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(W), RE 420 G(W), RE 620 G(W), RE 630 G(W),
RE 1225 G(W), RE 2025 G(W), RE 1050 G(W)

English
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YACE0088

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

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1 Safety

1.1 Safety information

Type and source
Consequences of non-compliance
• Action 1 • Action ...

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

Type and source
Consequences of non-compliance
• Action 1 • Action ...

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

Type and source
Consequences of non-compliance
• Action 1 • Action ...

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

Notice

Type and source
Consequences of non-compliance
• Action 1 • Action ...

"NOTICE" warns of possible property or environmental damage.

⇨ Reference Refers to further information in other sections.

1.2 General safety

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

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

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

Classes in the EMC standard DIN EN 61326-1.
Class A: Operation only on electrical supply networks without connected domestic areas.
Class B: Equipment for operation on electrical supply networks with connected domestic areas.
With unfavorable network conditions interfering voltage variations can occur.

EMC standard DIN EN 61326-1 (corresponds to VDE 0843-20-1) Devices for Europe	Class B
Devices for Canada and the USA	Class A
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.	

Instructions for Class A digital device, USA:

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

Instructions for Class A digital device, Canada:

"This Class A digital apparatus complies with Canadian ICES-003" (ICES = Interference Causing Equipment Standards).
« Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada ».

1.3 Special safety information

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

- The siting surface must be impervious, flat, non-slip and non-combustible. Do not position the thermostat at the edge of the bench or table.
- Keep to the specified wall spacing (⇨ 6.1).
- Protect the thermostat from dripping or condensing water.
- Do not store any liquids or combustible objects above the device.
- Do not work with flammable liquids in the direct vicinity of the device.
- Only connect the device to an earthed mains socket which is freely accessible.
- At higher operating temperatures parts of the bath cover can take on temperatures of over 70 °C. There is a danger of burns.
- Only use suitable hoses. (⇨ 6.4)
- Ensure that the hoses are not kinked during operation.
- Check the hoses at certain inspection intervals (⇨ 8.3.2) for material fatigue.
- Hoses with hot heat transfer liquid and other hot parts must not come into contact with the mains cable.
- When using the thermostat as a circulation thermostat, hot liquid can escape due to hose fracture and become a danger to personnel and materials.
- Toxic vapors may be generated depending on the heat transfer liquid used and the operating mode.
  - Ensure sufficient extraction of the vapors.
  - Use the bath cover.
- Carefully mount the immersion thermostat on the bath vessel.
- Only use bath vessels which are suitable for the intended operating temperatures.
- When filling, set the overtemperature switch-off point according to the heat transfer liquid used.
- When changing the heat transfer liquid from water to other liquids for temperatures above 100 °C, carefully remove all residues of water including from the hoses and consumers, otherwise there is a risk of scalding due to delay in boiling.
  To do this also remove the blank plugs on the pump inputs and outputs and blow them out with compressed air.
- Use the cooling coil with cooling water only at operating temperatures below 100 °C. At higher temperatures there is danger of hot vapors forming.
- Have repairs carried out only by specialists.
- Keep to all the service and maintenance intervals according to VDI 3033. (⇨ 8.3.2)
- Take note of all safety labels.

Applicable to water-cooled devices:

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

2 General remarks

2.1 Description of the device

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

Immersion thermostat (optionally with cooling coil), which is used for heating (and optionally for cooling) liquids.

Heating bath and circulation thermostat, designated in the following as a heating thermostat, which is used for heating liquids.

Heating bath and circulation thermostat (a cooling/heating thermostat), also designated in the following as a "cooling thermostat", which is used for cooling and heating liquids.

2.2 Intended application

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

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

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

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

- Aqua 90
- Kryo 20
- Kryo 30
- Kryo 51
- Ultra 350
- Therm 180
- Therm 200
- Therm 240
- Decalcified water

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

2.3 Use other than that intended

The device must not be used:

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

2.4 Responsibility of the operating body - safety information

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

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

2.5 EC conformity

CE

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

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

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3 Device description

3.1 Device types

Heating thermostats

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

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

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

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

Cooling thermostats

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

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

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

3.2 Pump

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

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

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

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

Pump characteristics (⇨ 10)

3.3 Programmer

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

3.4 Interfaces

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

3.5 Interface modules (Accessories)

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

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

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

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

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

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

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

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

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

3.6 Chiller

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

The compressor is equipped with a thermal release which responds to the compressor temperature and current consumption. The chiller is normally switched in automatically, but can also be switched in manually via the operating menu (⇨ A.3).

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

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

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

4 Operating and functional controls

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

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

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

Control panel and display ECO GOLD

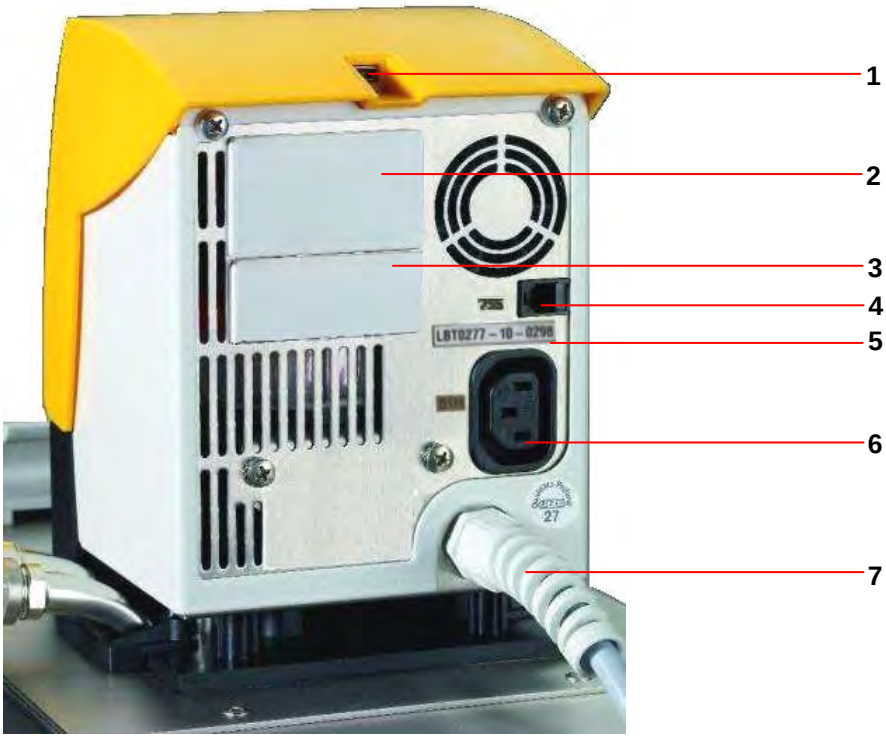
Display

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

Control panel

5	Soft keys, left and right
6	Enter key
7	Cursor keys (cursor keys) for Up, Down, Left and Right.
8	Taste T_{max}: Display and adjustment of the over-temperature switch-off point

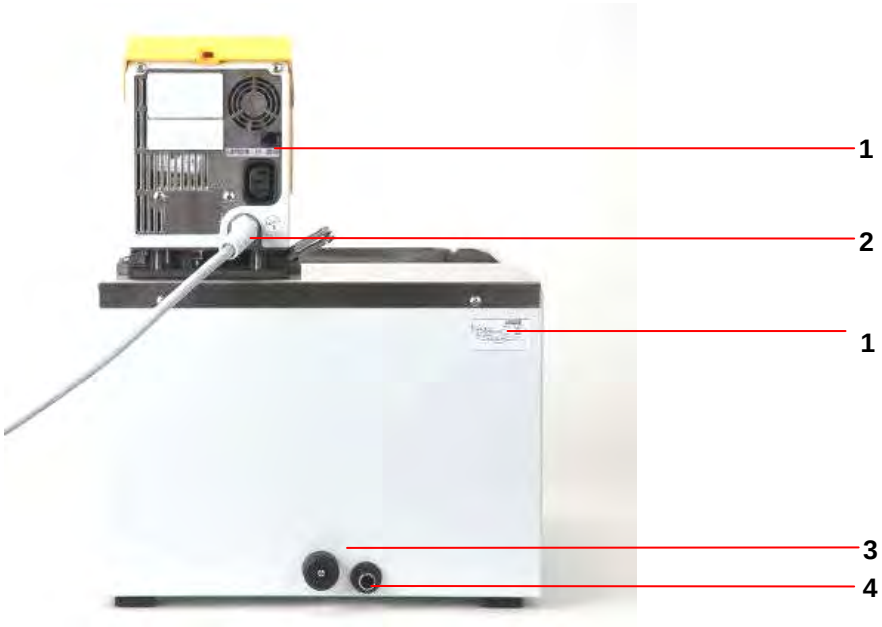
Rear view of Control Head ECO GOLD



1 USB interface
2 Upper module receptacle approx. 51 mm x 27 mm for analogue, RS 232/485, Profibus module and contact modules.
3 Lower module receptacle approx. 51 mm x17 mm for Pt100/LiBus module
4 Connection 75S for control cable of cooling underpart for RE 1050 G
5 Rating label
6 Connection socket 51H for power supply between the control head and cooling underpart
7 Mains connecting lead

Heating Thermostats ECO GOLD

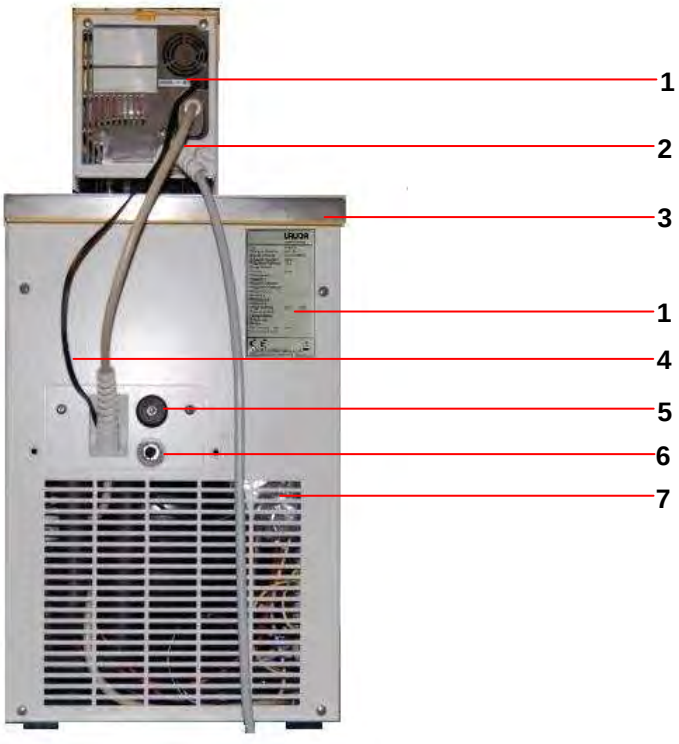
1 Cooling coil connections
2 Pump connection: outflow and return (as standard only with E 4 G and ET 15 G)
3 Bath cover (as standard only with E 4 G)
4 Four feet



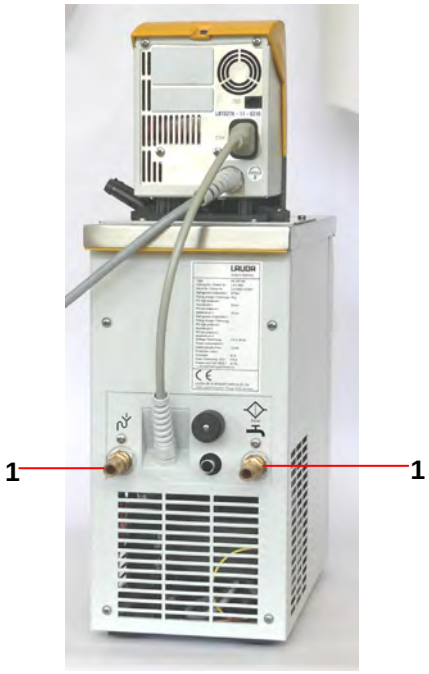
1 Rating label
2 Mains connecting lead
3 Bath draining tap
4 Bath drain point

Cooling Thermostats ECO GOLD

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



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



1 Connections for water cooling

5 Transport and unpacking

Keep your original packing of your thermostat for later transport.

Shipping damage
Electric shock hazard
• Check the device carefully for shipping damage before putting into operation. • Never operate the device if you have found shipping damage.

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

Notice

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

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

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

Standard accessories:

Catalogue number	Quantity	Description	Included with thermostat
HDQ 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	Cooling thermostats, E 4 G, ET 15 G
HKO 026	2	Fitting Ø 13 mm	Cooling thermostats, E 4 G, ET 15 G
HKM 032	2	Union Nuts M16x1	Cooling thermostats, E 4 G, ET 15 G
HKN 065	2	Sealing Plug	Cooling thermostats, E 4 G, ET 15 G
LCZ 0720	1	Cooling Coil	RE (cooling) devices, E 4 G, ET 6 G
LCZ 0721	1	Cooling Coil	E 10 G, E 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:** With applications above 70 °C attach the warning label at an easily visible point.
YACE0088	1	Operating Instructions	All thermostats

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6 Before putting the device into operation

Please note:

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

6.1 Assembly and siting

Always comply with the following safety information:

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

Affix the symbol "Hot surface".

The ECO thermostat is used as:

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

Assembly as immersion thermostat

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

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

Operation with cooling coil

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

Cut the thread with the enclosed screw

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

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

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

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

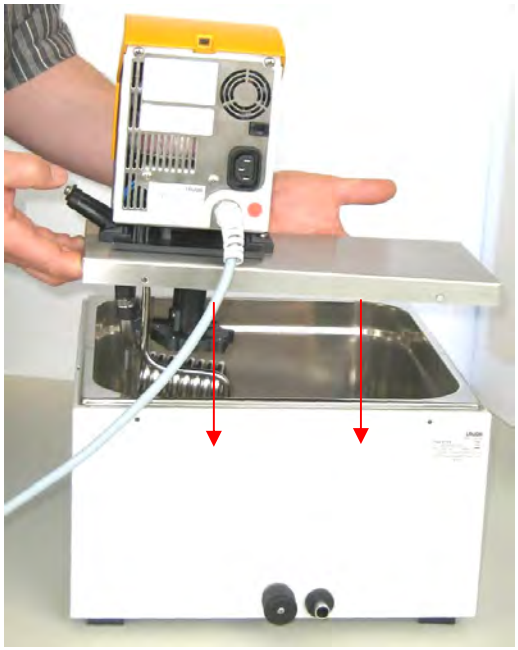
Holed flange

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

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

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

Assembly as immersion thermostat



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

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

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

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

Assembly as cooling thermostat

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

– After transport, site the device in place where possible two hours before putting it into operation so that, if necessary, oil deposits can form again and the compressor can develop its maximum power.
– Do not cover the ventilation openings.
– Keep a distance of at least 40 cm free on all sides of the device.
– Set the flow distribution to INT so that during operation as a bath thermostat (without external consumer) the flow is discharged from the opening for the internal bath circulation.
– Plug the appliance connector of the cooling underpart into the appropriate socket 51H and the control cable into the connection socket at the back of the operating panel.
– During operation as a bath thermostat without an external consumer and with the pump connection set fitted, the outflow nozzle of the pump connection set must be closed (use sealing plug) or connected to the return nozzle with a hose.
– For bath temperatures above 70 °C attach the sticker included in the supplied items to an easily visible point on the bath.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– Operation with external consumer (⇨ 6.2).

Connection of the cooling water

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

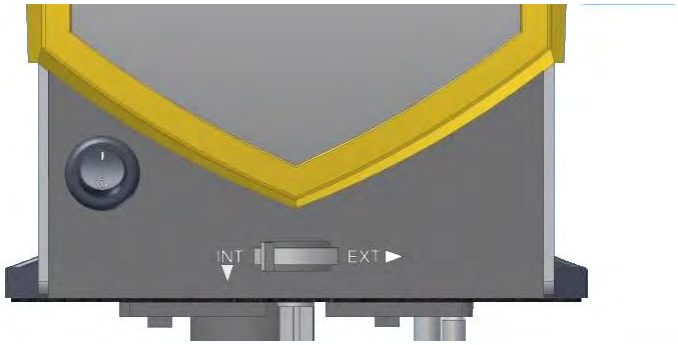
Cooling water pressure (feed - outlet)	max. 10 bar overpressure
Differential pressure (feed - outlet)	min. 3.0 bar
Culling water temperature	10 to 15 °C recommended, 10 to 30 °C admissible with power restrictions)
Cooling water quantity	see Technical Data (⇨10)
Cooling water hose for connection to the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

Ways of adjusting the pump flow

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

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

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



6.2 Connection of external consumers

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

Notice

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

Notice

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

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

Immersion thermostat/heating thermostat

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

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

Cut the thread with the screw

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

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

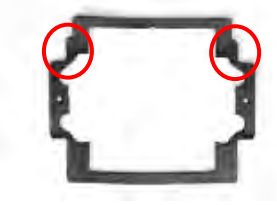
– Withdraw the mains plug.
– Use a soft underlay to avoid scratches to the upper side of the control head.
– With heating thermostats: Remove the flat seal.
– Remove the blind flange by releasing the two cross-head screws.

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

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

Holed flange

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



They must be positioned on the side of the display.

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

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

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

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

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

Operation as circulation thermostat

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

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

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

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

Note:

– Always use the largest possible cross-section and the shortest possible hose lengths in the external circuit.

– For a hose cross-section that is too small a temperature gradient occurs between the bath and external consumer due to a volume flow that is too low. In this case increase the bath temperature or the pump level appropriately.

– Secure the hoses with the aid of hose clips.

– If the thermostat is to be externally controlled, a temperature sensor must be fitted in the external consumer.

– If the consumers are situated at a higher level and with the pump stopped and air seeping into the external fluid circuit, then even with enclosed circuits the external volume may run empty. There is danger of the thermostat overflowing.

– If no external consumer is connected, the outflow nozzle must be sealed off or connected to the return nozzle by a hose.

Notice

Pump connections not closed off
Environmental hazard from leaking heat transfer liquid
• Fit sealing plugs to the pump connections when no external consumers are connected.

Notice

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

6.3 Filling and emptying

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

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

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

Notice

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

Filling

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

Draining and changing the heat transfer liquid

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

1 Drain tap, cooling thermostats
2 Drain tap, heating thermostats

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

Caution !

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

Caution !

