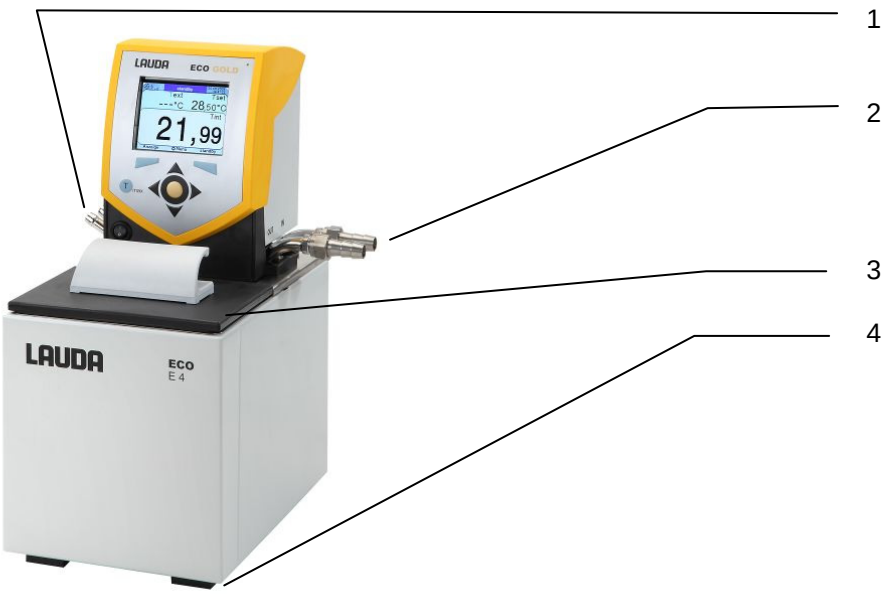
4 Connection for control cable of cooling underpart for RE 1050 G

5 Connection of power supply between the control head and cooling underpart

6 Rating label

7 Mains connecting lead

Heating Thermostats ECO GOLD

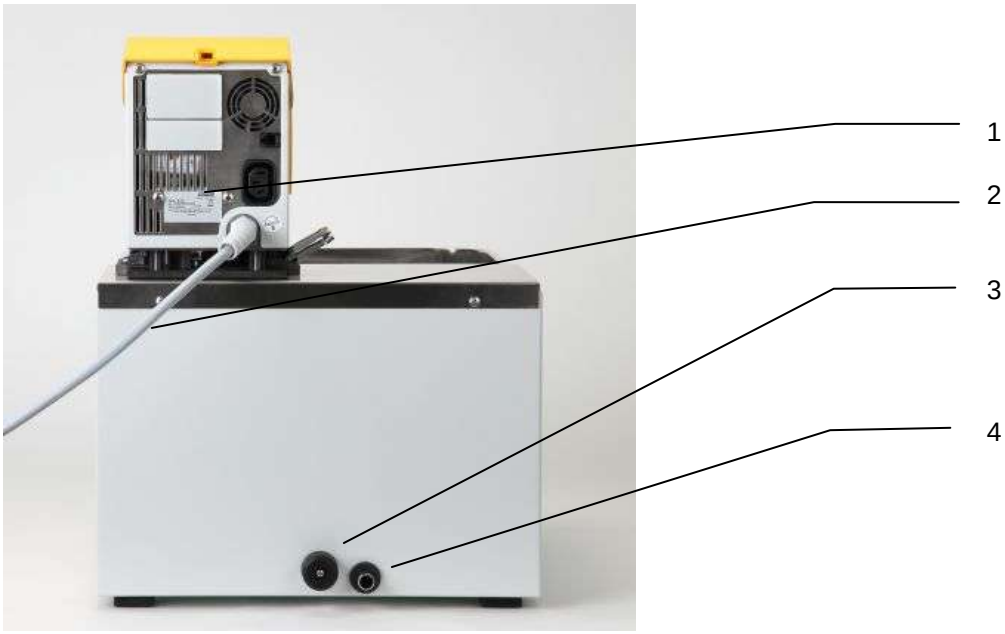


1 Cooling coil connections

2 Pump connection: outflow and return (as standard only with E 4 G and ET 15 G)

3 Bath cover (as standard only with E 4 G)

4 Four feet



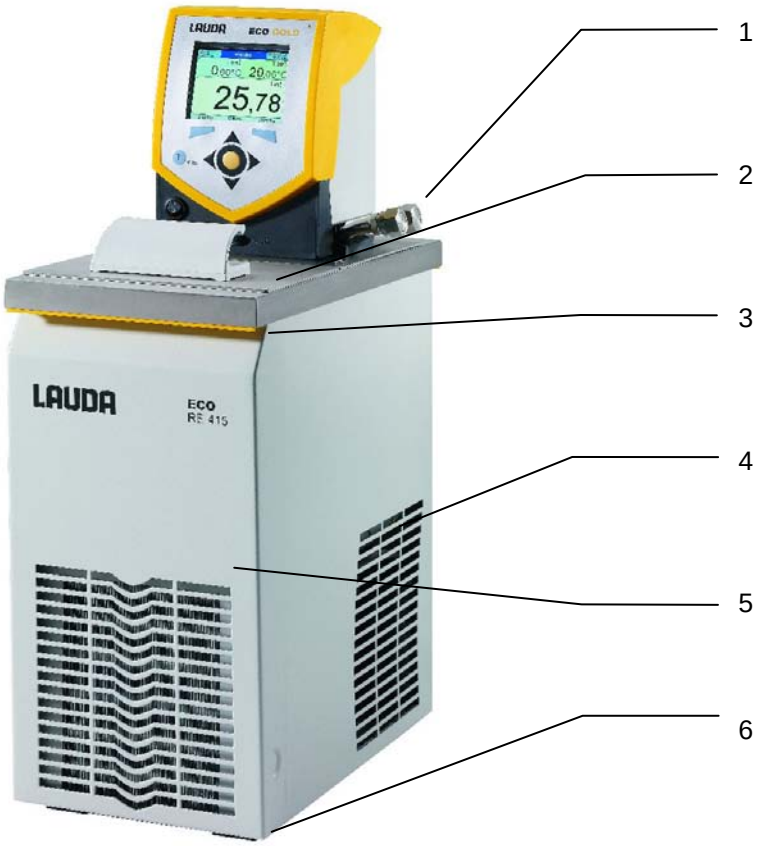
1 Rating label

2 Mains connecting lead

3 Bath drain tap

4 Bath drain point

Cooling Thermostats ECO GOLD



Pump connection with thread M16x1 (stainless steel)

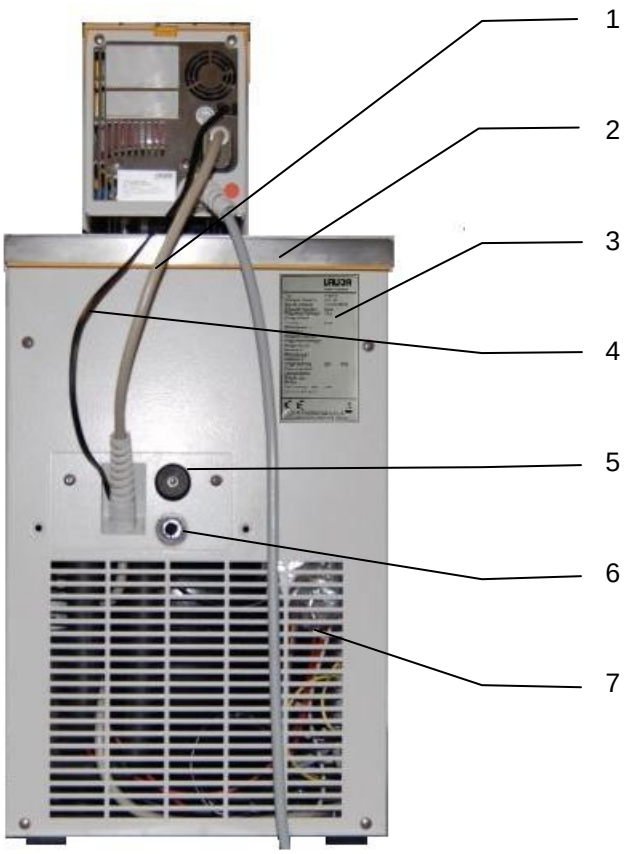
2 Bath cover

3 Front grip recess

4 Ventilation grill (both sides)

5 Front panel (removable without tools (⇨ 6.1))

6 Four feet



1 Connecting lead between the control head and cooling underpart

2 Back grip recess

3 Rating label

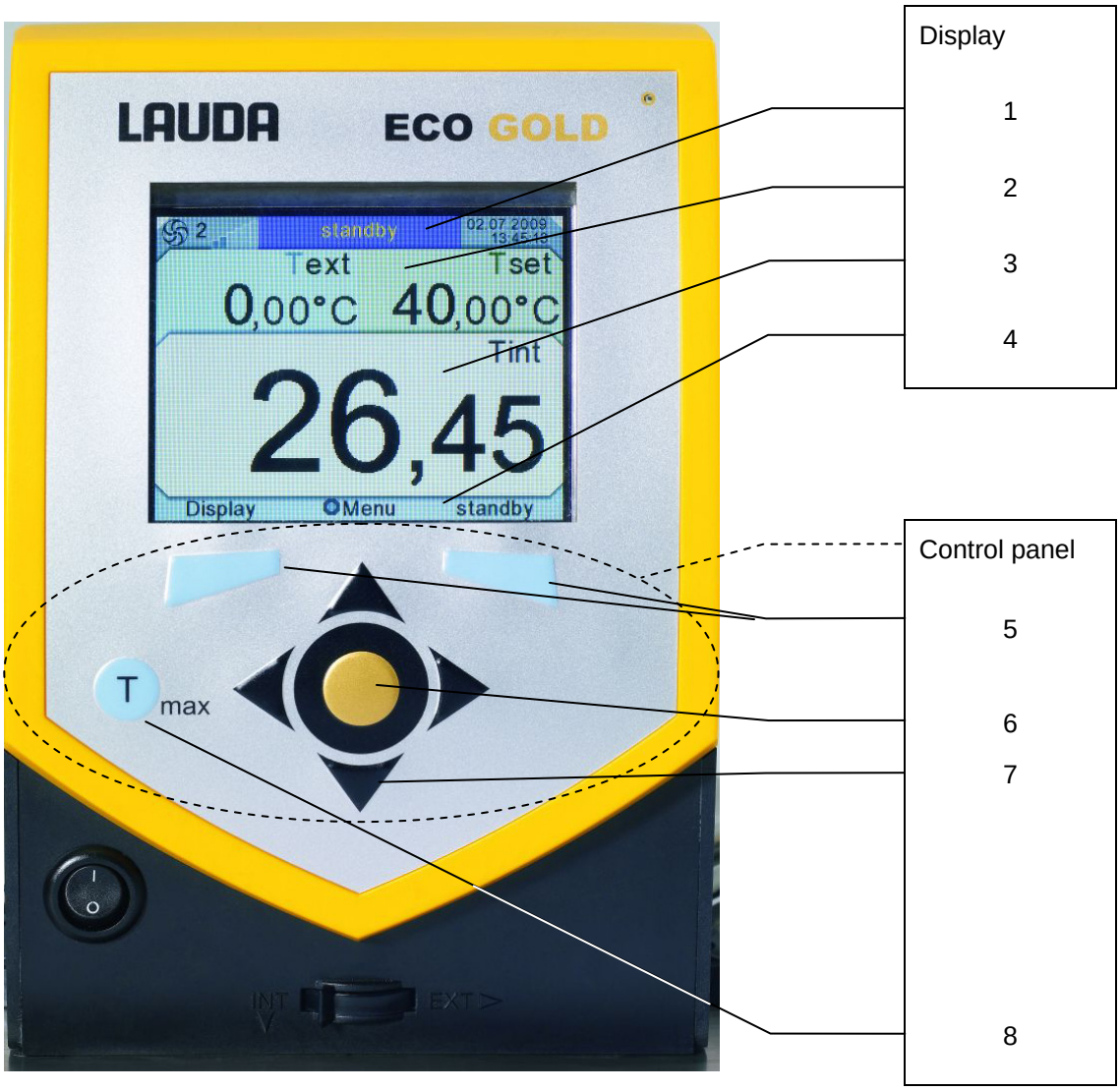
4 Control cable for cooling underpart (only with RE 1050 G)

5 Bath drain tap

6 Bath drain point

7 Ventilation grill

Control panel and display ECO GOLD



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

Control panel	
5	Soft keys, left and right
6	Enter key or soft key, centre
7	Cursor keys Cursor keys for Up, Down, Left and Right.
8	Key T_{max} Display and adjustment of the over-temperature switch-off point

4 Device description

4.1 Ambient conditions

Use of the thermostating unit is only admissible under the conditions stated in DIN EN 61010-1:2001 and DIN EN 61010-2-010:2003 :

- Operation only indoors.
- Elevation up to 2000 m above seal level.
- Siting base impermeable, flat, non-slip and non-flammable.
- Keep distance to walls (⇨ 6.1).
- Ambient temperature (⇨ 11).
  The ambient temperature must be taken into account.
- Permissible mains voltage variations (⇨ 11).
- Maximum relative humidity 80 % up to 31 °C and decreasing linearly to 50 % up to 40 °C.
- Overvoltage Category II and transient overvoltages according to Category II.
- Contamination Level: 2.

4.2 Device types

Heating thermostats

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

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

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

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

Cooling thermostats

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

Example: RE 415 G is a heating thermostat with a maximum bath volume of 4 litres and a minimum temperature of -15 °C.

4.3 Pump

All devices are equipped with a pressure pump. The pump has an output with a pivotable outflow elbow. With the bath and circulation thermostats this is joined to the pump set for external tempering 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.

In the heating range the pump operates up to viscosities of 150 mm²/s. In the controlled mode 30 mm²/s should not be exceeded.

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

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

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

Pump characteristics (⇨ 11)

4.4 Materials

All parts coming into contact with the heat transfer liquid are made of high quality material suitable for the operating temperature. Non-rusting stainless steel, and temperature-resistant and to a large extent solvent-resistant plastics are used.

4.5 Programmer

The devices are equipped with a programming function. This function provides five temperature/time programs. Up to 150 segments can be spread over the five programs. (⇨ 7.8).

4.6 Interfaces

In the basic version the GOLD devices are equipped with a mini-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.

4.7 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 (⇨ 8) and are inserted.
The following modules are currently available:

1. **Analogue Module** (LAUDA order 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 order 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 RS232 interface can be connected directly to the PC with a 1:1 connected cable (LAUDA order no. EKS 037).

3. **Contact Module** (LAUDA order 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 three-pole, (LAUDA order no. EQD 047) and Coupling Plug three-pole, (LAUDA order no. EQS 048).

4. **Contact Module** (LAUDA order no. LRZ 915) for 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 order no. EQM 030) and Plug Housing (LAUDA order no. EQG 017).

5. **Profibus Module** (LAUDA order no. LRZ 917).
   You will find further information in the Operating Instructions YAAD0020 for the Profibus Module.

6. **Pt100/LiBus Module** (LAUDA order 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, a reverse-flow protection device or a through-flow cooler (DLK) with LiBus connection.

4.8 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 (⇨ 7.5.5).

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

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

Cooling times for the various cooling thermostats can be taken from the **cooling curves** (⇨ 11**).**

5 Unpacking

After unpacking, first check the device and accessories for any transport damage. If contrary to expectations the device is found to be damaged, the shipping company must be immediately informed so that verification can take place.

Please also inform **LAUDA Service Constant Temperature Equipment** (⇨ 9.6).

Standard accessories:

Order number	Quantity	Description	Included with
HDQ 132	1	Bath Cover E 4	E 4 G
HDQ 127	1	Bath Cover RE 415, RE 420	RE 415 G and RE 420 G
HDQ 128	1	Bath Cover RE 620, RE 630	RE 620 G and RE 630 G
HDQ 129	1	Bath Cover RE 1050	RE 1050 G
HDQ 130	1	Bath Cover RE 1225	RE 1225 G
HDQ 131	1	Bath Cover RE 2025	RE 2025 G
LCZ 0716	1	Pump Connection Set	RE (cooling) devices, E 4 G, ET 15 G
HKO 026	2	Olive Ø 13 mm	RE (cooling) devices, E 4 G, ET 15 G
HKM 032	2	Union Nuts M16x1	RE (cooling) devices, E 4 G, ET 15 G
HKN 065	2	Sealing Plug	RE (cooling) devices, E 4 G, ET 15 G
LCZ 0720	1	Cooling Coil	E 4 G, ET 6 G
LCZ 0721	1	Cooling Coil	E 10 G, E 15 G, E 20 G, E 25 G, E 40 G, ET 12 G, ET 20 G
EZB 260	1	Warning Label "HOT" 	All thermostats Note: Attach to an easily visible point on the bath for applications above 70 °C
YACE0088	1	Operating Instructions (this document)	All GOLD thermostats

6 Preparations

6.1 Assembly and siting

a) Immersion thermostat

- Push the screw clamp on the underside of the control head into the guide rails.
- Insert the thermostat with the screw clamp into the tempering vessel (⇨ 10) and screw the clamp tightly to the bath edge by turning the knurled screw.
- With plastic baths the tubular heating element must not contact the bath wall.
- Do not cover the ventilation opening on the back of the device.
- Keep a distance of at least 20 cm free on all sides of the device.

Operation with Cooling Coils LCZ 0720 and LCZ 0721 (⇨ 10)

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).

- Use a soft underlay to avoid scratches to the upper side of the control head.
- Withdraw the mains plug.
- 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 flange with holes underneath it.

Flange with holes

- With the two cross-head screws, screw the carrier plate of the cooling coil and the flange with holes to the underside of the control head.

Operation with external load (circulation thermostat) (⇨ 6.2.)

- Carefully attach the immersion thermostat so that it cannot fall into the bath.
- If this should occur however, do not reach into the bath. Withdraw the mains plug immediately.

b) Bath and circulation thermostats

- 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 on the bath edge. Starting from the rear of the bath, guide the prongs of the bath bridge into the slots to the right and left. Now place the bath bridge down completely onto the edge of the bath. Fasten the bath bridge to the rear of the bath with the two enclosed cross-head screws.
- Do not cover the ventilation opening on the back of the control head.
- Keep a distance of at least 20 cm free on all sides of the device.
- Set the flow distribution to INT (⇨ 6.2), so that during operation as a bath thermostat (without external load) the flow is discharged from the opening for the internal bath circulation.
- During operation as a bath thermostat without an external load and with the pump connection set fitted, the outflow nozzle of the pump connection set must be closed (use sealing plug) or short circuited with the return nozzle.
- 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 to fit 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.
- Operation with external load (circulation thermostat) (⇨ 6.2).

c) Cooling bath and circulation thermostats

- Do not tilt the device and never turn it upside down.
- If possible after transport, site the device two hours before putting it into operation.
- Do not cover the ventilation openings at the back of the device and on the lower part of the device.
- Keep a distance of at least 40 cm free on all sides of the device.
- Set the flow distribution to INT (⇨ 6.2), so that during operation as a bath thermostat (without external load) the flow is discharged from the opening for the internal bath circulation.
- During operation as a bath thermostat without an external load and with the pump connection set fitted, the outflow nozzle of the pump connection set must be closed (use sealing plug) or short circuited with the return nozzle.
- 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 load (circulation thermostat) (⇨ 6.2).

