

## Operating Instructions

### **Ecoline**

Immersion thermostats E 200, E 300

Bath/ Circulation thermostats

E 206 T, E 212 T, E 215 T, E 220 T

E 203, E 211, E 219, E 225

E 306, E 312, E 320, E 326

From Series Z 01  
Software version 3.1  
01/01  
YAEE0013

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## Safety notes



Before operating the equipment please read carefully all the instructions and safety notes.

If you have any questions please phone us!

Follow the instructions on setting up, operation etc. This is the only way to avoid incorrect operation of the equipment and to ensure full warranty protection.

- Transport the equipment with care!
- Equipment and its internal parts can be damaged:
  - by dropping
  - by shock.
- Equipment should only be operated by technically qualified personnel!
- Never operate the equipment without the bath liquid!
- Do not start up the equipment if
  - it is damaged or leaking
  - the supply cable is damaged.
- Switch off the equipment and pull out the mains plug for
  - servicing or repair
  - the supply cable is damaged!
- Drain the bath before moving the equipment!
- Have the equipment serviced or repaired by properly qualified personnel only!

**The Operating Instructions include additional safety notes which are identified by a triangle with an exclamation mark. Carefully read the instructions and follow them accurately! Disregarding the instructions may have serious consequences, such as damage to the equipment, damage to property or injury to personnel**

We reserve the right to make technical alterations!

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### Explanation of signs



Danger:

This sign is used where there may be injury to personnel if a recommendation is not followed accurately or is disregarded.



Note


Here special attention is drawn to some aspect. May include reference to danger.



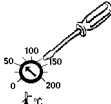
Reference:

Refers to other information in different Sections.

**1 Brief operating instructions**

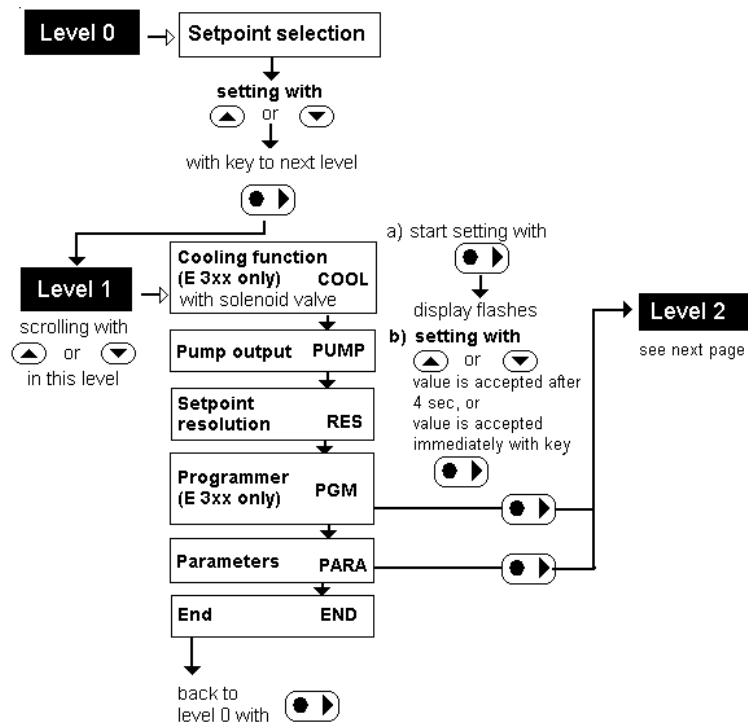
 This brief instruction shall give you the possibility to operate the unit quickly. For safe operation of the unit it is absolutely necessary to read carefully all the instructions and safety notes!

1. Assemble unit and add items as appropriate (➤ Section 5).  
Take care of the hose tubing connections (➤ Section 5.1. and 5.4.).
2. Fill the unit with corresponding liquid. (➤ Section 5.3.).  
The units are designed for operation with non-flammable and flammable liquids to EN 61010-2-010. → Take care of the level of the bath liquid! (➤ Section 5.2.)
3. Connect the unit only to a socket with a protective earth (PE) connection.  
Compare the information on the rating label with the supply details.

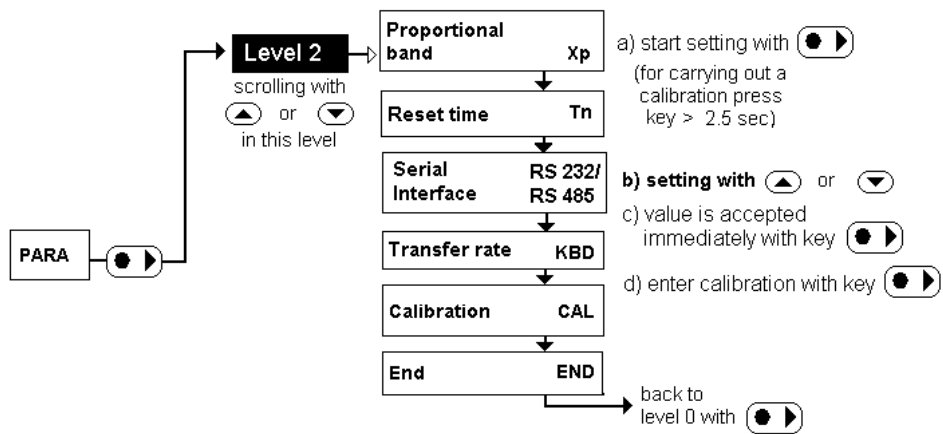
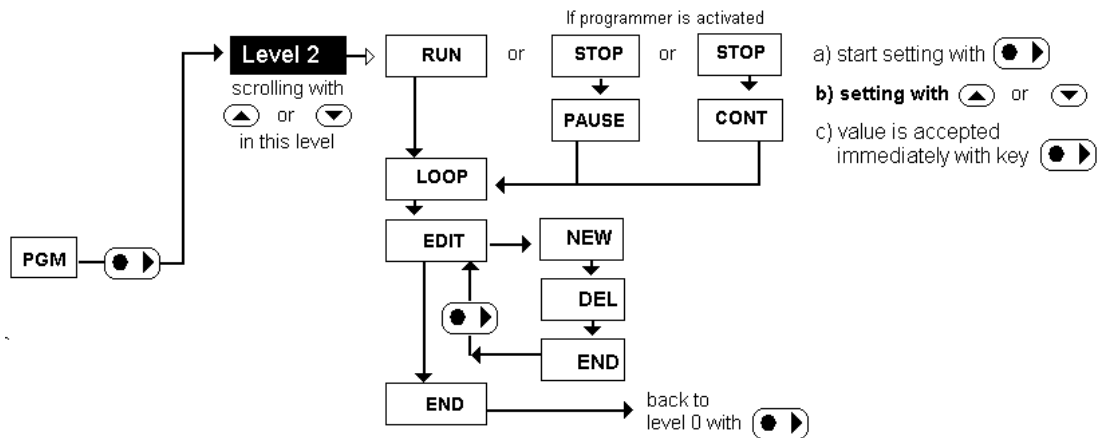
4.  Using a screwdriver, set the overtemperature cut-out point to a value clearly above ambient temperature (➤ Section 6.5.1.).



5. Switch on at the mains switch
6. Setting of the functions

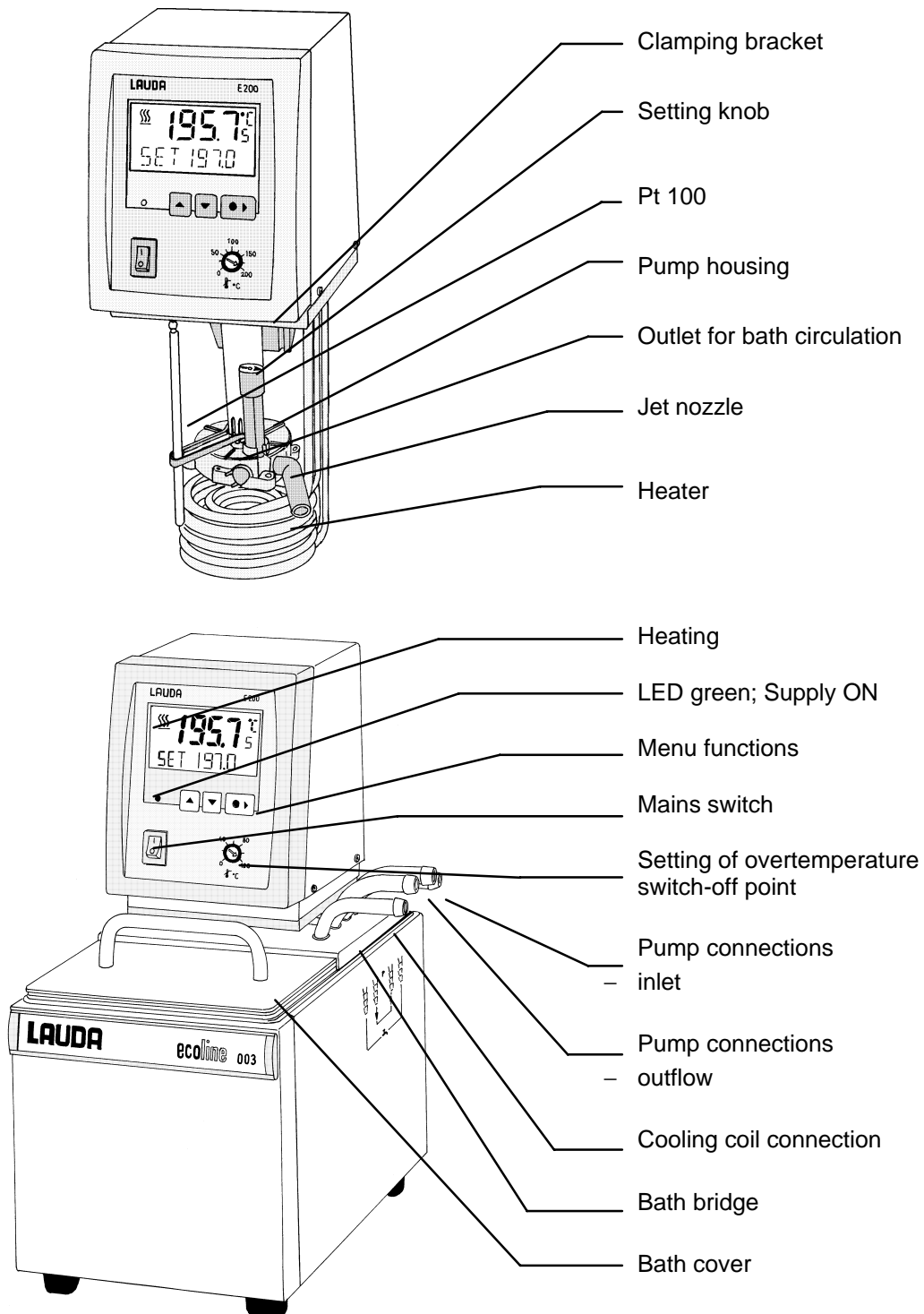


# Brief operating instructions





## 2 Control and functional elements



## Unit description

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### 3 Unit description

#### 3.1 Unit description

The immersion thermostats E 200 and E 300 have a device for fixing the immersion thermostat to the bath vessel (clamping bracket). An adapter is supplied for the deep-drawn LAUDA baths 003, 011, 019 and 025.

The type designation of the Ecoline bath/circulation thermostats consists of the control unit E 200 or E 300 and the type of bath.

Example: Control unit E 200 and bath 003 produces Thermostat Type E 203ö.

The letter T (for "Transparent") refers to the baths made of polycarbonate. Type E 203 and all Types E 3xx are supplied with bath cover. For other baths made of stainless steel bath covers are available as accessory (➤ Section 10. Accessories).

#### 3.2 Pumps

All units are supplied with a pressure pump with vario-drive. The pump has an outlet with a rotatable bend (immersion thermostat) which is connected to the pump nipple for external thermostating circuits (bath/circulation thermostats). An additional outlet provides circulation within the bath. By turning the setting knob you can choose between both outlets or divide the flows.

The pump chamber of immersion thermostats is rotatable in a restricted way to reach an optimal circulation. The pump can be used up to viscosities of 150 mm<sup>2</sup>/s during heating up. To get an optimum accuracy of control a viscosity of 30 mm<sup>2</sup>/s is recommended.

One of five pump output steps can be selected using the operating menu.