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

6.4 Heat transfer liquids, cooling water and hoses

Note:

- Tap water is unsuitable for operation with the thermostat due to the calcium carbonate content. The bath vessel may calcify.
- High purity water (from ion exchangers) and distilled or bidistilled water are unsuitable for operation due to the corrosive properties of these media. High purity water and distillates are suitable as a medium after the addition of 0.1 g of soda (Na_2CO_3, sodium carbonate) per liter of water.
- Water containing iron (rust formation), chlorine (pitting) and untreated river water ("algae formation") is unsuitable.
- The bath vessels of the LAUDA ECO thermostats are produced in stainless steel 1.4301 and are accordingly resistant to mechanical and chemical stresses.
- Metals have different electrochemical potentials. Therefore, in the case of direct contact between the tank and a frame (copper for example) electrochemical oxidation may occur. The bath corrodes despite the use of high quality materials on the tank. Avoid the use of this type of frame or direct contact with it or contact with non-ferrous metal samples and the inside of the container. Use original LAUDA stainless steel frames or commercially available frames in temperature-resistant plastics.

a) Approved heat transfer liquids

LAUDA designation	Operating temperature range	Chemical designation	Viscos-ity (kin)	Viscosity (kin) at temperature	Fire point	Container size Catalogue number		
	°C		mm²/s at 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 vaporization losses occur. In this case use a bath cover (⇨ 9). Use distilled water or pure demineralized water only after adding 0.1 g of soda (Na_2CO_3 sodium carbonate) per liter of water. Otherwise there is the risk of corrosion!

② The proportion of water reduces with longer working at high temperatures and the mixture becomes flammable (flash point 128 °C). Check the mixing ratio using a hydrometer.

③ Do not use in conjunction with EPDM hose.

Never use silicone oil with silicone hoses.

EPDM hose is not suitable for Ultra 350 nor for mineral oils.

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

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

b) Cooling water

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

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

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

Suitable cooling water quality

pH – value	7.5 – 9.0
Sulfates [SO_4^{2-}]	< 70 mg/L
Hydrocarbonates [HCO_3-]/ sulfates [SO_4^{2-}]	> 1.0
Total hardness	4.0 – 8.5 °dH
Hydrocarbonates [HCO_3-]	70 – 300 mg/L
Conductivity	10 - 500 µs/cm
Chlorides (Cl^-)	< 50 mg/L
Sulfites [SO_3^{2-}]	< 1 mg/L
Free chlorine gas (Cl_2)	< 1 mg/L
Nitrates (NO_3 -)	< 100 mg/L
Ammonia (NH_3)	< 2 mg/L
Iron (Fe), dissolved	< 0.2 mg/L
Manganese (Mn), dissolved	< 0.1 mg/L
Aluminum (Al), dissolved	< 0.2 mg/L
Free aggressive carbonic acid (CO_2)	< 5 mg/L
Hydrogen sulfide (H_2S)	< 0.05 mg/L
Algae growth	Not permissible
Suspended matter	Not permissible

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

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

Water pollution due to leakage

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

Servicing intervals

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

c) Approved elastomer hoses

Type of hose	Internal diameter Ø mm	Temperature range °C	Application range	Catalogue number
EPDM hose uninsulated	9	10...120	For all LAUDA heat transfer liquids except Ultra 350 and mineral oils	**RKJ 111**
EPDM hose uninsulated	12	10...120	For all LAUDA heat transfer liquids except Ultra 350 and mineral oils	**RKJ 112**
EPDM hose insulated	12 External Ø approx. 35 mm	-60...120	For all LAUDA heat transfer liquids except Ultra 350 and mineral oils	**LZS 021**
Silicone hose uninsulated	11	10...100	Water water/glycol mixture	**RKJ 059**
Silicone hose insulated	11 External Ø approx. 35 mm	-60...100	Water water/glycol mixture	**LZS 007**
Viton	11	10...200	For all LAUDA heat transfer liquids	**RKJ 091**
Viton cold insulated	8.5 External Ø approx. 30 mm	-20...150	For all LAUDA heat transfer liquids	**LZS 017**
Viton cold insulated	11 External Ø approx. 32 mm	-20...150	For all LAUDA heat transfer liquids	**LZS 018**

Note:

- EPDM hose is **not** suitable for Ultra 350 **nor** for mineral oils.
- Never use silicone oil with silicone hoses.
- Secure the hoses with the aid of hose clips.

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

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

6.5 Cooling of heating thermostats

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

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

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

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

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

6.6 First switch-on

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

Notice

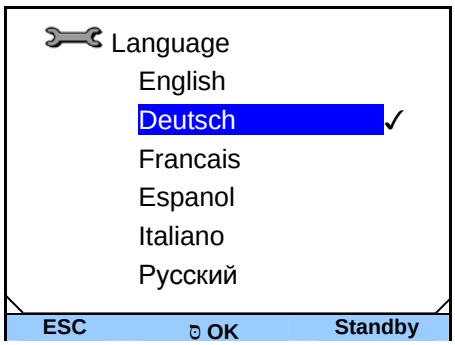
Use of inadmissible mains voltage or frequency
Property damage
• Compare the rating label with the available mains voltage and frequency.

Note:

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

Menu language

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



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

6.7 Installation of modules

When installing modules always follow this safety information:

Live parts during module installation
Electric shock hazard
• Disconnect the device from the mains before module installation. • Have the installation carried out only by specialists.

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

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

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

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

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

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

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

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

7 Operation

Always follow this safety information:

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

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

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

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

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

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

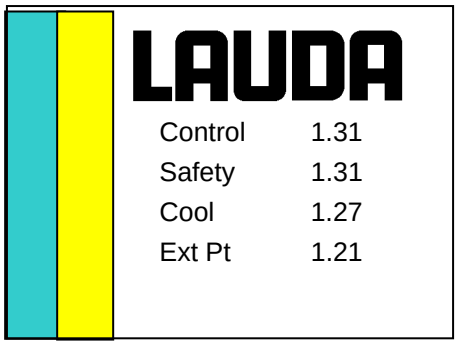
Notice

Inadmissible operating temperatures; temperature difference between outflow and product too large
Property damage (consumers, external components)
• Note that an externally controlled bath temperature, especially during a transient response, may differ substantially from the set-point temperature. • Note the various limitation options (Tih, Til, T_{max}, correction limitation). • Set the overtemperature switch-off point T_{max} according to the heat transfer liquid (at least 25 K below the fire point/boiling point).

7.1 Switching on

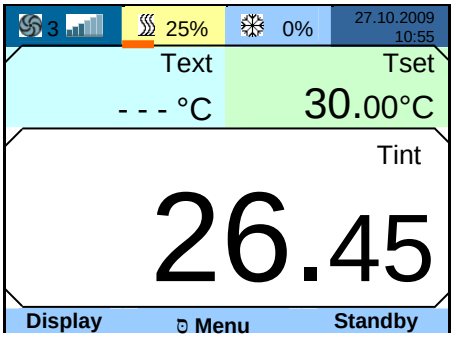
– Switch on the device with the mains switch. An acoustic signal sounds.

1 s



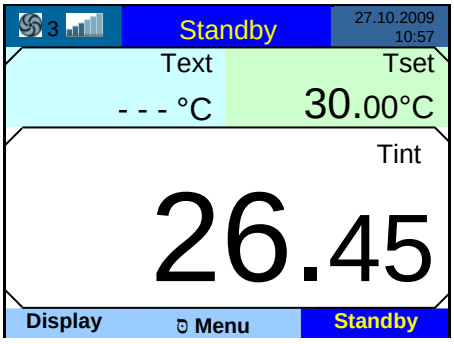
According to the adjacent display the software version numbers (depends on device type and options) appear for approx. 5 seconds.
When making technical enquiries, please have the version numbers and device serial number (⇨ 8.2.5) at hand.

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

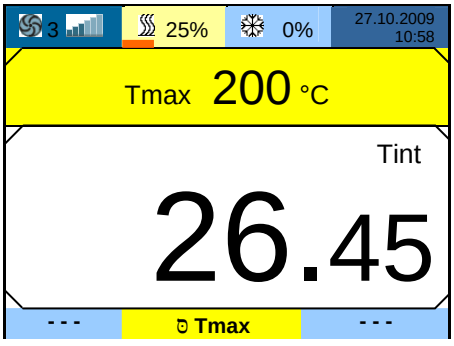


The current bath temperature (T_{int}) is displayed with the status display above it, the expanded status display at the top margin and the soft-key bar at the bottom margin.

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



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



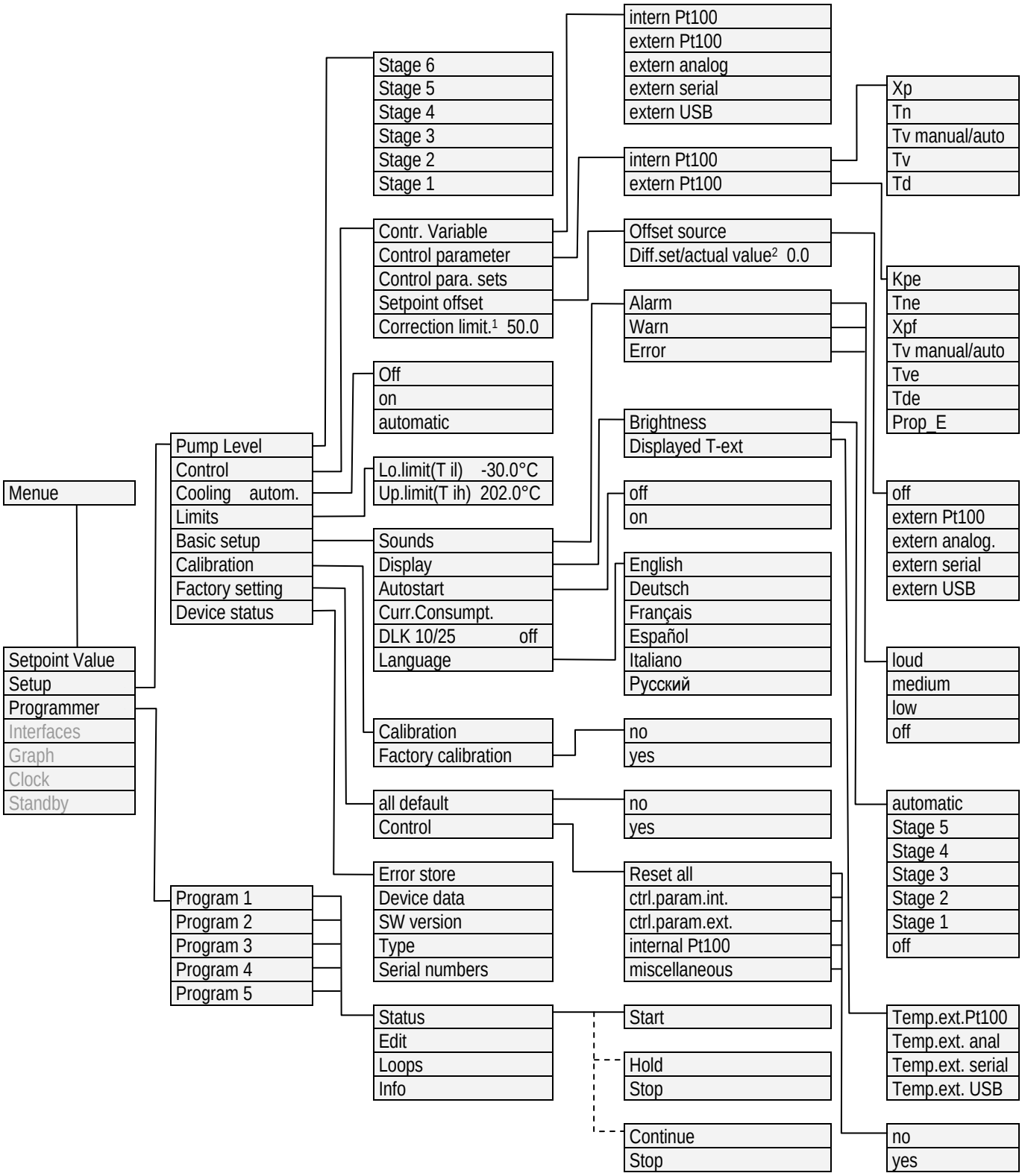
With the key T_{max} you check or change the overtemperature switch-off point:

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

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

7.2 Menu structure

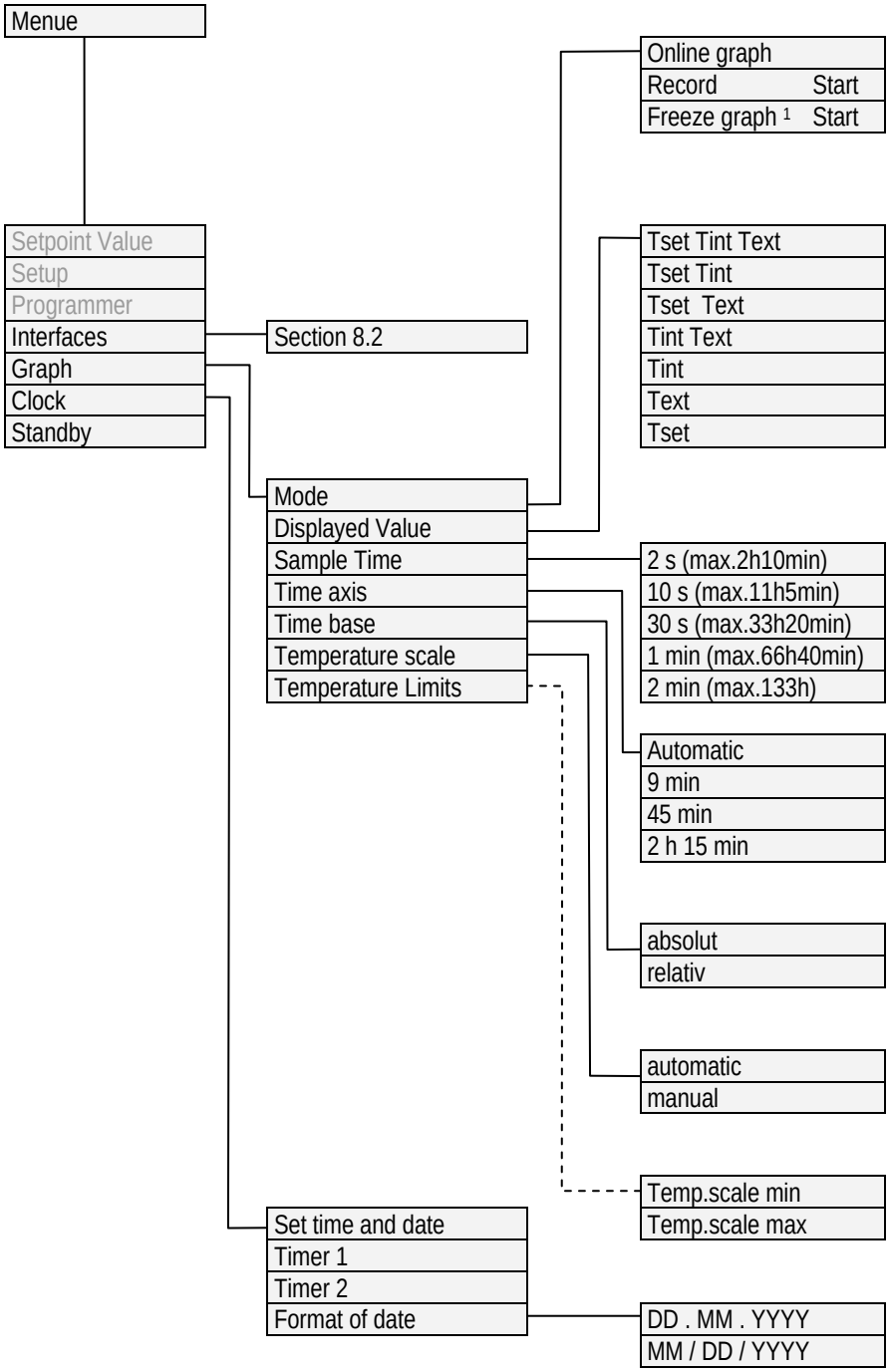
With the soft keys you can select the following menu points with the GOLD control head:



1 Correction limitation 2 Difference between set point/actual value

Continued...

Continued from previous page

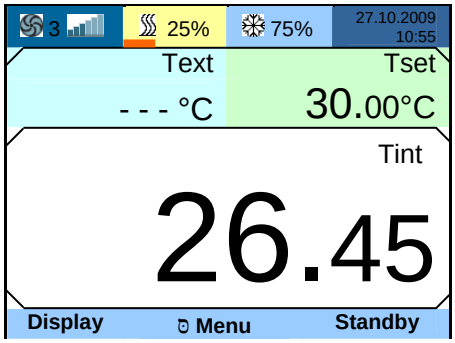


[1] Freeze Graph

7.3 Display representation

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

7.3.1 Basic window



The following information is displayed depending on the operating status:

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

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

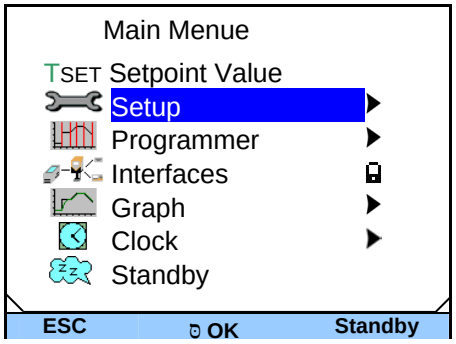
7.3.2 Menu window

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

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

Examples of display representation:

Main menu

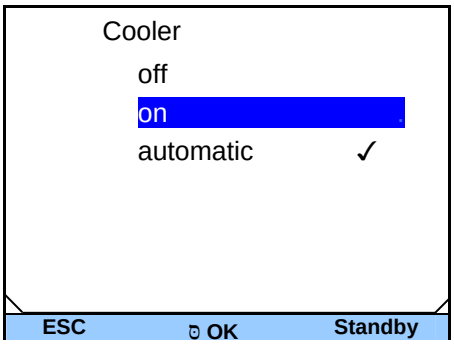


In the main menu selected menu points are displayed inversely.

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

ESC	You are returned to the main menu.
OK	You are taken to the submenu (this can also occur by pressing ▶).
Standby	Standby is activated. If Standby is inversely highlighted, standby is active. If not , the device is in operation.

Submenu "Cooling"



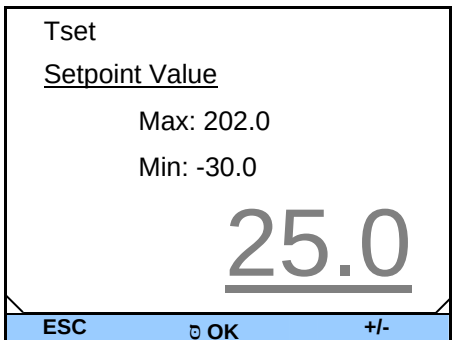
The following information is displayed in this window example:

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

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

7.3.3 Entry window

Values are input using the entry window.



In the entry window the following information is displayed:

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

The parameter is located below this in plain text.

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

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

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

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

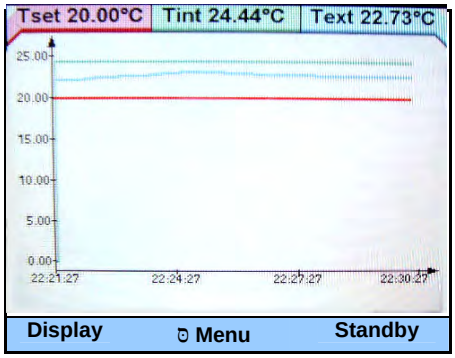
By pressing (+/-) the arithmetic sign can be changed.