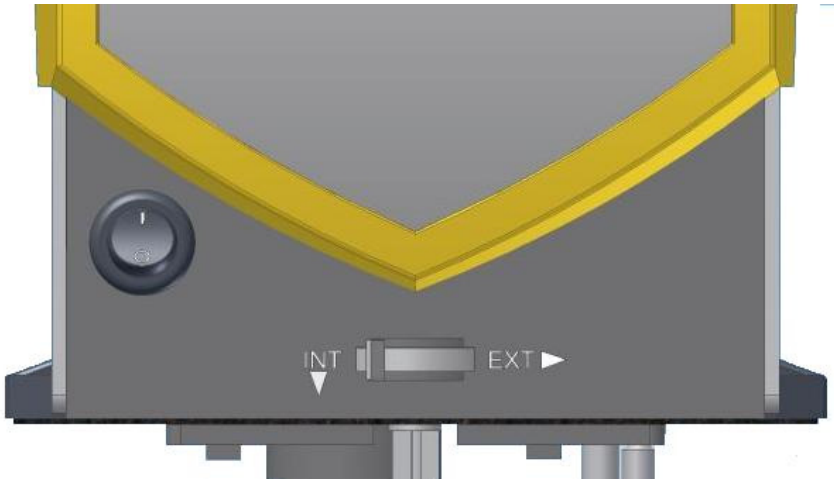
- The device can be operated up to an ambient temperature of 40 °C.
- An increased ambient temperature results in reduced cooling power.
- When putting the chiller into operation after a lengthy shut-down period, up to 30 minutes may pass until the rated cooling power is available depending on room temperature and device type.

Ways of adjusting the pump flow (⇨ 6.2)

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 possible during operation.

The adjustment between internal and external circulation is only practicable with a connected external load. A pump connection set is needed to do this. This set is included as standard with cooling devices and with the heating devices E 4G and ET 15 G. With immersion thermostats and the remaining heating thermostats the pump connection set is available as an accessory (⇨ 10).

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



6.2 Connection of external loads

For heating thermostats a pump connection set is available as an accessory (⇨ 10) for the connection of an external load. This set is included as standard with cooling thermostats and with the heating thermostats E 4 G and ET 15 G.

Withdraw the mains plug before cleaning, servicing, installing or removing modules or moving the thermostat.

a) Immersion thermostat/heating thermostat

With heating thermostats the control head must be removed first from the bath bridge (⇨ 6.1).

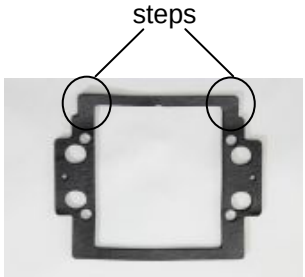
The pump connection set can only be mounted on one side of the control head. With the control head turned round and the mains cable pointing to the user this is then on the right (refer to illustration).

- Use a soft underlay to avoid scratches to the upper side of the control head.
- With heating thermostats: take out the flat seal.
- Loosen the two cross-head screws on the blind flange and remove it.
- 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 flange with holes under the pump connections and fasten it with two cross-head screws to the underside of the control head.

Flange with holes

- With heating thermostats: 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.



- With heating thermostats: Mount the control head on the bath bridge (⇨ 6.1)

- Select the division of the pump flow to suit the thermostating task using the selector switch on the front of the control head (⇨ 6.1).
- The position **EXT** signifies 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.

b) <u>Operation as circulation thermostat</u>

- With operation as circulation thermostat it should be ensured that the shortest hose connections are used with the largest possible internal hose diameter in order to obtain the largest possible volume flow.
- Connect a hose with 11-12 mm inside diameter (⇨ 6.4) to the pump connections.
- Pump connection:
  – return to the bath (rear)
  – outflow nozzle (front)
  (⇨ label on control head housing)

- Always ensure the largest possible cross-section and the shortest possible hose lengths in the external circuit.
- If external control is to be used, provide a temperature sensor probe in the external load (⇨ 7.7.1).
- For a hose cross-section that is too small a temperature gradient occurs between the bath and external load due to a volume flow that is too low. In this case case increase the bath temperature or the pump level appropriately.

- With loads 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. This means there is the risk of the thermostat overflowing.
- Secure the hoses against slippage by using hose clips.
- If no external load is connected, the outflow nozzle must be sealed off or short-circuited to the return nozzle.

6.3 Filling and emptying

Filling

- Withdraw the drain tap.
- Maximum filling level is 20 mm below the bath bridge.
- Optimum operation with 20-40 mm below the bath bridge.
- Operation down to 60 mm below the bath bridge is possible.
- Low-level switch-off at approx. 90 mm below the bath bridge!!!

- With the use of oils as heat transfer liquids note that they expand on heating (approx. 10 %/100 °C).
- With a connected external load the complete expansion takes place in the bath.

Emptying

- Switch off the thermostat and withdraw the mains plug.
- Push a hose onto the bath drain point.
- Drain the heat transfer liquid via the drain tap at the back of the device.

Drain tap, cooling thermostats

Drain tap, heating thermostats

6.4 Heat transfer liquids and hoses

Heat transfer liquids – approved by LAUDA

LAUDA designation	Operating temperature range	Chemical designation	Vis-cosity (kin)	Viscosity (kin) at temperature	Fire point	Container size Catalogue number		
	°C		mm²/s (20 °C)	mm²/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 vaporisation losses occur. In this case use a bath cover (⇨ 10). Use distilled water or pure demineralised water only after adding 0.1 g of soda (Na_2CO_3 sodium carbonate)/litre 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.

– When choosing the heat transfer liquid, it must be noted that at the lower limit of the operating temperature range a worsening of the tempering properties is to be expected due to the increasing viscosity. Therefore, only use the full operating temperature ranges 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.

– Never use silicone oil with silicone hoses.

Safety data sheets can be ordered on request.

Hoses

a) Elastomer hoses

Type of hose	Internal diameter Ø mm	Temperature range °C	Application range	Order 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**

- EPDM hose is <u>not</u> suitable for Ultra 350 <u>nor</u> for mineral oils.
- Never use silicone oil with silicone hoses.
- Secure hoses against slippage by using hose clips.

b) Metal hoses in non-rusting stainless steel with union nut M 16x1, inside diameter 10 mm

Type	Length (cm)	Temperature range °C	Application range	Order 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	20	10...400	"	**LZM 044**
MK 50	50	-90...200	With foam insulation for the cooling range For all LAUDA heat transfer liquids	**LZM 052**
MK 100	100	-90...200	"	**LZM 053**
MK 150	150	-90...200	"	**LZM 054**
MK 200	200	-90...200	"	**LZM 055**
Pump short circuit	20	-90...200	"	**LZM 045**

☞	**Important** There are different sorts of water! – Tap water may be unsuitable for operation due to the calcium carbonate content. There is a risk of calcification of the stainless steel vessel. – 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_2CO_3, sodium carbonate) / litre of water.
☞	– There is a risk of electrochemical oxidation with the use of frames of non-ferrous metals or non-ferrous metal samples. – The bath vessels of the LAUDA ECO thermostats are produced in stainless steel 1.4301 and are accordingly resistant to mechanical and chemical stresses. – Due to the different electrochemical potentials of metals electrochemical oxidation may occur in the case of direct contact between the tank and a frame (e.g. copper) and the bath may corrode despite the use of high quality materials for the tank. – **TIP:** Avoid the use of this type of frame or the direct contact with this sort of frame or contact with non-ferrous metal samples and the inside of the container. Use original LAUDA stainless steel frames and commercially available frames in temperature-resistant plastics.

6.5 Cooling the 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 an immersion thermostat: Fit the cooling coil (⇨ 6.1).

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

Cooling methods

Temperatures above 20 °C:

Cooling through the water supply. Ensure the lowest possible water consumption.

Temperatures below room temperature:

A LAUDA through-flow cooler DLK 10, DLK 25, DLK 45 or DLK 45 LiBus can be connected to the pump connections (⇨10). The through-flow cooler is built into the return line from the load to the thermostat.

7 Putting the device into operation

7.1 Mains connection

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

Device according to EMC standard EN 61326-1, refer to (⇨ 11).

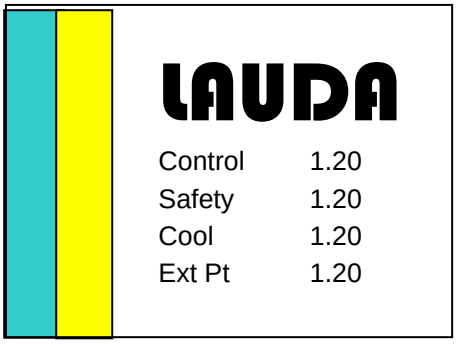
- The separable plug is used as disconnecting device.
  The separable plug shall be readily identifiable and easily reached by the operator.
- Only connect units to sockets having a safety earth conductor (PE).
- No liability is accepted for incorrect mains connection.
- Ensure that if not using an external load, the pressure nozzle is closed off or short-circuited to the return nozzle.
- Ensure that the unit is filled according to section (⇨ 6.2).

7.2 Switching on

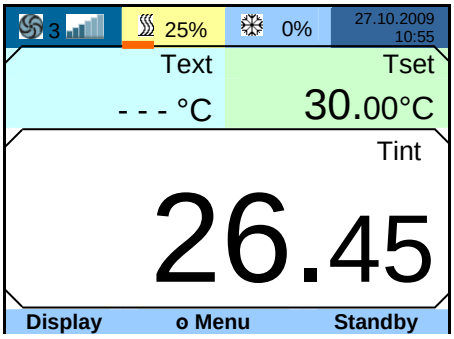
- Switch on the device with the mains switch at the front.

1 s

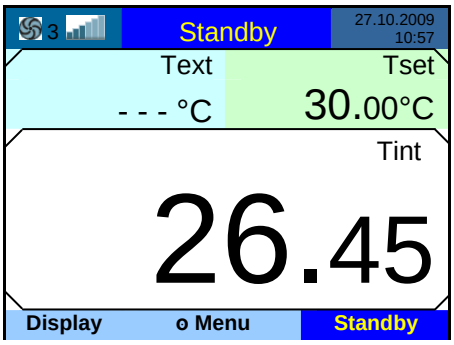
- An acoustic signal sounds for approx. 1 s. (Example: depends on device type and equipment).



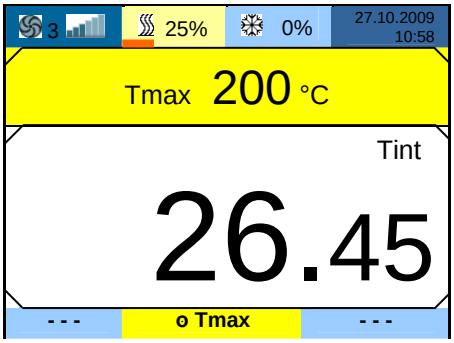
- The adjacent display appears for approx. five seconds with the corresponding version numbers of the software.
- The displayed versions are: Control and Safety. If present, Cool and External Pt100 are displayed.
- Other modules are displayed in → Setup → Device Status → software version (if these modules are also installed).
- When making technical queries, please have the device serial number (⇨ 9.3.5) to hand.



– The current bath temperature (Tint), status display, expanded status display and the soft-key bar at the bottom edge of the display appear.
– Pump starts up provided "Standby" has not been set.



If standby is activated (⇨ 7.4.4), "Standby" appears in the expanded status display. The "Standby" soft-key function is highlighted in a different colour.
– The values are accepted which were set before the switch-off.

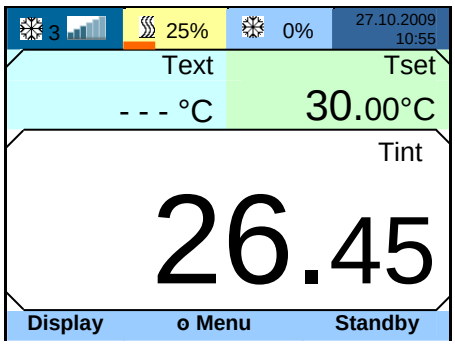


Check or set the overtemperature switch-off point with the key T_{max}.
– On pressing the key T_{max} the value in the upper line is displayed.
– Changing the overtemperature cut-off point. (⇨ 7.4.1)

7.3 Display representation

The ECO GOLD thermostats offer simple menu guidance in plain text. Information and possible entries are represented differently in the display. In the following the possible window views and the symbols used are explained.

7.3.1 Basic window



The following information is displayed depending on the operating status:

- 3 pump runs with the displayed pump level, graphical display with bars.
- 25% heating is active and heats with displayed percentage of total power.
- 75 % cooling is active and cools with displayed percentage of total power (only with cooling devices).
- Date and time.
- External temperature (text) (if external temperature sensor is connected) and setpoint value (Tset).
- Current bath temperature (Tint).
- Soft-key bar (display, ⊙ menu, standby).

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

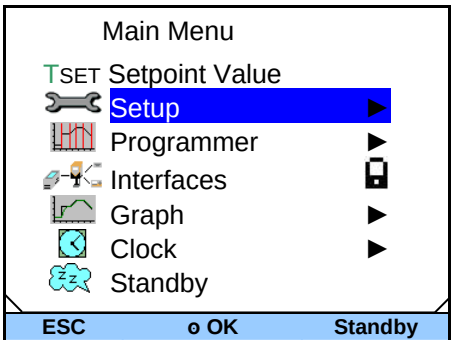
7.3.2 Menu window

The menu of the ECO GOLD thermostats consists of several menu levels. With the cursor keys (arrow keys) ▲, ▼, ◀, ▶ you can navigate to the individual menu points and select them with the enter key ●.

⊙	Symbolises the enter key or its function as a soft key.
✓	Displays the currently selected function.
▶	Indicates that further menu levels (submenus) are present.
🔒	The padlock symbolises that the function is locked. Possible reasons: – No access rights. – Deactivated function due to parameter settings.

Examples of display representation:

Main menu



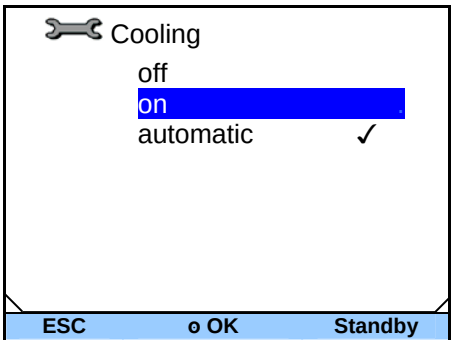
In the main menu the following information is displayed:

- The selected menu point is displayed inversely.
- In front of each menu point symbols are displayed which support the menu point graphically.
- An arrow ▶ behind the menu point indicates that a further menu level is available.
- A padlock behind the menu point indicates that the function is locked.
- The soft-key bar is shown in the lower region of the display. The following functions can be selected with the soft keys:

  ESC: You are returned to the basic window.

  OK: You enter 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

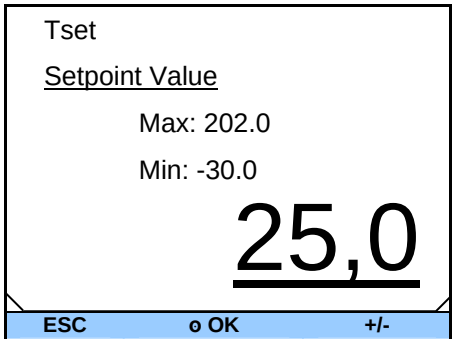


In the window the following information is displayed:

- The setting on is displayed inversely and can be selected by pressing .
- A tick ✓ behind the menu point indicates that this setting is active. In the example this indicates that the cooling is set to "automatic".

7.3.3 Entry window

Values are input using the entry window.

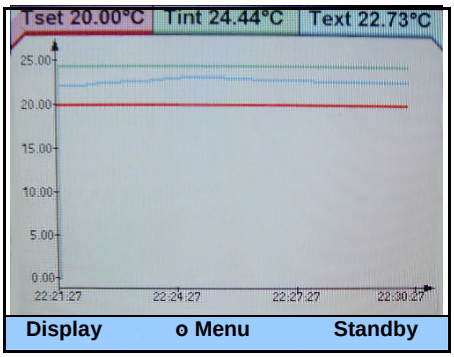


In the entry window the following information is displayed:

- In the first line the short form of the parameter is located whose value is to be entered. In the example shown this is T_{set}.
- The parameter is located underlined below this in plain text.
- Max. and Min. state the limits for the value to be entered.
- The value to be entered is shown in large characters. The cursor flashes under the value.
- You can change the value with ▲ or ▼. If you keep one of the two cursor keys pressed, input is speeded up.
- By pressing ◀ or ▶ you can also select numbers individually and change them with ▲ or ▼.
- By pressing (+/-) the arithmetic sign "+" or "-" can be selected.
- You confirm the set value by pressing ●.
- By pressing (ESC) you are returned to the menu level without the value being changed.

7.3.4 Graphics window

The ECO GOLD thermostats offer you the possibility of displaying temperature measurements graphically. The temperature traces are displayed in the graphics window



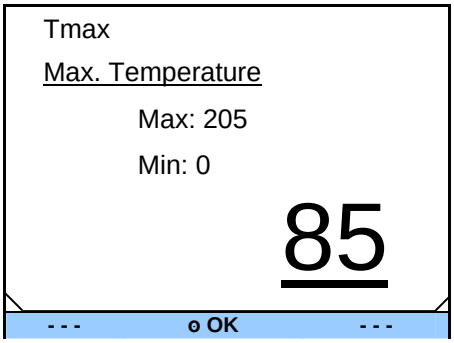
In the graphics window the following information is displayed depending on the setting:

- The set-point temperature Tset (red).
- The internal temperature Tint (in the bath, green).
- The temperature on the external load (external temperature sensor) in text (blue).
- The graphical display of the temperature against time.
- The colours of the curves correspond to the colours with which the respective temperature values are highlighted.