On small bath thermostats (e.g. E 203 or E 206 T) and with operation as bath thermostat it is advisable to use output step 1. The advantage is a low heat generation while having a uniform circulation, that means, that the unit can work without cooling down to just above ambient temperature.

When operating as circulation thermostat with an external circuit it is preferable to use a larger flow setting in order to ensure a small temperature difference, especially at higher temperatures and in conjunction with oil as the bath liquid.

The pump connections of Types E 3xx are fitted with M 16x1 nipples.

The pump outflow connection can be closed off without causing any damage to the pump.

**Pump characteristics** (➤ Section 9. Technical data)

### 3.3 Temperature indication, control, and safety circuit

The unit is provided with a 2-line LCD-Display with additional symbols for indicating bath temperature and settings as well as operating states. On E 3xx-Types the display has back-lightning. The setpoint is input and additional adjustments can be made using either two or three keys.

Remote operation is possible via an isolated RS 232 interface

A Pt 100 temperature probe is used for measuring the actual temperature and for control. A second Pt 100 serves as temperature probe for the safety circuit (overtemperature protection) which is independent of the control function

A low-level cut-out switches off the heating on both poles in order to prevent dry operation of the heater. The pump is switched off through the electronics. The setting of the overtemperature cut-out is adjusted with a tool on a potentiometer and is always limited to 5 °C above the operating temperature range. A floating contact "Combination fault" is available (➤ Section 6.5.4.).

All settings and fault messages are stored in the memory on supply failure or when the mains switch is set to OFF

The tubular heater is controlled from a modified PID controller through a triac circuit specially designed to be unaffected by supply variations and interference.

Types E 3xx have connection sockets for a solenoid valve for cooling regulation (19 H) and for the connection of flow-through coolers (34 H).

### 3.4 Programmer (Types E 3xx only)

Types E 3xx incorporate a programmer which can be used to run temperature programmes with up to 20 temperature-time-segments (➤ Section 6.4.4).

### 3.5 Materials

All parts which come into contact with the bath liquid are made from high-grade materials appropriate to the operating temperature. These are rust-free stainless steel, the plastics PPS, polycarbonate (bath 006 T, 015 T, 012 T, 020 T) and fluoride rubber.

# Unit description

## 3.6 Serial Interfaces RS 232, RS 485

### 3.6.1 Specification and interface test

Computer				Thermostat RS 232 Interface			
Data	9-pin sub-D socket		25-pin sub-D socket		9-pin sub-D socket		Data
	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	┌7	CTS
CTS	8		5		8	└8	RTS



① with Hardware Handshake: When connecting the thermostat to the computer please use a 1:1 cable and not a zero-modem-cable!

② without Hardware Handshake: The computer needs an operating mode: "without Hardware-Handshake". In the plug of the thermostat a bridge has to be inserted between Pin 7 and 8.

Thermostat RS 485 interface	
9-pin sub-D-socket	
pin	Data
1	Data A
5	SG (Signal Ground) optional
6	Data B

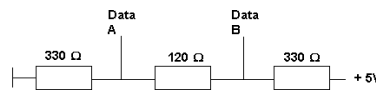


- Use shielded connecting cables..
- Connect the shielding to the plug case.
- Cover unused connectors with protection caps!
- The lines are electrically isolated from the remaining electronics.
- Unoccupied pins must not be connected!

The RS 232 Interface can easily be tested with the PC connected, using the MS-Windows operating system.

On Windows 3.11 with the program "Terminal" and on Windows 95 with the program "Hyper Terminal Terminal".

The RS 485 bus absolutely needs a bus-termination in form of a terminating network, which ensures a defined unattended time in the high resistance phases. The bus-terminal is defined as follows



Generally this network is integrated on the plug in card of the computer (RS 485).

## 3.6.2 General information

The interfaces operate with 1 stop bit, no parity bit and 8 data bits

Transfer rate (selectable): 2400, 4800, 9600 (factory setting) or 19200 baud.

### RS 232 Interface:



- This interface can also be handled by Hardware – Handshake (RTS/CTS) (➤ Section 3.6.1.)

Values can be transferred directly from the computer to the thermostat via the commands: OUT, STOP, START (➤ Section 3.7.3.). After a correct transfer of these commands the thermostat always responds with the message "OK" followed by "CR" and "LF". (Must be read out by the computer like any other response.)

### RS 485 Interface:



- The unit address has to be added in front of the RS 232 interface commands (possible are unit addresses 000...127 → the address always has to have 3 digits).
- **Example:** Transfer the setpoint temperature 30,5°C from the thermostat to the unit address 15 → "A015\_OUT\_SP\_00\_30.5°C"CR (➤ Section 3.6.3.).  
The thermostat always responds with the unit address first → "A015\_OK" CR LF

Values are transferred from the thermostat to the computer using an IN-command.  
(➤ Section 3.6.4.)

## Unit description

### 3.6.3 Output commands

Command	Explanation
OUT_SP_00_XXX.XX	Setpoint transfer with up to 3 places before the decimal point and up to 2 places behind
OUT_SP_01_XXX.XX	Pump output step 1, 2, 3, 4 or 5, 0 = STOP
OUT_SP_02_XXX.XX	Operating mode of the refrigeration system (E 3xx types only) "0" = Valve closed, "1" = Valve open, "3" = Automatic operation (proportional cooling)
OUT_PAR_00_XXX.XX	Setting of the control parameter Xp for controller (0,5...9,9°C)
OUT_PAR_01_XXX.XX	Setting of the control parameter Tn (5...60 s)
START	switches the unit on (from stand-by)
STOP	switches the unit to stand-by (pump, heating, refrigeration system off)
OUT_MODE_00_X  (A015_OUT_MODE_00_X --> RS 485)	Operating mode: 0 = RS 232 + keyboard, 1 = only RS 232  (Operating mode : 0 = RS 485 + keyboard/ 1 = only RS 485)
RMP_START	Starting the programmer
RMP_PAUSE	Stopping the programmer
RMP_CONT	Restart the programmer after PAUSE
RMP_STOP	Terminating the program
RMP_RESET	Deleting the program (all segments)
RMP_OUT_00_XXX.XX_XXX.X X	Programmer segments (max. 20) (temperature, time)
RMP_OUT_02_XXX.XX	Number of program running: 0...255, 0= infinite

① If the thermostat is not connected to cooling water, 0 or 1 should be selected



- The blank character " " is also permissible instead of "\_".
- Thermostat response "OK" or in case of a fault "ERR\_X"  
(RS 485 interface: "A015\_OK" or in case of a fault "A015\_ERR\_X")
- EXAMPLE: set setpoint to 20.00°C: " OUT\_SP\_00\_20"CR LF  
(RS 495 interface: "A015\_OUT\_SP\_00\_20"CRLF)

**Permitted data formats**

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

**3.6.4 Data request from the thermostat**

The response from the thermostat is always in the fixed format "XXX.XX" for negative values "-XXX.XX" or " ERR\_X" (RS 485 interface: "A015\_XXX.XX", for negative values "A015\_-XXX.XX" or "A015\_ERR\_X").

Input command	Explanation
IN_PV_00	Request to indicate the bath temperature
IN_SP_00	Request to indicate the active setpoint
IN_SP_01	Request to indicate the pump output step
IN_SP_02	Request to indicate the operating mode of the refrigeration system (E 3xx types only) "0" = Valve closed , "1" = Valve open, "3" = Automatic operation (proportional cooling)①
IN_SP_03	Request to indicate the current overtemperature switch-off point
IN_PAR_00	Request to indicate the current value of Xp
IN_PAR_01	Request to indicate the current value of Tn
TYPE	Request to indicate the unit type
VERSION	Request to indicate the software version number
STATUS	Request to indicate the unit status 0 = OK, - 1 = fault
STAT	Input for fault diagnosis answer XXXXX → X = 0 no fault, X = 1 fault char. 1 from right = internal fault microcontroller 2 char. 2 from right = internal fault microcontroller 1 char. 3 from right = pump blocked char. 4 from right = low level char. 5 from right = overtemperature
IN_ERR_00	fault diagnosis microcontroller 1 ②

## Unit description

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IN_ERR_01	fault diagnosis microcontroller 2 ②
IN_MODE_00 (A015_IN_MODE_00 -->RS485)	0 = RS 232 + keyboard/ 1 = only RS 232 interface (0 = RS 485 + keyboard/1 = only RS 485 interface)
RMP_IN_00_XX (1...20)	Request to indicate the program segments (answer e.g 030.00_010.00 = 30.00 °C, 10 min)
RMP_IN_01	Request to indicate the current segment number, if programmer is activated
RMP_IN_02	Request to indicate the number of program running (pre-set)
RMP_IN_03	Request to indicate the current program running

① If the thermostat is not connected to cooling water, 0 or 1 should be selected.

② >Section 6.5.5. Other error messages

### 3.6.5 Error messages

Message	Explanation
ERR_2	incorrect input (e.g. buffer overflow)
ERR_3	incorrect command
ERR_5	syntax error on value
ERR_6	illegal value
ERR_28	receive – frame – error (e.g. stop bit missing)
ERR_29	Function blocked (at this time)→ wait a few ms, then try again
ERR_30	Programmer, all segments are occupied




RS 485 interface: Message "A015\_ERR\_2".



## 4 Unpacking

After the unit and accessories have been unpacked they have to be examined for possible transport damage. If there is any damage visible on the unit, the forwarding agent or the post office has to be notified so that the shipment can be examined.

### Standard accessories:

Bath cover	E 203 and on all bath/circulation thermostats E 3xx
13 mm dia. nipple union nuts (M16x1)	on all bath/circulation thermostats E 3xx
Closing plugs	on all bath/circulation thermostats
	on all bath/circulation thermostats
Warning label	
Operating Instructions	on all immersion and bath/circulation thermostats

## 5 Preparations

### 5.1 Assembly and setting up

#### a) Immersion Thermostat

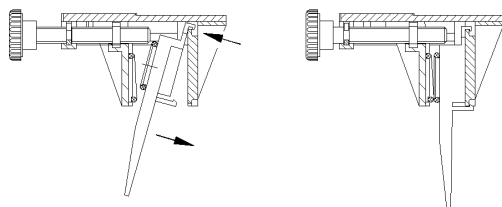
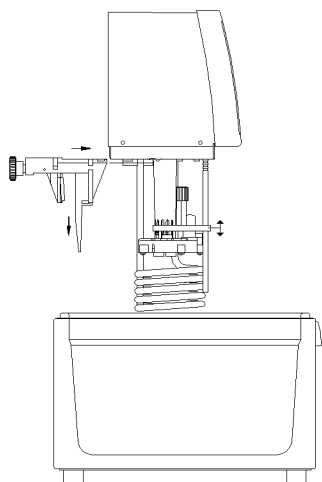
- Hang the thermostat into the bath to be thermostated (baths > Section 10. Accessories)



- In baths made of plastic the heater should not have contact to the sides of the bath!
- Do not cover the ventilation opening at the back of the unit.  
Keep clear distance of at least 20 cm.

#### Adjustment of the pump chamber

- The fixation of the temperature probe has to be moved upwards approx. 15 mm.
- Adjust the pump chamber.
- Move the fixation of the temperature probe downwards again (see ill. on the left)

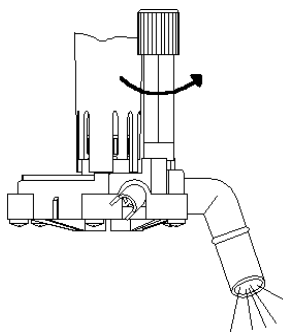


- For all LAUDA baths (plastic and deep-drawn baths), please fix the adapter (standard accessory) on the clamping bracket.
- Turn the jet nozzle to face diagonally into the bath. The outflow for the bath circulation can then be closed.
- Turn the setting knob to the left (see. ill. 1.)