The enter key takes over the set value.

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

7.3.4 Graphics window

The ECO GOLD thermostats offer you the possibility of displaying temperature traces graphically (⇨ 0).



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

T_{set}	set-point temperature (red)
T_{int}	internal bath temperature (green)
T_{ext}	Temperature on the external consumer, external temperature sensor (blue).

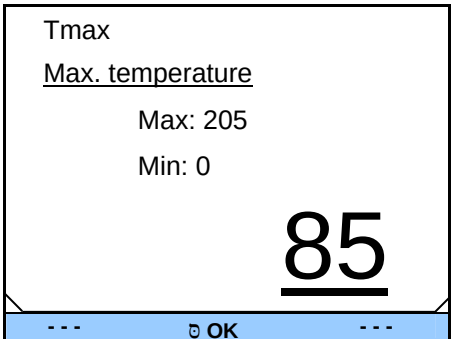
7.4 Basic setup

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

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

Overheating due to entering an incorrect T_{max} and set-point temperature
Burns, scalds, fire
• Set T_{max} in each case according to the heat transfer liquid used (at least 25 K below fire point).

Hold the key T max *pressed during the complete setting procedure:*



– Press the enter key ●.

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

– Change the value with ▲ or ▼.

Note: With a longer depression the figures increment faster.

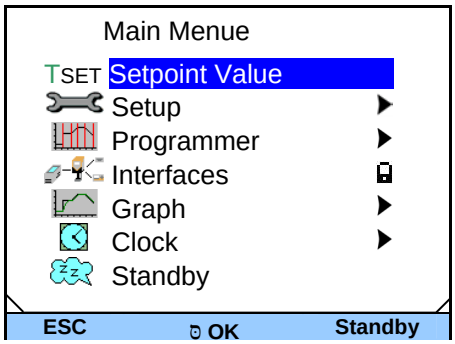
– Single figures can be selected by pressing ◀ or ▶.

– Confirm your choice with the enter key ●.

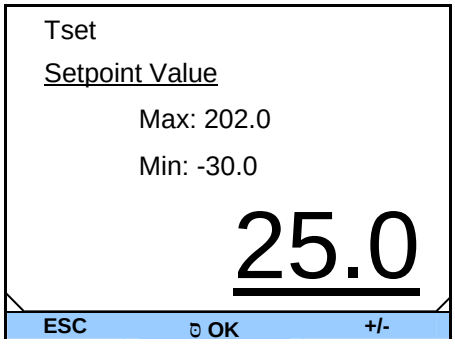
On releasing T max *you are returned to the menu level without any change.*

For T_{max} the following applies: 5 K above desired bath temperature, but at least 25 K below the fire point of the heat transfer liquid used.

7.4.2 Setting the temperature set-point value



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



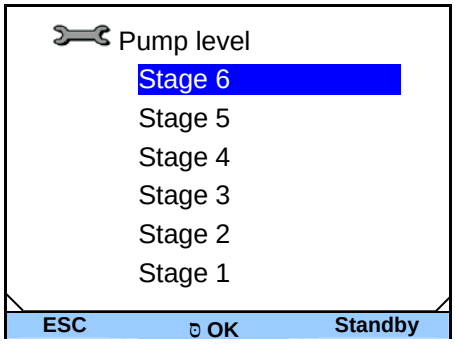
The entry window appears. The cursor below the temperature value flashes and can be changed within the displayed limits.

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

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

7.4.3 Setting the pump level

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

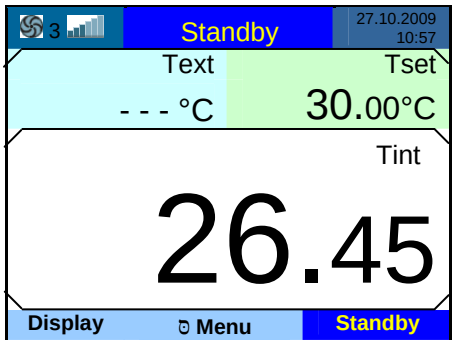


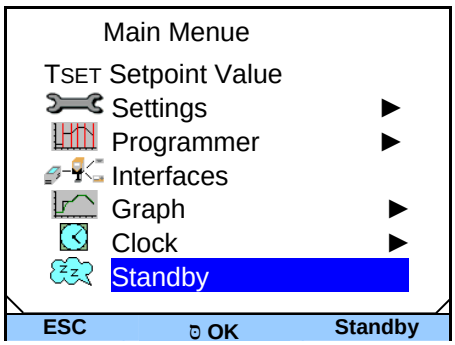
– Access to the main menu level is obtained by pressing the enter key.
– The adjacent menu window appears by selecting and confirming → Setup → Pump level.
– The level can be selected with ▼ or ▲. The selected level is immediately active without confirmation (in this example it is Level 6).

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

7.4.4 Activating the "Standby" operating state

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





There are two ways of selecting the "Standby" mode:

– 1. Activate "Standby" by pressing (right soft key).

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

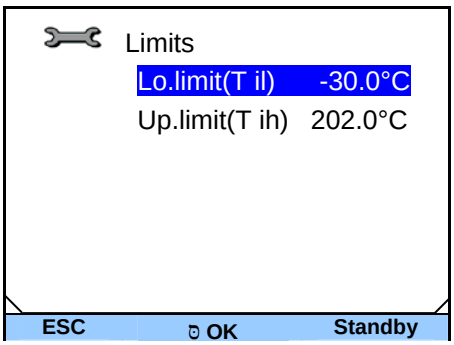
– Select "Standby" with ▲ or ▼ and confirm with .

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

Note: By pressing the enter key again your return to the active operating state.

7.4.5 Defining temperature limits

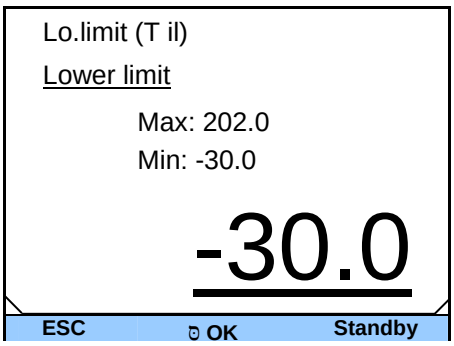
With this function the temperature limits Til and Tih are defined. If, for example, you are using water as the heat transfer liquid, +5 °C is practicable as the minimum temperature and +95 °C as the maximum temperature.



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

The adjacent menu window appears.

– Select the lower (Til) or upper (Tih) limit with ▲ or ▼ and confirm it with.

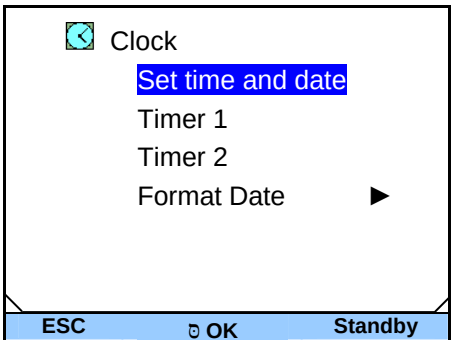


In the entry window the cursor flashes below the value to be changed. The permissible adjustment range is indicated with Min and Max.

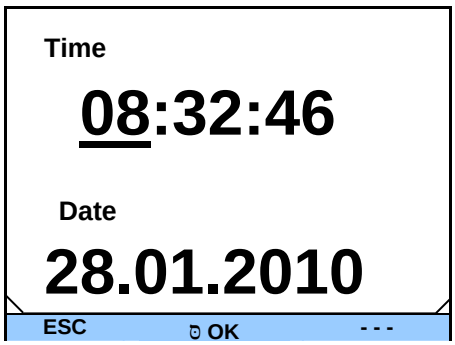
– Change the value with ▲ or ▼.
– Single figures can be selected by pressing ◀ or ▶.
– By pressing (+/-) the arithmetic sign can be changed.
– Confirm your choice with the enter key.

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

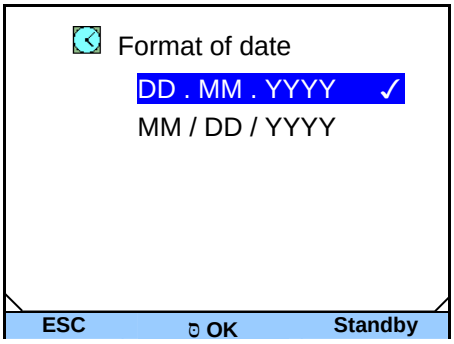
7.4.6 Setting the date and time.



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



The adjacent menu window appears.
– The cursor flashes under the hours display.
– Change the value with ▲ or ▼.
– Single figures can be selected by pressing ◀ or ▶.

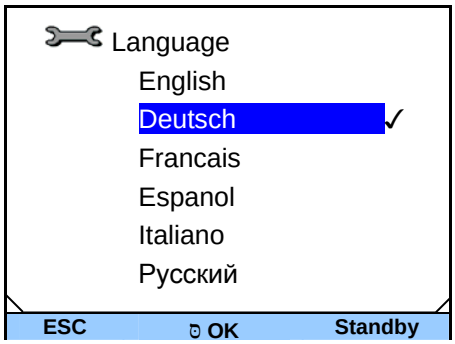


– The adjacent menu window appears on selecting the menu point "Format of date".
– The selection with ▲ or ▼ and confirmation with ● selects between the date formats "DD . MM . YYYY" and "MM / DD / YYYY".

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

7.4.7 Selecting the menu language

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



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

The adjacent menu window appears.
– Select the language with ▲ or ▼ and confirm with ●.

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

8 Maintenance

8.1 Alarms, warnings and errors

Alarms:	Alarms are relevant to safety. Pump, heating and chiller switch off.
Warnings:	Warnings are normally not relevant to safety. The device continues to run.
Errors:	If a malfunction occurs, switch off the unit at the mains switch. If the malfunction recurs after switching on the device, contact LAUDA Service Constant Temperature Equipment (⇨ 8.7) or your local service organization.

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

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

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

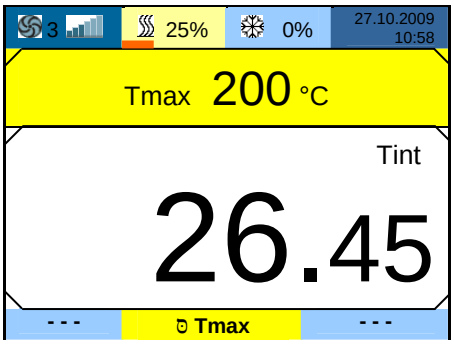
8.1.1 Overtemperature protection: Alarm and checking

Overheating due to entering an incorrect T_{max} and set-point temperature
Burns, scalds, fire
• Set T_{max} in each case according to the heat transfer liquid used (at least 25 K below fire point).

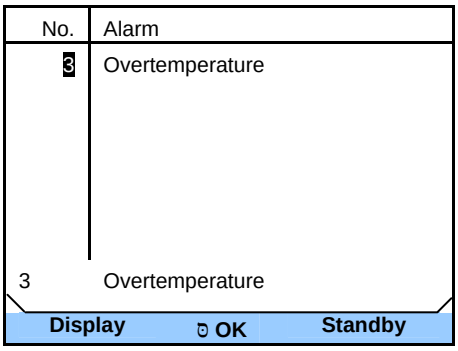
Note: The devices are rated for operation with flammable and non-flammable liquids according to DIN EN 61010-1 and DIN EN 61010-2-010.

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

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



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



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

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

If "Overtemperature" appears in the display:

– Unlock the "Overtemperature" display with .

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

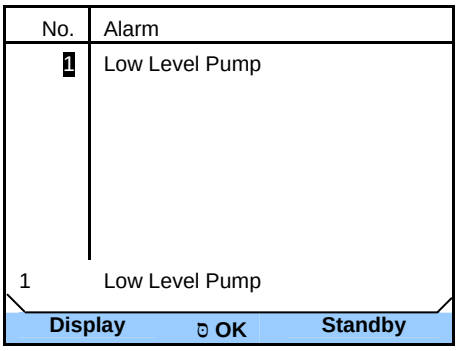
– Slowly reduce T_{max} as described in (⇨ 7.4.5). The thermostat should switch off when the actual temperature is greater than T_{max}.

Alarm signaling (see above) must occur.

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

8.1.2 Low level: Alarm and checking

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



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

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

Alarm signaling (see above) must occur.

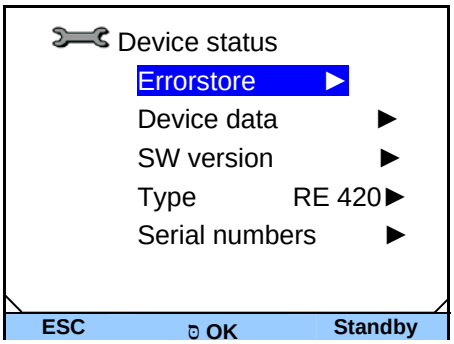
– Top up with heat transfer liquid.
– Unlock the "Low Level Pump" display with .

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

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

8.2 Device status

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



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

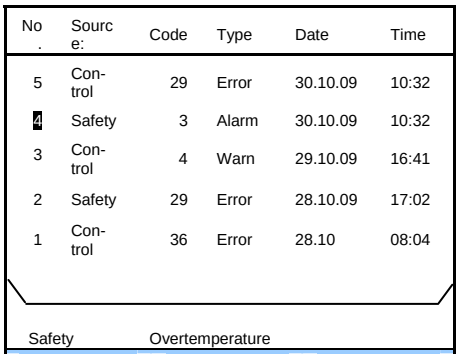
The adjacent menu window appears.

Here, you can now

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

8.2.1 Store for errors, alarms and warnings

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



No.	Source:	Code	Type	Date	Time
5	Control	29	Error	30.10.09	10:32
4	Safety	3	Alarm	30.10.09	10:32
3	Control	4	Warn	29.10.09	16:41
2	Safety	29	Error	28.10.09	17:02
1	Control	36	Error	28.10	08:04

Safety Overtemperature

Error store

– confirm with.

The latest message is located in the first position.

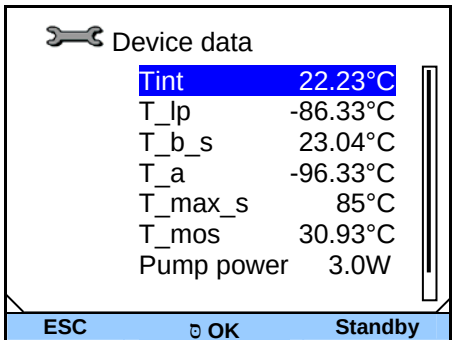
– You navigate with ▲ or ▼ through the results which are sorted by date. The message text appears in the footer.

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

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

"Type" specifies alarm, warning or error. The list of alarms and warnings can be found in the appendix (⇨ 0).

8.2.2 Device data

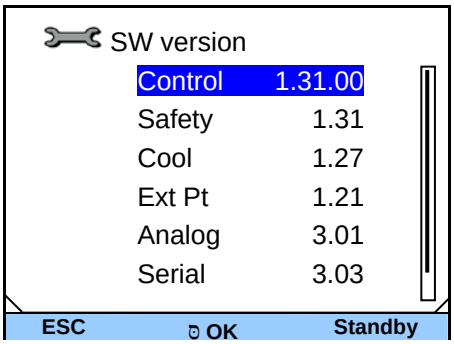


Device data

– confirm with.

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

8.2.3 Software version



SW version

– confirm with .

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

8.2.4 Displaying and changing the device type

Type

– confirm with .

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

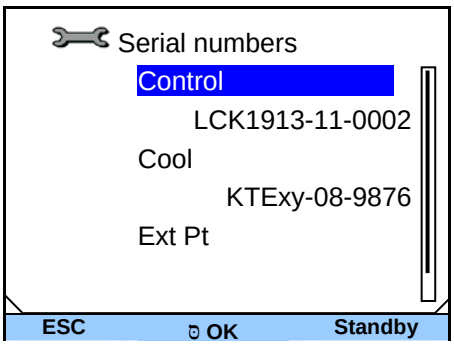
You can change the device type .

Note:
With a change of device type parameters are re-initialized and control parameters adapted by the user are lost! Therefore, the type change has a three second delay on the key depression.

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

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

8.2.5 Displaying serial numbers



Serial numbers

– confirm with .

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

8.3 Servicing

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

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

8.3.1 Cleaning

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

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

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

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

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

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

8.3.2 Servicing intervals to VDI 3033

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

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

8.3.3 Inspecting the heat transfer liquid

Contaminated or degenerated heat transfer liquid must be renewed.

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

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

Caution !

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

8.3.4 Cleaning the condenser

8.3.4.1 Air-cooled condenser

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

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

Note:

Caution !

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

8.3.4.2 Water-cooled condenser

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

Cleaning the plug-in sieve

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

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

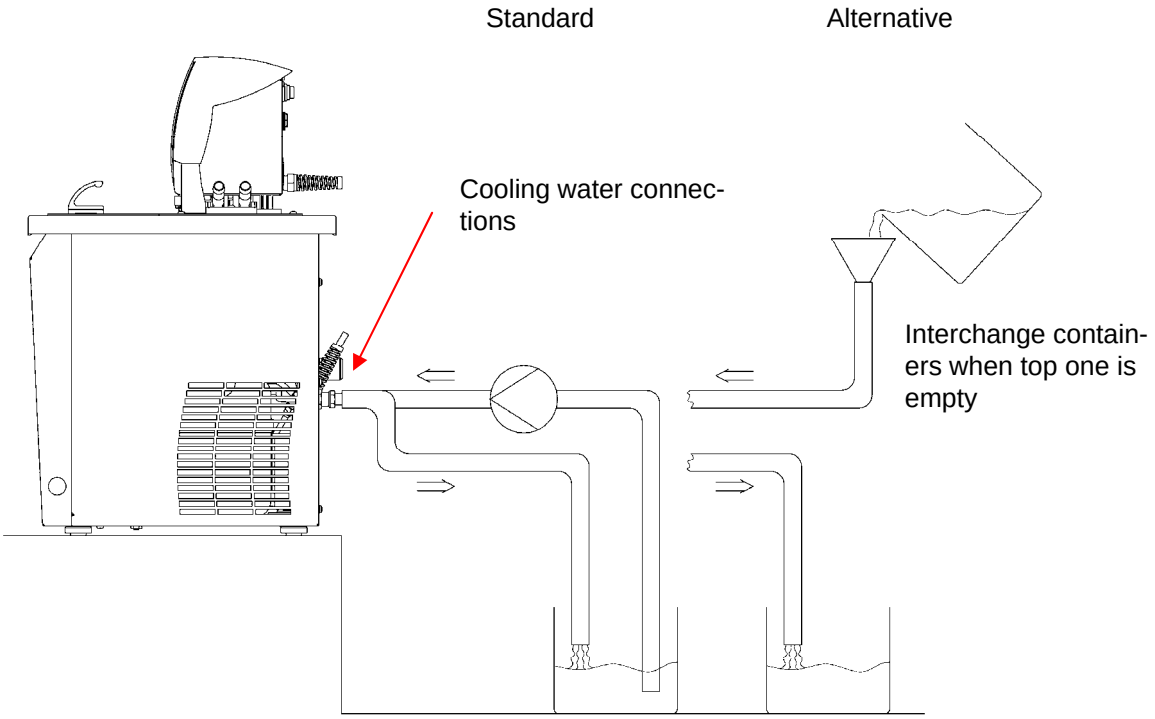
Decalcifying the cooling water circuit

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

Required equipment:

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

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



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

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

8.4 Fault finding

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

In doing so, follow all this safety information:

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

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

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

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

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

8.5 Disposal information

The following applies to Europe: Disposal of the device may only be carried out by qualified specialists according to EC Directive 303/2008/EC in conjunction with 842/2006/EC.