☞ A special feature of a window view is that presented for the programmer. This is described in detail in section 7.8.

7.4 Basic setup

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



– Press the key T max and keep it pressed during the complete setup; simultaneously press ●. The entry window appears. The T_{max} value is underlined. The maximum and minimum possible adjustable temperature values are displayed.

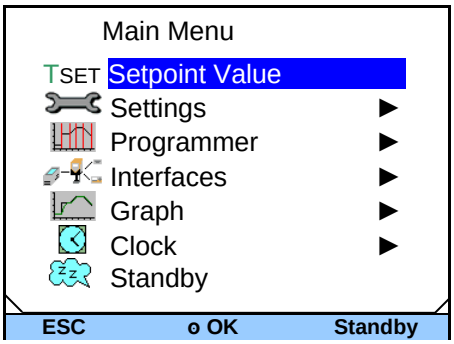
– Change the value with ▲ or ▼.

– By pressing ◀ or ▶ individual numbers can be selected and changed with ▲ or ▼.

– The selected value is confirmed with ●.

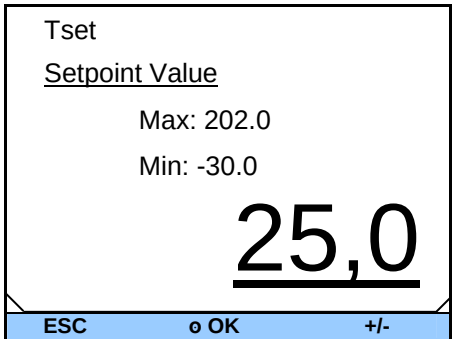
– By pressing T max you are returned to the menu level without the value being changed.

7.4.2 Setting the temperature setpoint value



– Access to the main menu level is obtained by pressing ●.

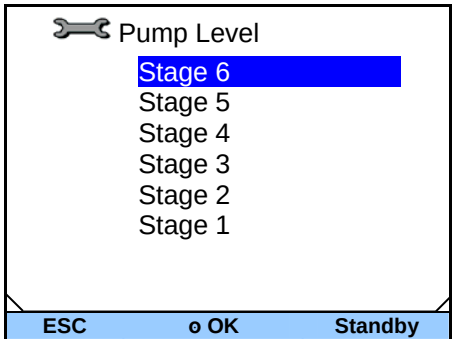
– "Setpoint Value" is highlighted in colour.



- Select with . The entry window appears. The temperature value is displayed with a flashing underscore. The maximum and minimum possible adjustable temperature values are displayed.
- Change the value with or .
- By pressing or you can also select numbers individually and change them with or .
- By pressing (+/-) the arithmetic sign "+" or "-" can be selected.
- You confirm the set value by pressing .
- By pressing (ESC) you are returned to the menu level without the set-point being changed.

7.4.3 Setting the pump level

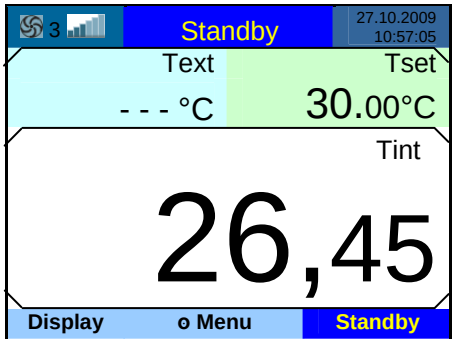
With the ECO Vario pump you have six pump levels available with which you can optimise the bath circulation, flow rate and pressure, the noise generated and the mechanical heat input. With small thermostats (e.g. E 4 G, RE 415 G, RE 420 G) without an external load, power levels 1 to 3 are practicable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



- Access to the main menu level is obtained by pressing .
- 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 6.
- You quit the menu with (ESC) or .

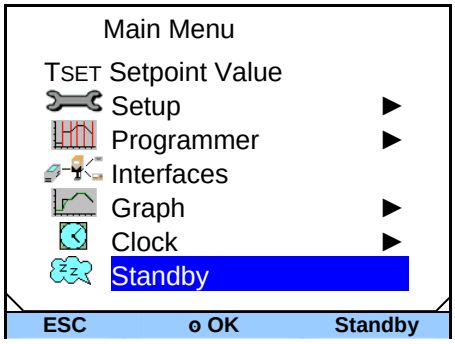
7.4.4 Setting up standby

Standby operation: Pump, heating and chiller are switched off; the operating display remains active.



There are two ways of selecting the standby mode.

– 1. Confirm Standby by pressing .



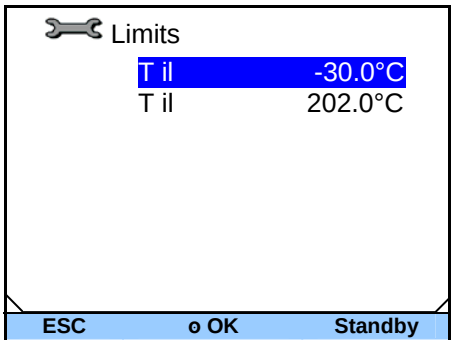
– 2. Select menu by pressing .
The adjacent menu window appears. Select "Standby" with ▲ or ▼ and confirm with .

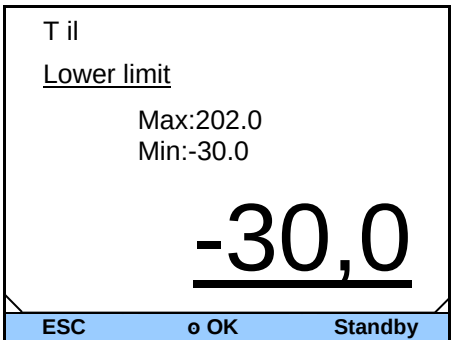
– If "Standby" is active, it is highlighted in colour in the soft-key bar → Standby.

7.5 Other settings

7.5.1 Defining temperature limits

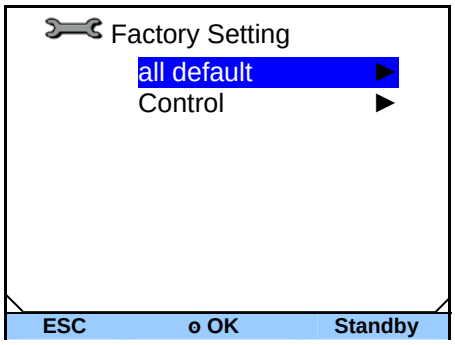
With this function it is possible to define a minimum and maximum temperature within which the controller operates. If, for example, you are using water as the heat transfer liquid, +95 °C would be practicable as the maximum temperature and +5 °C the minimum temperature.



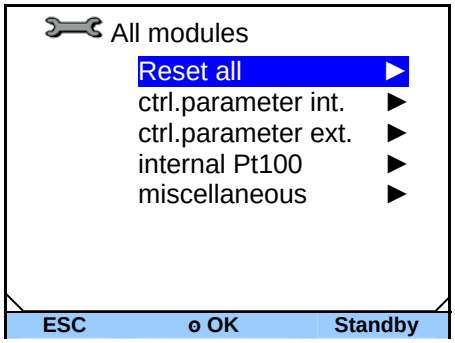


- Access to the main menu level is obtained by pressing .
- The adjacent menu window appears by selecting and confirming → Setup → Limits.
- Select the lower (Til) or upper (Tih) limit with ▲ or ▼ and confirm it with . In the entry window the cursor flashes below the value to be changed. The permissible adjustment range is indicated with Min and Max.
- Change the value with ▲ or ▼.
- By pressing ◀ or ▶ you can also select numbers individually and change them with ▲ or ▼.
- By pressing (+/-) the arithmetic sign "+" or "-" can be selected.
- You confirm the set value by pressing .
- By pressing (ESC) you are returned to the menu level without the set-point being changed.

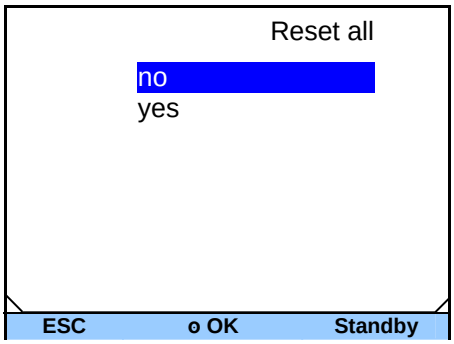
7.5.2 Restoring factory settings



– Access to the main menu level is obtained by pressing  .
– Selection and confirmation of → Setup → Factory Setting. The adjacent menu window appears.
– If all default is selected, a display appears in which a choice between "no" and "yes" can be made.
– With no you return to the "Factory Setting" menu level without changes being made. With yes all settings are reset.



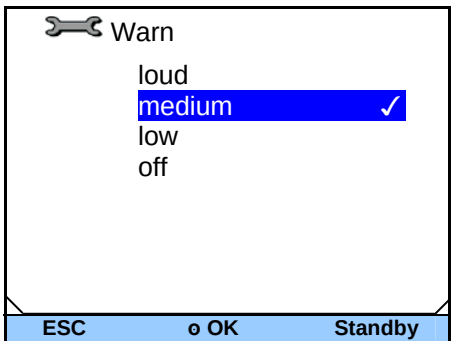
– By selecting Control you can select the displayed parameters with ▲ or ▼. The adjacent menu window appears.
– The parameters can be reset individually.
– With "miscellaneous" the following can be reset: set value, pump level, max. current consumption, control to internal and autostart to "auto".



– For all menu points under "All modules", a display appears in which a choice between "no" and "yes" can be made.
– With no you return to the "All modules" menu level without changes being made. With yes the respective setting is reset.
– With ◀ or  (ESC) you quit the respective window without changes.

7.5.3 Setting the volume of the acoustic signals

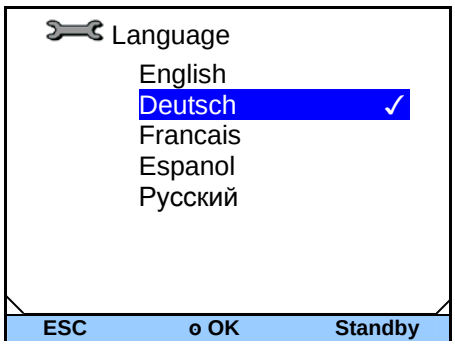
The ECO GOLD thermostats signal alarms and errors as a two-tone acoustic signal and warnings as a continuous tone.



– Access to the main menu level is obtained by pressing  .
– Selection and confirmation of → Setup → Basic setup → Sounds.
– Choose Alarm, Warn or Error. The adjacent menu window appears.
– The volume can be selected with ▼ or ▲. The selected level is immediately active without confirmation. In this example the volume is medium.
– You quit the window with  (ESC), ◀ or  .

7.5.4 Selecting the menu language

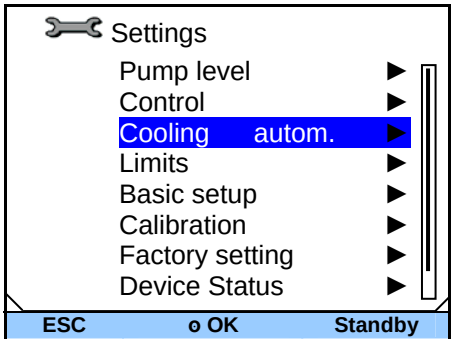
The ECO GOLD thermostats offer you the possibility of selecting the menu languages of English, German, French, Spanish and Russian.



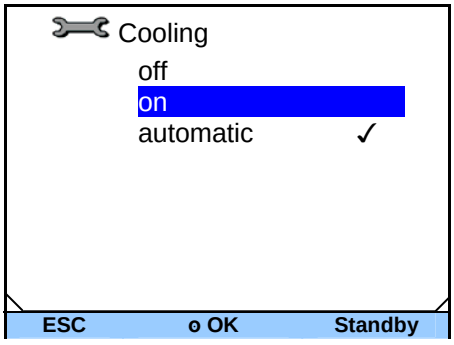
– Access to the main menu level is obtained by pressing .
– Selection and confirmation of → Setup → Basic setup → Language. The adjacent menu window appears.
– Select the language with ▲ or ▼ and confirm with .
– With ◀ or (ESC) you quit the window without changes.

7.5.5 Setting the chiller

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



– Access to the main menu level is obtained by pressing .
– Selection and confirmation of → Setup → Cooling autom.▶. The adjacent menu window appears.
– As well as Cooling the current operating mode is stated. This is "off", "on" or "automatic".
– Select Cooling with .

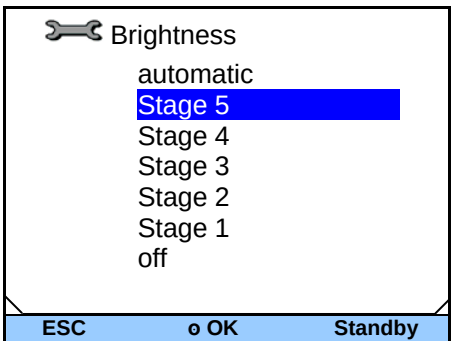


– Select the operating status "off", "on" or "automatic" with ▲ or ▼ and confirm with .
– In the menu "Cooling" the set operating status is displayed by a tick ✓.
– With ◀ or (ESC) you quit the window without changes.

When the refrigerating machine is switched off, it can take up to two minutes before it switches on again.

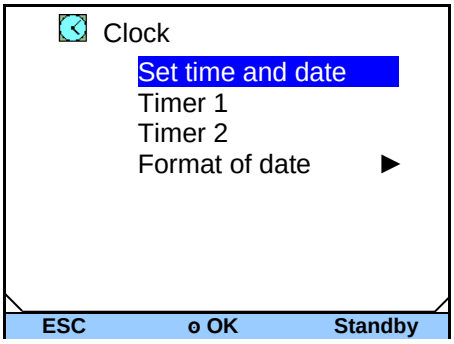
7.5.6 Setting the display brightness

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



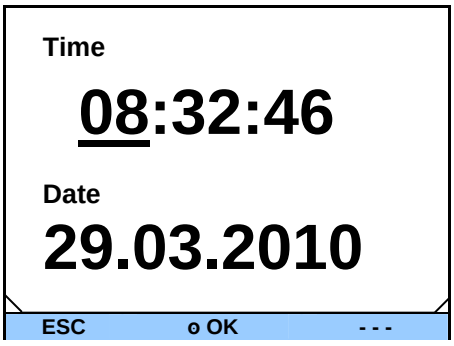
– Access to the main menu level is obtained by pressing the rotary knob.
– Selection and confirmation of → Setup → Basic setup → Display → Brightness. The adjacent menu window appears.
– Select "automatic", "Stage" or "off" with ▲ or ▼. The selected level is immediately active without confirmation.
– You quit the window with (ESC), ◀ or the rotary knob.

7.5.7 Setting the date and time.

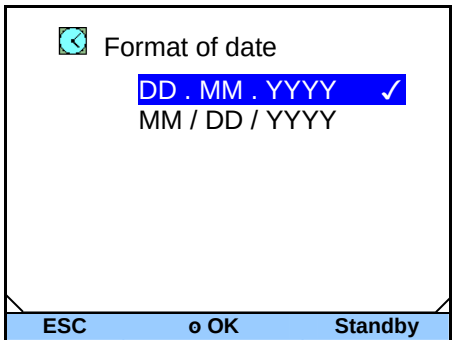


– Access to the main menu level is obtained by pressing the rotary knob.
– Selection and confirmation of → Clock → Set time and date.

The adjacent menu window appears.



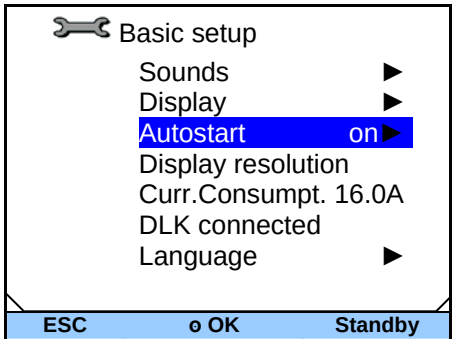
– The cursor flashes under the hours display.
– Move to the value which is to be changed with the ◀ or ▶ cursor.
– Change the value with ▲ or ▼ and confirm with the rotary knob.
– You quit the window without changes with (ESC).



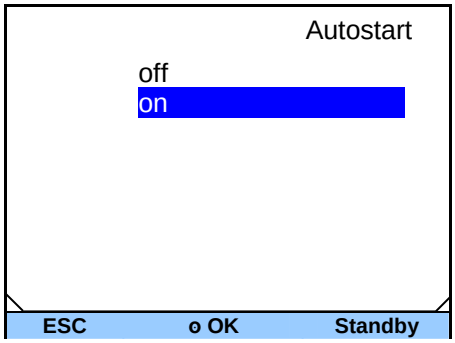
– The adjacent menu window appears on selecting the menu point "Format of date". You can select the date format by selecting with ▲ or ▼ and confirming with the rotary knob.
There are two formats available
"DD . MM . YYYY" or "MM / DD / YYYY".

7.5.8 Defining the starting mode (Autostart)

Usually it is required that the thermostat starts operating again after a power interruption. However, if this is not desired due to safety considerations, you can insert a manual activation step.



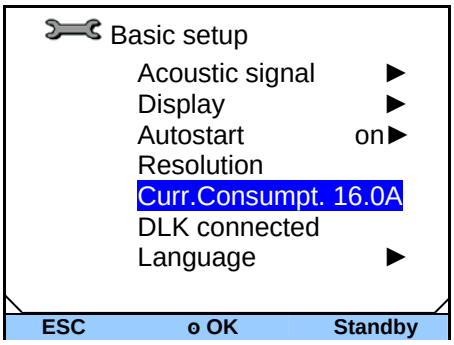
– Access to the main menu level is obtained by pressing .
– Selection and confirmation of → Setup → Basic setup. The adjacent menu window appears.
– As well as Autostart the current setting is stated. This is "off" or "on".
– Select Autostart with .



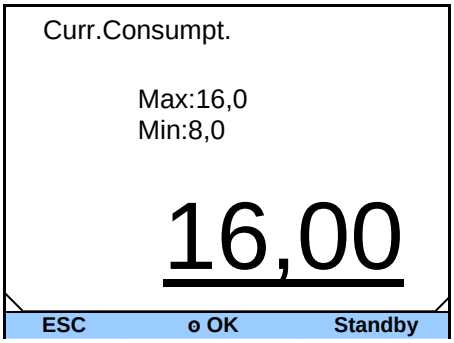
– Select the operating status "off" or "on" with ▲ or ▼ and confirm with .
– With ◀ or (ESC) you quit the window without changes.

7.5.9 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 then also reduced correspondingly. Here, take into consideration whether other loads are connected to the same fused circuit or whether your ECO thermostat is the only load.