#### Adjustments of the pump outflows

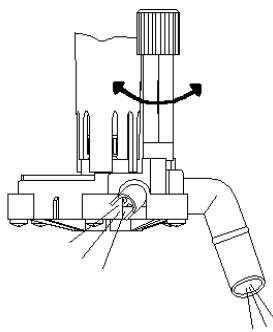
ill 1

Setting knob turned anticlockwise



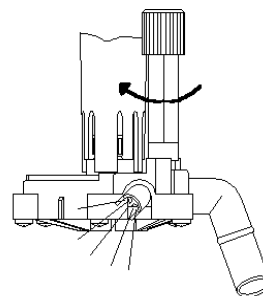
ill 2

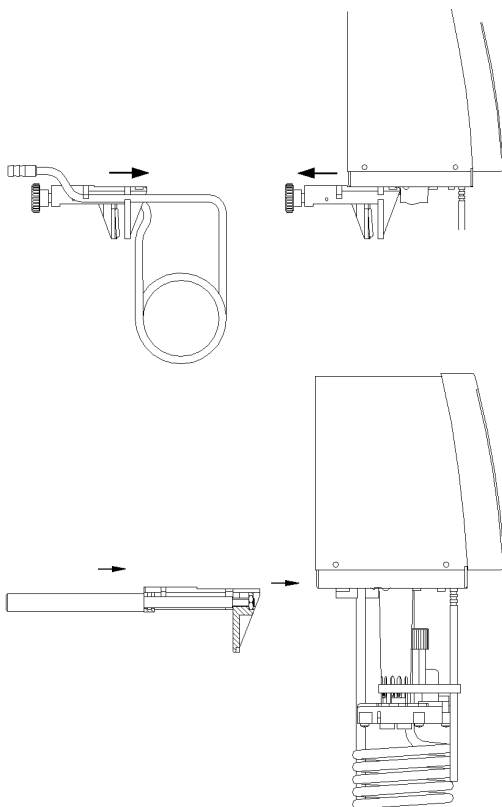
Setting knob medium position



ill 3.

Setting knob turned clockwise






**Operation with cooling coil** (≥ Section 10. Accessories)

- Pull the clamping bracket to the back for fixing the cooling coil while releasing it with a screwdriver.
- Push the cooling coil on the clamping bracket.
- Install the clamping bracket again.

**Operation with fixing rod** (≥ Section 10. Accessories)


- Pull the clamping bracket to the back while releasing it with a screwdriver.
- Install the fixing rod together with the clamping bracket.

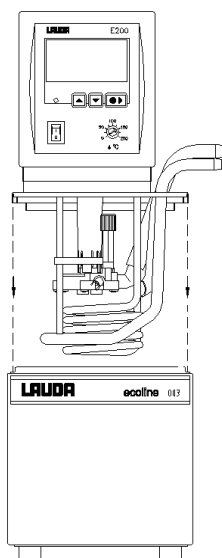
**Operation with external circuit** (≥ Section 5.4.)



- The immersion thermostats have to be fixed carefully at the bath, for they must not fall into the bath.
- In that case don't touch the bath liquid! Pull out mains plug immediately!

**a) Bath/Circulation thermostats**


- Place the unit on a flat surface.
- 
- Do not cover the ventilation openings at the back.
  - Keep a clear distance of at least 20 cm.
  - Put the control unit with the bath bridge on the bath (Types E 2xx only)
  - When operating without an external consumer (bath thermostat) the setting knob has to be turned so that the flow comes out of the outlet for bath circulation (≥ ill. 3, Section 5.1.).




## Preparations

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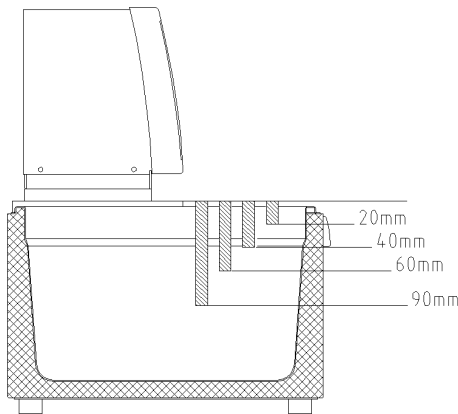
### **b) Operation with external consumer** (Circulation thermostat) (≥ Section 5.4.)



- At bath temperature above 70°C the label  supplied must be affixed on the bath in a clearly visible position.
- When operating as bath thermostat without external consumer the pump pressure outflow has to be closed (use closing plugs) or linked to the return.

## 5.2 Filling and emptying

### **Filling**

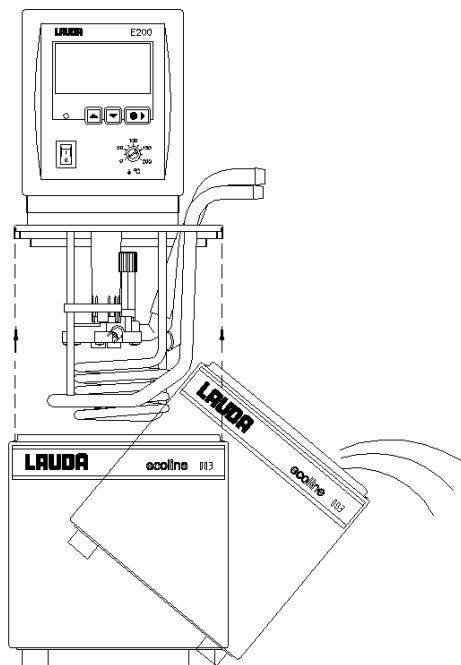


- Close the drain cock (Types E 3xx only).
- Fill baths up to a maximum level of 20 mm below the bath bridge.
- Optimum operation at 20-40 mm below the bath bridge.
- Operation is possible down to 60 mm below the bath bridge.
- The low-level cut-out operates at approx. 90 mm below the bath bridge



- When using thermal oils it is necessary to allow an expansion of approx. 8 %/100 °C.
- When operating with an external consumer the total expansion takes place in the bath.

## Emptying



- Switch off the thermostat, pull out the mains plug!
- a) Immersion thermostat, Bath/ Circulation thermostat (Types E 2xx)
  - Unscrew the immersion thermostat or take off the control unit with the bath bridge.
  - Drain the bath
- b) Bath/Circulation thermostat (Types E 3xx) are equipped with a drain cock --> Attach the hose on the drain cock and drain the bath.



- The units are designed for operation with non-flammable and flammable liquids to EN 61010-2-010! Flammable liquids can be operated up to no more than 25°C below the firepoint (> Section 5.3.).
- Observe the appropriate regulation when disposing used thermostating liquid.
- When connecting an external consumer take care that the level of the bath liquid does not drop too much → fill in bath liquid if necessary.



Do not drain the thermostating liquid when it is hot or very cold (below 0°C)!

# Preparations

## 5.3 Bath liquids and hose connections

### Bath liquids

LAUDA Designation		Working temperature range	Chemical Designation	Viscosity (kin)	Viscosity (kin) at Temperature	Fire-point	Ref.No. Quantity		
	Former designation						5 l	10 l	20 l
	water	+5...+90	deionised water ①	--	--	--			
Kryo 30 ②	G 100 ②	-30...+90	Mono-ethylene-glycol/water	4	50 at -25°C	--	LZB 109	LZB 209	LZB 309
Kryo 50	SK Super Frigor	-50...+95	Silicone oil	6	35 at -50°C	> 139	LZB 103	LZB 203	LZB 303
Kryo 20	160 MS	-20...+180	Silicone oil	11	28 at -20°C	> 230	LZB 116	LZB 216	LZB 316
Ultra 350	330 SCB	+30...+200	synthetic thermal oil	47	28 at +30°C	> 240	LZB 107	LZB 207	LZB 307
Therm 230	RDS 50	+60...+230	Silicone oil	44	28 ... +60°C	> 362	LZB 117	LZB 217	LZB 317



① At higher temperatures → Evaporation losses → Use bath covers (➤ Section 10. Accessories).  
Distilled water or fully deionised water must only be used with the addition of 0,1g sodium carbonate/l water, otherwise  
→ danger of corrosion!

② Water content falls after prolonged operation at higher temperatures  
→ mixture becomes flammable (flash point 128 °C).  
→ Check the mixture ratio with a densimeter.

- When selecting bath liquids it should be noted that performance must be expected to worsen at the lower limit of the operating temperature range due to increasing viscosity. The full operating range should only be utilised if really necessary.
- The operating ranges of the bath liquids and tubing represent general data which may be limited by the operating temperature range of the unit.




Silicone oil causes pronounced swelling of Silicone rubber → never use Silicone oil with Silicone tubing!

**DIN Safety data sheets are available on request**

**Hose connections**

**a) Elastomer tubing**

Tubing type	Int. dia. Ø mm	Temperature range °C	Application	Ref. No.
Perbunan tubing, uninsulated	9	0 to 120	for all bath liquids	RKJ 011
Perbunan tubing, uninsulated	12	-0 to 120	for all bath liquids	RKJ 012
Perbunan tubing insulated	12 ext. dia. 35mm approx.	-60 to 120	for all bath liquids	LZS 008
Silicone tubing, uninsulated	11	-30 to 100	water, water/glycol mixture	RKJ 059
Silicone tubing insulated	11 ext. dia. 35mm approx.	-60 to 100	water, water/glycol mixture	LZS 007
Viton	11	-60 to 200	for all bath liquids	RKJ 091
 <ul style="list-style-type: none"> <li>- Silicone oil causes pronounced swelling of Silicone rubber → never use Silicone oil with Silicone tubing!</li> <li>- Protect tubing with hose clips against slipping off.</li> </ul>				

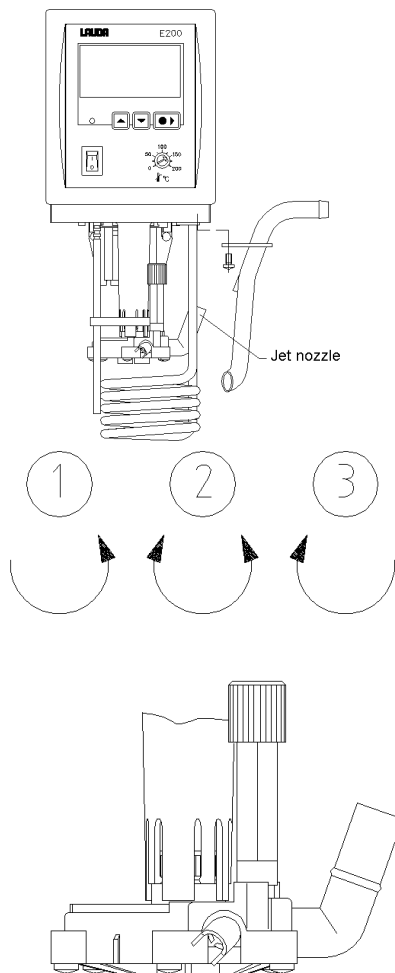
**b) Metal hoses for Types E 3xx, rust free stainless steel, with M 16 x 1 union nut 10 mm int. Dia**

Type	Length cm	Notes	Ref. No.
MC 50	50	With single insulation	<b>LZM 040</b>
MC 100	100	"	<b>LZM 041</b>
MC 150	150	"	<b>LZM 042</b>
MC 200	200	"	<b>LZM 043</b>
Pump connection link	20	"	<b>LZM 044</b>
MK 50	50	with foam insulation for low temperatures	<b>LZM 052</b>
MK 100	100	"	<b>LZM 053</b>
MK 150	150	"	<b>LZM 054</b>
MK 200	200	"	<b>LZM 055</b>
Pump connection link	20	"	<b>LZM 045</b>

# Preparations

## 5.4 Connection of external circuits

### a) Immersion thermostats



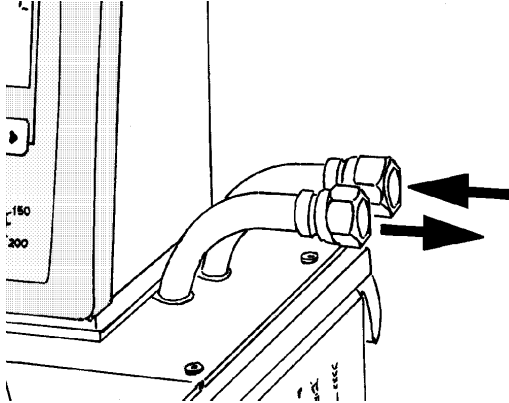
- Push 11-12 mm int. dia. tubing (≥ Section 5.3.) directly onto the jet nozzle and connect it to the external circuit.
- Hang the return tubing into the bath and fix it!
- We recommend to use the pump set (≥ Section 10. Accessories). In this case
- screw on the pump connectors.
- install the connecting tube.
- Using the setting knob at the pump outflows, divide up the pump flow in accordance to the thermostating task.(≥ Section 5.1)
- Position ① → maximum flow in the external circuit, the setting knob is turned anticlockwise.
- Position ② → flow passes through pump outflow and outlet for bath circulation, the setting knob is in medium position.
- Position ③ → external circuit is closed and the outlet for bath circulation fully open, the setting knob is turned clockwise.