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

8.5.1 Disposal of the refrigerant

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

The Global Warming Potentials (GWP)
[cf. CO_2 = 1.0]

Refrigerant	$GWP_{(100a)}$*
R134a / HFKW-134a	1.300
R404A / HFKW-404A	3.784

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

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

8.5.2 Disposal of the packaging

The following applies to Europe: The disposal of the packaging must be carried out according to the EC Directive 94/62/EC.

8.6 Taking the device out of service

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

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

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

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

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

8.7 Ordering replacement parts / LAUDA Service

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

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

LCK19111 = Catalogue number
11 = Year of manufacture 2011
0001 = Incremental numeration

Your contact for maintenance and expert service support.

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

We are available at any time for queries and ideas!

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Internet http://www.lauda.de

9 Accessories

Please take catalogue numbers for accessories from the following table.

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

Immersion thermostats

Accessories	Suitable for	Catalogue number
Cooling coil set (small)	ECO GOLD, bath vessels up to 6 liters	**LCZ 0720**
Cooling coil set (large)	ECO GOLD, bath vessels from 6 liters	**LCZ 0721**
Pump connection set (outflow and return nozzles) with fitting 13 mm (plastic)	ECO GOLD	**LCZ 0716**
Pump connection set (pressure and return nozzles) with thread M16 x1 (stainless steel) 2 fittings, 2 union nuts	ECO GOLD	**LCZ 0717**

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

Heating thermostats

Accessories	Suitable for	Catalogue number
Pump connection set (outflow and return nozzles) with fitting 13 mm (plastic)	All heating thermostats	**LCZ 0716**
Pump connection set (outflow and return nozzles) with thread M16 x 1 (stainless steel)	All heating thermostats	**LCZ 0717**
Bath cover in stainless steel	E 10 G, 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

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

For all devices

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

* functions only in conjunction with LRZ 918

10 Technical data and graphs

The figures were determined according to DIN 12876.

Data applicable to all ECO GOLD thermostats		
Ambient temperature range	°C	5 ... 40
Relative humidity		Maximum relative humidity 80 % at 31 °C and decreasing linearly to 50 % up to 40 °C.
Contamination level		2
Setting resolution	K	±0,01
Display resolution	K	±0,01
Temperature measurement		
Absolute accuracy	K	±0,2
Temperature accuracy	K	±0,01
Pump type/number of power levels		Pressure pump/6
Discharge pressure, max.	bar	0.55
Discharge flow, max.	L/min	22
Viscosities of the heat carrier liquid	mm²/s	Heating range: maximum 150; Control range: ≤ 30
Display field		TFT display 3.5"; 320 x 240 pixel
Programmer		5 programs with a total of 150 temperature/time segments
Standard interface		USB
Class of protection		IP 21
Classification		III
Labeling		FL (suitable for flammable and non-flammable liquids)
Overvoltages		Overvoltage Category II and transient overvoltages according to Category II.
Class of protection for electrical operating equipment DIN EN 61140 (VDE 0140-1)		Class I

Immersion thermostats

		ECO GOLD			
		230 V	**220 V**	**115 V**	**100 V**
Working temperature range ①	°C	20…200			
Working temperature range with water cooling	°C	20…200			
Operating temperature range ②	°C	-20…200			
Heater rating / power consumption	kW	2.6/2.7	2.4/2.5	1.3/1.4	1/1.1
Heater surface loading	W/cm²	6.8	6.2	6.8	5.1
Bath depth	mm	At least 150			
Overall dimensions (W x D x H)	mm	130 x 135 x 325			
Weight	kg	3.4	3.4	3	3
Mains connection		**Catalogue number**			
230 V ±10 %; 50/60 Hz		**LCE 0228**	**---**	**---**	**---**
220 V ±10 %; 60 Hz		**---**	**LCE 2228**	**---**	**---**
115 V ±10 %; 60 Hz		**---**	**---**	**LCE 4228**	**---**
100 V ±10 %; 50/60 Hz		**---**	**---**	**---**	**LCE 6228**

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 accuracy	K	±0,01					
Bath volume	L	3…3.5	7.5…11	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 (B x T)	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
Pump connection Stainless steel fittings 13 mm (thread M16 x 1)		Standard	③ Optional accessory				
230 V; 50/60 Hz							
Heater rating / power consumption	kW	2.6/2.7					
Weight	kg	7.0	9.0	10.7	12.2	13.5	17.6
220 V; 60 Hz							
Heater rating / power consumption	kW	2.4/2.5					
Weight	kg	7.0	9.0	10.7	12.2	13.5	17.6
115 V; 60 Hz							
Heater rating / power consumption	kW	1.3/1.4					
Weight	kg	6.6	8.6	10.3	11.8	13.1	17.2
100 V; 50/60 Hz							
Heater rating / power consumption	kW	1/1.1					
Weight	kg	6.6	8.6	10.3	11.8	13.1	17.2

Mains connection	**Catalogue number**					
	E 4 G	E 10 G	E 15 G	E 20 G	E 25 G	E 40 G
230 V ±10 %; 50/60 Hz	LCB 0737	LCB 0739	LCB 0741	LCB 0743	LCB 0745	LCB 0747
220 V ±10 %; 60 Hz	LCB 2737	LCB 2739	LCB 2741	LCB 2743	LCB 2745	LCB 2747
115 V ±10 %; 60 Hz	LCB 4737	LCB 4739	LCB 4741	LCB 4743	LCB 4745	LCB 4747
100 V ±10 %; 50/60 Hz	LCB 6737	LCB 6739	LCB 6741	LCB 6743	LCB 6745	LCB 6747

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

Heating thermostats with transparent bath

		ET 6 G	ET 12 G	ET 15 G	ET 20 G
Working temperature range ①	°C	20…100			
Working temperature range with water cooling	°C	20…100			
Operating temperature range ②	°C	-20…100			
Temperature accuracy	K	±0,01			
Bath volume	L	5…6	9.5…12	13.5…15	15…20
Bath vessels		Polycarbonate			
Usable bath opening (W x D) with control head	mm	130 x 285	300 x 175	275 x 130	300 x 350
Bath depth	mm	160	160	310	160
Usable bath depth	mm	140	140	290	140
Height of bath edge without cover	mm	169	208	356	208
Overall dimensions (W x D)	mm	143 x 433	322 x 331	428 x 148	322 x 506
Overall height	mm	349	389	532	389
Pump connection Stainless steel fittings 13 mm (thread M16 x 1)		③ Optional accessory	③ Optional accessory	Standard	③ Optional accessory
230 V; 50/60 Hz					
Heater rating / power consumption	kW	2.6/2.7			
Weight	kg	4.5	6.8	6.8	8.0
220 V; 60 Hz					
Heater rating / power consumption	kW	2.4/2.5			
Weight	kg	4.5	6.8	6.8	8.0
115 V; 60 Hz					
Heater rating / power consumption	kW	1.3/1.4			
Weight	kg	4.1	6.4	6.4	7.6
100 V; 50/60 Hz					
Heater rating / power consumption	kW	1/1.1			
Weight	kg	4.1	6.4	6.4	7.6

Mains connection	**Catalogue number**			
	ET 6 G	**ET 12 G**	**ET 15 G**	**ET 20 G**
230 V ±10 %; 50/60 Hz	**LCM 0097**	**LCD 0287**	**LCD 0289**	**LCD 0291**
220 V ±10 %; 60 Hz	**LCM 2097**	**LCD 2287**	**LCD 2289**	**LCD 2291**
115 V ±10 %; 60 Hz	**LCM 4097**	**LCD 4287**	**LCD 4289**	**LCD 4291**
100 V ±10 %; 50/60 Hz	**LCM 6097**	**LCD 6287**	**LCD 6289**	**LCD 6291**

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

Cooling thermostats (1)

			RE 415 G	RE 415 GW	RE 420 G	RE 420 GW	RE 620 G	RE 620 GW	RE 630 G	RE 630 GW
Working temperature - ACC range*		°C	-15...200		-20…200		-20…200		-30…200	
Ambient temperature range		°C	5...40							
Temperature accuracy		K	±0.02							
max. storage temperature		°C	43 with water-cooled devices the evaporator must be completely drained							
Cooler (L)air/(W)water			L	W	L	W	L	W	L	W
Refrigerant			R134a							
Cooling output at 20 °C ambient temperature, 15 °C cooling water temperature, 3 bar cooling water pressure and Pump stage 2	20 °C	W	180		200		200		300	
	10 °C	W	160		180		180		270	
	0 °C	W	120		150		150		240	
	-10 °C	W	80		100		100		190	
	-20 °C	W	30 ①		30		30		100	
	-30 °C	W							20	
Bath volume		liters	3.3...4		3.3…4		4.6…5.7		4.6…5.7	
Overall dimensions (W x D)		mm	130 x 105		130 x 105		150 x 130		150 x 130	
Bath depth		mm	160							
Usable depth		mm	140							
Height to top edge of bath		mm	365		374		400		400	
Overall dimensions (W x D)		mm	180 x 350		180 x 396		200 x 430		200 x 430	
Overall height		mm	546		555		581		581	
Sound level (1 m)		dB(A)	50							
Pump connection			Stainless steel fittings 13 mm (thread M16 x 1)							
230 V; 50 Hz										
Heater rating / power consumption		kW	2.6 / 2.8						2.6 / 2.9	
Weight		kg	20.0	20.9	22.0	22.9	23.7	24.7	27.6	28.6
220 V; 60 Hz										
Heater rating / power consumption		kW	2.4 / 2.6						2.4 / 2.7	
Weight		kg	20.0	20.9	22	22.9	23.7	24.7	27.6	28.6
115 V; 60 Hz										
Heater rating / power consumption		kW	1.3 / 1.5						1.3 / 1.6	
Weight		kg	19.6	20.5	21.6	22.5	23.3	24.3	27.2	28.2
100 V; 50/60 Hz										
Heater rating / power consumption		kW	1 / 1.2						1 / 1.3	
Weight		kg	19.6	20.5	21.6	22.5	23.3	24.3	27.2	28.2

Mains connection	**Catalogue number**							
	RE 415 G	RE 415 GW	RE 420 G	RE 420 GW	RE 620 G	RE 620 GW	RE 630 G	RE 630 GW
230 V ±10 %; 50 Hz	LCK 1911	LCK 1925	LCK 1913	LCK 1927	LCK 1915	LCK 1929	LCK 1917	LCK 1931
220 V ±10 %; 60 Hz	LCK 2911	LCK 2925	LCK 2913	LCK 2927	LCK 2915	LCK 2929	LCK 2917	LCK 2931
115 V ±10 %; 60 Hz	LCK 4911	LCK 4925	LCK 4913	LCK 4927	LCK 4915	LCK 4929	LCK 4917	LCK 4931
100 V ±10 %; 50/60 Hz	LCK 6911	LCK 6925	LCK 6913	LCK 6927	LCK 6915	LCK 6929	LCK 6917	LCK 6931

*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

Cooling thermostats (2)

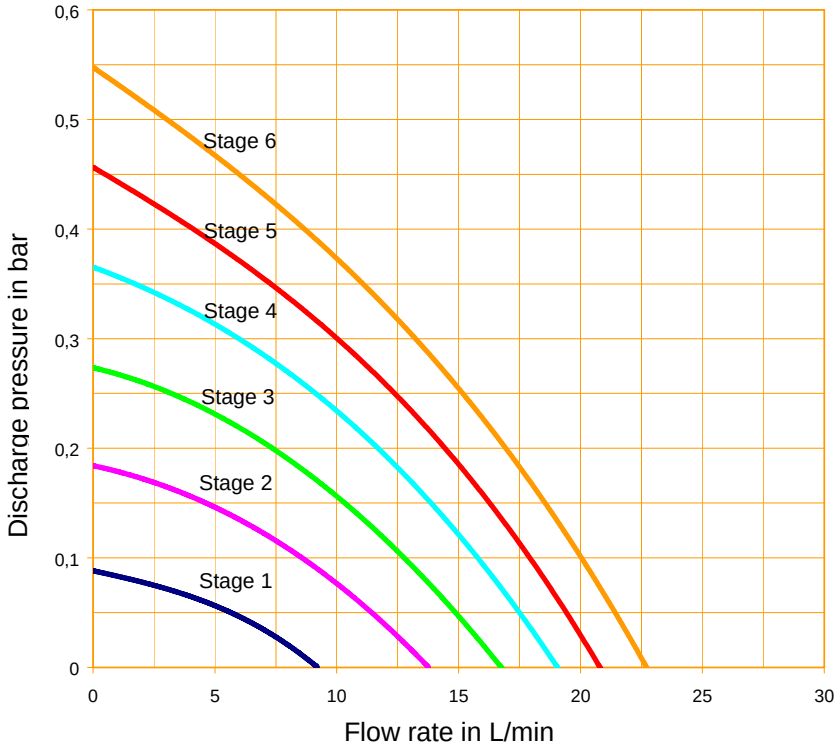
			RE 1225 G	RE 1225 GW	RE 2025 G	RE 2025 GW	RE 1050 G	RE 1050 GW
Operating temperature, ACC *		°C	-25…200		-25…200		-50…200	
Ambient temperature range		°C	5...40					
Temperature accuracy		K	±0,02					
max. storage temperature		°C	43 with water-cooled devices the evaporator must be completely drained					
Cooler			Air	Water	Air	Water	Air	Water
Refrigerant			R134a		R134a		R404A	
Cooling output at 20 °C ambient temperature, 15 °C cooling water temperature, 3 bar cooling water pressure and Pump Level 2	20 °C	W	300		300		700	
	10 °C	W	270		260		660	
	0 °C	W	240		230		600	
	-10 °C	W	180		150		520	
	-20 °C	W	90		60		350	
	-25 °C	W	40		30		---	
	-30 °C	W					190	
	-40 °C	W					100	
	-50 °C	W					20	
Bath volume		liters	9.3...12		14…20		8…10	
Overall dimensions (W x D)		mm	200 x 200		300 x 350		200 x 200	
Bath depth		mm	200		160		160	
Usable depth		mm	180		140		140	
Height to top edge of bath		mm	443					
Overall dimensions (W x D)		mm	250 x 435		350 x 570		280 x 440	
Overall height		mm	624					
Sound level (1 m)		dB(A)	50				52	
Pump connection			Stainless steel fittings 13 mm (thread M16 x 1)					
230 V; 50 Hz								
Heater rating / power consumption		kW	2.6 / 2.9				2.6 / 3.3	
Weight		kg	30.4	31.6	37.4	38.5	35	36
220 V; 60 Hz								
Heater rating / power consumption		kW	2.4 / 2.7				2.4 / 3.1	
Weight		kg	30.4	31.6	37.4	38.5	35	36
115 V; 60 Hz								
Heater rating / power consumption		kW	1.3 / 1.6				1.3 / 2.0	
Weight		kg	30	31.2	37	38.4	34.6	35.6
100 V; 50/60 Hz								
Heater rating / power consumption		kW	1 / 1.3				1 / 1.7	
Weight		kg	30	31.2	37	38.4	34.6	35.6

Mains connection	**Catalogue number**					
	RE 1225 G	RE 1225 GW	RE 2025 G	RE 2025 GW	RE 1050 G	RE 1050 GW
230 V ±10 %; 50 Hz	**LCK 1921**	**LCK 1935**	**LCK 1923**	**LCK 1937**	**LCK 1919**	**LCK 1933**
220 V ±10 %; 60 Hz	**LCK 2921**	**LCK 2935**	**LCK 2923**	**LCK 2937**	**LCK 2919**	**LCK 2933**
115 V ±10 %; 60 Hz	**LCK 4921**	**LCK 4935**	**LCK 4923**	**LCK 4937**	**LCK 4919**	**LCK 4933**
100 V ±10 %; 50/60 Hz	**LCK 6921**	**LCK 6935**	**LCK 6923**	**LCK 6937**	**LCK 6919**	**LCK 6933**

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

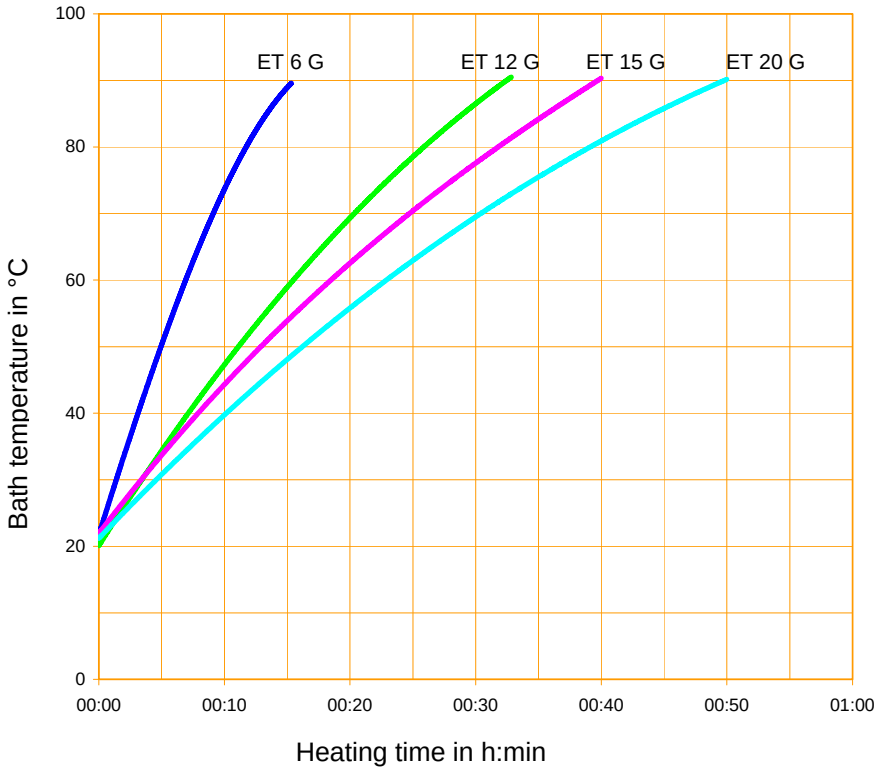
Technical modifications reserved!