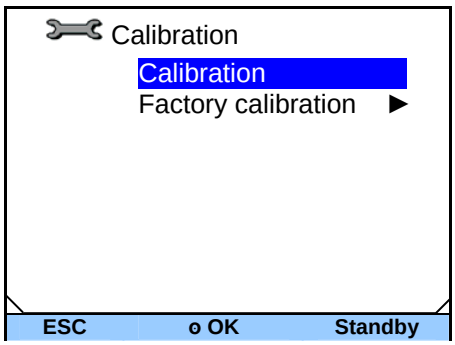
- Access to the main menu level is obtained by pressing .
- Selection and confirmation of → Setup → Basic setup. The adjacent menu window appears.
- As well as Curr.Consumpt. the set value is displayed.
- Select Curr.Consumpt. with .



- Change the value with ▲ or ▼.
- By pressing ◀ or ▶ you can also select numbers individually and change them with ▲ or ▼.
- You confirm the set value by pressing .
- You quit the window without changes with (ESC).

7.5.10 Entering the offset of the displayed temperature (calibration)

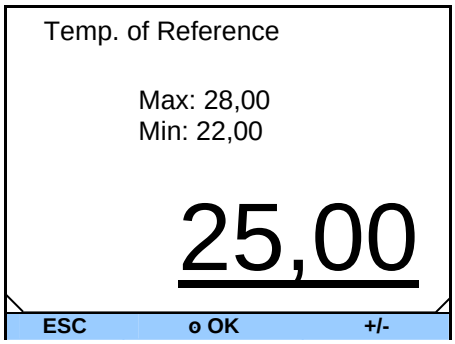
If a deviation is found when checking with a calibrated reference thermometer, e.g. from the LAUDA DigiCal series, the offset of the internal measuring chain can be adjusted with the following function.



– Access to the main menu level is obtained by pressing 

– Selection and confirmation of → Setup → Calibration. The adjacent menu window appears.

– Select "Calibration" with ▲ or ▼ and confirm with  . The entry window appears.



– Change the value with ▲ or ▼.

– By pressing ◀ or ▶ you can also select numbers individually and change them with ▲ or ▼.

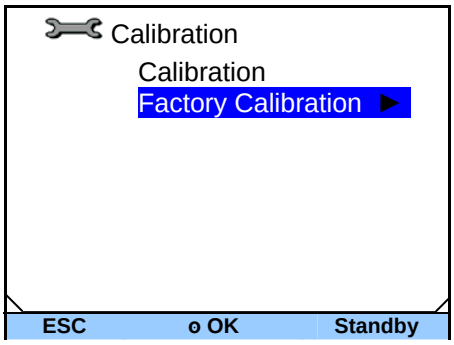
– By pressing (+/-) the arithmetic sign "+" or "-" can be selected.

– You confirm the set value by pressing  .

– By pressing (ESC) you are returned to the menu level without the actual value being changed.

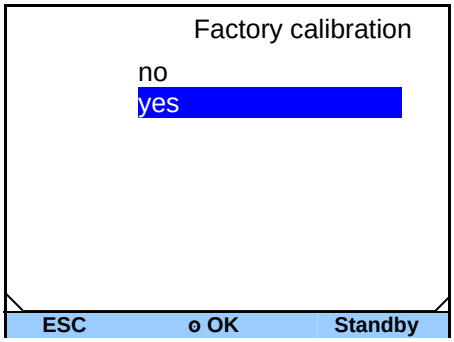
7.5.11 Restoring the factory setting of the internal temperature sensor (factory calibration)

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



– Access to the main menu level is obtained by pressing  .

– Selection and confirmation of → Setup → Calibration. The adjacent menu window appears.

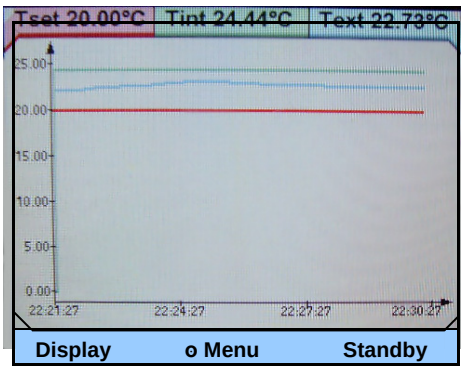


– Select "Factory Calibration" with ▲ or ▼ and confirm with  . The adjacent menu window appears.

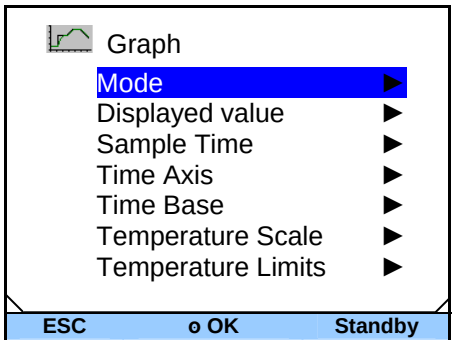
– Select "yes" using ▲ or ▼ and confirm with  to restore the factory settings.

– With "no",  (ESC) or ◀ you quit this menu level without changes.

7.6 Graphical display of temperature measurements



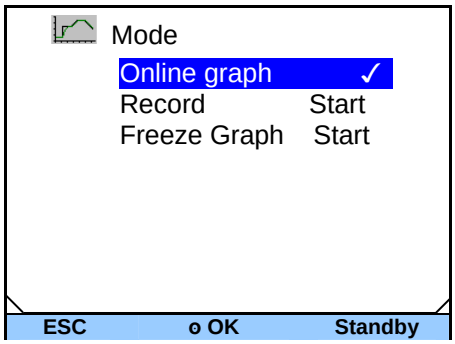
– From the basic window you access the graphics window by pressing (display).
– The temperature traces are shown in different colours.
The red line is the temperature set-point Tset;
the green line is the internal bath temperature Tint;
the blue line is the external bath temperature Text.
– You can change the settings for the graphics window in the submenu Graph.



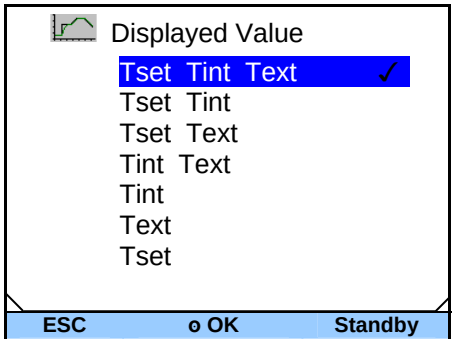
– Access to the menu level is obtained by pressing .
– In the main menu select the menu point Graph with or and confirm with .
The adjacent menu window appears.

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

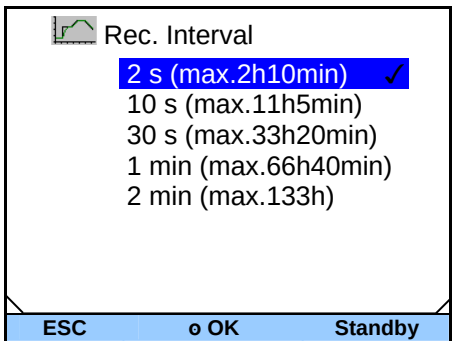
– All menu points are selected with or and confirmed with .
– With or you quit the respective window without changes.



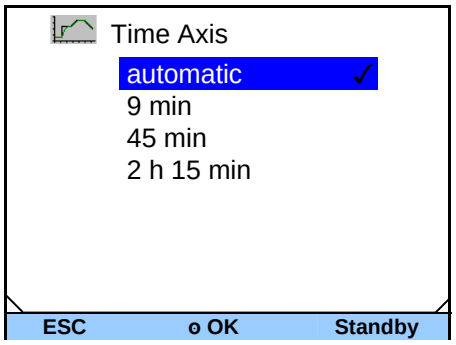
In the menu "Mode" there are the following settings:
– The recording runs continuously as an Online graph.
– The recording is started with Record Start and terminates with Record Stop.
– The current recording is saved with Freeze Graph Start.



With display measurements you can define which temperature values are to be graphically displayed.
In the menu all possible combinations are offered.

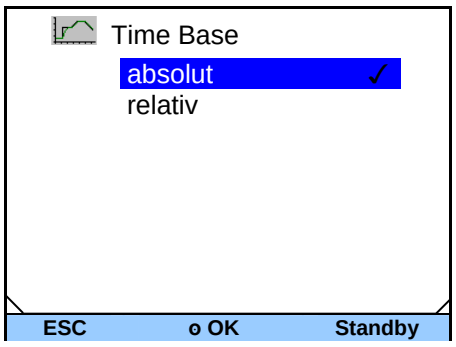


With "Rec. Interval" you can define the time interval at which the temperature measurements are to be recorded.
The values in brackets give the maximum recording time.
In the menu five possibilities are offered.



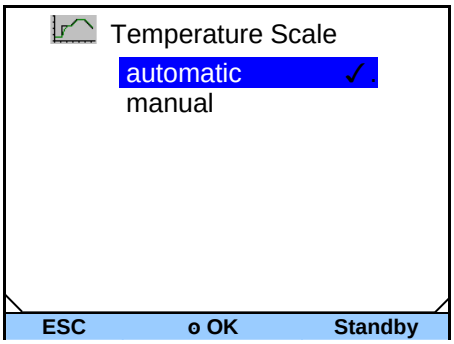
With "Time Axis" you can define the temporal range over which the measurements are to be displayed.

– With automatic the program finds the optimum representation.
– Manually you can define a time axis of 9 min, 45 min or 2 h 15 min (up to 144 h depending on the recording interval).



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

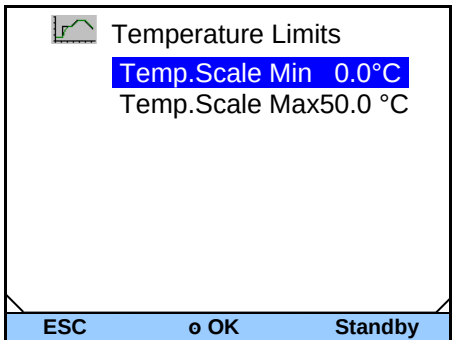
– With absolut the current time is displayed.
– With relativ scaling starts at 00:00:00.



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

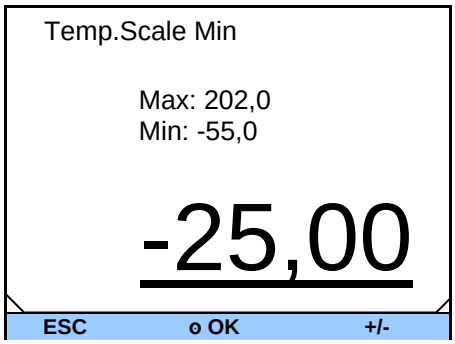
– With automatic the scaling is defined by the program.
– You can define the limits yourself with manual.

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



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

– As well as Temp.Scale Min the momentary minimum value is displayed.
– As well as Temp.Scale Max the momentary maximum value is displayed.



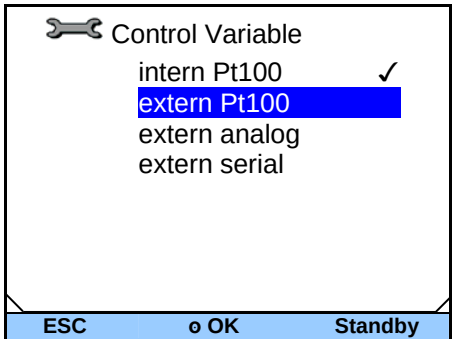
When "Temp.Scale Max" or "Temp.Scale Min" (as in the illustrated example) has been selected, the entry window appears.

– The minimum and maximum possible temperature values and the current minimal temperature value are displayed.
– Change the value with ▲ or ▼.
– By pressing ◀ or ▶ you can also select numbers individually and change them with ▲ or ▼.
– By pressing (+/-) the arithmetic sign "+" or "-" can be selected.
– You confirm the set value by pressing .
– You quit the window without changes with (ESC).

7.7 External control

The devices can also be controlled via an external Pt100 temperature sensor, which is connected at the back of the control head. However, the connection is not included in the items supplied with standard production devices. It is necessary to install an external Pt100/LiBus module (⇨ 8) for external control (⇨ 7.9.2). The module is available as an accessory (⇨ 10).
Furthermore, the signal coming from an analogue or serial module can also be controlled. The analogue module and contact modules are available as accessories (⇨ 10).

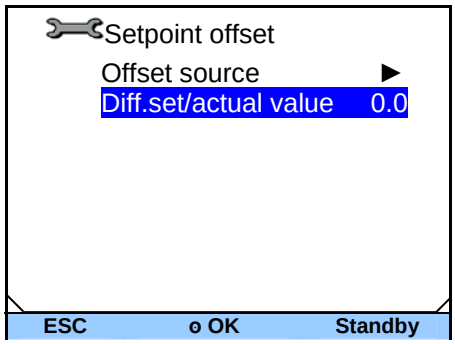
7.7.1 Activating external control (external Pt100)



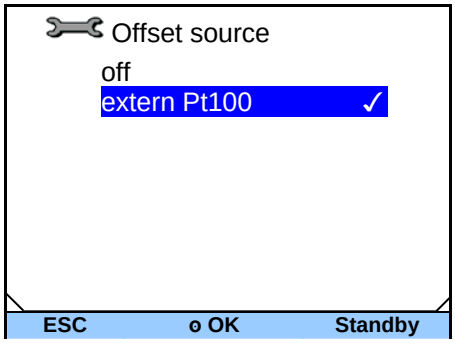
- Access to the menu level is obtained by pressing .
- Selection and confirmation of → Setup → Control → Contr. Variable. The adjacent menu window appears. The menu item extern Pt100 only appears when the module for an external connection is available.
- Select extern Pt100 with ▲ or ▼ and confirm with .
- With ◀ or (ESC) you quit the window without changes.

7.7.2 Setpoint offset operating mode (Diff.set/actual)

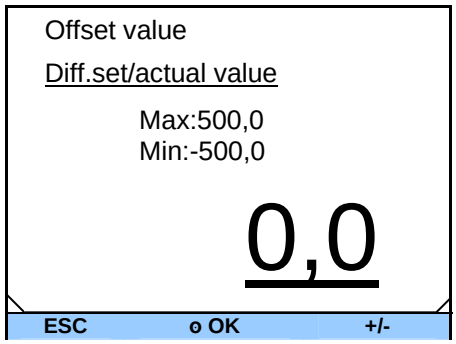
It is possible to apply an offset value to the temperature, which is provided by an external temperature sensor and to process it as the set value. The bath temperature can therefore be operated, for example, -15 °C below the temperature of a reactor measured by the external temperature sensor.



– Access to the menu level is obtained by pressing .
– Selection and confirmation of → Setup → Control → Setpoint offset. Adjacent menu window appears.
– As well as Diff.set/actual value the currently set offset value is displayed.



– The adjacent menu window appears on selecting the menu point "Offset source".
– Select the set-value source with ▲ or ▼ and confirm it with .
– The setpoint offset is deactivated with "off".



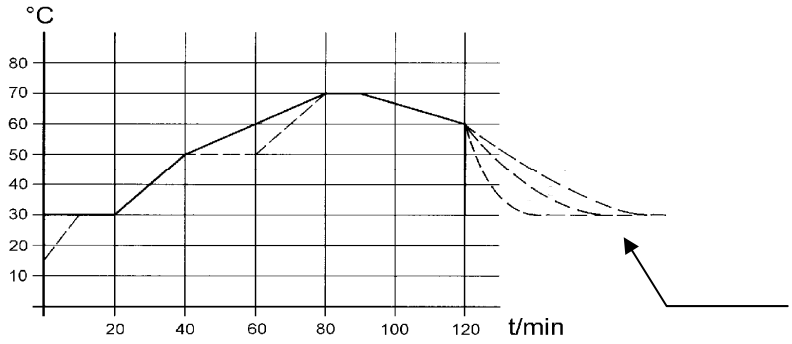
– Select Diff.set/actual value with ▲ or ▼ and confirm with . The adjacent menu window appears.
– The minimum and maximum possible offset values and the current offset value are displayed.
– Change the value with ▲ or ▼.
– By pressing ◀ or ▶ you can also select numbers individually and change them with ▲ or ▼.
– By pressing (+/-) the arithmetic sign "+" or "-" can be selected.
– You confirm the set value by pressing .
– You quit the window without changes with (ESC).

7.8 Programmer

The programming function enables you to save five temperature/time programs. The programs consist of several temperature/time segments. This also includes how often the program is to be run (loops). The sum of all segments of all programs can be up to 150. Step changes in temperature, i.e. the time is zero, or also temperature holding phases, i.e. the temperature at the start and end of a segment is the same, are possible. On starting the current set value is taken as the starting value of the first segment.

If the pump level is to be changed in the course of the program, then the specified pump level is entered in the respective program line. If the pump level is to remain unchanged, "0" is entered and it is indicated as "---" in the display.

7.8.1 Programming example



Graph 1

No.	Tend	hh	mm	Tolerance		No.	Pump	S1	S2	S3
Start	30.00	--	--	0.1		Start	2	off	off	off
2	50.00	0	20	0.0		2	2	off	off	off
3	70.00	0	40	0.0		3	3	off	off	off
4	70.00	0	10	0.1		4	4	off	off	off
5	60.00	0	30	0.0		5	2	off	off	off
6	30.00	0	0	0.0		6	2	off	off	off

☞ No time specification is possible in segment 1 (starting 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.

Edited programming example (refer to dashed curve in graph 1)

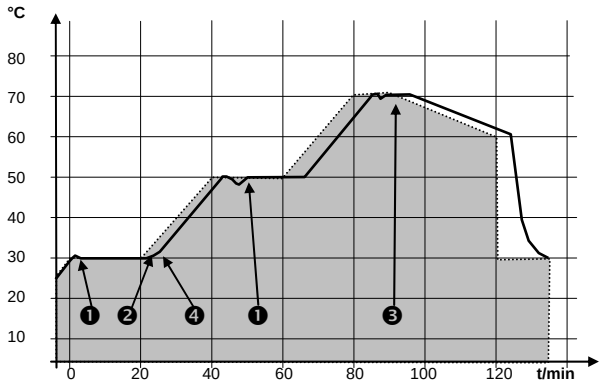
No.	Tend	hh	mm	Tolerance		No.	Pump	S1	S2	S3
Start	30.00	--	--	0.1		Start	2	off	off	off
2	50.00	0	20	0.0		2	2	off	off	off
3①	50.00 ①	0	20②	0.1③		3	3	off	off	off
4	70.00	0	20②	0.0		4	4	off	off	off
5	70.00	0	10	0.8③		4	2	off	off	off
6	60.00	0	30	0.0		5	2	off	off	off
7	30.00	0	0	0.0		6	2	off	off	off

① Insert new segment (⇨ 7.8.2)

② ③ Change segment time or tolerance (⇨7.8.2)

The field "Tolerance" (Refer to programming table above and graph below):

- It facilitates exact conformance to the dwell time at a specified temperature. Segment 1 is not processed until the actual temperature is within the tolerance band ❶, so that the ramp (Segment 2) starts delayed at 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.