- Operate the setting knob only when the bath contents are near ambient temperature.
- When no tubing is connected, close the pump outflow with closing plugs even in position ③.



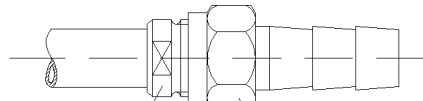
**b) Bath/Circulation thermostat**



- Connect 11-12 mm int. dia. tubing (for Types 3xx use metal hoses) (> Section 5.3.) to the pump connector
- Pump outflow connection always in front, return connection always at the back.



- If the cross-section of the tubing is too small → temperature drop between bath and external system due to low flow rate. Increase the bath temperature appropriately.
- Always ensure the maximum possible flow cross-section in the external circuit!
- On Types E 3xx, when tightening the union nut hold on to the pump nipple with a SW 14 spanner (see ill.)!



SW14 — SW19



- When the external consumer is placed at a higher level than the thermostat, the pump is stopped and air penetrates into the thermostating circuit the external liquid may drain down into the bath even with a closed system → danger of flooding the thermostat!
- Protect tubing with hose clips against slipping off!
- When no external circuit is connected to the thermostat, the outflow connection must be closed (use closing plugs) or linked to the return!

## 5.5 Cooling the thermostats

At bath temperatures down to just above ambient temperature (approx. 2 – 10°C) it is possible to work without cooling. Additional cooling is required for lower temperatures

Immersion thermostat. → attach the cooling coil (➤ Section 5.1.).

Bath/Circulation thermostats → fitted with cooling coil, as standard..

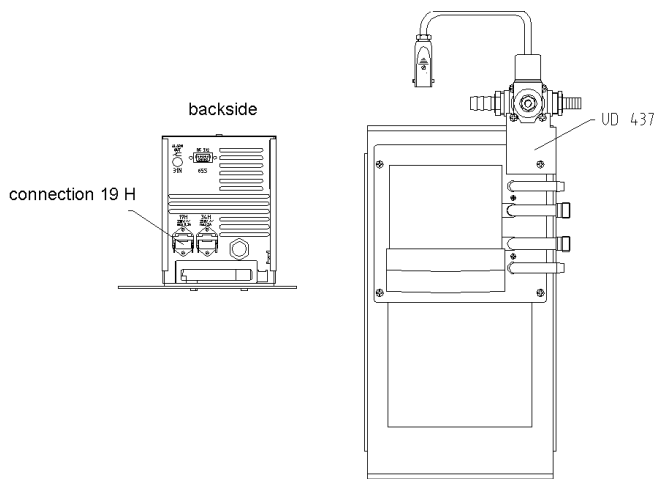
### Cooling possibilities

- down to 20 °C Mains water → keep the water consumption as low as possible!
- down to –30°C flow-through cooler DLK 10/ DLK 25 (depending on bath size and temperature) ➤ Section 10. Accessories  
→ use water/glycol mixture (ratio 1:1).  
Mains supply outlet 34H (types E 3xx only) → Connection socket for through-flow- cooler (Countersocket ➤ Section 10).  
Mains supply 230V will be switched off in case of fault. Consumption of current 2A max.



- Use insulated tubing!
- When thermostating an external system the equipment must be arranged in the following order: thermostat → external circuit → flow-through cooler → thermostat

For Types E 3xx → Connection of a solenoid valve is possible for controlled cooling with mains water in combination with a cooling coil. (connection socket 19H, 230V, max. 0,2A). Within a temperature range of approx. 15 to 100 °C the cooling is automatically adjusted to the requested demand. A set of solenoid valves is necessary (➤ Section 10. Accessories). It is absolutely necessary to use hose clips. Fasten the outflow tube in the drain.




## 6 Starting up

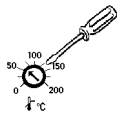
### 6.1 Connection to the supply

Compare the supply voltage against the data on the rating label.

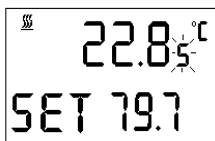
Model according to EMC directive EN 61326-1 Class B.\*

	<ul style="list-style-type: none"> <li>– Connect the unit only to a grounded mains power socket (PE).</li> <li>– No warranty when the thermostat is connected to a wrong supply!</li> <li>– Without external circuit ensure that the pump pressure outflow is closed or linked to the pump return.</li> <li>– Ensure that the unit is filled in accordance with Section 5.2.!</li> </ul>
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### 6.2 Switching on



**0,25s**

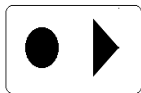


- Using a screwdriver set the overtemperature switch-off point to a value clearly above ambient temperature.
- Switch on at the mains switch.  
The green LED for "Supply ON" lights up.
- A tone sounds for approx. 0,25 s.
- The unit self-test starts up. All display segments and symbols light up for approx. 1 s. Then the software version is indicated for approx. 1 s.
- Display shows the actual bath temperature (above) (resolution 0,05 °) and the setpoint. The pump starts up. The values which were active before switching off are entered.
- If necessary add more bath liquid to replace the amount pumped out to the external circuit.
- If the pump does not purge the system immediately. The unit may switch off again although it is filled sufficiently (only when starting up for the first time)..

\* Notic only valid for EU countries

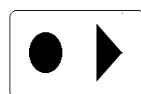
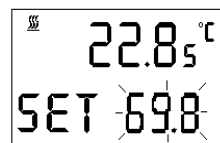
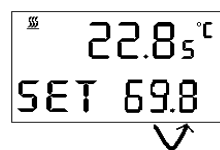
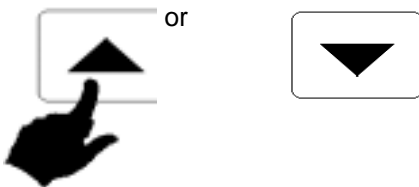
## Starting up

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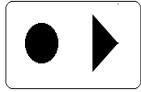
- A double signal tone sounds.
- The display for low-level (LEVEL) appears.
- The fault triangle is flashing
- Press the key. If necessary repeat several times.
- Also press the key if the unit had switched off under a fault condition.

### 6.3 Setpoint selection (level 0)



- Input the setpoint with one of the keys.
- Speeding the setting process by:
  - a) continuous pressing the keys or
  - b) pressing one key (holding it down) and shortly pressing the other key.
- Briefly releasing (1 s) the key (s) and again pressing one of the keys moves the cursor one place to the right.
- Display flashes 4 s → the new value is accepted automatically, or
- Value is entered immediately with this key.
- For safety reasons the setpoint can only be adjusted up to 2 °C above the upper limit of the operating temperature range of the particular unit type

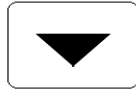
## 6.4 Menu functions



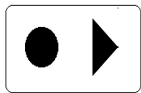
- Switching from setpoint selection (level 0) to level 1 using the key



or

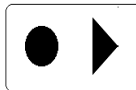
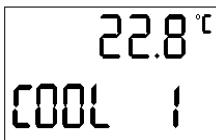


- Within one level it is possible to scroll using the keys.
- **In principle**, after each setting has been made it is entered automatically after approx. 4 s or

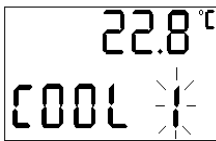


- Settings are entered immediately on operating this key

### 6.4.1 Cooling function (E 3xx only) (level 1)



- The display shows the current bath temperature, COOL and the set operating mode. To alter the setting, press the key on the left.



- The display flashes (approx. 4 s).



or



During this time start to set the operating mode with one of the keys

0 = solenoid valve CLOSED

1 = solenoid valve OPEN

A = unit operates valve as required (proportional cooling)



- Forward with key to "pump output" or



- with key back to level 0 (setpoint input).

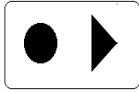


- If the thermostat is not connected to cooling water, setting 0 or 1 should be selected.
- When using a through-flow chiller (DLK) at socket 34 H, this is operating continuously except in the case of a fault or if the pump is set to 0.

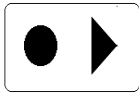
# Starting up

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## 6.4.2 Pump output



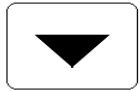
- For setting the pump output starting from level 0, press the key shown on the left (on Types E 2xx).



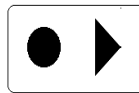
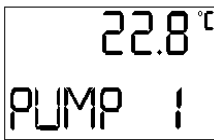
and 1x



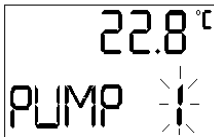
- On Types E 3xx press this key combination shown on the left or



- move forward from COOL function with this key (types E 3xx only).



- The display shows the current bath temperature, PUMP and the current output step. To alter the setting press the key shown on the left.



- Display flashes (approx. 4 s).



or



- During this time start to set the required step with one of the keys.  
0 = pump stopped, heating off  
1 = low pump output  
2 , 3 , 4 = medium pump output  
5 = maximum pump output



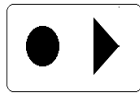
- The pump responds immediately (can be heard). (Setting is entered after approx. 4 s > Section 6.4.)

- Move forward with key to "Selecting the setpoint resolution" or

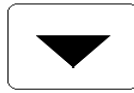


- back with the key to "COOL - function" (E 3xx) or to "Setpoint selection" (E 2xx).

**6.4.3 Setting the setpoint resolution**



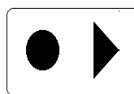
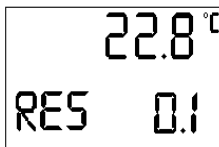
and 2x  
and 1x



– To set the setpoint resolution from level 0 press the key combination on the left (top one on E 3xx, bottom one on E 2xx) or



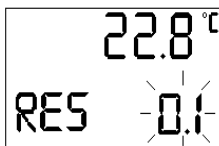
– move forward with the key from the PUMP-function.



– The current bath temperature, RES and the current setpoint resolution are indicated.

– To alter the setting, press the key on the left.

– Display flashes (approx. 4 s).



or



– During this time, start to set the required resolution with one of the two keys.

normal setting → 0,1 = 0,1 °C setpoint resolution, **or**  
0,01 = 0,01 °C setpoint resolution. During setpoint input only S is indicated instead of SET.



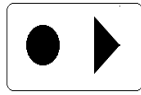
– Forward with the key to "parameter level" (E 2xx only) or to "programmer" (E 3xx only) or



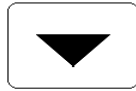
– with key back to "PUMP".

# Starting up

## 6.4.4 Programmer (Types E 3xx only)

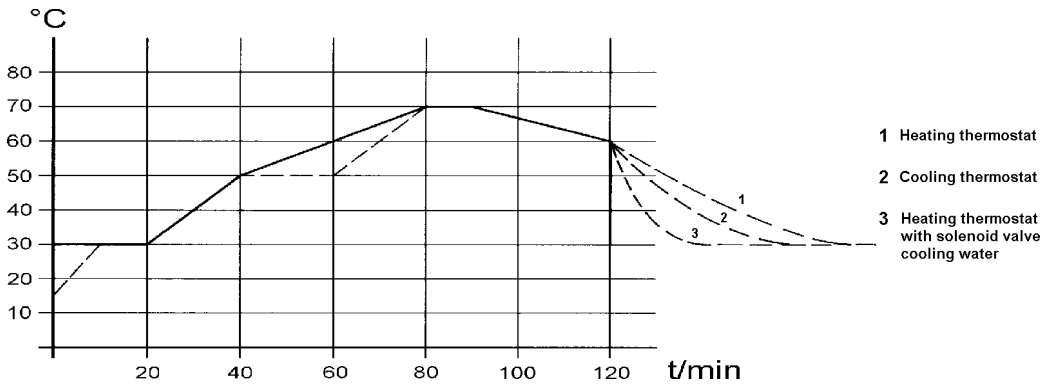


and 3x



- To view or to set the programmer, starting from level 0 (setpoint input) press the key combination on the left, or
- from RES function scroll with this key.
- The display shows PGM (programmer). Data for up to 20 program segments can be input there.