Pump characteristic ECO GOLD



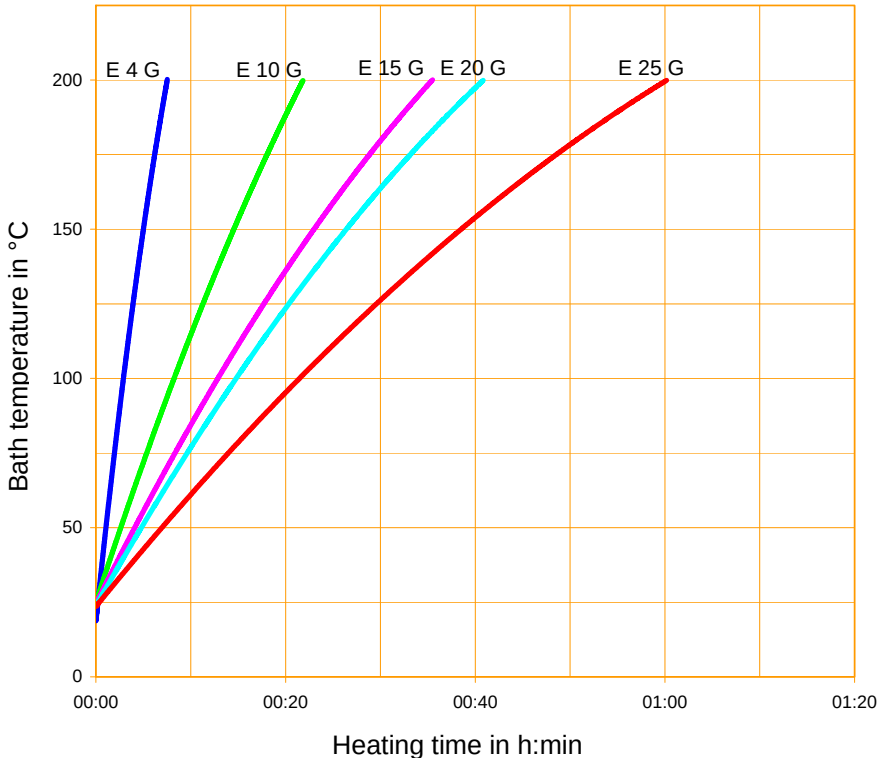
Pump characteristics measured with water

Heating curve for ECO GOLD heating thermostats with transparent bath



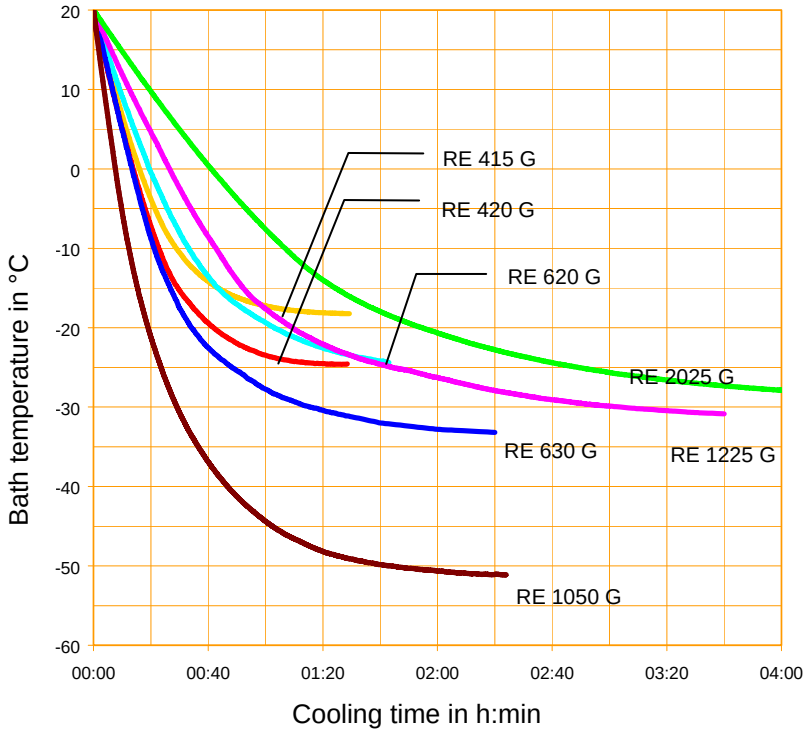
Heat transfer liquid: Water,
bath closed

Heating curve for ECO GOLD heating thermostats with stainless steel bath



Heat transfer liquid:
Therm 240,
bath closed

Cooling curves for ECO GOLD cooling thermostats



Heat transfer liquid:
Ethanol,
bath closed

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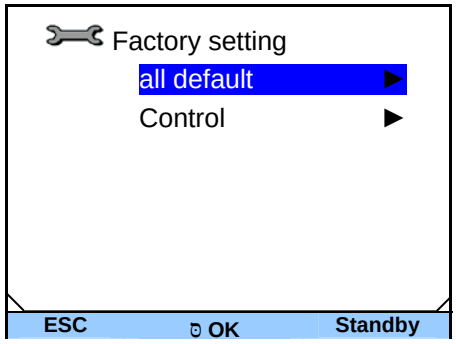
Appendix with settings

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

A Other settings

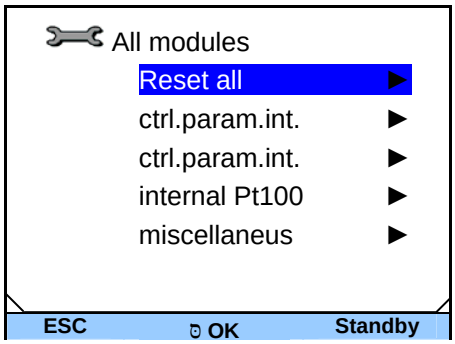
A.1 Resetting to factory settings



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

The adjacent menu window appears.

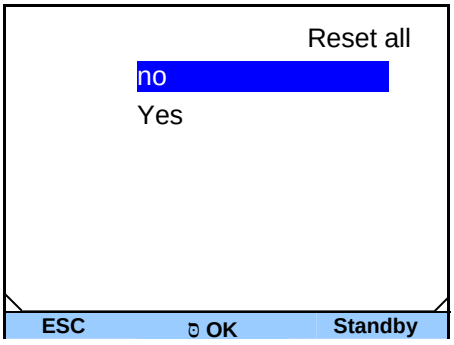
– If all default, you can choose between "no" and "yes".
– With no you return to the "Factory Setting" menu level without changes being made.
  With yes all settings are reset.



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

The parameters can be reset individually.

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



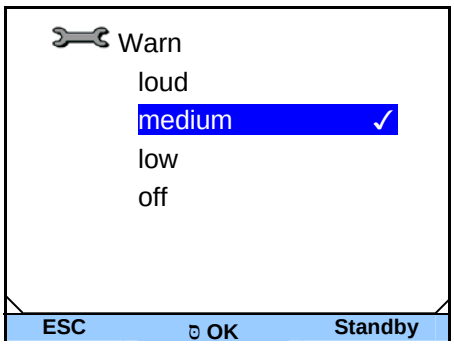
For all menu points under "Control" you can choose between "no" and "yes".

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

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

A.2 Setting the volume of the acoustic signals

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



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

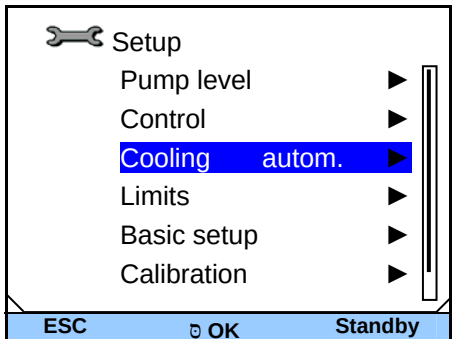
The adjacent menu window appears.

– The volume is selected with ▼ or ▲. The selected level is immediately active without confirmation. In this example the volume is medium.

– *By pressing (ESC), ◀ or the enter key you are returned to the menu level without any change.*

A.3 Setting the chiller

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

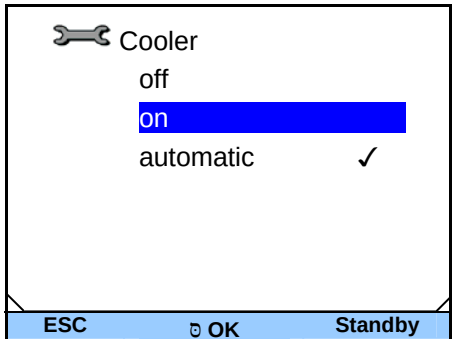


– Access to the main menu level is obtained by pressing the enter key.
– Selection and confirmation of → Setup → Cooling

The adjacent menu window appears.

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

– Select Cooling with the enter key.



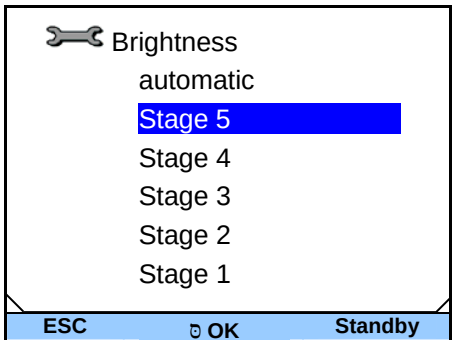
– With ▲ or ▼ and the enter key you select and confirm the operating status "off", "on" or "automatic".
– In the menu the set operating status is displayed by a tick ✓.

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

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

A.4 Setting the display brightness

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



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

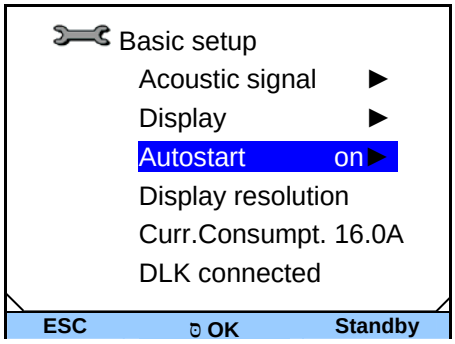
The adjacent menu window appears.

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

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

A.5 Defining the starting mode (Autostart)

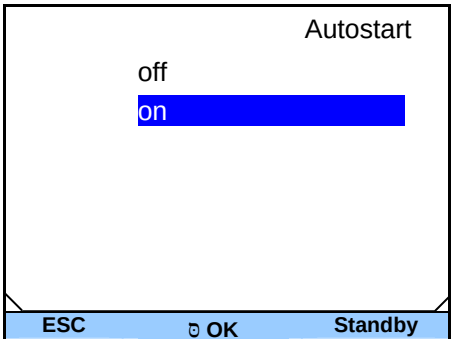
Generally, it is required that the thermostat starts operating again after a power interruption. For reasons of safety, for example, you can insert a manual activation step.



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

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

– Select Autostart with .



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

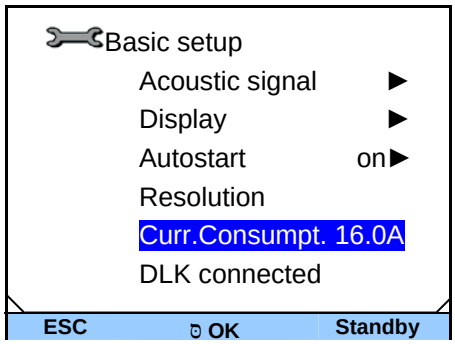
If "off" is selected, standby operation is activated after a mains interruption.

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

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

A.6 Limiting the mains current consumption

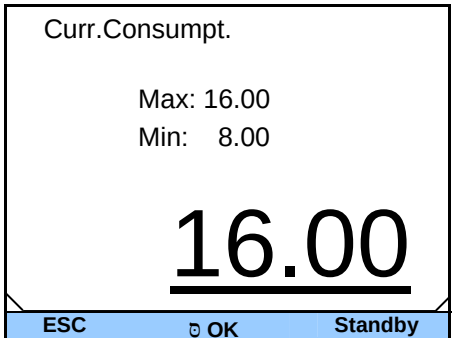
If your mains fusing is below 16 A, the current consumption can be reduced in steps from 16 A to 8 A. The maximum heating power is reduced correspondingly. Here, take into consideration whether other loads are connected to the same fused circuit or whether your ECO thermostat is the only load.



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

The adjacent menu window appears.

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

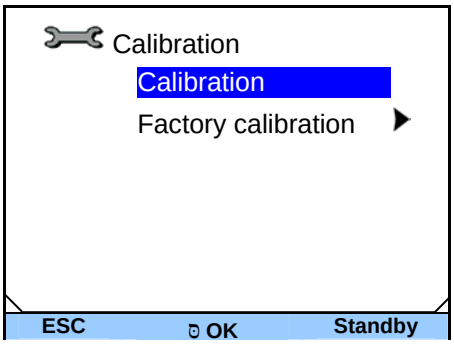


– Change the value with ▲ or ▼.
– Single figures can be selected by pressing ◀ or ▶.
– Confirm the input with the enter key .

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

A.7 Entering the offset of the displayed temperature (calibration)

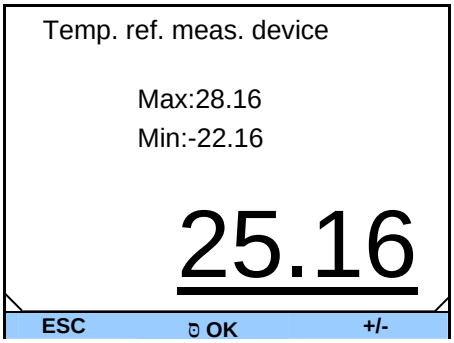
Deviations to the calibrated reference thermometers (e.g. LAUDA DigiCal) can be corrected internally by the "Offset" function.



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

The adjacent menu window appears.

– Select Calibration with ▲ or ▼ and confirm with .



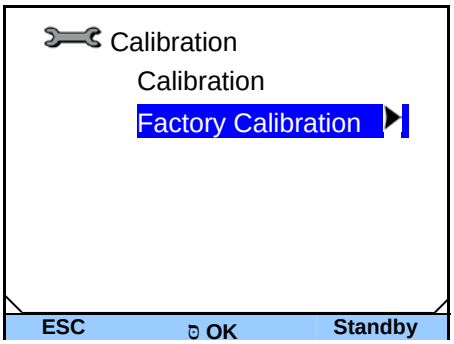
The entry window appears. The value indicated on the reference thermometer must be entered as the value.

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

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

A.8 Restoring the factory setting of the internal temperature sensor

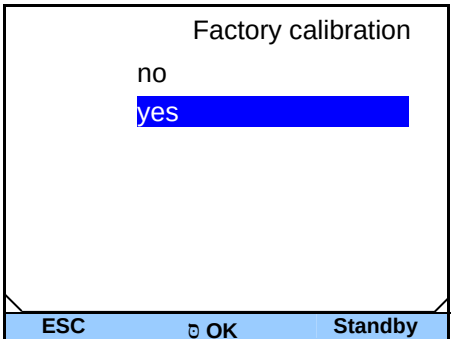
If the offset has been adjusted, the factory setting can be restored again.



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

The adjacent menu window appears.

– Select and confirm Factory calibration with ▲ or ▼ and ●.



The adjacent menu window appears.

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

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

B List of "Alarm and warning codes"

Alarms

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

Warnings

Code	0XX Control system	Meaning	Code	3XX SmartCool	Meaning
1	CAN receive overf	Overflow during CAN reception	**1**	CAN receive overf	Overflow during CAN reception
2	Watchdog Reset	Watchdog reset	**2**	Watchdog Reset	Watchdog reset
3	T_il limit active	til llmit active	**3**	adaption missing	No adaption run
4	T_ih limit active	tih llmit active	**4**	Pressure switch activated	Pressure Switch in cooling circuit triggered
5	corrupt parameter	Inadmissible internal parameter	**5**	Clean condenser	Clean condenser
6	corrupt progr	Inadmissible programmer data	**6**	TO1 out of range (Klixon)	Injection temperature outside value range
7	Invalid Parameter	Inadmissible parameter in memory	**7**	Invalid Parameter	Inadmissible parameter in memory
8	CAN system	Problem during internal data interchange	**8**	CAN system	Problem during internal data interchange
9	Unknown Modul	Unknown module connected	**9**	Unknown Modul	Unknown module connected
10	SW control too old	Software version of control panel too old	**10**	SW control too old	Software version of control panel too old
11	SW safety too old	Software version of protection too old	**11**	SW safety too old	Software version of protection too old
12	SW command too old	Software version of command remote control unit too old	**12**	SW command too old	Software version of command remote control unit too old
13	SW cool too old	Software version of cooling module too old	**13**	SW cool too old	Software version of cooling module too old
14	SW analog too old	Software version of analog too old	**14**	SW analog too old	Software version of analog too old
15	SW serial too old	Software version of serial too old	**15**	SW serial too old	Software version of RS232 too old
16	SW contact old	Software version of contact module too old	**16**	SW contact old	Software version of contact module too old
17	SW Valve 0 old	Software version of solenoid valve too old	**17**	SW Valve 0 old	Software version of solenoid valve 0 too old
18	SW Valve 1 old	Software version of solenoid valve 1 too old	**18**	SW Valve 1 old	Software version of solenoid valve 1 too old
19	SW Valve 2 old	Software version of solenoid valve 2 too old	**19**	SW Valve 2 old	Software version of solenoid valve 2 too old
20	SW Valve 3 old	Software version of solenoid valve 3 too old	**20**	SW Valve 3 old	Software version of solenoid valve 3 too old
21	SW Valve 4 old	Software version of solenoid valve 4 too old	**21**	SW Valve 4 old	Software version of solenoid valve 4 too old
26	SW HTC old	Software version of high temperature cooler too old	**26**	SW HTC old	Software version of high temperature cooler too old
27	SW Ext Pt100 old	Software version of external Pt100 too old	**27**	SW Ext Pt100 old	Software version of external Pt100 too old
33	RTC wrong data	Internal clock defective	**33**	valve sm0 break	Cable of injection valve 0 defective
41	wrong net voltage	Incorrect mains voltage setting	**34**	valve sm1 break	Cable of injection valve 1 defective
42	no eco type	Device type not configured	**35**	valve sm2 break	Cable of injection valve 2 defective
43	no eco voltage	Mains voltage not configured	**36**	valve sm3 break	Cable of injection valve 3 defective
44	chiller missing	Chiller not running	**37**	output sm0	Triggering of injection valve 0 defective
45	Diff.voltages	Different mains voltage configured (head and cooling underpart)	**38**	output sm1	Triggering of injection valve 1 defective
			39	output sm2	Triggering of injection valve 2 defective
			40	output sm3	Triggering of injection valve 3 defective
			41	sm0 min too small	Start value of injection valve too small
			42	no eco type	Device type not configured
			43	no eco voltage	Mains voltage not configured
			44	chiller missing	Chiller not running