Example of the effect of the tolerance input with external bath control:

The setpoint temperature of the programmer is shown in grey.

The actual temperature in the external bath container is represented as a continuous line.

Graph 2

7.8.2 Creating or changing a program (editing)

Here, there are the following functions:

- Create a program.
- Display the program data of a saved program and change the segment data.
- Insert or append a new segment.
- Delete a segment.

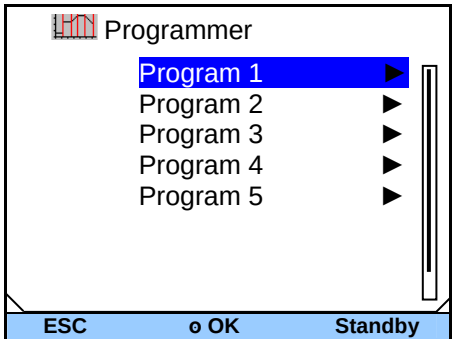
- New segments and be inserted and existing ones changed, also the currently active segment, even when a program is currently being executed. Furthermore, except for the currently active segment, all segments can be deleted at any time.
- Changes to the currently running segment are possible. The segment is continued as though the change has been valid since the start of the segment.

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

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

Creating a program:

Programming example (⇨ 7.8.1)



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

No.	Tend	hh	mm	Tolerance
Start	30.00	--	--	0.1
2	50.00	0	20	0.0
3	50.00	0	20	0.0
4	70.00	0	20	0.1
5	60.00	0	30	0.0
6	30.00	0	0	0.0

ESC o new delete

- By selecting and confirming Program 1 → Edit you obtain access to the editor view of the programmer. To view the complete window information go to the right with ▶.
- With the keys ▲, ▼, ◀ and ▶ you obtain access to the individual segments.
- The appropriate parameter is selected with the rotary knob and can be changed with ▲ and ▼.
- You can quit the edit window with the cursor in any position 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.

No.	Pump	S1	S2	S3
Start	2	off	- - -	off
2	2	off	- - -	off
3	3	off	- - -	off
4	4	off	- - -	off
5	2	off	- - -	off
6	2	off	- - -	off

ESC o OK - - -

– The programmer edit window contains the following parameters:

No.: Program segment number

Tend: Final temperature to be attained

hh: Time in hours (hh) in which the specified temperature is to be attained

mm: Time in minutes (mm) in which the specified temperature is to be attained

– If the value "0" is entered in the fields "hh" and "mm", the set value is accepted immediately and the bath temperature approached as quickly as possible.

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

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

Pump: Pump level at which the segment is to be processed.

S1, S2, S3: Switching contacts of the contact module (if present) can be programmed here. Contact modules are available as accessories (⇨ 10). The setting "- - -" stands for no change to the preceding segment, i.e. if "- - -" is present in all fields, the contact setting of the start setup or that before the program start is retained.

Inserting a new segment

No.	Tend	hh	mm	Tolerance
Start	30.00	--	--	0.1
2	50.00	0	20	0.0
3	50.00	0	20	0.0
4	70.00	0	20	0.1
5	60.00	0	30	0.0
6	30.00	0	0	0.0

ESC o new delete

– With ▲ or ▼ go to the segment number after 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

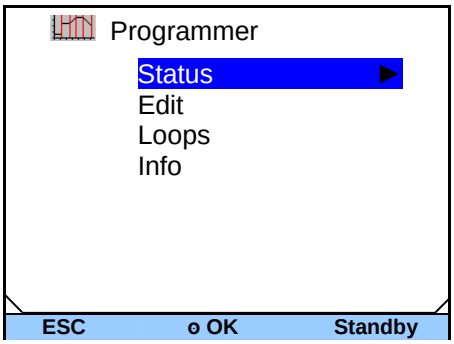
No.	Tend	hh	mm	Tolerance
Start	30.00	--	--	0.1
2	50.00	0	20	0.0
3	50.00	0	20	0.0
4	70.00	0	20	0.1
5	60.00	0	30	0.0

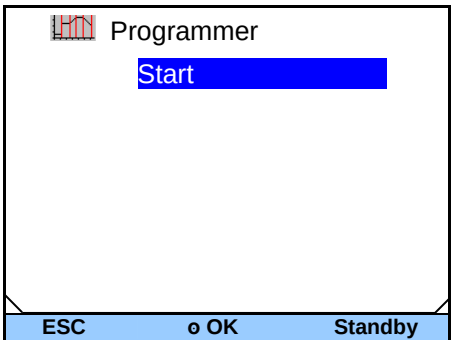
ESC o new delete

– With ▲ or ▼ go to the segment number which is to be deleted.

– The new segment is deleted on pressing ▬ (delete).

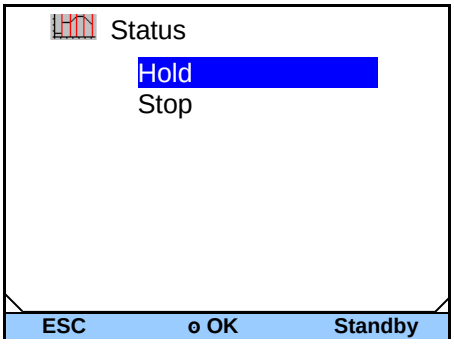
7.8.3 Starting the program



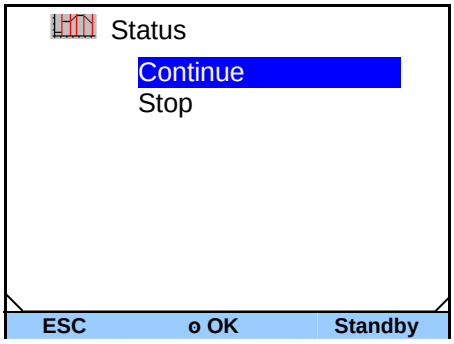


- The submenu Status appears by selecting and confirming → Programmer → Program 1.
- With the menu Status you can carry out the following with the program
  1. start Start
  2. pause Hold
  3. continue Continue or
  4. terminate Stop.
- You can also pause the programmer with (Standby). When "Standby" 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.

7.8.4 Interrupting, continuing or terminating the program

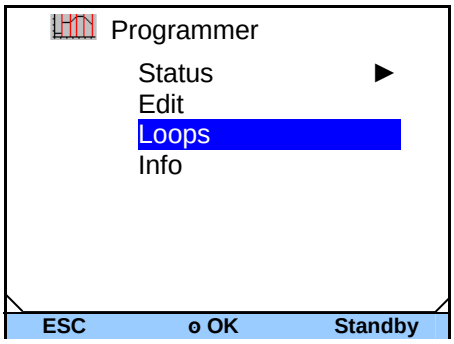


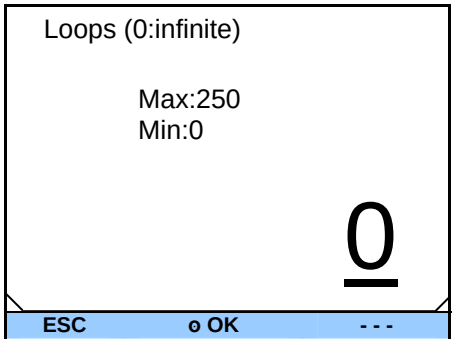
- When a program has been started by pressing , the menu points Hold and Stop are displayed.
- An option can be selected with ▲ or ▼. On confirming with the program is paused with Hold or terminated with Stop.



- The continuation of the program which is paused with Hold occurs with Continue by pressing .
- You can also pause the programmer with (Standby). Pump, heating and chiller are switched off.
- When (Standby) is pressed again, the programmer returns to the previously selected operating mode: Hold, or active mode, depending on that which was previously selected.

7.8.5 Defining the number of program loops (Loops)





- Programs can be processed many times.
- Select the menu point Loops with ▲ or ▼ and confirm with ●.
- Enter the required number with ▲ or ▼ and confirm with ●.
- On entering two or three-figure numbers, the cursor can be moved to the appropriate position with ◀ or ▶ and the figures entered here with ▲ or ▼.
- If "0" is entered, the program is continuously repeated.
- You quit the window without changes with ▬ (ESC).

7.9 Control parameters

The control parameters have been optimised at the factory for operation as a bath thermostat (with water as the heat transfer liquid) with internal control. The standard parameters are set as default also for the temperature stabilisation 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 behaviour.

7.9.1 Internal control variable (internal temperature sensor)

Only change the control parameters if you have appropriate knowledge of control techniques.

If you have not connected any temperature sensor (and activated it as in section 7.7.1 as a control variable), continue reading here.
For activated external control please read (⇨ 7.9.2).

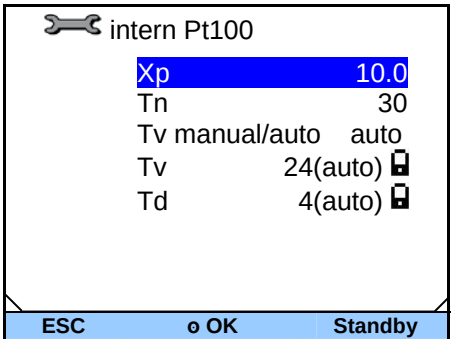
The control compares the setpoint temperature with the current bath temperature and computes the set value, i.e. the measure used for heating or cooling.

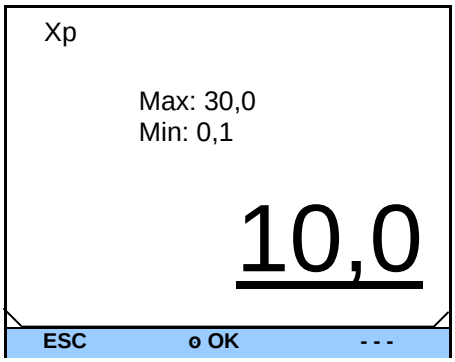
These control parameters can be set:

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

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

Additionally, the parameter Temperature Limits Tih, Til (⇨ 7.5.1) can also influence the control.





- Access to the menu level is obtained by pressing .
- Selection and confirmation of → Setup → Control → Control parameter → intern Pt100. The adjacent menu window appears. Apart from the control parameters the currently set values are displayed.
- Under the menu point "Tv manual/auto" you can select between manual and automatic entry using . The selection "automatic" is displayed in the menu line by (auto).
- If "automatic" is selected, the entry is blocked for the parameters Tv and Td.
- Select the parameters with ▲ or ▼ and confirm with .
- The respective edit window appears with Min and Max figures for the parameter values Xp, Tn, Tv and Td.
- By pressing ◀ or ▶ you can also select numbers individually and change them with ▲ or ▼.
- You confirm the set value by pressing .
- You quit the window without changes with (ESC).

7.9.2 External control variable

Only change the control parameters if you have appropriate knowledge of control techniques.

Continue reading here only if you have connected a temperature sensor or the actual temperature is read in from a module (and you have activated it as in section 7.7 as a control variable).

The control system for external actual values is realised 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 correcting quantity limit the maximum permissible deviation between the temperature on the external load and the temperature of the outflow liquid can be limited. The limit can be set via a menu point. (⇨ 7.9.2.1)

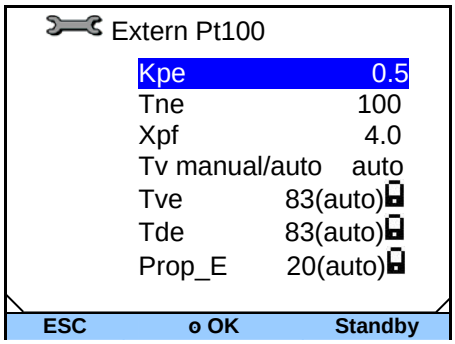
These parameters can be set on the master controller (PIDT$_1$ controller or external controller):

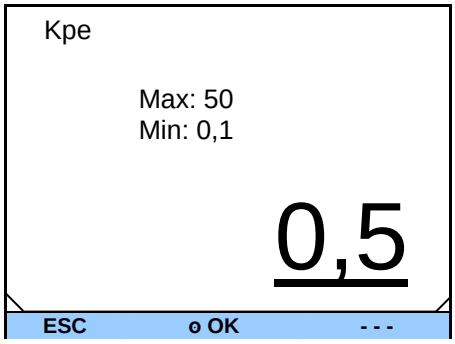
Description	Short form	Unit
Gain	Kpe	-
Proportional range	Prop_E	K
Reset time	Tne	s
Derivative time	Tve	s
Damping time	Tde	s

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

Description	Short form	Unit
Proportional range	Xpf	K

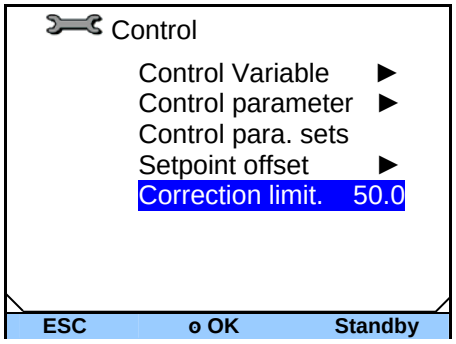
If Tv manual/auto is set to "automatic", Tve, Tde and Prop_E cannot be changed. Tve and Tde are in this case derived from Tne with fixed factors.



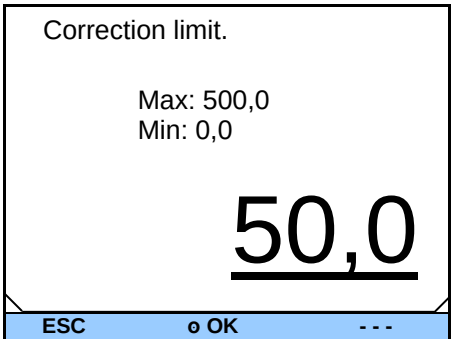


- Access to the menu level is obtained by pressing .
- Selection and confirmation of → Setup → Control → Control parameter → extern Pt100. The adjacent menu window appears. Apart from the control parameters the currently set values are displayed.
- Under the menu point "Tv manual/auto" you can select between manual and automatic entry using . The selection "automatic" is displayed in the menu line by (auto).
- If "automatic" is selected, the entry is blocked for the parameters Tv and Td.
- Select the parameter with ▲ or ▼ and confirm it with .
- The respective edit window appears with Min and Max figures for the parameter values Kpe, Tne, Tve, Tde and Xpf.
- By pressing ◀ or ▶ you can also select numbers individually and change them with ▲ or ▼.
- You confirm the set value by pressing .
- You quit the window without changes with (ESC).

7.9.2.1 Setting the correcting quantity limit



– Access to the menu level is obtained by pressing  .
– Selection and confirmation of → Setup → Control. Adjacent menu window appears.



– Select Correction limit. with ▲ or ▼ and confirm it with  . The adjacent menu window appears. The minimum and maximum possible values and the current value are displayed.
– Change the value with ▲ or ▼.
– By pressing ◀ or ▶ you can also select numbers individually and change them with ▲ or ▼.
– You confirm the set value by pressing  .
– You quit the window without changes with  (ESC).

7.9.2.2 Procedure for setting the control parameters for external control

1. Activating external control (⇨ 7.7.1).
2. Set the slave controller:

2.1. Parameter to auto;
Xpf in dependence of:

- Check or adjust device type (⇨ 9.3.4).
- 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,
- set the circulation as strong and fast as possible,
- select the hose length as short as possible, e.g. 2 x 1 m,
- hose cross-sectional area as large as possible, e.g. ½ inch,
- set the throughput through the external load as large as possible.

2.2. Set Xpf:

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

3. Setting the master controller (PID controller):

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

3.1. Setting Kpe:

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

3.2. Setting Tne/ Tve/ Tde:

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

4. Correcting quantity limit (or outflow temperature limit) (⇨ 7.9.2) and temperature limits (Til/Tih) (⇨ 7.5.1).

- Set according to the physical boundary conditions. Examples:

Heat transfer liquid	Correcting quantity limit	Til	Tih
Water	Depends on heat transfer liquid and on container.	5 °C	95 °C

8 Interface modules

8.1 Installation of modules

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

Upper module receptacle (approx. 51 x 27 mm) for:

- RS 232/485 module
- Analogue module
- Contact module
- Profibus Module

Lower module receptacle (approx. 51 x 17 mm) for:

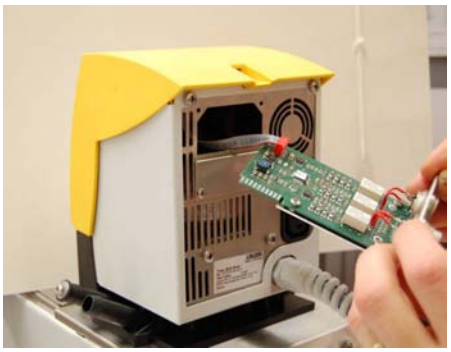
- Pt100/LiBus module

- 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.

For the upper module receptacle (approx. 51 x 27 mm)

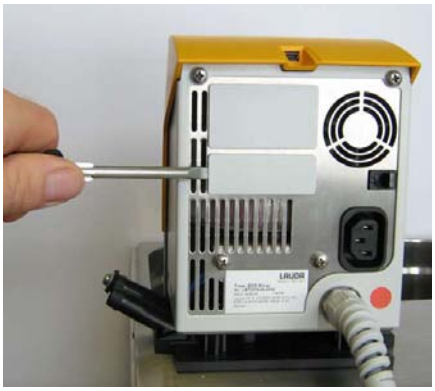
- The plastic cover has a recess on each side to ease removal.
  Insert a screwdriver first in the right and then in the left recess of the plastic cover and lever it up. The cover can then be taken off.

- 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.

For the lower module receptacle (approx. 51 x 17 mm)



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

- Pull the bus connecting lead out of the plastic cover.
- Plug in the bus connecting lead (red plug in the red socket).