### 6.4.4.1 Program example



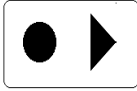
Segment	1	2	3	4	5	6	7
Temperature	30,0	50,0	70,0	70,0	60,0	30,0	
Time	20	20	40	10	30	0	

Segment	1	2	3	4	5	6	7
Temperature	30,0	50,0	50 ①	70,0	70,0	60,0	30,0
Time	20	20	20 ①	20 ②	10	30	0

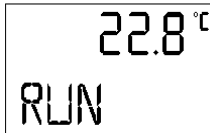
① A new segment has been inserted after segment No. 2 (➤ Section 6.4.4.5.)      ② The time at segment No. 3 has been altered (➤ Section 6.4.4.2.)



### 6.4.4.2 Indicating/ altering of programme segments



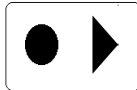
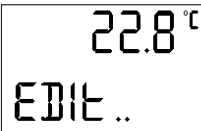
- When PGM appears on the display (therefore proceed as described in 6.4.4.) press the key on the left.



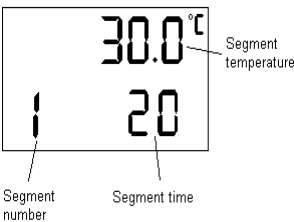
- The display shows RUN. Here the programmer can be started (➤ Section 6.4.4.4.)



- Forward with key until EDIT appears..



- Here the program segments can e.g. be indicated and altered. To do so press the key.



- The display indicates 3 variables: segment number (a), segment end temperature (b) and segment time (c).

- **EXAMPLE:** segment number 1, b = 30,0 °C, c = 20 min. The bath liquid has to be heated up or cooled down to 30 °C within 20 min.



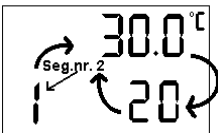
- When having deleted the programme example the variables on the display show 0. Before altering the segments it is necessary to insert new segments (➤ Section 6.4.5.5.)



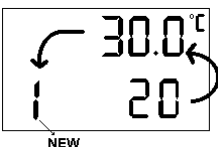
or



- These keys can be used to scroll through the different variables.



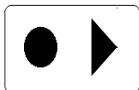
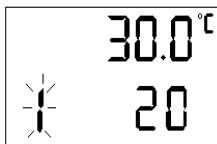
- Sequence with the key:: 1 (a) → 30,0 °C (b) → 20 (c) → 50,0 ° (2. Segment), → 20 (2. Segment).



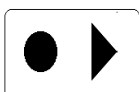
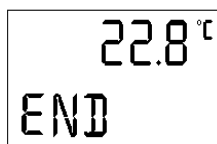
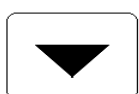
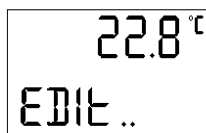
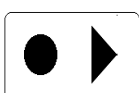
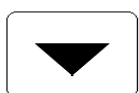
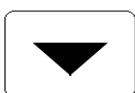
- When the segment number is flashing, pressing the key leads directly to the menu for inserting or deleting segments (➤ Section 6.4.4.5.). Otherwise scroll e.g. from segment time back to segment temperature and segment number.

## Starting up

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or

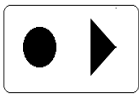


- The variable currently activated flashes quickly (here the segment number).
  - To alter the required variable start with this key
  - If e.g. the segment number is flashing, all segments can be indicated in sequence by pressing one of the two keys, **or**
  - If segment temperature or segment time are flashing, the required temperature or time can be input by pressing the key and then using the other two keys.
  - Segment temperature: 2 °C max. above the upper limit of the operating temperature range of the particular thermostat type.
  - Segment time: 0...255 min.
  - After having changed the segments move forward with key to END
1. Forward with the key to EDIT.
    - with the key to END and then
    - back to level 0 with the key, or
  2. with the key back to LOOP (➤ Section 6.4.4.3.) resp. to RUN (➤ Section 6.4.4.4.)

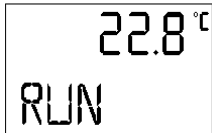


- While the programmer is in operation segments can be altered (including the current segment) and new segments can be inserted. All segments can also be deleted at each time (except the current segment) (➤ Section 6.4.4.5.)  
**BUT:** If the new segment time is shorter than the segment time which has already elapsed, the next segment is activated.
- If a segment time longer than 255 min is required, this time must be distributed over several consecutive segments.

**6.4.4.3 Number of program running**



- From level 0 proceed as described under 6.4.4. When PGM appears on the display, press the key on the left



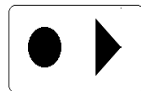
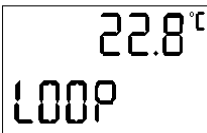
- The display first shows RUN.



- Forward with key until LOOP appears, or



- from EDIT with this key to LOOP.



- Here the number of program running can be input. Therefore press the key. The display is flashing for approx. 4 s.



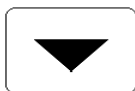
or



- During this time start to set the required number of running with one of the two keys. Input possibility: 0...255 (0 = infinite).



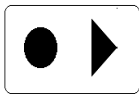
- Then with the key back to RUN (➤ Section 6.4.4.4.), or



- with key until END and then

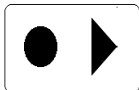
## Starting up

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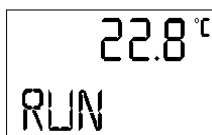


- with key back to "setpoint selection". (level 0)

### 6.4.4.4 Starting of the programmer



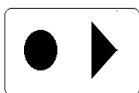
- From level 0 proceed as described under 6.4.4. When PGM appears on the display, press the key on the left



- The display shows RUN, **or**



- with key from EDIT resp. LOOP until RUN appears, **then**

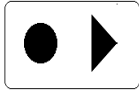


- start the programme with the key on the left. The setpoint level (level 0) is then on display.

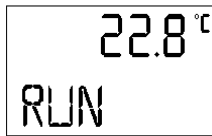


- During the start the current setpoint is accepted as the starting value.
- If the programmer is activated:  
level 0 shows PGM XXX.XX instead of SET XXX.XX (setpoint temperature), with PGM flashing short (**short off, long on**).
- Setpoint can not be input with 0,01 °C resolution (only possible via RS 232 interface.)
- General Rule: Programmer can also be loaded and operated via the RS 232 interface.

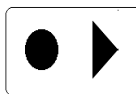
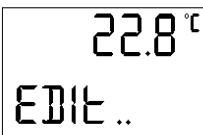
### 6.4.4.5 Inserting/ deleting of program segments



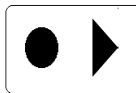
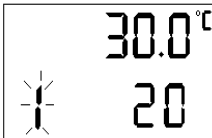
1. From level 0 proceed as described under 6.4.4. When PGM appears on the display, press the key on the left.



2. The display shows RUN (or STOP if the programmer had been started). Scroll with this key until EDIT appears.



3. The display shows EDIT, press the key.



4. Segment number is flashing, press the key.



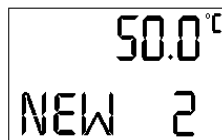
or



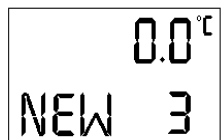
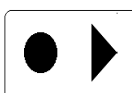
– Using the keys, select the segment number **behind** which the new segment has to be inserted.

**EXAMPLE:** Section 6.4.4.1.:

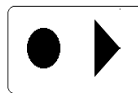
A new segment has to be inserted after segment 2. Select segment 2 with the keys.



– With the key forward until NEW appears. The segment number "2" behind which the new segment and the segment temperature are indicated.



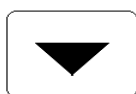
– Press the key, the display shows NEW as well as the segment number and temperature of the new segment.



– Then jump with the key to segment temperature or segment time and start input with the key, **then**



or



– using both keys input the required segment time and segment temperature, then continue as described below (step 5-8)

## Starting up

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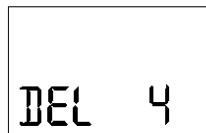
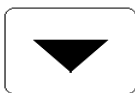
- When a new segment is inserted, all subsequent segments are shifted on by one position. ( > example Section 6.4.4.1).
- When 20 segments are inserted, the last one will disappear when a new segment will be input.
- New segments can also be inserted while the programmer is activated.



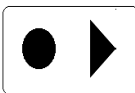
or



- In order to delete a segment, proceed as above step 1-4.
- Using the keys, select the segment number which has to be deleted.



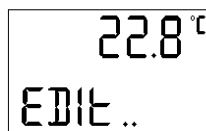
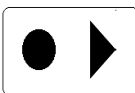
- Scroll forward with the key until DEL appears. Next to it the segment number to be deleted is shown.



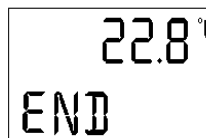
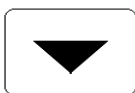
- Press the key, the segment is deleted.



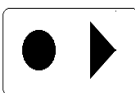
5. Then with the key forward to END.



6. with the key to EDIT, then



7. with the key to END and



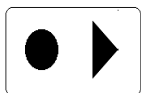
8. with the key back to level 0.



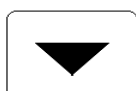
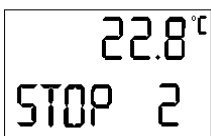
- When a segment is deleted, all subsequent segments move forward by one position.
- When the programmer is activated, the currently active segment cannot be deleted.
- **To input a segment time longer than 255 min it has to be split between several consecutive segments.**

## 6.4.4.6 Holding/continuing the program

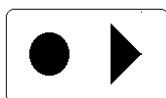
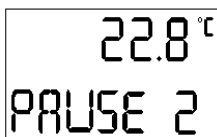
When the programmer is activated, the programme can at any time be held and be continued again. For this



1. from level 0 proceed as described under 6.4.4. When the display shows PGM, press the key



2. The display shows STOP. Scroll forward with the key until PAUSE appears



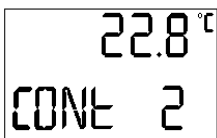
- The currently running segment is shown after PAUSE, press the key.



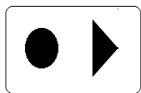
- The program is held. Scroll forward to END, then press the key to return to level 0.



- When the program is held with PAUSE, the display at level 0 no longer shows SET XXX.XX (set temperature) but PGM XXX.XX, with PGM not flashing.



- To continue the program, proceed as described in steps 1-2 above, but scroll forward until the display shows CONt. The segment number of the programmer during which the program was held, is shown after CONt.



- Press the key, the program continues, the programmer jumps back to level 0.

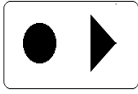


- When the program is continued, the display PGM XXX.XX at level 0 is again flashing.
- If there is a fault, the program is stopped by PAUSE. After the fault has rectified, the system has to be reset with CONt.

# Starting up

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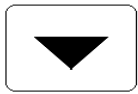
## 6.4.4.7 Terminating the program



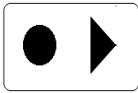
- From level 0 proceed as described under 6.4.4. When the display shows PGM, press the key.



- The display shows STOP. The current segment is indicated after STOP. Press the key, the programme is terminated immediately.

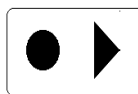


- With the key, forward to END, then

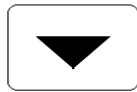


- with the key back to level 0.

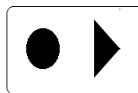
## 6.4.5 Parameters



and 4x



- Directly from level 0 (setpoint selection) press the key combination on the left (on E 3xx),



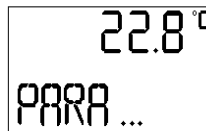
and 2x



- on E 2xx , or



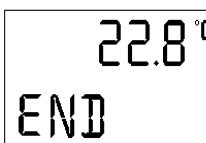
- forward with the key from PGM function



- Here it is possible to switch over to level 2. Press the key on the left, continue with Section 6.4.5.1. or



- with key to step END.



- End of the menu.
- Return to level 0 (setpoint selection) with the key on the

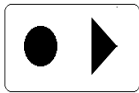




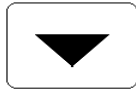
left, or

- with key back to programmer (E 3xx only) or to "Setting the setpoint resolution" (E 2xx).

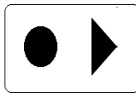
### 6.4.5.1 Setting the proportional band of the PID-controller



and 4x  
and 2x



- Directly from level 0 (setpoint selection), press the key combination on the left (top one on E 3xx, bottom one E 2xx), until the PARA -function is reached, then



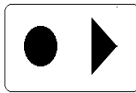
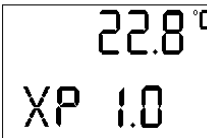
- switch to level 2 from PARA (see above) with key on the left.