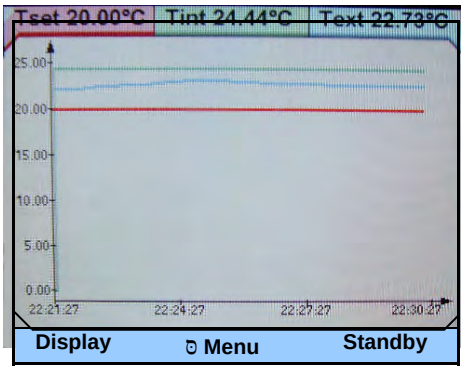
Code	1XX Safety system	Meaning	Code	2XX Command	Meaning
1	CAN receive overf	Overflow during CAN reception	1	CAN receive overf	Overflow during CAN reception
2	Watchdog Reset	Watchdog reset	2	Watchdog Reset	Watchdog reset
5	Heat 1 failed	Heater 1 defective	3	Clock Error	Battery fault
6	Heat 2 failed	Heater 2 defective	9	Unknown Modul	Unknown module connected
7	Invalid Parameter	Inadmissible parameter in memory	10	SW control too old	Software version of control panel too old
8	CAN system	Problem during internal data interchange	11	SW safety too old	Software version of protection too old
9	Unknown Modul	Unknown module connected	12	SW command too old	Software version of command remote control unit too old
10	SW control too old	Software version of control panel too old	13	SW cool too old	Software version of cooling module too old
11	SW safety too old	Software version of protection too old	14	SW analog too old	Software version of analog too old
12	SW command too old	Software version of command remote control unit too old	15	SW serial too old	Software version of RS232 too old
13	SW cool too old	Software version of cooling module too old	16	SW contact old	Software version of contact module too old
14	SW analog too old	Software version of analog too old	17	SW Valve 0 old	Software version of solenoid valve 0 too old
15	SW serial too old	Software version of RS232 too old	18	SW Valve 1 old	Software version of solenoid valve 1 too old
16	SW contact old	Software version of contact module too old	19	SW Valve 2 old	Software version of solenoid valve 2 too old
17	SW Valve 0 old	Software version of solenoid valve 0 too old	20	SW Valve 3 old	Software version of solenoid valve 3 too old
18	SW Valve 1 old	Software version of solenoid valve 1 too old	21	SW Valve 4 old	Software version of solenoid valve 4 too old
19	SW Valve 2 old	Software version of solenoid valve 2 too old	26	SW HTC old	Software version of high temperature cooler too old
20	SW Valve 3 old	Software version of solenoid valve 3 too old			
21	SW Valve 4 old	Software version of solenoid valve 4 too old			
26	SW HTC old	Software version of high temperature cooler too old			
27	SW Ext Pt100 old	Software version of external Pt100 too old			

Code	4XX Analog module	Meaning	Code	5XX Serial (RS232/485)	Meaning
1	CAN receive overf	Overflow during CAN reception	1	CAN receive overf	Overflow during CAN reception
2	Watchdog Reset	Watchdog reset	2	Watchdog Reset	Watchdog reset
9	Unknown Modul	Unknown module connected	9	Unknown Modul	Unknown module connected
10	SW control too old	Software version of control panel too old	10	SW Contr. too old	Software version of control panel too old
11	SW safety too old	Software version of protection too old	11	SW safety too old	Software version of protection too old
12	SW command too old	Software version of command remote control unit too old	12	SW command too old	Software version of command remote control unit too old
13	SW cool too old	Software version of cooling module too old	13	SW cool too old	Software version of cooling module too old
14	SW analog too old	Software version of analog too old	14	SW analog too old	Software version of analog too old
15	SW serial too old	Software version of RS232 too old	15	SW serial too old	Software version of RS232 too old
16	SW contact old	Software version of contact module too old	16	SW contact old	Software version of contact module too old
17	SW Valve 0 old	Software version of solenoid valve 0 too old	17	SW Valve 0 old	Software version of solenoid valve 0 too old
18	SW Valve 1 old	Software version of solenoid valve 1 too old	18	SW Valve 1 old	Software version of solenoid valve 1 too old
19	SW Valve 2 old	Software version of solenoid valve 2 too old	19	SW Valve 2 old	Software version of solenoid valve 2 too old
20	SW Valve 3 old	Software version of solenoid valve 3 too old	20	SW Valve 3 old	Software version of solenoid valve 3 too old
21	SW Valve 4 old	Software version of solenoid valve 4 too old	21	SW Valve 4 old	Software version of solenoid valve 4 too old
26	SW HTC old	Software version of high temperature cooler too old	26	SW HTC old	Software version of high temperature cooler too old
27	SW Ext Pt100 old	Software version of external Pt100 too old	27	SW Ext Pt100 old	Software version of external Pt100 too old

Code	6XX Switch contacts	Meaning	Code	7, 8, 9, 10, 11, 16XX Solenoid valve	Meaning
1	CAN receive overf	Overflow during CAN reception	**1**	CAN receive overf	Overflow during CAN reception
2	Watchdog Reset	Watchdog reset	**2**	Watchdog Reset	Watchdog reset
9	Unknown Modul	Unknown module connected	**3**	No cooling liquid	No cooling liquid present (HTC)
10	SW Contr. too old	Software version of control panel too old	**6**	no unfill liquid too hot	No draining, because bath temperature is too hot (HTC)
11	SW safety too old	Software version of protection too old	**9**	Unknown Modul	Unknown module connected
12	SW command too old	Software version of command remote control unit too old	**10**	SW Contr. too old	Software version of control panel too old
13	SW cool too old	Software version of cooling module too old	**11**	SW safety too old	Software version of protection too old
14	SW analog too old	Software version of analog too old	**12**	SW command too old	Software version of command remote control unit too old
15	SW serial too old	Software version of RS232 too old	**13**	SW cool too old	Software version of cooling module too old
16	SW contact old	Software version of contact module too old	**14**	SW analog too old	Software version of analog too old
17	SW Valve 0 old	Software version of solenoid valve 0 too old	**15**	SW serial too old	Software version of RS232 too old
18	SW Valve 1 old	Software version of solenoid valve 1 too old	**16**	SW contact old	Software version of contact module too old
19	SW Valve 2 old	Software version of solenoid valve 2 too old	**17**	SW Valve 0 old	Software version of solenoid valve 0 too old
20	SW Valve 3 old	Software version of solenoid valve 3 too old	**18**	SW Valve 1 old	Software version of solenoid valve 1 too old
21	SW Valve 4 old	Software version of solenoid valve 4 too old	**19**	SW Valve 2 old	Software version of solenoid valve 2 too old
26	SW HTC old	Software version of high temperature cooler too old	**20**	SW Valve 3 old	Software version of solenoid valve 3 too old
27	SW Ext Pt100 old	Software version of external Pt100 too old	**21**	SW Valve 4 old	Software version of solenoid valve 4 too old
			26	SW HTC old	Software version of high temperature cooler too old
			27	SW Ext Pt100 old	Software version of external Pt100 too old

Code	17XX Pt100/LiBus Module	Meaning
1	CAN receive overf	Overflow during CAN reception
2	Watchdog Reset	Watchdog reset
3	Ext_Pt_short	Line short on external t100
7	Invalid Parameter	Inadmissible parameter in memory
8	CAN system	Problem during internal data interchange
9	Unknown Modul	Unknown module connected
10	SW Contr. too old	Software version of control panel too old
11	SW safety too old	Software version of protection too old
12	SW command too old	Software version of command remote control unit too old
13	SW cool too old	Software version of cooling module too old
14	SW analog too old	Software version of analog too old
15	SW serial too old	Software version of RS232 too old
16	SW contact old	Software version of contact module too old
17	SW Valve 0 old	Software version of solenoid valve 0 too old
18	SW Valve 1 old	Software version of solenoid valve 1 too old
19	SW Valve 2 old	Software version of solenoid valve 2 too old
20	SW Valve 3 old	Software version of solenoid valve 3 too old
21	SW Valve 4 old	Software version of solenoid valve 4 too old
26	SW HTC old	Software version of high temperature cooler too old
27	SW Ext Pt100 old	Software version of external Pt100 too old

C Graphical display of temperature measurements



– From the main menu window you access the graphics window by pressing (display).

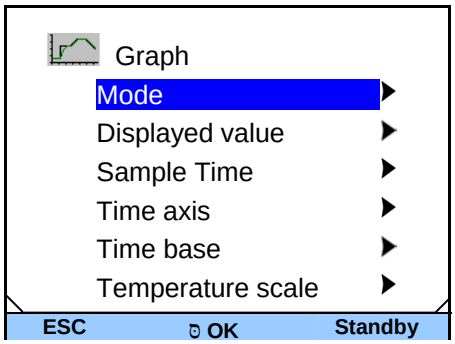
The temperature traces are shown in different colors.

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

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

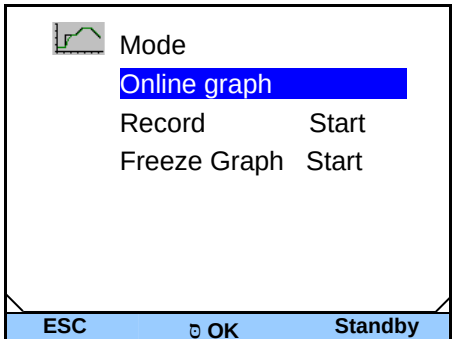
– Access to the menu level is obtained by pressing .
– Select and confirm Graph in main menu with or and .

The adjacent menu window appears.



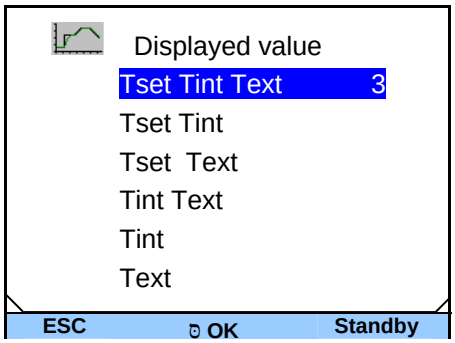
– *With or you quit the respective window without changes.*
– *All menu points are selected with or and confirmed with .*

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



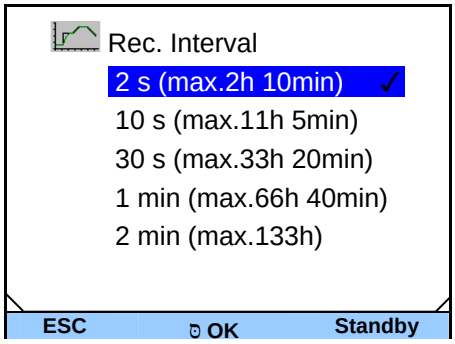
In the menu "Mode" there are the following settings:

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



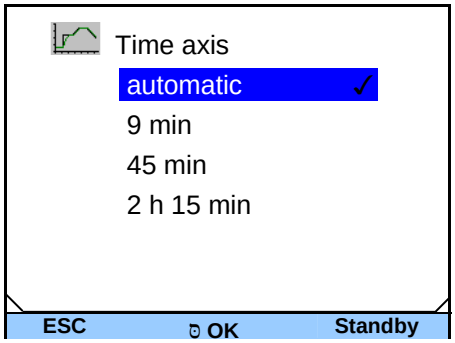
With display measurements you can define which temperature values are to be graphically displayed.

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



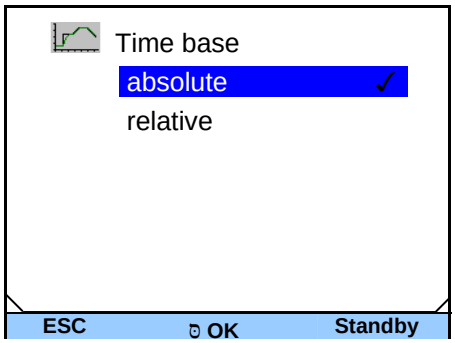
With Rec. interval you define the time interval between recorded temperature measurements (the values in brackets state the maximum recording time).

The menu offers five options.



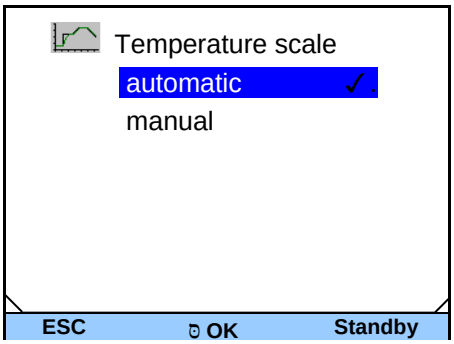
With Time axis you can define the temporal range over which the measurements are to be displayed.

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



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

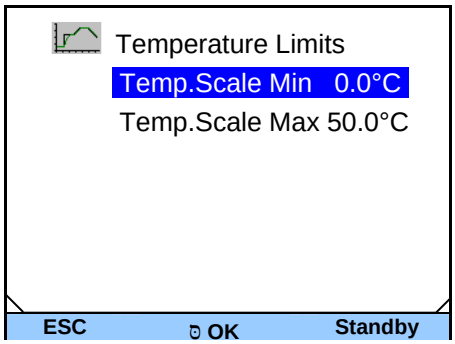
–	absolute	Reference current time
–	relative	Start time "00:00:00"



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

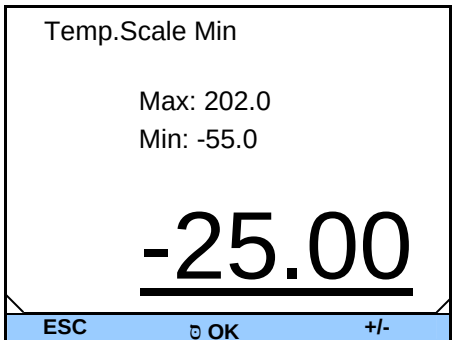
–	automatic	Program optimized scaling
–	manual	Here you can define the limits yourself.

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



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

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



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

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

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

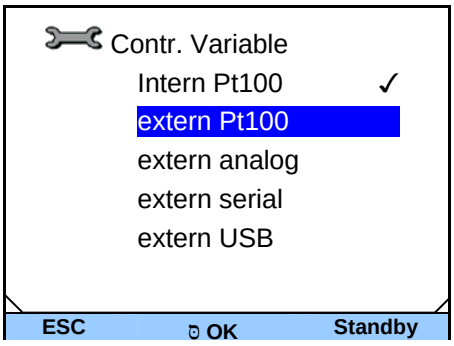
– *By pressing (ESC) you are returned to the menu level without any change.*

D External control

The devices can also be optionally controlled via an external Pt100 temperature sensor, which can be connected at the back of the control head. It is necessary to install an external Pt100/LiBus module (⇨ 6.7) for external control (⇨ F.2). The module is available as an accessory (⇨ 9).

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

D.1 Activating external control (external Pt100)



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

The adjacent menu window appears.

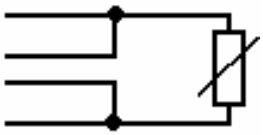
– The menu item extern Pt100 only appears when the module for an external connection is available. A temperature sensor has to be connected to the module
– Select and confirm extern Pt100 with ▲ or ▼ and .

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

Note: To show the selected control variable on the display, carry out chapter (⇨ D.2).

Connection of the external Pt100 to Lemo socket 10S

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



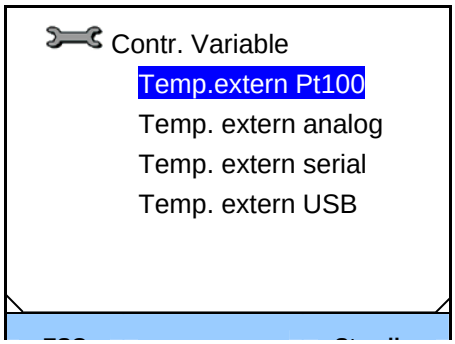
Pt100
DIN EN 60751

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

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

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

Note: This setup must be done so that the control variable (which was selected in chapter D.1) is displayed in the basic window.



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

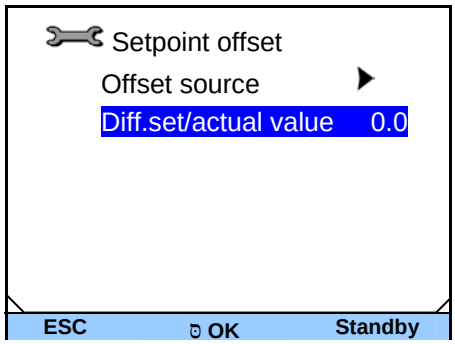
The adjacent menu window appears.
The different menu items only appear when the module is available (e.g. Temp. ext. Pt100).

– Select and confirm Temp. ext. Pt100 with ▲ or ▼ and ●.

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

D.3 Setpoint offset operating mode (Diff.set/actual)

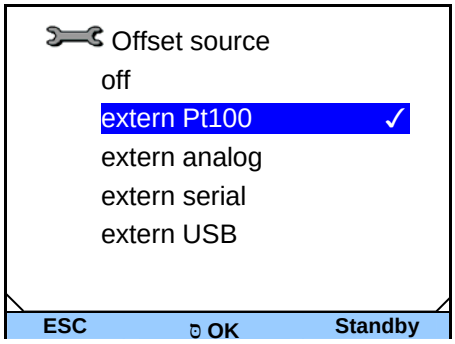
It is possible to apply an offset value to the temperature, which is provided by an external temperature sensor and to process it as the set value.
The bath temperature can therefore be operated, for example, -15 °C below the temperature of a reactor measured by the external temperature sensor.



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

The adjacent menu window appears.

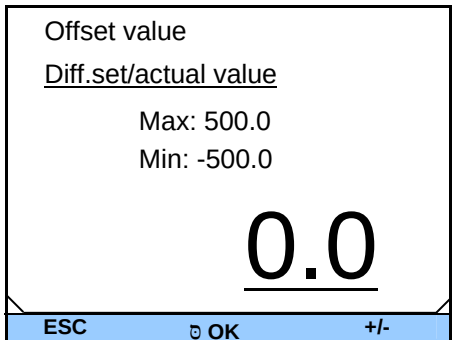
As well as Diff.set/actual value the currently set offset value is displayed.



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

– Select and confirm setpoint source with ▲ or ▼ and ●.

The setpoint offset is deactivated with "off".



– Select and confirm Diff.set/actual value with ▲ or ▼ and ●.

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

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

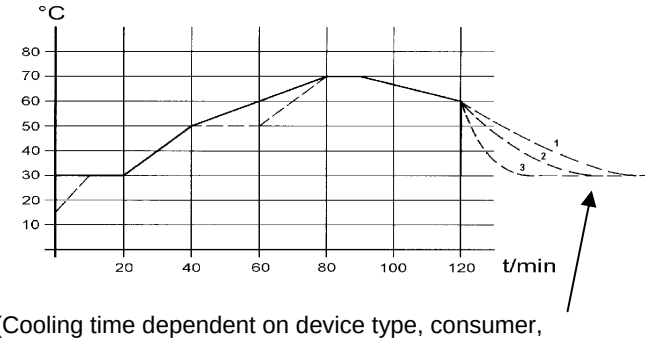
– *By pressing (ESC) you are returned to the menu level without any change.*

E Programmer

The programming function enables you to save five temperature/time programs. The programs consist of a number of temperature/time segments and details about their repetition. The total number of freely programmable segments is 150. Temperature step changes (time is zero) or also temperature retention phases for the same start and end temperatures in the segment are possible.
On starting the current set value is taken as the starting value of the first segment.