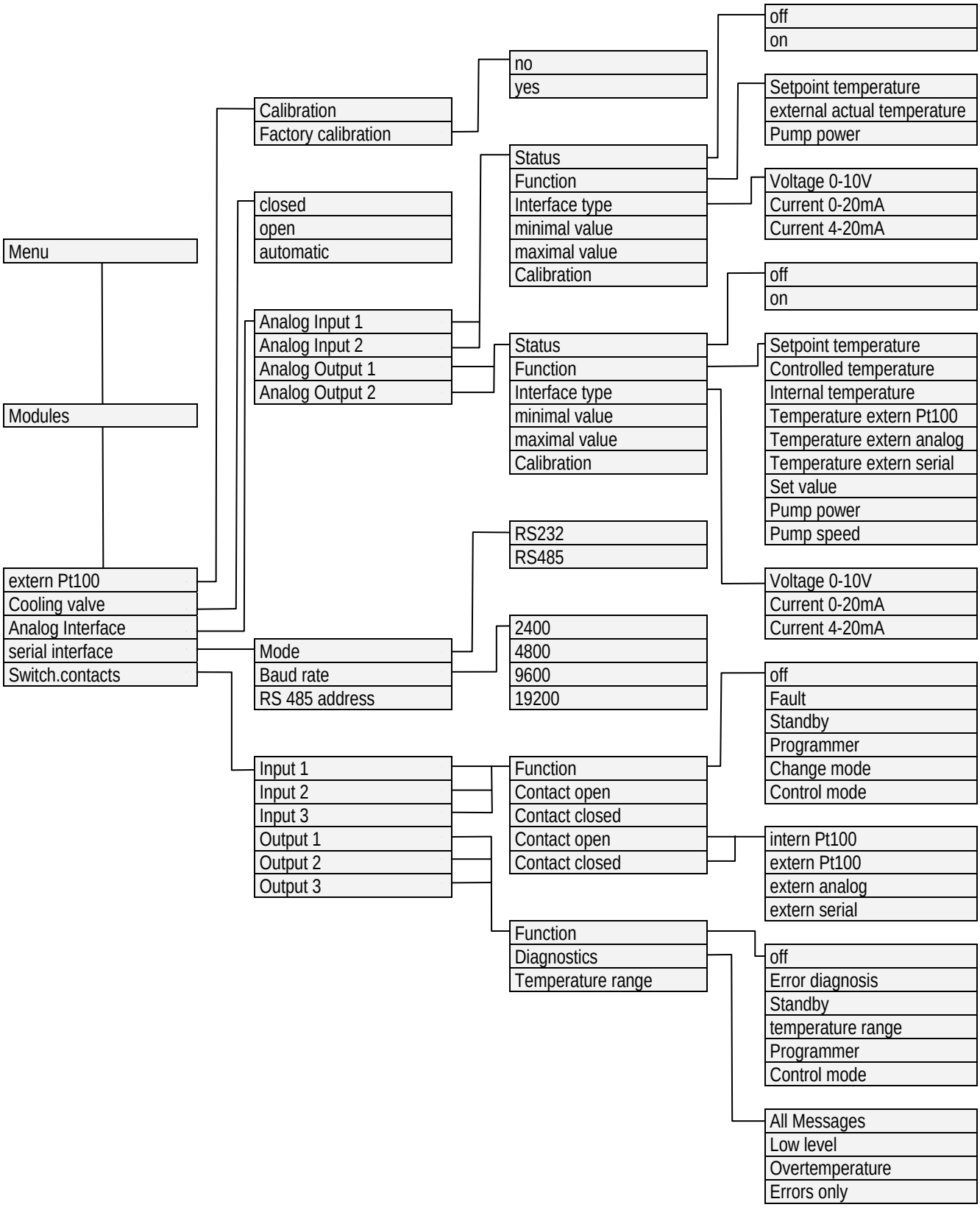
- Introduce the module into the appropriate receptacle and fasten it using the two cross-head screws.
- Insert the mains plug again and switch on the thermostat.

☞

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

8.2 Menu structure of the modules

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



8.3 Analogue module

Analogue Module (LAUDA order 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:

- setpoint temperature with the function Setpoint temperature.
- external actual temperature with the function Ext. actual temperature.
- Pump power with the function Pump pow..

The following values can be output via the outputs:

- setpoint temperature with the function Setpoint temperature.
- The temperature controlled: Controlled temp. .
- Actual temperature (bath temperature): Internal temp. .
- External actual temperature of the Pt100: Temp.extern Pt100.
- External actual temperature of the analogue input: Temp.extern analog.
- External actual temperature of the serial interface: Temp.extern serial.
- Set value: Set value.
- Pump power: Pump power.
- Pump speed: Pump speed.

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

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

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

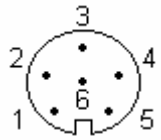
– Inputs, current	Input resistance < 100 Ohm
– Inputs, voltage	Input resistance > 50 kOhm
– Outputs, current	Burden < 400 Ohm
– Outputs, voltage	Load > 10 kOhm

Connection of analogue inputs and outputs

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

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

Socket 74S



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

☞ Use screened connecting leads. Connect screen to the plug housing.

8.4 RS 232/485 interface module

RS 232/485 Interface Module
(LAUDA order 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).

8.4.1 Connecting lead and interface test RS 232

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

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

② without hardware handshake: 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".

8.4.2 RS 232 protocol

- 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

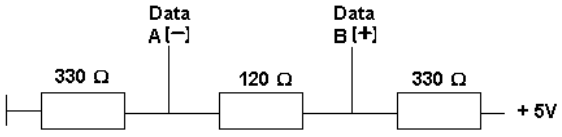
Computer	Thermostat
„OUT_SP_00_30.5“CRLF	⇨
⇦	„OK“CRLF

8.4.3 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).

8.4.4 RS 485 protocol

- 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

8.5 USB interface

8.5.1 Description

The ECO GOLD heating and cooling thermostats are equipped with a mini-USB interface at the back of the control head. 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.
When connecting up, make sure the correct plug is used.

Mini-USB interface

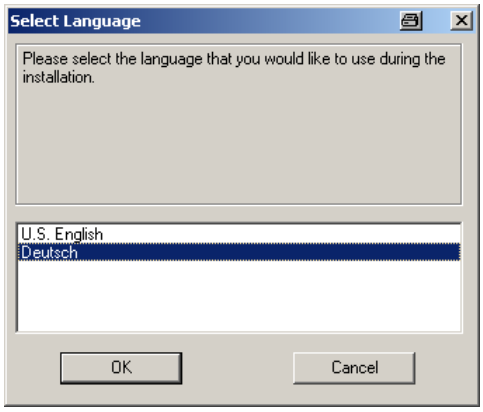
LAUDA makes the drivers specially produced for the USB interface available free of charge for download at http://www.lauda.de.

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

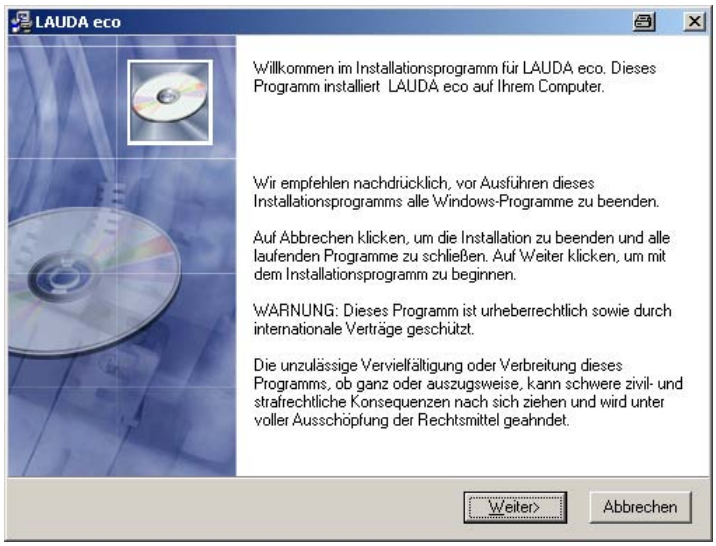
8.5.2 Installation of the USB driver

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

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



Select the language and confirm with OK.



Key Continue

Key Finish
Driver installation is installed

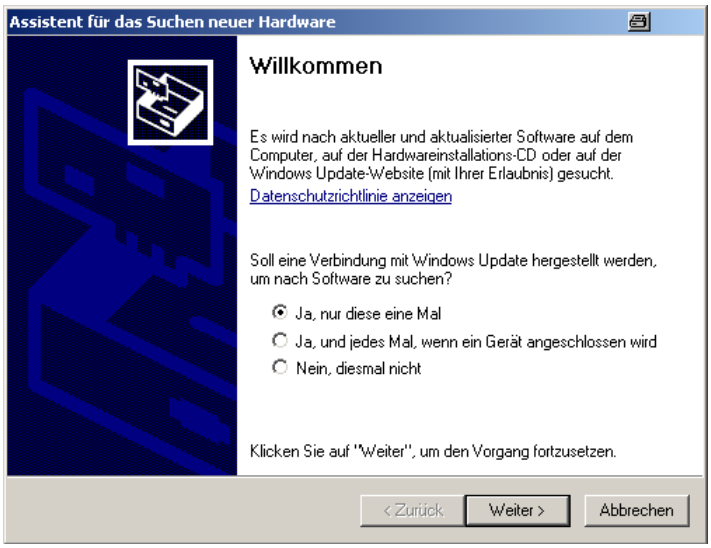
8.5.3 Connecting the thermostat to the PC

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.

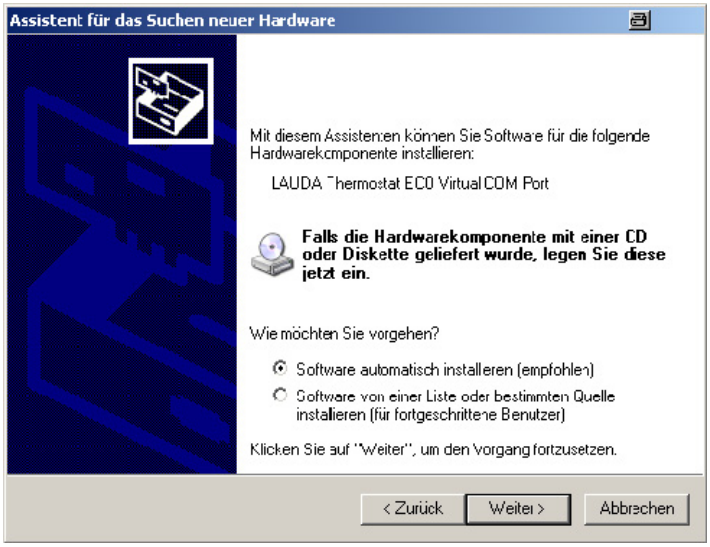
Plug the mini-USB cable into the control head.

Switch on the thermostat at the mains switch.

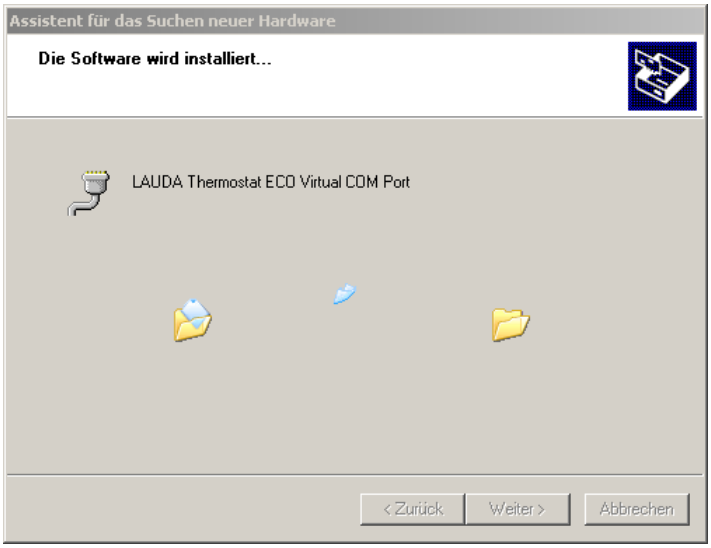
For the first time, after installation on the PC, a wizard opens to search for new hardware. Please follow the wizard instructions.



Key Continue

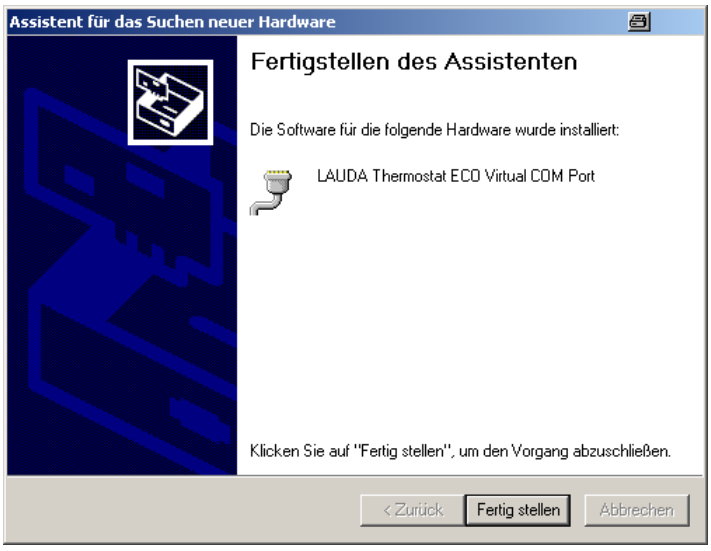


Key Continue



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

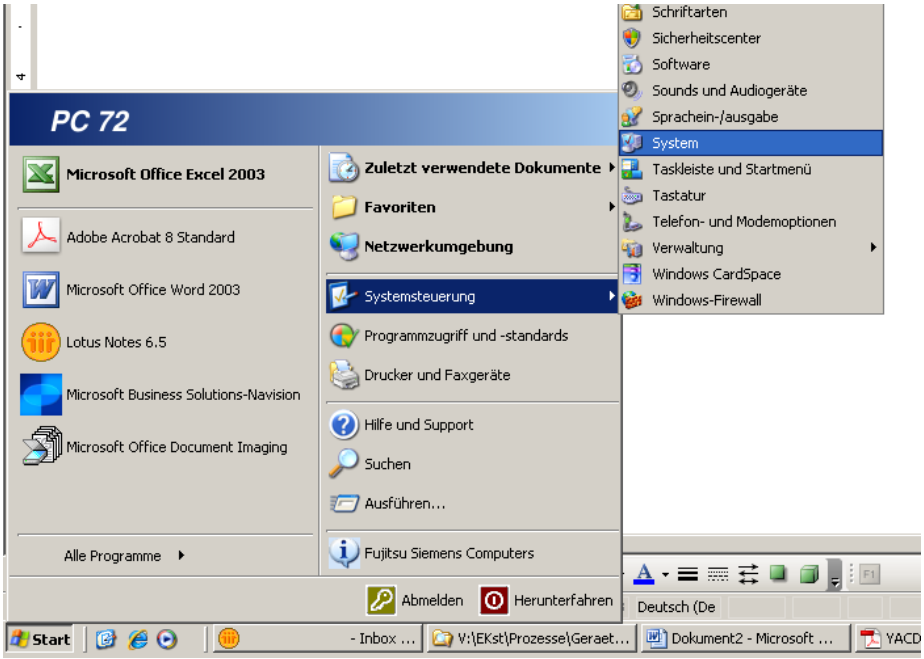
click on Continue installation

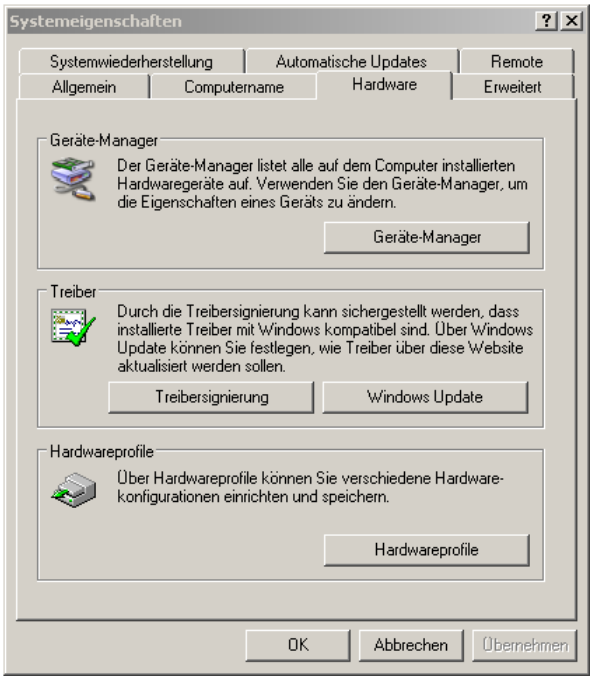


click on the key Finish

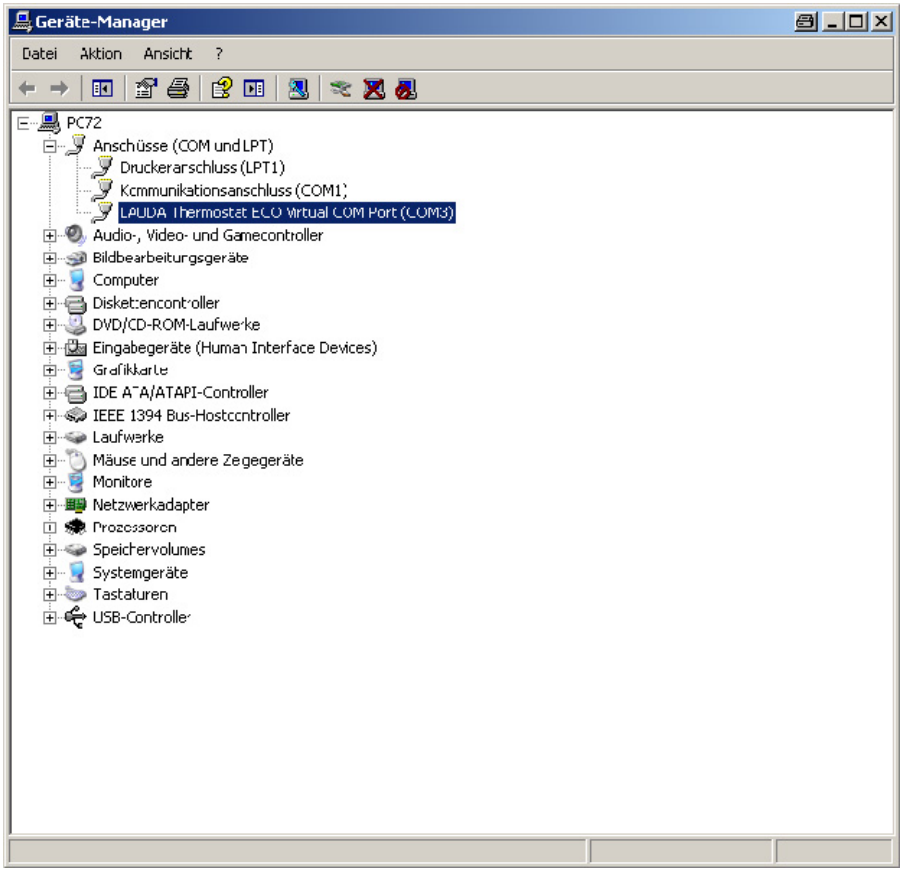
8.5.4 Where is the ECO Virtual COM Port?