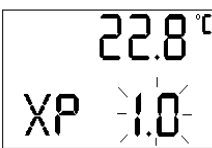
or



- Within this level it is possible to scroll with the keys.



- The display shows the current bath temperature Xp and the current setting. To alter the setting press the key on the left. Available settings from 0,5 to 9,9 °C . (➤ Section 6.4.5.2. Note). (➤ Section 9. Technical data)



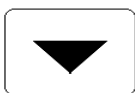
- Display flashes (approx. ca. 4 s).



or



- During this time start to set the required value with one of the two keys.



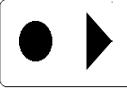
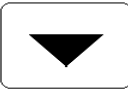
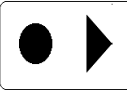

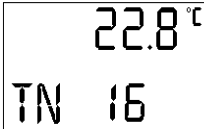
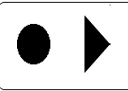
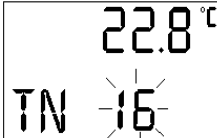


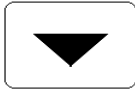


- Forward with the key to "Setting the reset time" **or**



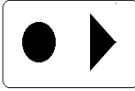

- with the key back to "PARA".

# Starting up

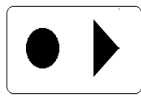
## 6.4.5.2 Setting the reset time of the PID-controller

-  and 4x  
and 2x 
  - Directly from level 0 (setpoint selection), press the key combination on the left (top one on E 3xx, bottom one E 2xx), until the PARA function is reached, then
  
-  and 1x 
  - switch to level 2 and move forward with the keys on the left.
  
-  
  - The display shows the current bath temperature, Tn and the current setting. To alter the setting, press the key on the left.  
→ Possible adjustment from 5 to 60 s
  
- 
  - The display is flashing (approx. 4 s).
  
-  or 
  - During this time, start to set the required value with one of the two keys.
  
- 
  - Forward with the key to "Selection of the interface" or
  
- 
  - with key back to "Setting the proportional band".
  
- 
  - The control parameters are pre-set to suit the unit type. Normally no change is required. Some adjustment is necessary only when using Silicone oil and with very stringent demands on short-term stability. If there are control fluctuations, increase the values for Xp and Tn. If the setpoint is not reached → select smaller values. The derivative time Tv (D-part) is altered automatically through a fixed factor to Tn.  
(Standard settings of control parameters and pump ➤ Section 9. Technical data)

## 6.4.5.3 Selection of the interface

-  and 4x  
and 2x 
  - Directly from level 0 (setpoint selection), press the key combination on the left (top one on E 3xx, bottom one

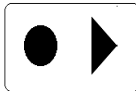
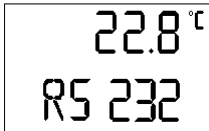
E 2xx), until the PARA function is reached, then



and 2x



- switch to level 2 and move forward with key on the left.



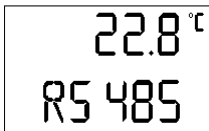
- The display shows the current bath temperature and the currently set interface. To alter the setting press the key.



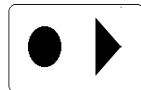
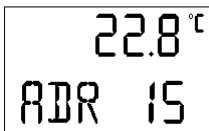
or



- Display flashes (approx. 4 s.). During this time start to set the required interface with one of the keys.



- Having chosen the RS 485 interface press the key.



- The display shows the current bath temperature, ADR and the current unit address (e.g.. 15). Press the key, display flashes (approx. 4 s.).



or



- During this time start to set the required unit address. (possible setting: 000...127)

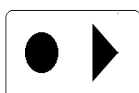


- Forward with key to "Setting the baud rate" or



- back with key to "Selection of the interface" resp. when pressing the key twice you return to "Setting the reset time..."

#### 6.4.5.4 Setting the Baud rate/ transfer rate (serial interface)



and 4x  
and 2x

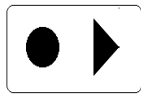


- Directly from level 0 (setpoint selection), press the key combination on the left (top one on E 3xx, bottom one

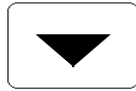
## Starting up

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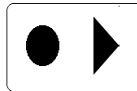
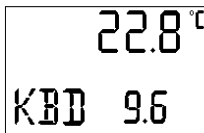
E 2xx), until the PARA function is reached, **then**



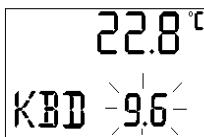
and **3x**



– switch to level 2 and move forward with key on the left.



– The display shows the current bath temperature, KBD and the current setting. To alter the setting press the key.



– Display flashes (approx. 4 s).



or



– During this time, start to set the required value with one of the two keys.

Settings available: 2400, 4800, 9600 or 19200 baud



– Forward with key to "user calibration" **or**



– with key back to "Selection of the interface".

### 6.4.5.5 User calibration

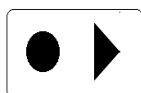


– Remove the external consumers and switch the setting knob of the pump to right side. (>Section 5.4).

– A reference thermometer with necessary accuracy is required. Otherwise the factory calibration should not be altered. The reference thermometer has to be inserted far enough and long enough into the bath.

– It is not allowed to calibrate to more than  $\pm 3$  °C. Multiple calibration to more than  $\pm 3$  °C cause internal faults (after 2 min "E1006" or "e16").

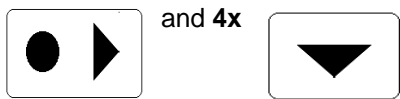
– **The factory calibration will be lost through overwriting → please work carefully!!!**



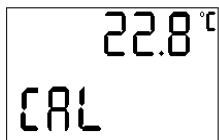
and **4x**  
and **2x**



– Directly from level 0 (setpoint selection), press the key combination on the left (top one on E 3xx, bottom one E 2xx), until the PARA-function is reached, then

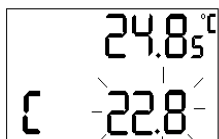
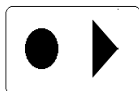


– switch to level 2 and move forward with key on the left.

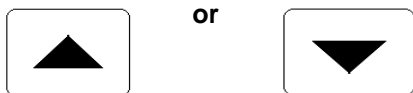


>2,5 s

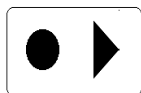
1. The display shows CAL and the current bath temperature. To carry out a calibration, press the key longer than 2.5 s.



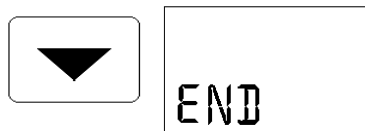
2. The actual value appears.



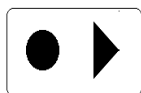
3. Input the value indicated on the reference thermometer with one to the two keys.



4. The additive calibration must be entered with the key shown on the left.



5. Forward with key to "END", then



6. Switch back to level 0 or



7. with key back to "Setting the transfer rate".

## Starting up

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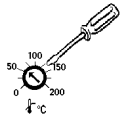
- Example**
- a) Insert a suitable thermometer into the bath (long enough and far enough).
  - b) Remove the external consumers and turn the setting knob of the pump outflows to the right side.
  - c) Set the setpoint to a temperature where you use to work (e.g. set the setpoint to 45°C (≥ Section 6.3.))
  - d) Wait until the actual bath temperature has reached the setpoint temperature of 45°C and until the indication on the reference thermometer does not change any more.
  - e) Remove the reference thermometer, which shows e.g. 44,8 °C.
  - f) Select CAL on the display and go forward as mentioned under point 1-7 (see above). The actual bath temperature switches from 45°C to 44,8°C and the unit starts to heat up until the actual bath temperature has reached 45°C. (→ the reference thermometer should also indicate 45°C).

**6.5 Warning and safety functions**

**6.5.1 Overtemperature protection and testing**



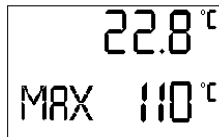
- The units are designed for operation with non-flammable and flammable liquids to EN 61010-2-010!



- Set the overtemperature switch-off point. Recommended setting 5°C above required bath temperature.



- Not higher than 25 °C below the firepoint of the bath liquid (≥ Section 5.3.).



- The actual switch-off point is indicated on the display, e.g. 110°C.



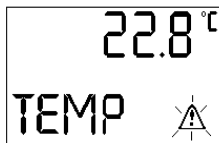
- When the switch-off point is being adjusted by more than 2°C → display shows MAX and actual overtemperature switch-off point with 1°C resolution for approx. 4 s.
- The position of the potentiometer is decisive for the setting. The display is just a help for the setting.
- Setting is possible only up to a upper limit of the operating temperature range + 5 °C.



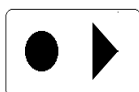
- When the bath temperature arises above the overtemperature switch-off point.

1. Double signal tone sounds.

2. The display shows the indication for overtemperature (TEMP) the fault triangle is flashing  
 → heating is switched off on both poles,  
 → pump is switched off by the electronics



- Rectify the cause of the fault.
- Wait until the bath temperature has cooled down below the switch-off point or set the switch-off point at a higher value. .
- When the display shows TEMP, reset with the key.

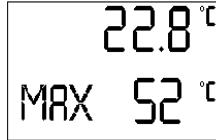
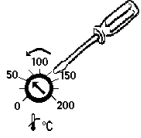


## Starting up

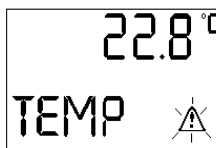
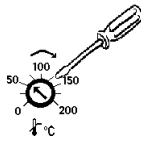
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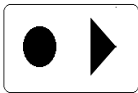
- Before the unit is run is running unattended for longer periods **overtemperature protection** should be tested. **Therefore:**



- Turn the potentiometer slowly anticlockwise. → The unit must switch off at the bath temperature.



- Step 1 - 2 (see above) must follow.
- Set the overtemperature switch-off point again above the bath temperature and wait until the indication TEMP appears on the display, then

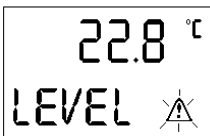


- reset with the key.

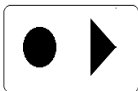
### 6.5.2 Low-level protection and testing



- Double signal tone sounds, if the bath liquid falls so much that the heater is no longer covered with liquid completely.



1. The display shows LEVEL (low-level) and the fault triangle is flashing  
 → heating is switched off on both poles,  
 → pump is switched off by the electronics



2. Top up the bath ➤ Section 5.2 and reset with the key.



- If necessary repeat several times in case that the pump does not purge immediately.
- Testing at regular intervals by lowering the bath level. Place a hose on the pump connector and pump some of the bath liquid into a suitable container.
- Step 1 - 2 must follow.





- Bath temperature during this test not below 0°C or higher than 50°C, otherwise danger of burn injuries !
- If there is any irregularity when testing the safety devices, switch off the unit immediately and pull out the mains plug !
- Have the unit checked by the LAUDA service or the local service organisation!

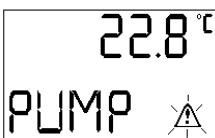
### 6.5.3 Pump motor monitoring



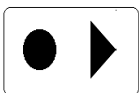
- In case of pump motor overload or a blockage the heating and the pump are switched off.



- Double signal tone sounds.



- The display shows PUMP and the fault triangle is flashing
- Rectify the cause of the fault, i.g. clean the pump or check the viscosity, then

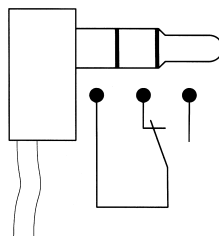


- reset with the key.
- If several faults appear simultaneously, they have to be reset individually

### 6.5.4 Connection floating contact "Combination fault" 31 N

(Alarm out) 3-pole locking connector

1 = common, 2 = n.c. (make) , 3 = n.c. (break). When the unit is o.k. 1 and 3 are closed (see ill.). Max contact rating: 0.2A 24 V. 3-pin plug (≥ Section 10. Accessories).

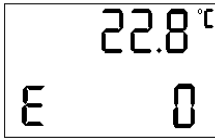


- Contact operates in case of error at overtemperature protection, low-level protection, pump monitoring or any other error message.