Changes to the pump level are entered in the relevant line. If the pump level is to remain unchanged, "0" is entered (display shows "---").

E.1 Programming example



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

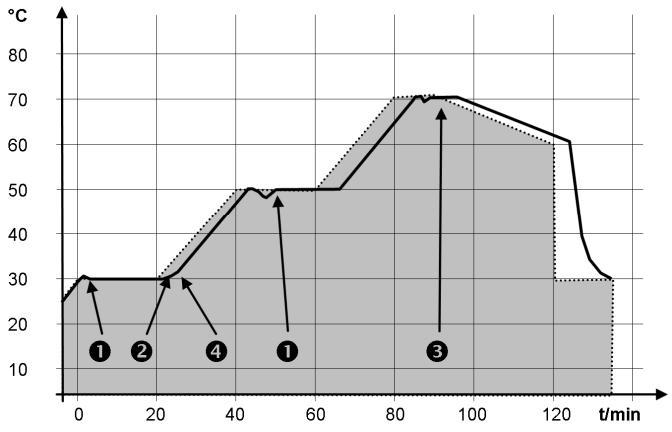
(Cooling time dependent on device type, consumer, etc.)

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

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

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

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



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

Note:

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

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

E.2 Creating and editing a program

In the following functions are explained below:

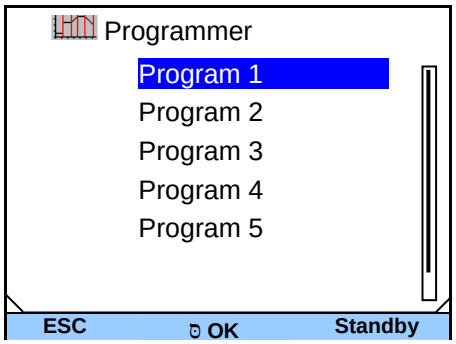
- Creating and editing a program.
- Insert or append a new segment.
- Delete a segment.

Note:

– New segments and be inserted and existing ones changed, also the currently active segment, even when a program is currently being executed. Furthermore, except for the currently active segment, all segments can be deleted at any time.
– Changes to the currently running segment are possible. The segment is continued as though the change has been valid since the start of the segment.
– If the new segment time is shorter than the already expired segment time, then the program skips to the next segment.
– If a segment time is required > 999h: 59min, then this time must be spread over several consecutive segments.

Creating and editing a program:

Compare the programming example (⇨ E.1)



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

No.	Tend	hh	mm	Tolerance
Start	30.00	--	--	0.1
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 | OK new | delete

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

You can now select the next segment to be changed using the control keys.

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 | OK | - - -

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

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

The programmer edit window contains the following parameters:

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

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

Inserting a new segment

No.	Tend	hh	mm	Tolerance
Start	30.00	--	--	0.1
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 | new | delete

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

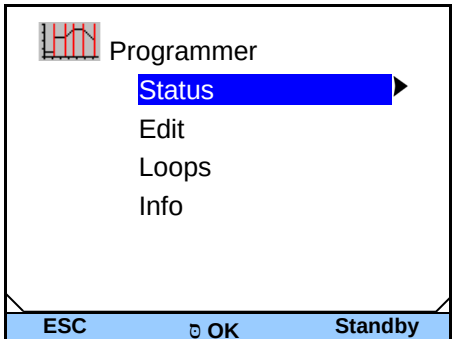
Deleting a segment

No.	Tend	hh	mm	Tolerance
Start	30.00	--	--	0.1
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 | new | delete

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

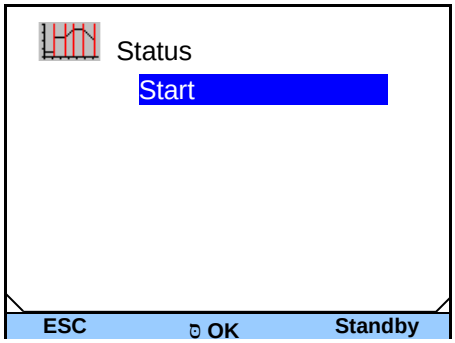
E.3 Starting the program



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

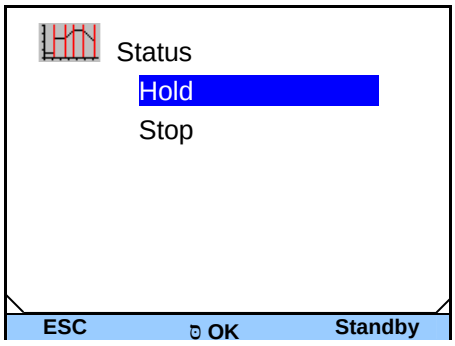
Start	Start program
Hold	Hold program
Continue	Continue program
Stop	Terminate program

by pressing the enter key.
– You can also pause the programmer with (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.

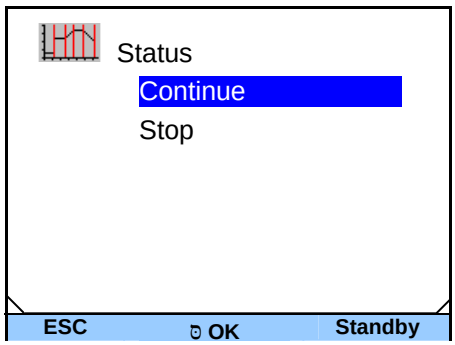
E.4 Interrupting, continuing or terminating the program



– After the program start the menu points Hold and stop are displayed.
– The options can be selected with ▲ or ▼.

Hold	Interrupt program
Stop	Terminate program

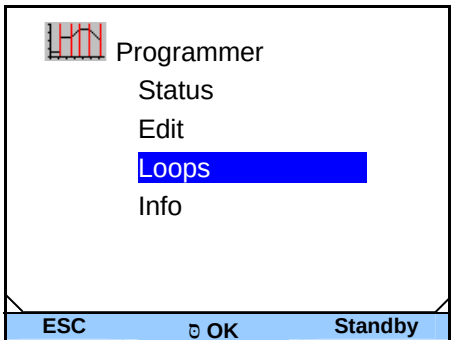
– Confirm your choice with the enter key.



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

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

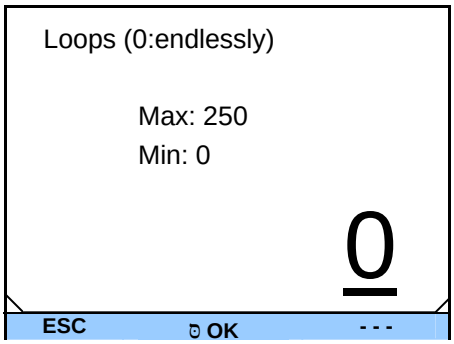
E.5 Defining the number of program loops (Loops)



Programs can be processed many times.

– The submenu Loops appears by selecting and confirming → Programmer → Program *n*.

– Select and confirm Loops with ▲ or ▼ and ●.



– Enter the desired number with ▲ or ▼.
– Confirm your choice with the enter key ●.

Note: To enter two or three-figure numbers move the cursor to the appropriate point and change the figures with ▲ or ▼.
If "0" is entered, the program is continuously repeated.

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

F Control parameters

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

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

F.1 Internal control variable (internal temperature sensor)

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

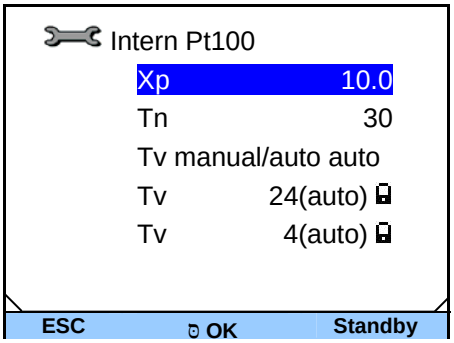
The control corresponds to the set-point temperature with the current bath temperature and calculates the set value for heating or cooling.

These control parameters can be set:

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

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

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



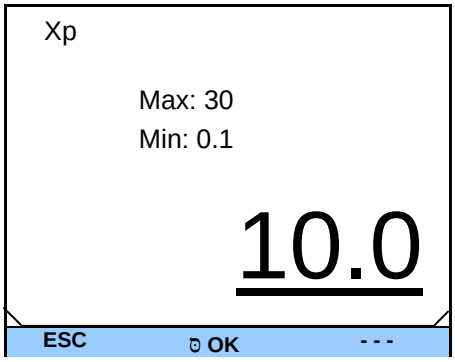
– Access to the main menu level is obtained by pressing the enter key.
– Selection and confirmation of → Setup → Control → Contr.parameter → intern Pt100.

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

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

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

– Select and confirm parameters with ▲ or ▼ and.



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

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

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

F.2 External control variable

The setting options illustrated in this section are only possible with a connected external temperature sensor or with an existing module (as activated as control variable in Section D.1) for reading in the actual temperature.

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

Correcting quantity limit

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

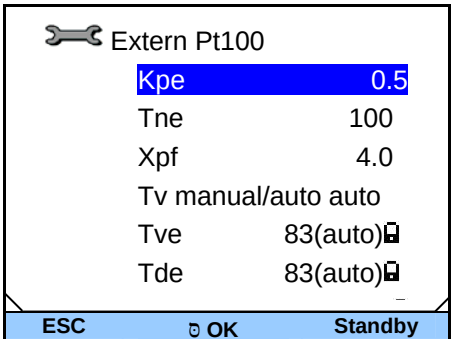
These parameters can be set on the master controller (PIDT or external controller):

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

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

Description	Short form	Unit
Proportional range	Xpf	K

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



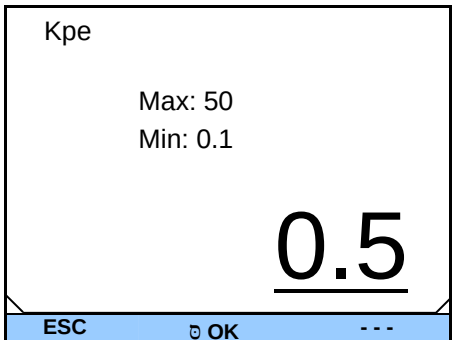
– Access to the main menu level is obtained by pressing the enter key.
– Selection and confirmation of → Setup → Control → Contr.parameter → extern Pt100.

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

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

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

– Select and confirm parameters with ▲ or ▼ and.

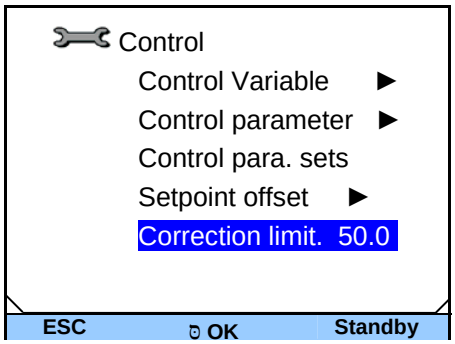


The respective edit window appears with Min and Max figures for the parameter values Kpe, Tne, Tve, Tde and Xpf.

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

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

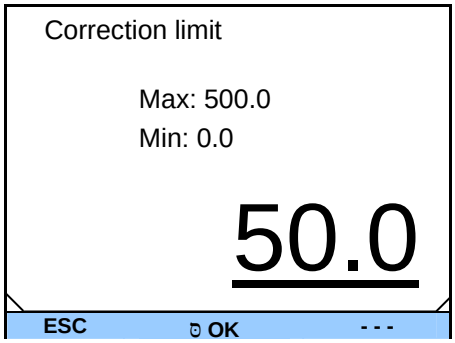
F.2.1 Setting the correcting quantity limit



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

The adjacent menu window appears.

– Select and confirm Correction limit. with ▲ or ▼ and.



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

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

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

F.2.2 Procedure for setting the control parameters for external control

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

2.1. Parameter to auto;
Xpf in dependence of:

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

2.2. Set Xpf:

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

3. Setting the master controller (PID controller):

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

3.1. Setting Kpe:

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

3.2. Setting Tne/ Tve/ Tde:

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

4. Correcting quantity limit (⇨ F.2.1) and temperature limits (Til/Tih) (⇨ 7.4.5).

- Set according to the physical boundary conditions.

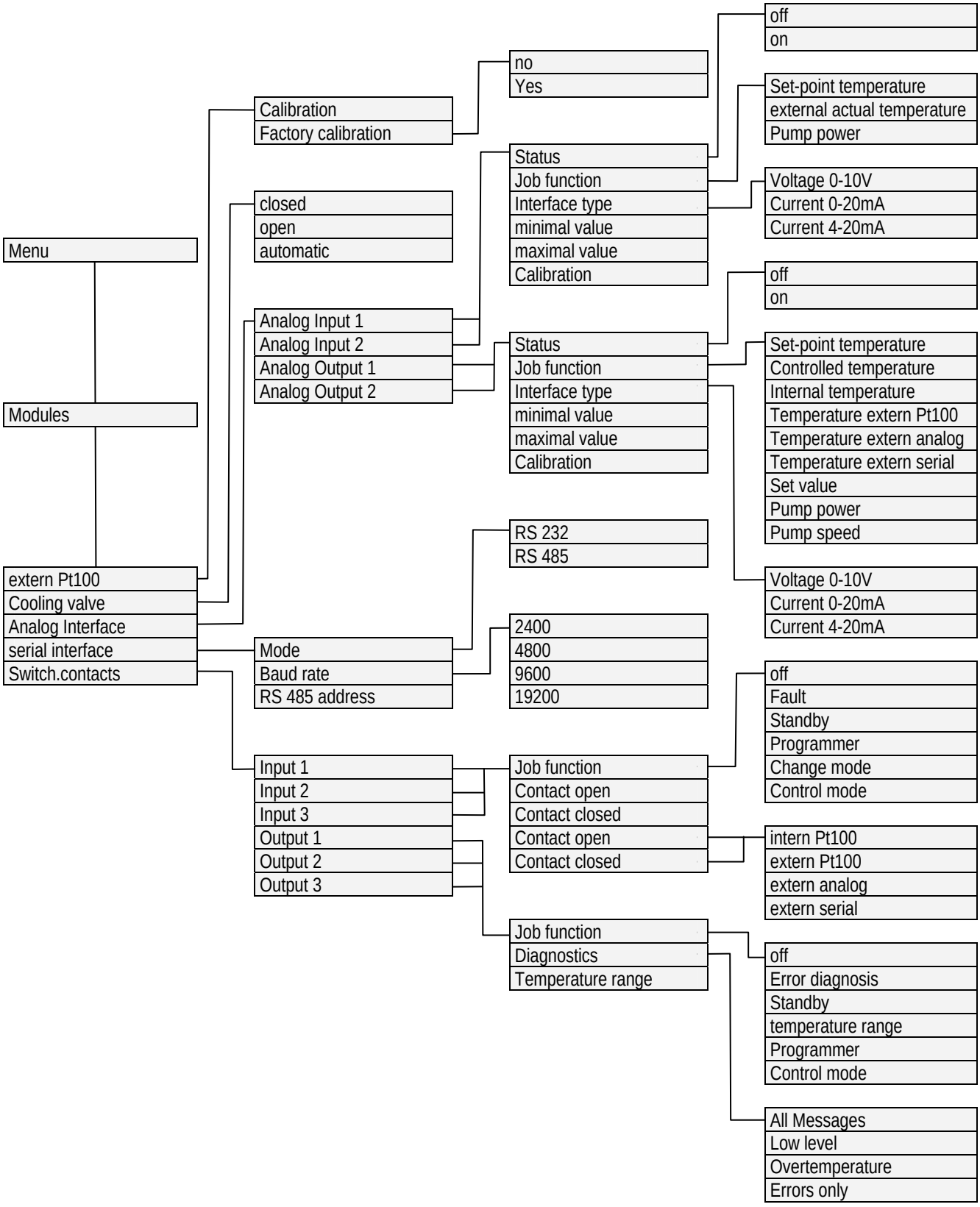
Example:

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

G Interface modules

G.1 Menu structure of the modules

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



G.2 Analog module

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

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

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

The following values can be defined via the inputs:

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

The following values can be output via the outputs:

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

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

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

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

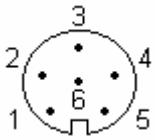
- Inputs, current – Input resistance < 100 Ohm
- Inputs, voltage – Input resistance > 50 kOhm
- Outputs, current – Burden < 400 Ohm
- Outputs, voltage – Load > 10 kOhm

Connection of analogue inputs and outputs

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

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

Socket 74S



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

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

G.3 RS 232/485 interface module

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

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

G.3.1 Connecting lead and interface test RS 232

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

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

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

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

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

Alternatives for Windows Vista and Windows 7:

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

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

G.3.2 RS 232 protocol

Note the following aspects:

- The interface operates with one stop bit, no parity bit and with eight data bits.
- Transfer speed alternatively: 2400, 4800, 9600 (factor setting) or 19200 baud.
- The RS 232 interface can be operated with or without hardware-handshake (RTS/CTS).
- The command from the computer must be terminated with a CR, CRLF or LFCR.
- The response from the thermostat is always terminated with a CRLF.