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 Hardware with the mouse and then on the Device manager.



8.6 Commands and error messages applicable to the RS 232/485 interface module and to the USB interface

8.6.1 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_XXX.X	Setting of the control parameter Td.
OUT_PAR_04_XXX.XX	Setting of the control parameter KpE.
OUT_PAR_05_XXX	Setting of the control parameter TnE (0...998 s; 999 = Off).
OUT_PAR_06_XXX	Setting of the control parameter TvE.
OUT_PAR_07_XXX.X	Setting of the control parameter TdE.
OUT_PAR_09_XXX.X	Setting of the max. outflow temperature limit.
OUT_PAR_10_XXX.X	Setting of the control parameter XpF.
OUT_PAR_11_XXX	Setting of the control parameter TnF (5...180 s; 181 = Off).
OUT_PAR_12_XXX	Setting of the control parameter TvF.
OUT_PAR_13_XXX.X	Setting of the control parameter TdF.
OUT_PAR_14_XXX.X	Setting of the setpoint offset.
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 remote control unit Command: 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.
RMP_OUT_06_XXX.XX	Programmer tolerance setting (0 = off / 0.01 °C...450.00 °C) All the following segments are assigned this tolerance setting.

- A " " (space character) is also admissible for "_".
- 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:

-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				

8.6.2 Read commands (data request from the thermostat)

Command	Meaning
IN_PV_00	Interrogation of external 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 external temperature **in 0.0001 °C**.
IN_PV_13	Interrogation of external temperature TE (Pt100) **in 0.0001 °C**.
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 (999 = OFF).
IN_PAR_06	Interrogation of the control parameter TvE.
IN_PAR_07	Interrogation of the control parameter TdE.
IN_PAR_09	Interrogation of the max. outflow temperature limit.
IN_PAR_10	Interrogation of the control parameter XpF.
IN_PAR_11	Interrogation of the control parameter TnF (181 = OFF).
IN_PAR_12	Interrogation of the control parameter TvF.
IN_PAR_13	Interrogation of the control parameter TdF.
IN_PAR_14	Interrogation of setpoint offset.
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: 0 = Device ON / 1 = Device OFF.
IN_MODE_03	Keypad: 0 = released / 1 = locked.

Command	Meaning
IN_MODE_04	Setpoint offset source: 0 = normal/ 1 = ext. Pt/ 2 = ext. Analog/ 3 = ext. Serial.
TYPE	Interrogation of device type.
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_T	Interrogation of the software version number of the cooling system.
VERSION_A	Interrogation of the software version number of the analogue 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...5 respectively	Interrogation of the software version number of the solenoid valve 0...5.
STATUS	Interrogation of the device status 0 = OK, -1 = Error.
STAT	Interrogation of the error diagnosis response: XXXXXXX → 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 = High level (with Alarm setting) 7th character = External control value missing
RMP_IN_00_XXX	Interrogation of a program segment XXX (Response: e.g. 030.00_010.00_005.00_001.00 => Set-point temperature = 30.00 °C, Time = 10 min, Tolerance = 5.00 °C, Pump level = 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).
LOG_IN_00_XXXX	Interrogation of a measurement point XXX from data logger (Response: e.g. 020.00_021.23_030.50 => Set-point temperature = 20.00 °C, outflow temperature = 21.23 °C, external temperature = 30.5 °C).
LOG_IN_01	Interrogation of all measurement points from data logger In contrast to the command "LOG_IN_00" a tabulator character is used here as delimiter instead of '_'. The measurement points are separated by CR and LF. The end is signalled by CR LF CR LF.
LOG_IN_02	Interrogation of starting time of data logger (Response: e.g. 20_14_12_20 => Day 20, 14:12:20).
LOG_IN_03	Interrogation of acquisition interval from data logger (Response in seconds).

- For "_" " " (space character) is also admissible.
- The response of thermostats always occurs in the fixed-point format " XXX.XX" or for negative values "-XXX.XX" or " ERR_X". (RS 485 interface e.g. "A015_ XXX.XX" or "A015_-XXX.XX" or "A015_ERR_X").

8.6.3 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	Illegal value.
ERR_8	Module or value not present
ERR_30	Programmer, all segments occupied
ERR_31	No set-point input possible, analog setpoint input ON
ERR_32	TiH ≤ TiL
ERR_33	External probe missing
ERR_34	Analog value not present
ERR_35	Automatic set
ERR_36	No setpoint input, programmer is running or is stopped on Pause
ERR_37	Start from programmer not possible, analogue setpoint input is switched on

8.6.4 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.

8.7 Contact module

8.7.1 Contact module LRZ 914 with 1 input and 1 output

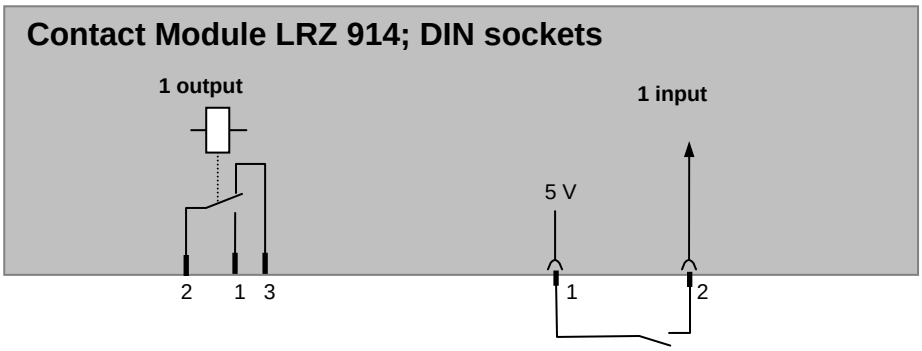
Contact module (order no. LRZ 914) with connectors to NAMUR NE28, with 1 output and 1 input on each of 2 DIN sockets.

The inputs provide the following functions:

- Set Error with the function Error.
- Set Standby with the function Standby.
- Control programmer (Input 1 activates the programmer. The programmer is started on the first "closed" and is put into "hold" on "open". The next "closed" triggers "continue") with the function Programmer.
- Control change mode (the switching statuses of contact "open" or "closed" are assigned 2 different set-point temperatures) Change 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) Control mode.

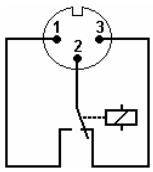
The outputs provide the following functions:

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

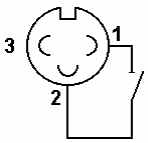


Contact outputs and inputs

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



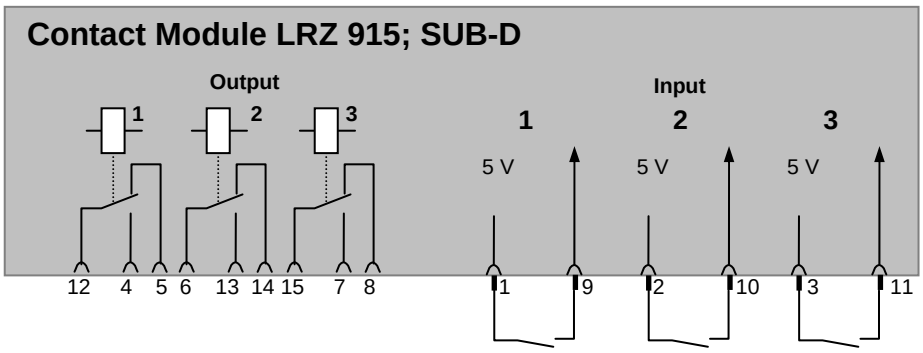
1 = NO contact
2 = Centre contact
3 = NC contact



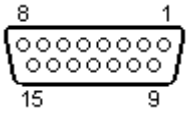
– Use screened connecting leads. Connect screen to the plug housing. Cover unused connectors with protective caps.

8.7.2 Contact module LRZ 915 with 3 inputs and 3 outputs

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



Contact inputs and outputs



– View of sockets on the plug side or of sockets on the solder side.
– A suitable 15-pole Sub-D plug can be obtained together with a suitable housing:
Catalogue no. EQM 030 and plug housing, catalogue no. EQG 017.

9 Maintenance

9.1 Alarms, warnings and errors

Your ECO thermostat triggers alarms, warnings or error messages as necessary.

All warnings, alarms or error messages are shown in plain text in the display.

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

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

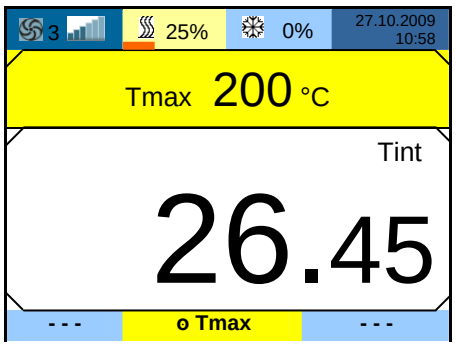
Errors: If a malfunction occurs, switch off the unit at the mains switch. If the malfunction recurs after switching on the device, contact LAUDA Service Constant Temperature Equipment (⇨ 9.6) or your local service organisation.

Once the cause has been rectified, alarms and warnings can be cleared with  .

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

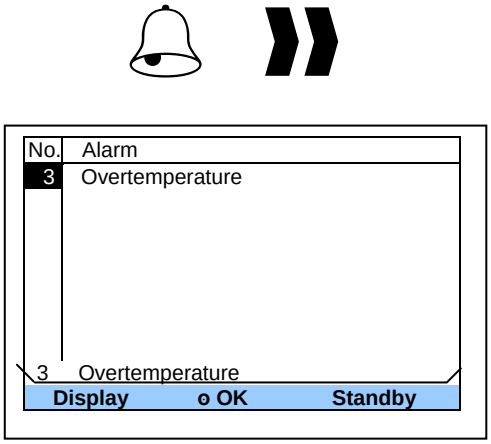
9.1.1 Overtemperature protection alarm and overtemperature protection check

The devices are rated for use with flammable and non-flammable liquids according to 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.
– **Important!!** The overtemperature switch-off point T_{max} is controlled by a system which operates independently of the bath control.
– The overtemperature switch-off point is displayed on pressing  in the display.

– Do not set the switch-off point higher than 25 K below the fire point of the heat transfer liquid (⇨ 6.4) used.



– If the bath temperature increases above the overtemperature switch-off point:

Two-tone alarm signal sounds.

"Overtemperature" appears in the display.

Heating switches off on both poles.

Pump and chiller are switched off via the electronics.

– Rectify the cause of the malfunction.
– Wait until the bath temperature has cooled below the cut-off point or set the cut-off point higher than the bath temperature. If "Overtemperature" appears in the display:
– Unlock with .

– With longer periods of unsupervised operation you should **check the overtemperature protection; to do this:**

– Slowly reduce T_{max} as described in (⇨ 7.5.1). 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 with .

9.1.2 Low level protection alarm and low level protection check

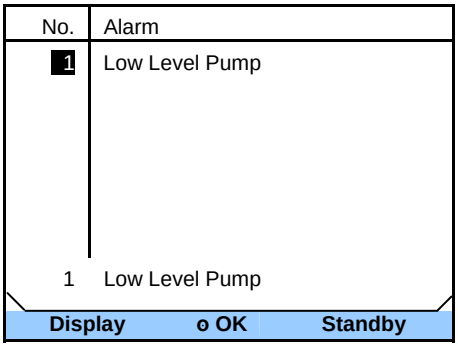
When the liquid level falls so far that the heaters are no longer completely covered with liquid, an alarm is triggered.

Two-tone alarm signal sounds.

"Low Level Pump" appears in the display.

Heating switches off on both poles.

Pump and chiller are switched off via the electronics.



– Rectify the cause of the malfunction and top up the missing liquid (⇨ 6.3 and 6.4).
– Unlock with .

– **Check the safety system at regular intervals** by lowering the bath level.

– An alarm message (step 1-2, see above) should follow.
– Top up with heat transfer liquid.
– Unlock with .

- To avoid hazards due to temperatures which are too hot or cold do not carry out this test at a bath temperature below 0 °C or above 50 °C.
- If irregularities occur during the check of the safety equipment, switch off the device immediately and withdraw the mains plug.
- Contact LAUDA Service Constant Temperature Equipment (⇨ 9.6).

9.2 Cleaning

Withdraw the mains plug before cleaning the unit.

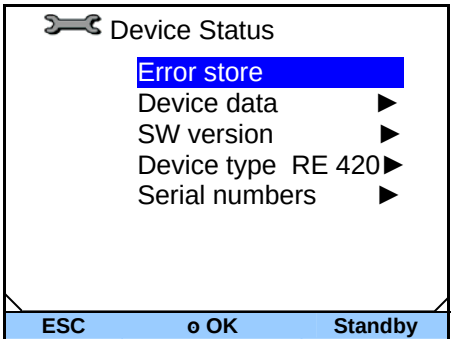
Cleaning can be carried out with water with a few drops of a surfactant (washing-up liquid) added and with the aid of a damp cloth.

No water should penetrate into the control section.

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.

9.3 Device status

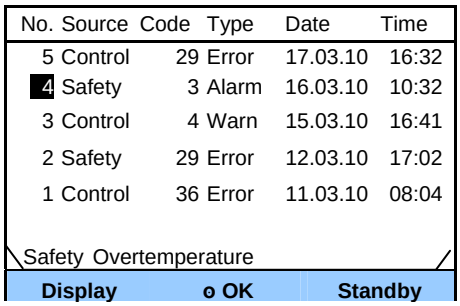
You can conveniently check the device data via the display.



- Access to the menu level is obtained by pressing  .
- Selection and confirmation of → Setup → Device Status. The adjacent menu window appears.

9.3.1 Error store

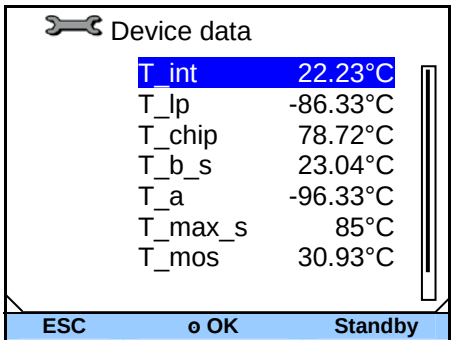
With the ECO GOLD thermostats there is an error store in which up to 140 errors and alarm messages can be stored for the analysis and localisation of errors.



- Access to the menu level is obtained by pressing  .
- Selection and confirmation of → Setup → Device Status→ Errorstore.
- The last message is located in the first position.
- Each message line can be marked with ▲ or ▼. In the footer the message appears in plain text.
- The relevant module which is causing the message is displayed under Source.
- Code is the number to which the message described in plain text is assigned.
- Type: Alarm, warning or error.

9.3.2 Device data

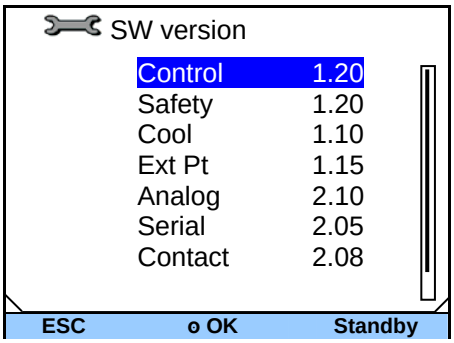
The most important device parameters are displayed under the menu point Device data.



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

9.3.3 Software version

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



- Access to the menu level is obtained by pressing  .
- Selection and confirmation of → Setup → Device Status→ SW version.
- Only the modules which are connected are displayed with the software version number.

9.3.4 Displaying and changing the device type

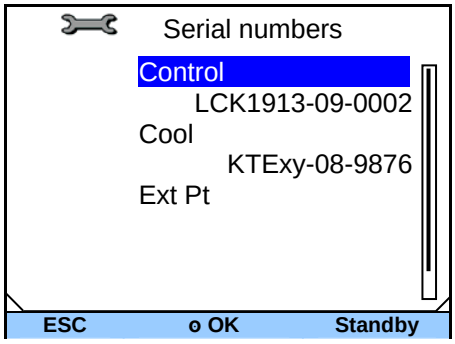
The device type (⇨ 4.2) without the suffix "G" (GOLD) is shown in the menu under Setup → Device Status → Type.
A type change can be carried out here in this menu point.
The type change is linked to a 3 second key depression delay to prevent an unintentional type change. In this way all parameters are reinitialised, i.e. even adjusted control parameters are lost.

Automatic adaptation of Tmax to the selected device type, i.e. with the ECO GOLD thermostat Tmax = 202 °C and with the ECO GOLD with transparent bath Tmax = 102 °C.

Following this, Tmax must be re-entered manually (⇨ 7.4.1), because otherwise the device goes into the error status (error message in ECO GOLD "T max diff. Ctrl-Safety".

9.3.5 Displaying serial numbers

The corresponding serial numbers of Control and Safety are displayed in two lines under the menu point Serial numbers. Provided they are available, the serial numbers of connected modules are also displayed.



- Access to the menu level is obtained by pressing  .
- Selection and confirmation of → Setup → Device Status → Serial numbers.

9.4 Servicing and repair

9.4.1 Servicing intervals to VDI 3033

Device part	Frequency	Remarks
	Each time device is put into operation and then:	
Complete device		
External condition of device	Monthly	
Heat transfer liquid		
Analysis of heat transfer liquid	(⇨ 9.4.2)	
Bath vessel with drain tap		
Sealing	Daily	External inspection
External hoses		
Material fatigue	Monthly	External inspection
Chiller		
Cleaning of condenser	(⇨ 9.4.3)	Cooling thermostat
Electronics		
Overtemperature protection	(⇨ 9.1.1)	
Low-level protection	(⇨ 9.1.2)	

9.4.2 Inspecting the heat transfer liquid

If the heat transfer liquid becomes contaminated or degenerated, it should be renewed (⇨ 6.3 and 6.4).

If necessary, the heat transfer liquid should be checked for fitness for use (e.g. with a change of application), or at least once yearly. Further use of the heat transfer liquid is only permissible if the inspection indicates this.

☞ The heat transfer liquids should be inspected according to DIN 51529.

9.4.3 Cleaning the condenser

- The cooling circuit is largely maintenance-free. Depending on the operating time and the amount of dust present in the device environment, remove the dust from the condenser at intervals of two weeks or longer.
- To do this, remove the front grille by grasping it at the bottom with both hands and pulling the grille to the front.
- Then brush down the condenser and, where necessary, blow it out with compressed air.