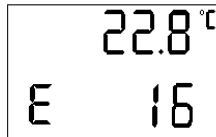
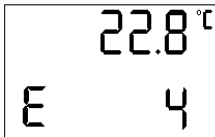
# Starting up

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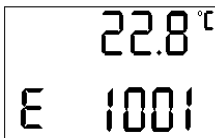
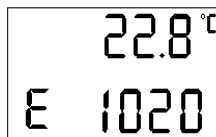
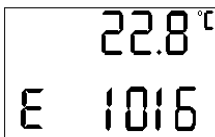
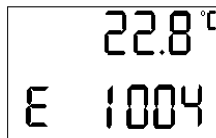
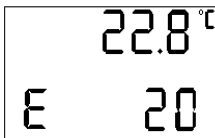
## 6.5.5 Other error messages



– E 0 etc. is flashing in the bottom line.



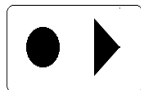
→ various temperature probe faults.



→ pump fault, proceed as in Section 6.5.3.



- If the fault report is repeated → pull out the mains plug and try whether the motor can be rotated by the fan blade inserting a screwdriver into the ventilation opening at the back of the unit.
- Error code 0 ...255 → microprocessor error.
- Error code 1000...1255 → slave processor error.
- Indication can be used for remote diagnosis.



– After rectifying the fault, reset with the key.

## 7 Safety notes

### 7.1 General safety notes

A laboratory thermostat is intended for heating and pumping liquids according to the needs of the user. This leads to hazards by high temperatures, fire, and the general hazards by the use of electrical energy.

The user is largely protected through the application of the appropriate standard specifications.

Additional hazards may arise from the type of material being thermostated, e.g. when going above or below certain temperature levels or through breaking of the container and reaction with the thermostating liquid.

It is not possible to cover all possibilities; they remain largely within the responsibility and the judgement of the user.

The unit must only be used as intended and as described in these Operating Instructions. This includes operation by suitably instructed qualified personnel

The units are not designed for use under medical conditions according to EN 60601-1 or IEC 601-1 !

### 7.2 Other safety notes

- Connect the unit to a grounded mains power socket.
- Parts of the bath cover may reach surface temperatures above 70 °C when operating at higher temperatures. Take care when touching it!
- Use suitable hoses > Section 5.3.
- Protect tubing with hose clips against slipping off. Prevent kinking of tubing!
- Check tubing from time to time for possible material defects.
- Heat transfer tubing and other hot parts must not come into contact with the supply cable!
- When using the thermostat as circulation thermostat, failure of tubing may lead to leaking of hot liquid and become a danger to personnel and objects.
- When no external consumer is connected to the thermostat the pump outflow connection must be closed (use closing plugs) or linked to the return.
- Don't change the pump connections with the connections of the cooling coil!
- Allow for expansion of the bath oil at elevated temperatures


## Safety notes

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- Depending on the bath liquid used and the mode of operation it is possible for toxic vapours to be produced. Ensure appropriate ventilation!
- Immersion thermostats have to be fixed carefully at the bath vessels!
- Only use bath vessels which are appropriate for the intended operating temperatures!
- When changing the bath liquid from water to oil, for temperatures above 100 °C, carefully remove all traces of water, also from tubing and from the external consumer, otherwise → danger of burns through delayed boiling!
- The cooling coil with the cooling water has only to be used for operating temperatures below 100°C. At higher temperatures → danger of hot vapour to be produced!
- Always pull out the mains plug before cleaning, maintenance or moving the thermostat!
- Repairs on the control unit and the refrigeration system must be carried out by properly qualified personnel only!
- Values for temperature control and indicating accuracy apply under normal conditions according to DIN 58966. High-frequency electromagnetic fields may under special conditions lead to unfavourable values. This does not affect the safety.


## 8 Maintenance

### 8.1 Cleaning



Before cleaning the unit, pull out the mains plug!

The unit can be cleaned with water adding a few drops of detergent (washing up liquid), using a moist cloth..




Water must not enter the control unit!



- Carry out appropriate detoxification if dangerous material has been spilled on or inside the unit.
- Method of cleaning and detoxification are decided by the special knowledge of the user. In case of doubt please contact the manufacturer!

### 8.2 Maintenance and repair

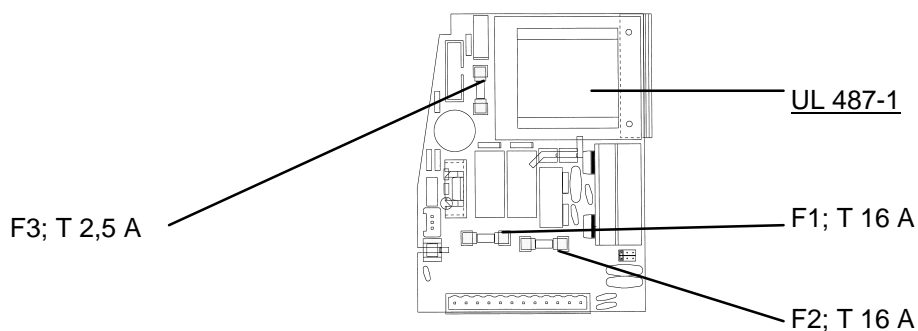


- Before any maintenance and repair work pull out the mains plug!
- Repair on the control unit must only be carried out by properly qualified personnel!

LAUDA thermostats are largely maintenance-free. If the thermostating liquid becomes dirty it has to be replaced (≥ Section 5.2.).



- If a fuse blows (→ supply indication not alight) fit only fuses as specified (2 x T 16 A; 1 x T 2,5 A, size 5 x 20 → fuses are inside the unit).



## 8.3 Ordering spares

When ordering spares please quote instrument type and serial number from the rating label. This avoids queries and supply of incorrect items.

We shall always be happy to deal with queries and to receive suggestions and criticism

**LAUDA DR. R. WOBSE**  
**GMBH & CO.KG**  
P.O. Box 1251  
97912 Lauda-Königshofen  
GERMANY  
Phone: (+49) (0) 9343/ 503-0  
Fax: (+49) (0) 9343/ 503-222  
E-mail [info@lauda.de](mailto:info@lauda.de)  
Internet <http://www.lauda.de>

**9 Technical data(to DIN 58966)**

Common technical data

			<b>E 200</b>	<b>E 300</b>
			types starting with 2	types starting with 3
Ambient temperature range	°C	5 to 40		
Setting resolution	°C	0.1/ 0.01		
Indication resolution	°C	0.05		
Indication accuracy	°C	± 0,2 °C additive re-calibration ②		
Temperature control	± °C	0,01		
Safety features ①		FL		
Additional functions		LCD Display two line	Back light two line LCD-Display, outputs for solenoid valve for controlled cooling and through- flow cooler, programmer	
Power consumption	230 V;50/60 Hz 115 V; 60 Hz 100 V:50/60 Hz	kW	2,3 1,4 1,1	

① FL: suitable for flammable and non-flammable liquids; NFL: only suitable for non-flammable liquids

② > Section 7.2. last item

**Immersion thermostats**

			<b>E 200</b>	<b>E 300</b>
Operating temperature range ①	°C	25 to 200		
" with water cooling	°C	20 to 200		
Operating temperature range ②	°C	-20 to 200		
Interface		RS 232, RS 485	RS 232, RS 485	
Heater power	230 V; 50/60 Hz 115 V; 60 Hz 100 V; 50/60 Hz		2,25 1,3 1,0	
Pump type		pressure pump with choice of 5 output steps		
Max. discharge pressure ③	bar	0.4		
Max. flow rate③	l/min	20		
Pump connections	mm	nipples 13 mm dia.	nipples 13mm dia. (M16x1)	
Bath depth ④	mm	min 150		
Usable depth ④	mm	min 100		
Overall size (WxD)	mm	125x133		
Height (H)	mm	315		
Weight	kg	3		
Ref. No.	230 V; 50/60 Hz 115 V; 60 Hz 100 V; 50/ 60Hz		LCE 0222 LCE 4222 LCE 6222	LCE 0223 LCE 4223 LCE 6223

① at pump output step 1

② with additional cooling

③ at pump output step 5

④ baths > section 10. Accessories

## Technical data

### Bath/Circulation thermostats

			E 203	E 211	E 219	E 225
Operating temperature range ①		0	23 to 150			
"with water cooling		°C	20 to 150			
Operating temperature range ②		°C	-20 to 150			
Heater power	230 V; 50/60 Hz	kW	2.25			
	115 V; 60 Hz		1,3			
	100 V; 50/60 Hz		1,0			
Pump type			pressure pump with choice of 5 output steps			
Max. discharge pressure ③		bar	0.4			
Max. flow rate ③		l/min	17			
Pump connections		mm	nipples 13 mm dia.			
Max. bath volume		l	3.5	12	18	25
Bath			deep-drawn inner vessel, steel casing painted			
Bath opening (WxD)		mm	135x105	300x190	300x365	300x365
Bath depth ④		mm	150	150	150	200
Usable depth ④		mm	130	130	130	180
Height top edge of bath		mm	178	178	178	228
Overall size (WxD)		mm	168x271	331x360	331x536	331x536
Height		mm	349	349	349	399
Weight		kg	6	9	10	12
Ref. No.	230 V; 50/60 Hz		LCB 0692	LCB 0694	LCB 0696	LCB 0698
	115 V; 60 Hz		LCB 4692	LCB 4694	LCB 4696	LCB 4698
	100 V; 50/ 60Hz		LCB 6692	LCB 6694	LCB 6696	LCB 6698

			E 206 T	E 212 T	E 215 T	E 220 T
Operating temperature range ①		°C	23 to 100			
" with water cooling		°C	20 to 100			
Operating temperature range ②		°C	-20 to 100			
Heater power	230 V; 50/60 Hz	kW	2.25			
	115 V; 60 Hz		1,3			
	100 V; 50/60 Hz		1,0			
Pump type			pressure pump with choice of 5 output steps			
Max. discharge pressure ③		bar	0.4			
Max. flow rate ③		l/min	17			
Pump connections		mm	nipples 13 mm dia.			
Max. bath volume		l	7	13	15	20
Baths			polycarbonate			
Bath opening (WxD)		mm	130x285	300x175	275x130	300x350
Bath depth ④		mm	160	160	310	160
Usable depth ④		mm	140	140	290	140
Height top edge of bath		mm	170	208	356	208
Overall size (WxD)		mm	145x435	316x330	428x142	316x506
Height		mm	330	369	517	369
Weight		kg	4	7	6	8
Ref. No.	230 V; 50/60 Hz		LCM 0092	LCD 0262	LCD 0264	LCD 0266
	115 V; 60 Hz		LCM 4092	LCM 4262	LCM 4264	LCM 4266
	100 V; 50/ 60Hz		LCM 6092	LCM 6262	LCM 6264	LCM 6266

① at pump output step 1

② with additional cooling

③ at pump output step 5

④ baths > section 10. Accessories



**Bath/Circulation thermostats**

			<b>E 306</b>	<b>E 312</b>	<b>E 320</b>	<b>E 326</b>
Operating temperature range ①		°C	25 to 200	23 to 200		
“ with water cooling		°C	20 to 200	20 to 200		
Operating temperature range ②		°C	-20 to 200	-20 to 200		
Heater power	230 V; 50/60 Hz 115 V; 60 Hz 100 V; 50/60 Hz	kW	2,25 1,3 1,0			
Pump type			pressure pump with choice of 5 output steps			
Max. discharge pressure ③		bar	0.4			
Max. flow rate ③		l/min	17			
Pump connections		mm	nipples 13 mm dia (M16x1)			
Max. bath volume		l	5.5	13	20	26
Baths			insulated bath, drain cock and grips			
Bath opening (WxD)		mm	150x130	300x175	300x350	300x350
Bath depth ④		mm	160	160	160	200
Usable depth ④		mm	140	140	140	180
Height top edge of bath		mm	203	203	203	243
Overall size (WxD)		mm	200x310	350x355	350x530	350x530
Height		mm	364	364	364	404
Weight		kg	7	11	13	15
Ref. No.	230 V; 50/60 Hz		<b>LCB 0699</b>	<b>LCB 0700</b>	<b>LCB 0701</b>	<b>LCB 0702</b>
	115 V; 60 Hz		<b>LCB 4699</b>	<b>LCB 4700</b>	<b>LCB 4701</b>	<b>LCB 4702</b>
	100 V; 50/ 60Hz		<b>LCB 6699</b>	<b>LCB 6700</b>	<b>LCB 6701</b>	<b>LCB 6702</b>

①at pump output step 1

②with additional cooling

③at pump output step 5

④Baths > Section 10. Accessories

**Units to EU-Directive 89/ 336/ EWG (EMC) and 73/ 23/ EWG (low-voltage) with CE-mark.**

Standard settings of control parameters > Section 6.4.5.1. and 6.4.5.2. and 6.4.2.