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

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

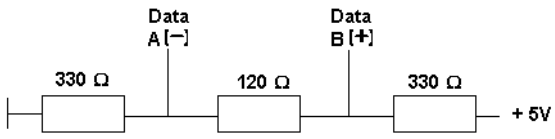
Computer	Thermostat
„OUT_SP_00_30.5“CRLF	⇨
⇦	„OK“CRLF

G.3.3 RS 485 connecting lead

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

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

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



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

G.3.4 RS 485 protocol

Note the following aspects:

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

CR = Carriage Return (Hex: 0D)

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

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

G.4 USB interface

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

G.4.1 Description

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

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

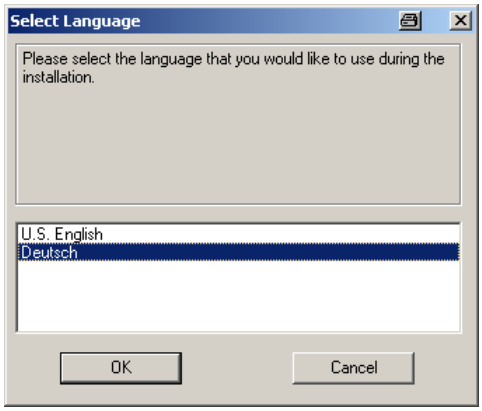
USB interface

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

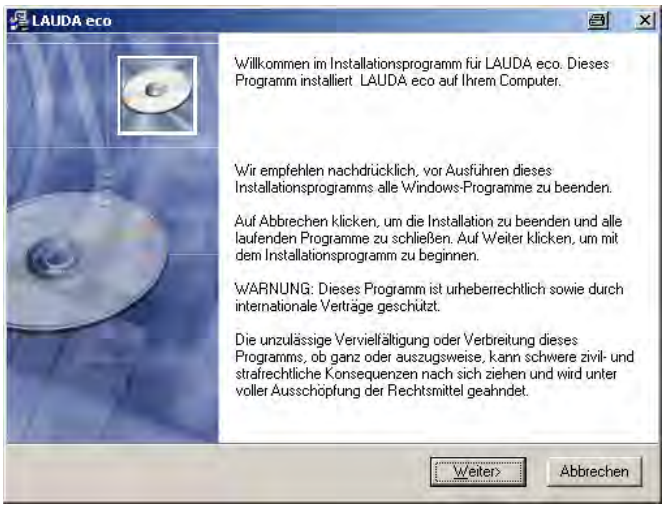
G.4.2 Installation of the USB driver

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

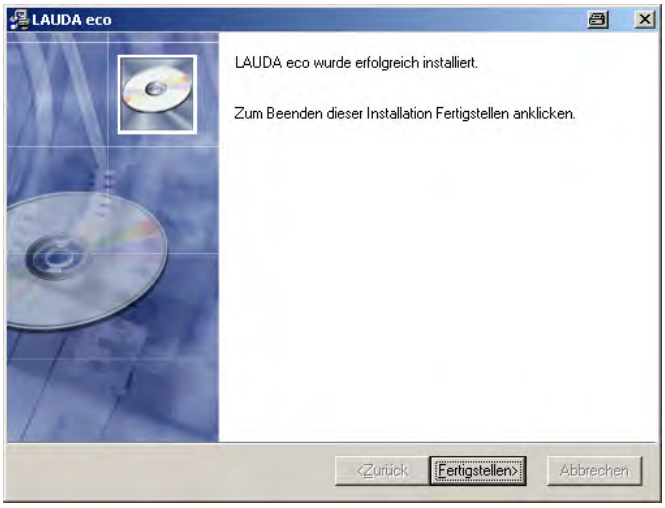
Execute the file "LAUDA_ECO_USB_Driver.exe". The window below opens.



1. Select the language and confirm with OK .



2. Key Continue



3. Key Finish
Driver installation is installed

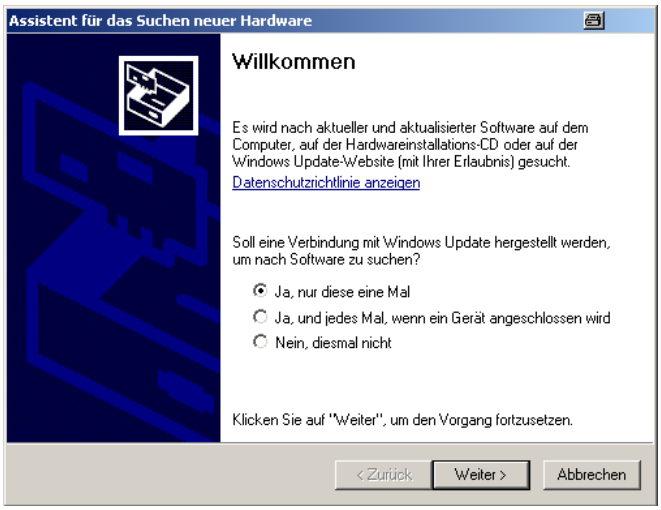
G.4.3 Connecting the thermostat to the PC

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

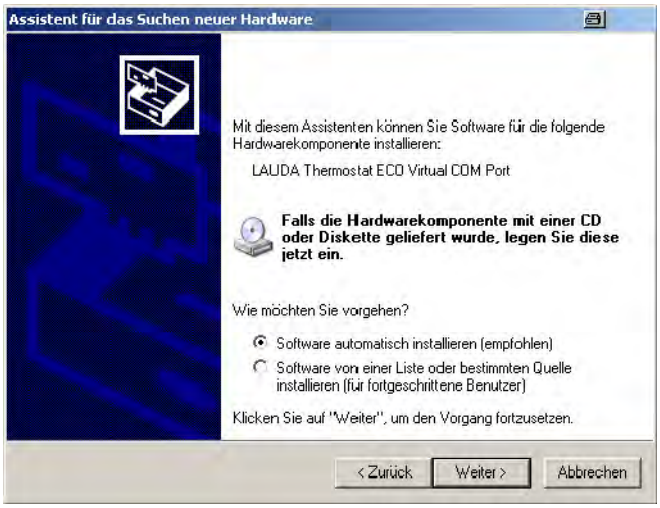
1. Plug the USB cable into the control head.

2. Switch on the thermostat at the mains switch.

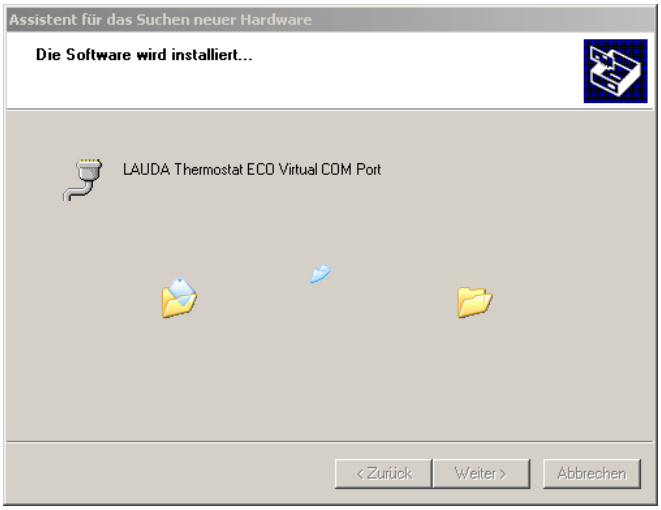
For the first time, after installation on the PC, a wizard opens to search for new hardware. Please follow the wizard instructions.



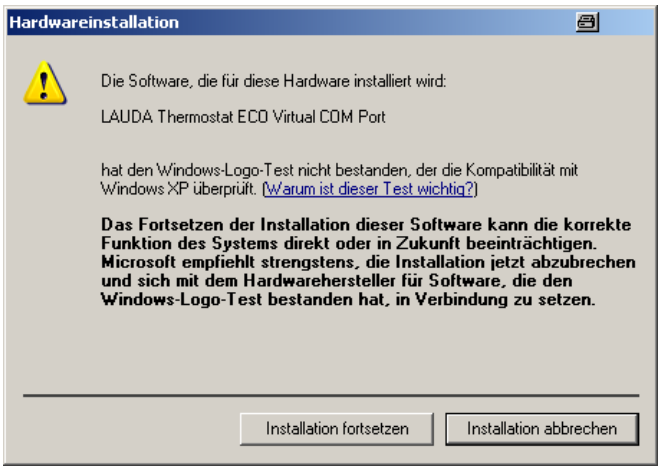
3. Key Continue



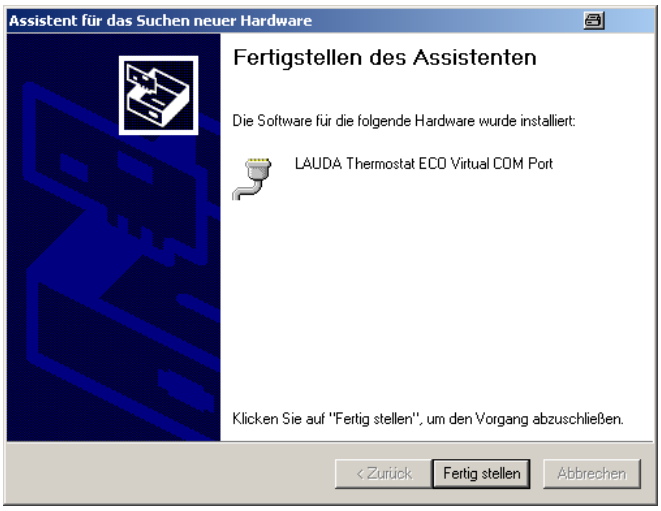
4. Key Continue



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



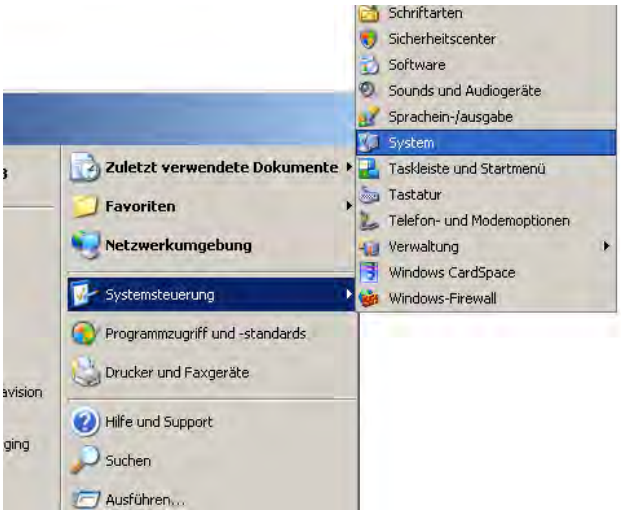
5. Click on Continue installation.

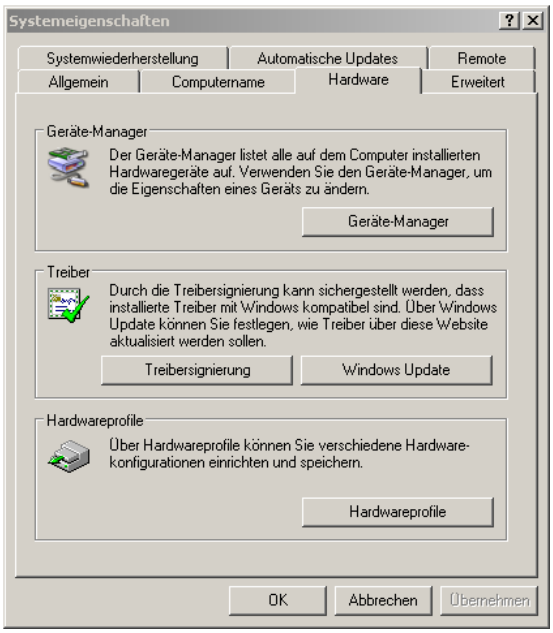


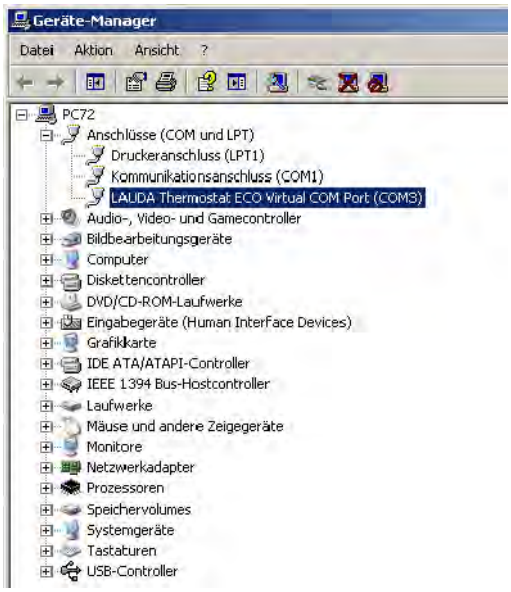
6. Click on the key Finish .

G.4.4 Where is the ECO Virtual COM Port?

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







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

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

G.5.1 Interface write commands (data issued to the thermostat)

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

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

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

RMP_SELECT_X	Selection of program (1...5) to which further commands are to refer. When the device is switched on Program 5 is selected.
RMP_START	Start the programmer.
RMP_PAUSE	Stop the programmer.
RMP_CONT	Start the programmer again after a hold.
RMP_STOP	Terminate the program.
RMP_RESET	Delete program (all segments)
RMP_OUT_00_XXX.XX_XXXXX_XXX.XX_X	Sets programmer segment (temperature, time, tolerance, and pump level). A segment is appended and assigned appropriate values.
RMP_OUT_02_XXX	Number of program loops: 0 = endless / 1...250.

Note:

- For "_" " (space character) is also admissible.
- Response from thermostat "OK" or with an error " ERR_X" (RS 485 interface e.g. "A015_OK" or with an error "A015_ERR_X".)

Admissible data formats:

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

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

Command	Meaning
IN_PV_00	Interrogation of bath temperature (outflow temperature)
IN_PV_01	Interrogation of controlled temperature(int./ext., Pt/ext., Analog/ ext. serial).
IN_PV_03	Interrogation of external temperature TE (Pt100).
IN_PV_04	Interrogation of external temperature TE (Analog Input).
IN_PV_10	Interrogation of bath temperature in 0.001 °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 (response: XXXX; 9001 = OFF).
IN_PAR_06	Interrogation of the control parameter TvE (response: XXXX; 5 = OFF).
IN_PAR_07	Interrogation of the control parameter TdE (response: XXXX.X).
IN_PAR_09	Interrogation of the max. correcting quantity limit.
IN_PAR_10	Interrogation of the control parameter XpF.
IN_PAR_14	Interrogation of setpoint offset.
IN_PAR_15	Interrogation of the control parameter PropE.

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

IN_MODE_00	Keypad: 0 = released / 1 = locked.
IN_MODE_01	Control: 0 = int./ 1 = ext. Pt100 / 2 = ext. Analog / 3 = ext. Serial.

Command	Meaning
IN_MODE_02	Standby operation: 0 = Device ON / 1 = Device OFF.
IN_MODE_03	Keypad remote control unit Command: 0 = released / 1 = locked.
IN_MODE_04	Setpoint offset source: 0 = normal/ 1 = ext. Pt/ 2 = ext. Analog/ 3 = ext. Serial.

TYPE	Interrogation of the device type (response = "ECO")
VERSION_R	Interrogation of the software version number of the control system.
VERSION_S	Interrogation of the software version number of the protection system.
VERSION_B	Interrogation of the software version number of the Command remote control.
VERSION_T	Interrogation of the software version number of the cooling system.
VERSION_A	Interrogation of the software version number of the analogue module.
VERSION_V	Interrogation of the software version number of the RS 232/485 module.
VERSION_D	Interrogation of the software version number of the digital module.
VERSION_M_0	Interrogation of the software version number of the solenoid valve (cooling water).
VERSION_M_3	Interrogation of the software version number of the solenoid valve (shut-off valve 1).
VERSION_M_4	Interrogation of the software version number of the solenoid valve (shut-off valve 2).
VERSION_M_5	Interrogation of the software version number of the high temperature cooler.
VERSION_E	Interrogation of the software version number of the external Pt100 module.
STATUS	Interrogation of the device status 0 = OK, -1 = Error.
STAT	Interrogation of the error diagnosis response: 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 = 0 7th character = External control value missing

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

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 , bath 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 signaled 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 hrs.).
LOG_IN_03	Interrogation of acquisition interval from data logger (Response in seconds).

Note:

- For ”_“ ” ” (space character) is also admissible.
- Unless otherwise stated, with the command the response is always in the fixed-point format "XXX.XX" or for negative values "-XXX.XX" or "ERR_X" (RS 485 interface, e.g. "A015_XXX.XX" or "A015_ERR_X"

G.5.3 Interface error messages

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

G.5.4 Driver software for LABVIEW®

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

G.6 Contact module

G.6.1 Contact module LRZ 914 with 1 input and 1 output

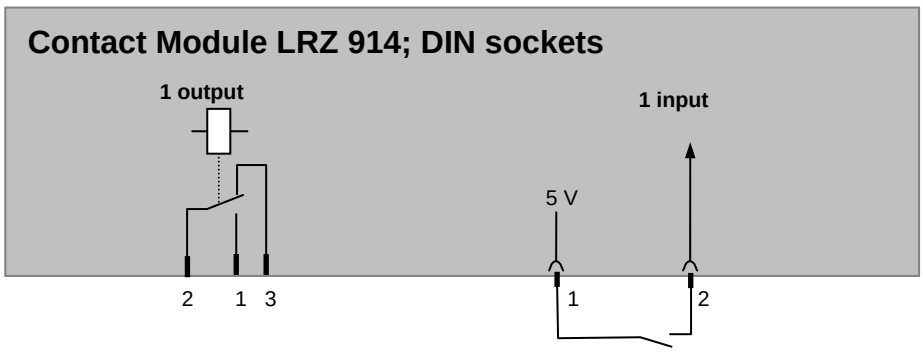
Contact module (catalogue no. LRZ 914) with connectors to NAMUR NE28, with 1 output and 1 input on each of 2 DIN sockets.

The inputs provide the following functions:

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

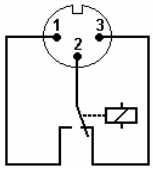
The outputs provide the following functions:

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

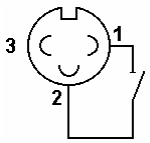


Contact outputs and inputs

Output	Input
– 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



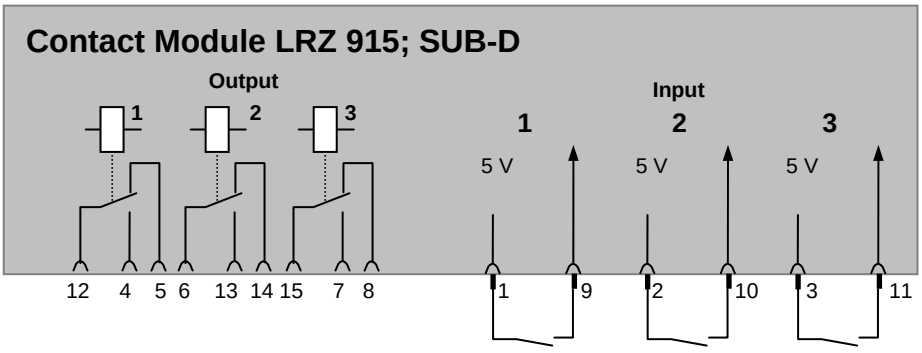
1 = NO contact
2 = Center contact
3 = NC contact



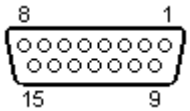
Note: Only use screened connecting leads and connect the screen to the plug housing. Cover unused connectors with protective caps.

G.6.2 Contact module LRZ 915 with 3 inputs and 3 outputs

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



Contact inputs and outputs



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

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

BESTÄTIGUNG / CONFIRMATION / CONFIRMATION

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

Von / From / De :

Firma / Company / Entreprise: _____

Straße / Street / Rue: _____

Ort / City / Ville: _____

Tel.: _____

Fax: _____

Betreiber / Responsible person / Personne responsable: _____

Hiermit bestätigen wir, daß nachfolgend aufgeführtes LAUDA-Gerät (Daten vom Typenschild):
We herewith confirm that the following LAUDA-equipment (see label):
Par la présente nous confirmons que l'appareil LAUDA (voir plaque signalétique):

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

mit folgendem Medium betrieben wurde
was used with the below mentioned media
a été utilisé avec le liquide suivant

_____

_____

_____

_____

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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