- To avoid damage, remove the front grille slowly and carefully.

9.5 Disposal information

9.5.1 Disposal of the coolant

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

The Global Warming Potentials (GWP) [CO_2 = 1.0]	
Coolant	$GWP_{(100a)}$*
R-134a / HFKW-134a	1,300
R-404A / HFKW-404A	3,784

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

9.5.2 Disposal of the packaging

Packaging parts	**Material**	**Disposal route**
Pallet	Laminated wood Wood, for export	Recyclable Pallet recycling
Inner and outer packaging	Corrugated cardboard	Paper recycling
Foam inner packaging	Polyurethane foam (PUR) and plastic bag of polyethylene (PE-HD)	Plastics recycling
Cushioning damper parts (technical foam)	Polyethylene (PE) foam boards	Plastics recycling
Bubble wrap	Polyethylene (PE-HD) film	Plastics recycling
Volume filler	Air filled polyethylene (PE-HD) bag	Plastics recycling
Moulded parts	Polystyrene, foamed (PS-E, polystyrene)	Plastics recycling
Clear plastic folder for operating instructions	Polypropylene (PP)	Plastics recycling
Fastening strips	Polyester tape, high strength	Plastics recycling

If recycling is not possible, the packaging parts can also be disposed of in the normal waste.

9.6 Ordering replacement parts

When ordering replacement parts, please state the device type and the number from the rating label. This avoids queries and erroneous shipment.

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

LCK1910 = Catalogue number
10 = Year of manufacture 2010
0001 = Incremental numeration

Your contact for maintenance and expert service support.

LAUDA Service Constant Temperature Equipment
Phone: +49 (0)9343/ 503-236 (English and German)
Fax: +49 (0)9343/ 503-283
e-mail service@lauda.de

We are available at any time for queries, ideas and critique.

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10 Accessories

Immersion thermostat

Accessory	Suitable for	Catalogue number
Cooling coil set (small)	ECO GOLD, bath vessels up to 6 litres	**LCZ 0720**
Cooling coil set (large)	ECO GOLD, bath vessels from 6 litres	**LCZ 0721**
Pump connection set (outflow and return nozzles) with olive 13 mm (plastic)	ECO GOLD	**LCZ 0716**
Pump connection set (pressure and return nozzles) with thread M16x1 (stainless steel) 2 olives, 2 union nuts	ECO GOLD	**LCZ 0717**

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

Bath and circulation thermostats

Accessory	Suitable for	Catalogue number
Pump connection set (outflow and return nozzles) with olive 13 mm (plastic)	All heating thermostats	**LCZ 0716**
Pump connection set (outflow and return nozzles) with thread M16x1 (stainless steel)	All heating thermostats	**LCZ 0717**
Bath cover in stainless steel	E 10 G, E 15 G	**HDQ 133**
Bath cover in stainless steel	E 20 G, E 25 G	**HDQ 134**
Bath cover in stainless steel (three-part)	E 40 G	**LCZ 0718**
Cooling coil set for ET 15	ET 15 G	**LCZ 0719**

Cooling thermostats

Accessory	Suitable for	Catalogue number
Pump connection set (outflow and return nozzles) with olive 13 mm (plastic)	All cooling thermostats	**LCZ 0716**

For all devices

Accessory	Catalogue number
For upper module receptacle approx. 57 x 27 mm:	
Analogue module	**LRZ 912**
RS 232/485 interface module	**LRZ 913**
Contact module with 1 input and 1 output	**LRZ 914**
Contact module with 3 inputs and 3 outputs	**LRZ 915**
Profibus module	**LRZ 917**
For lower module receptacle approx. 57 x 17 mm	
External Pt100/LiBus module	**LRZ 918**
Remote control unit Command*	**LRT 914**

* functions only in conjunction with LRZ 918

11 Technical data and graphs

The figures were determined according to DIN 12876.

Data applicable to all ECO thermostats			
Ambient temperature range		°C	5 ... 40
Setting resolution		°C	0.01
Display resolution		°C	0.01
Absolute accuracy		K	±0,2
Relative humidity			maximum relative humidity 80 % at 31 °C and decreasing linearly to 50 % up to 40 °C
Temperature for storage		°C	-20…45 (for air-cooled thermostats)
Pump type/number of power levels			Pressure pump/6
Discharge pressure, max.		bar	0.55
Discharge flow, max.		L/min	22
Heating power	230 V; 50/60 Hz	kW	2.6
Power consumption	230 V; 50/60 Hz	kW	2.7
Class of protection			IP 21
Safety equipment			Class III/FL to DIN 12876-1; suitable for flammable and non-flammable liquids
Class of protection for electrical operating equipment DIN EN 61140 (VDE 0140-1)			Class I
EMC requirements to DIN EN 61326-1 (corresponds to VDE 0843-20-1) applies to Europe			Class B
for Canada and the USA			Class A
EC directives			The devices conform to the directives of the European Parliament and of the Council: 2004/108/EC regarding electromagnetic compatibility (EMC) and 2006/95/EC relating to electrical operating equipment for use within certain voltage limits (Low Voltage Directive). The devices bear the CE label.

Immersion thermostat		
		GOLD
Working temperature range ①	°C	20…200
Working temperature range with water cooling	°C	20…200
Operating temperature range ②	°C	-20…200
Interface		Mini-USB
Bath depth	mm	At least 150
Overall dimensions (W x D x H)	mm	130 x 135 x 325
Weight	kg	3.4
Mains connection		**Catalogue number**
230 V ±10 %; 50/60 Hz		**LCE 0228**

① at Pump power level 1

② with extraneous cooling

Heating thermostats with stainless steel bath							
		E 4 G	**E 10 G**	**E 15 G**	**E 20 G**	**E 25 G**	**E 40 G**
Working temperature range ①	°C	20…200					
Working temperature range with water cooling	°C	20…200					
Operating temperature range ②	°C	-20…200					
Temperature stability	±K	0.01					
Bath volume	L	3…3.5	7.5…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	7.0	9.0	10.7	12.2	13.5	17.6
Pump connection		Stainless steel olives 13 mm (thread M16x1)	---	---	---	---	---
Mains connection		**Catalogue number**					
230 V ±10 %; 50/60 Hz		**LCB 0737**	**LCB 0739**	**LCB 0741**	**LCB 0743**	**LCB 0745**	**LCB 0747**

① at Pump power level 1

② with extraneous cooling

Heating thermostats with transparent bath					
		ET 6 G	**ET 12 G**	**ET 15 G**	**ET 20 G**
Working temperature range ①	°C	20…100			
Working temperature range with water cooling	°C	20…100			
Operating temperature range ②	°C	-20…100			
Temperature stability	±K	0.01			
Bath volume	L	5…6	9.5…12	13.5…15	15…20
Bath vessels		Polycarbonate			
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
Weight	kg	4.5	6.8	6.8	8.0
Pump connection		---	---	Stainless steel olives 13 mm (thread M16x1)	---
Mains connection		**Catalogue number**			
230 V ±10 %; 50/60 Hz		**LCM 0097**	**LCD 0287**	**LCD 0289**	**LCD 0291**

① at Pump power level 1

② with extraneous cooling

Cooling thermostats									
			RE 415 G	RE 420 G	RE 620 G	RE 630 G	RE 1050 G	RE 1225 G	RE 2025 G
Working temperature - ACC range*		°C	-15…200	-20…200	-20…200	-30…200	-50…200	-25…200	-25…200
Ambient temperature range		°C	5...40						
Temperature stability		±K	0.02						
Cooling capacity at ambient temperature 20 °C and Pump power stage 2	20 °C	kW	0.18	0.20	0.20	0.30	0.70	0.30	0.30
	10 °C	kW	0.16	0.18	0.18	0.27	0.66	0.27	0.26
	0 °C	kW	0.12	0.15	0.15	0.24	0.60	0.24	0.23
	-10 °C	kW	0.08	0.10	0.10	0.19	0.52	0.18	0.15
	-20 °C	kW	0.03 ①	0.03	0.03	0.10	0.35	0.09	0.06
	-30 °C	kW				0.02	0.19	0.04 ②	0.03 ②
	-40 °C	kW					0.10		
	-50 °C	kW					0.02		
Bath volume		litres	3.3…4	3.3…4	4.6…5.7	4.6…5.7	8…10	9.3…12	14…20
Overall dimensions (W x D)		mm	130 x 105	130 x 105	150 x 130	150 x 130	200 x 200	200 x 200	300 x 350
Bath depth		mm	160	160	160	160	160	200	160
Usable depth		mm	140	140	140	140	140	180	140
Height to top edge of bath		mm	365	374	400	400	443	443	443
Overall dimensions (W x D)		mm	180 x 350	180 x 396	200 x 430	200 x 430	280 x 440	250 x 435	350 x 570
Overall height		mm	546	555	581	581	624	624	624
Sound level (1 m)		dB(A)	50	50	50	50	52	50	50
Weight		kg	20.0	22.0	23.7	27.6	35.0	30.4	37.4
Pump connection			Stainless steel olives 13 mm (thread M16x1)						
Mains connection			**Catalogue number**						
230 V ±10 %; 50 Hz			**LCK 1911**	**LCK 1913**	**LCK 1915**	**LCK 1917**	**LCK 1919**	**LCK 1921**	**LCK 1923**

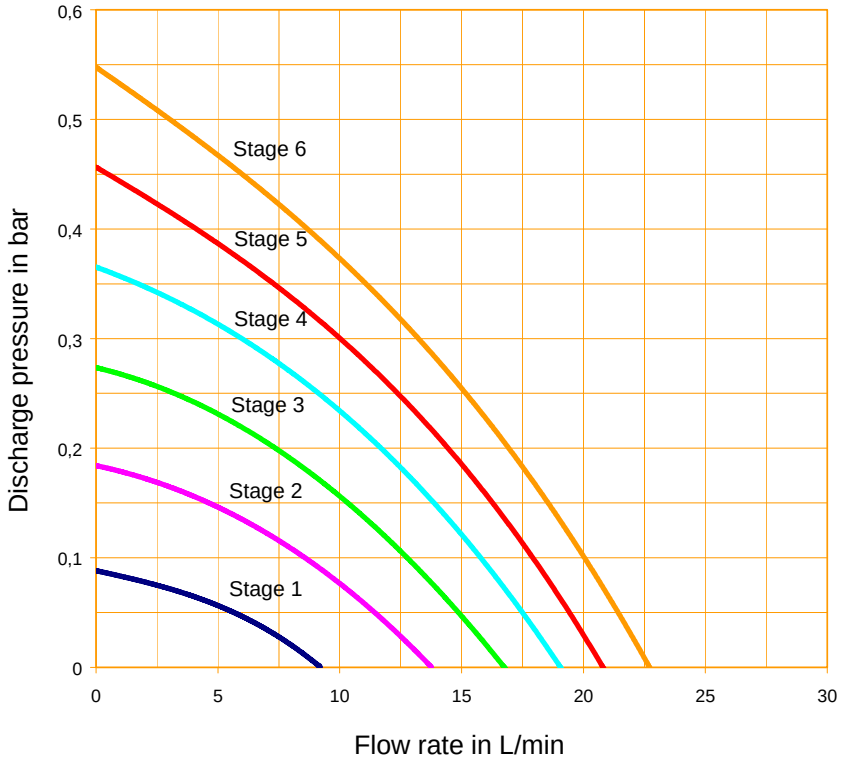
*ACC range (Active Cooling Control) according to DIN 12876 is the working temperature range for operation with an active refrigerating machine

① at bath temperature t_b = -15 °C

② at bath temperature t_b = -25 °C

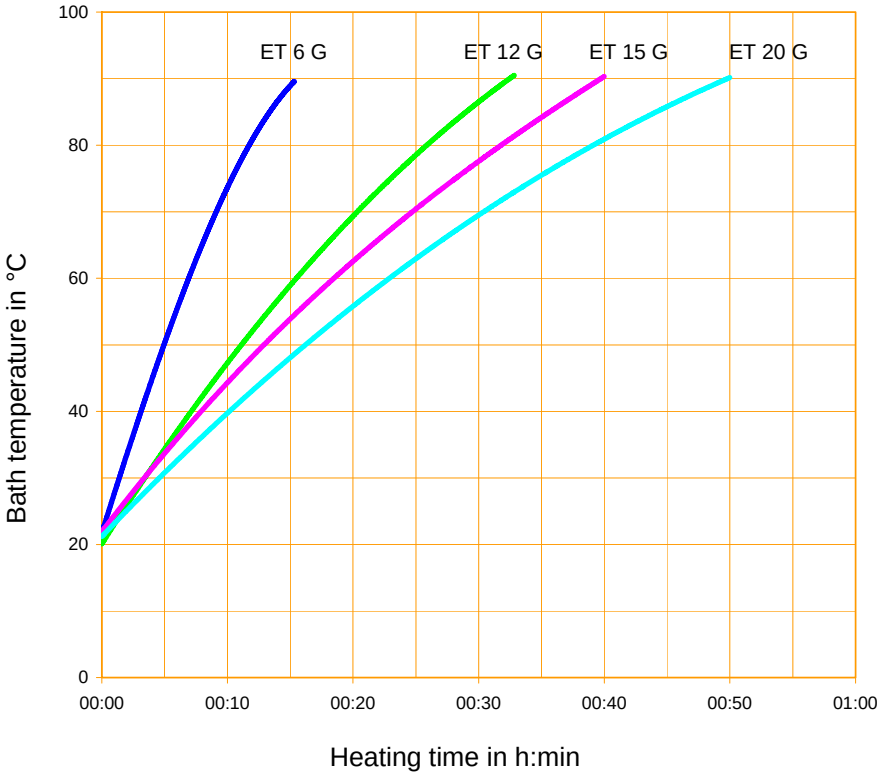
Technical modifications reserved.

Pump characteristic ECO GOLD



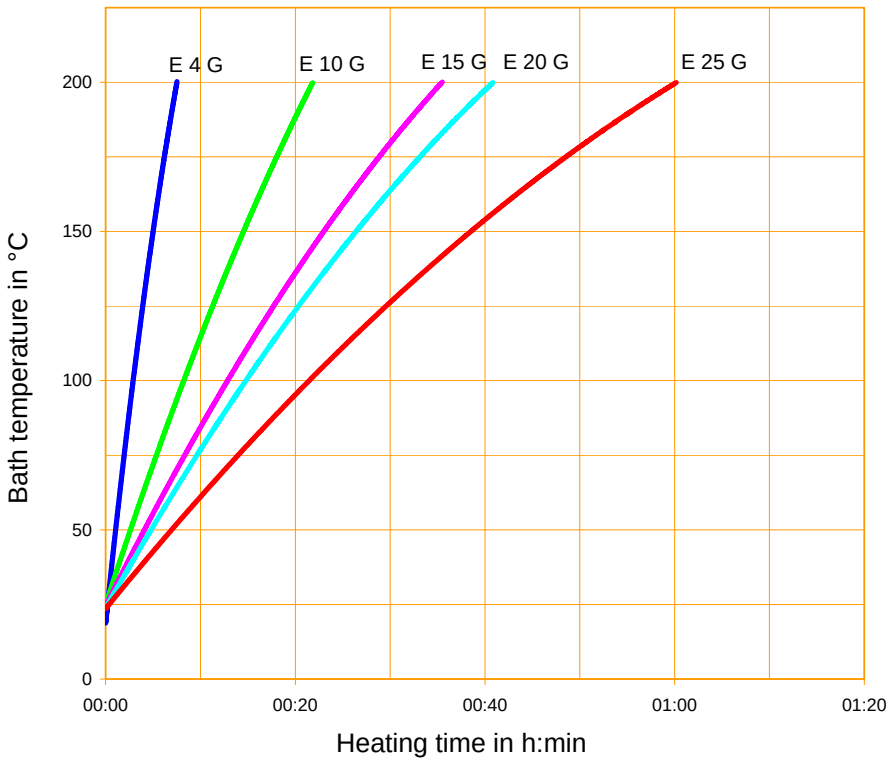
Measured with water

Heating curve for ECO GOLD heating thermostats with transparent bath



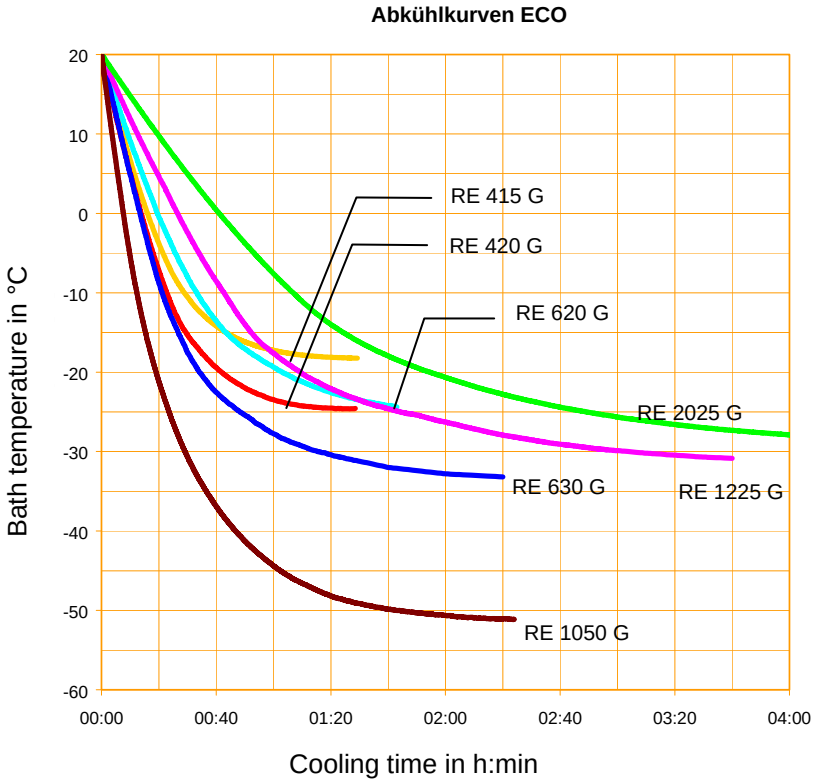
Heat transfer liquid:
Water, bath closed

Heating curve for ECO GOLD heating thermostats with stainless steel bath



Heat transfer liquid:
Therm 240, bath closed

Cooling curves for ECO GOLD cooling thermostats



Heat transfer liquid:
Ethanol, bath closed

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BESTÄTIGUNG / CONFIRMATION / CONFIRMATION

An / To / A:
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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

_____

_____

_____

_____

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 dangeureux dans la cuve.

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

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