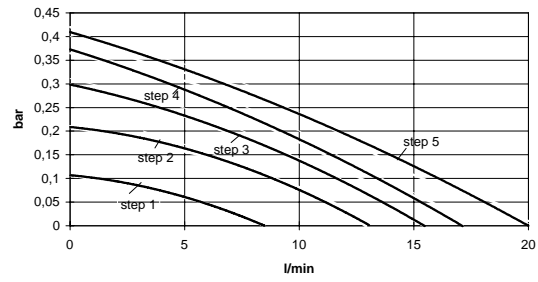
<b>Equipment types</b>	<b>Xp ( °C )</b>	<b>Tn ( s )</b>	<b>Pump output step</b>
E 200, 300	3,0	30	2
E 203	6,0	20	1
E 211, E 212 T, E 306, E 312	2,5	25	2
E 206 T	4,0	25	2
E 215 T	2,0	25	3
E 219	2,0	30	3
E 225, E 220 T, E 320	2,0	30	4
E 326	2,0	30	5

**We reserve the right to make technical alterations!**

## Pump characteristics

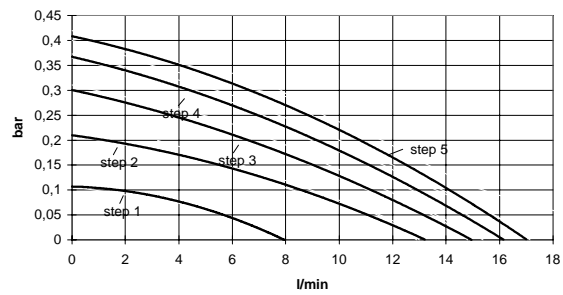
### Immersion thermostats

measured with water



### Bath/ Circulation thermostats

measured with water



## 10 Accessories

### Immersion thermostats

Accessories	Ref. No.
Cooling coil	HOK 064
Pump set (outflow and return connection)	LCZ 0638
Fixing rod	LCZ 0637

Bath	Materials	Max. Temp (°C)	Volume (l)	Inner size (WxDxH)	Ref. No.
006 T	polycarbonate	100	5 to 7	130x420x160 *	LCZ 0628
015 T	polycarbonate	100	10 to 5	416x130x310	LCZ 0630
020 T	polycarbonate	100	14 to 20	300x490x160	LCZ 0631
012 T	polycarbonate	100	9 to 13	300x315x160	LCZ 0629
003	deep-drawn stainless steel	150	2.5 to .3.5	135x240x150 *	LCZ 0620
011	deep-drawn stainless steel	150	9 to 12	300x329x150 *	LCZ 0621
019	deep-drawn stainless steel	150	12 to 18	300x505x150 *	LCZ 0622
025	deep-drawn stainless steel	150	19 to 25	300x505x200 *	LCZ 0623
006	stainless steel	200	3.5 to 5.5	150x260x160	LCZ 0624
012	stainless steel	200	8 to 13	300x305x160	LCZ 0625
020	stainless steel	200	13. to 20	300x480x160	LCZ 0626
026	stainless steel	200	19 to 26	300x480x200	LCZ 0627
040	stainless steel	200	30 to 40	300x750x200	LCZ 029

## Accessories

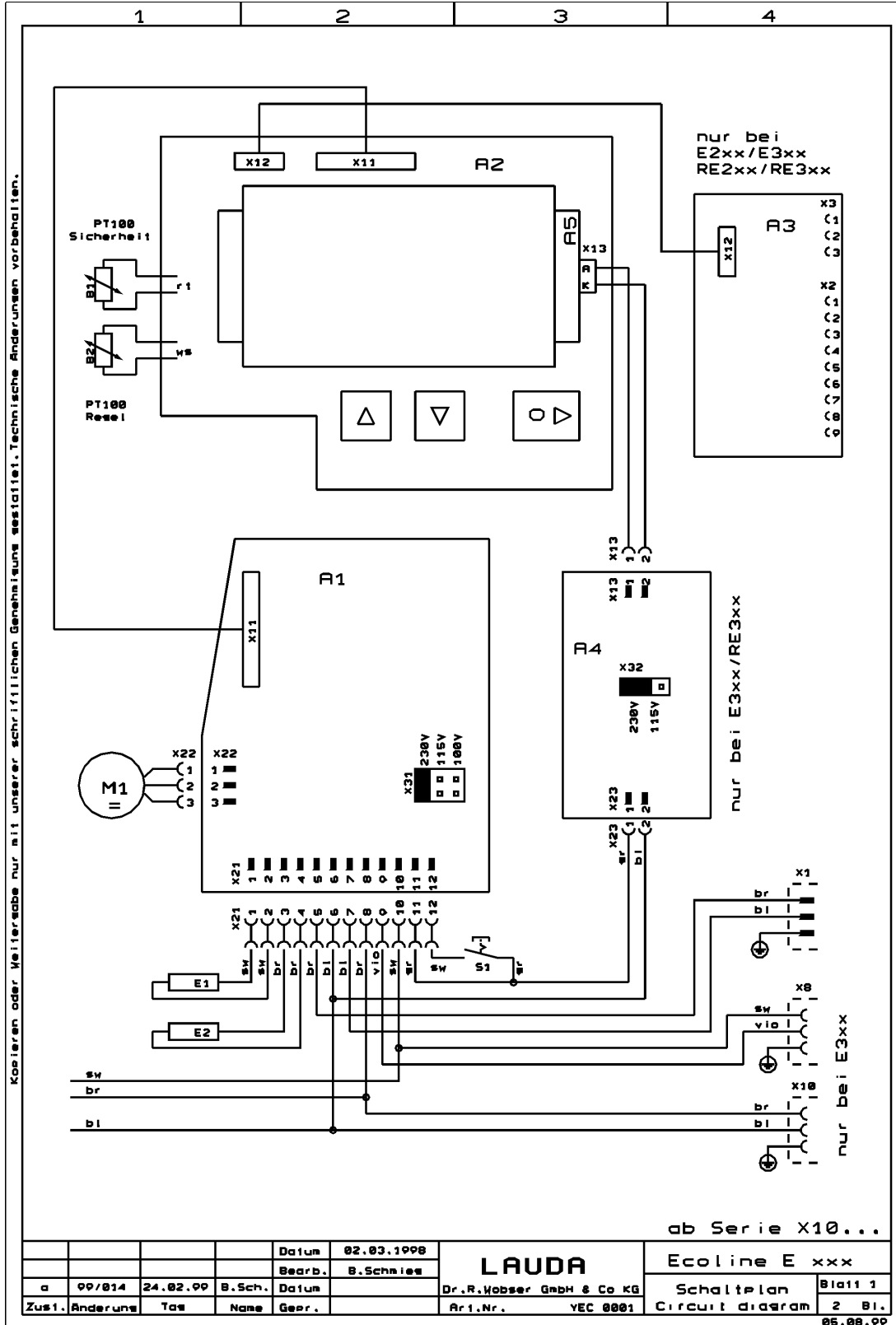
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### Bath / Circulation thermostats

<b>Accessories</b>	<b>suitable for</b>	<b>Ref. No.</b>
Bath cover	E 211	HDQ 079
Bath cover two parts	E 219, E 225	LCZ 0632
Gable cover	E 220 T, E 320, E 326	LCZ 011
Gable cover	E 219, E 225	LCZ 0634
Cover plate MD 15 K	E 215 T	LSZ 0115
Cover plate MD 15 V	E 215 T	LCZ 041
Cover plate MD 15 V/K	E 215 T	LCZ 040
Rising platform 8 steps	E 203	LCZ 0645
Rising platform 8 steps	E 206 T	LCZ 0648
Rising platform 8 steps	E 212 T, E 211, E 312, E 120 T, E 220 T, E 219, E 225, E 320, E 326	LCZ 0635
Pump short circuit	E 300	LZM 044
Through-flow cooler DLK 10 to -10 °C		LFD 005
Through-flow cooler DLK 25 to -30 °C		LFD 108
Countersocket for mains supply outlet 34 H (Types E 3xx)		EQS 045
3-pole locking connector (floating contact „Combination fault“ 31 N)		EQS 054
Set of solenoid valves (mains supply outlet 19 H; 230 V; 50/60 Hz)		UD 437
Wintherm Software under Windows	for all units	LDSE 4001

For further information please contact us.

11 Circuit diagram



# Circuit diagram

230V; 50Hz ◆ 230V; 50/60Hz ◆ [230V; 60Hz]

at serial no: X01

	<b>E 1xx</b>	<b>E 2xx</b>	<b>E 3xx</b>
A 1 Printed circuit board „Mains“	UL 487-1	UL 487-1	UL 487-1
A 2 Printed circuit board „Display“	UL 488-1A	UL 488-1B	UL 488-1C
A 3 Printed circuit board serial interface RS 232/RS 485	-----	UL 490	UL 490
A 4 Printed circuit board Mains LED-Backlight	-----	-----	UL 492
A 5 Printed circuit board Display LED-Backlight	-----	-----	EAO 015
B 1 Pt100 probe safety circuit	ETP 057	ETP 057	ETP 057
B 2 Pt100 probe actual value			
E 1 Heater 1,5 kW	EH 168	-----	-----
E 2 Heater 2,25 kW	-----	EH 169	EH 169
M 1 Pump motor	EM 109	EM 109	EM 109
S 1 Mains switch	EST 101	EST 101	EST 101
U 3 SSR (BRT22H) Y 1 output A1	-----	EYI 158	-----
X 1 Mains connection	EKN 001	EKN 001	EKN 001
X 2 Lock screw	-----	2x EQZ 048	2x EQZ 048
X 8 Connection socket Cooling (Stakei 2)	-----	-----	EQK 004
			EQZ 006
X 10 Connection socket Cooling unit (Stakei 200)	-----	-----	EQD 037
			EQZ 006
X 13 Housing 2pol.	-----	-----	EQF 067
X 21 Plug strip terminal 12pol.	EQF 079	EQF 079	EQF 079
X 23 Line up terminal 2pol.	-----	-----	EZK 063

115V; 60Hz ◆ [100V; 50/60Hz]

at serial no: X01

	<b>E 1xx</b>	<b>E 2xx</b>	<b>E 3xx</b>
A 1 Printed circuit board „Mains“	UL 499	UL 499	UL 499
A 2 Printed circuit board „Display“	UL 488-1A	UL 488-1B	UL 488-1C
A 3 Printed circuit board serial interface RS 232/RS 485	-----	UL 490	UL 490
A 4 Printed circuit board Mains LED-Backlight	-----	-----	UL 492
A 5 Printed circuit board Display LED-Backlight	-----	-----	EAO 015
B 1 Pt100 probe safety circuit	ETP 057	ETP 057	ETP 057
B 2 Pt100 probe actual value			
E 1 Heater 1,3 kW at 115V 1,0 kW at 100V	EH 171	EH 171	EH 171
M 1 Pump motor	EM 109	EM 109	EM 109
S 1 Mains switch	EST 101	EST 101	EST 101
U 3 SSR (BRT22H) Y 1 output A1	-----	EYI 158	-----
X 1 Mains connection	EKN 003	EKN 003	EKN 003
X 2 Lock screw	-----	2x EQZ 048	2x EQZ 048
X 8 Connection socket Cooling (Stakei 2)	-----	-----	EQK 004
			EQZ 006
X 10 Connection socket Cooling unit (Stakei 200)	-----	-----	EQD 037
			EQZ 006
X 13 Housing 2pol.	-----	-----	EQF 067
X 21 Plug strip terminal 12pol.	EQF 079	EQF 079	EQF 079
X 23 Line up terminal 2pol.	-----	-----	EZK 063

**An / To / A:**

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

**Von / From / De :**

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

Straße / Street / Rue: \_\_\_\_\_

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

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

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

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

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

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

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

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

mit folgendem Medium betrieben wurde

was used with the below mentioned media

a été utilisé avec le liquide suivant

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

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

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

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

Formblatt / Form / Formulaire:

Unbedenk.doc

Erstellt / published / établi:

LSC

Änd.-Stand / config-level / Version:

0.1

Datum / date:

30.10.1998

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