Operating Instructions

Ecoline

Low-temperature thermostats
RE 204, RE 206, RE 207, RE 212, RE 220
RE 306, RE 307, RE 312, RE 320

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From Series X01
Software version 3.1
3/99
YACE0060

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.

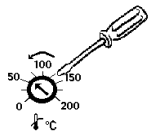
1 Brief operating instructions

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.)

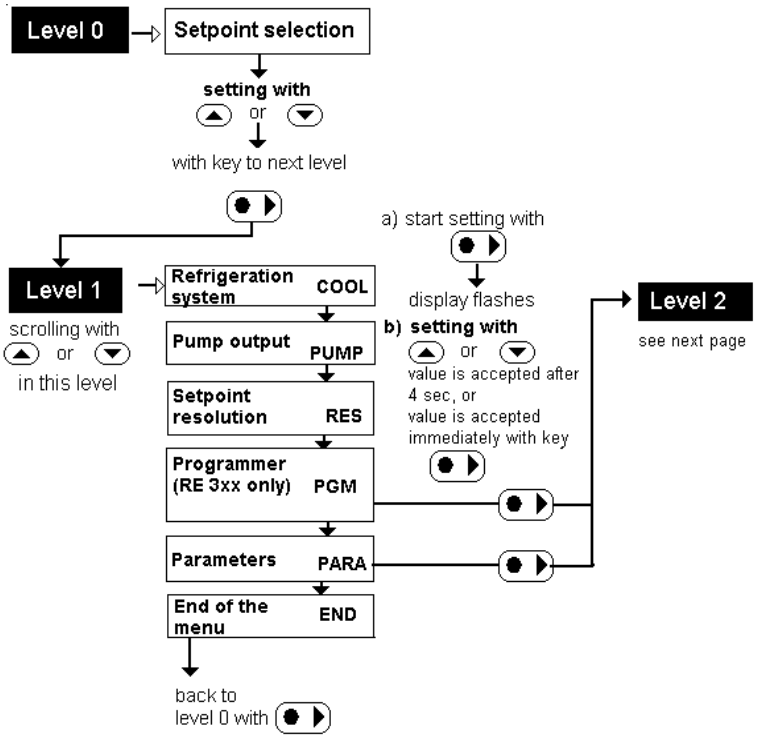
3. Connect the unit only to a socket with a protective earth (PE) connection.
   Compare the information on the rating label with the supply details.

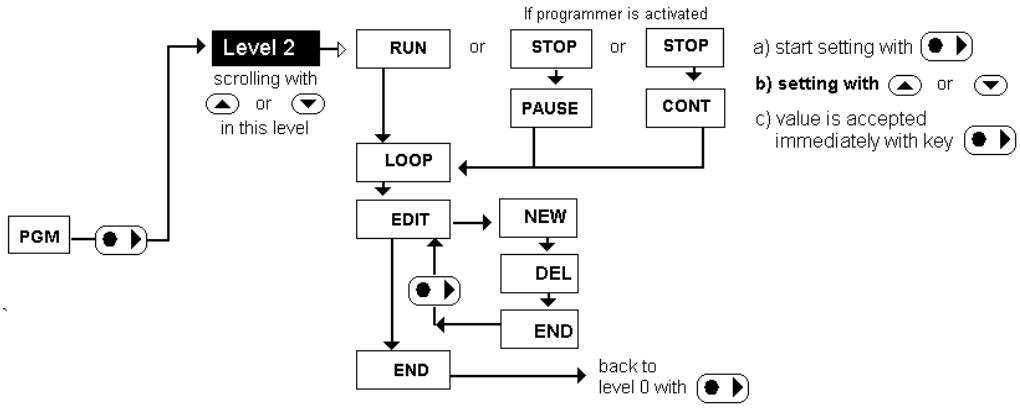
4. 

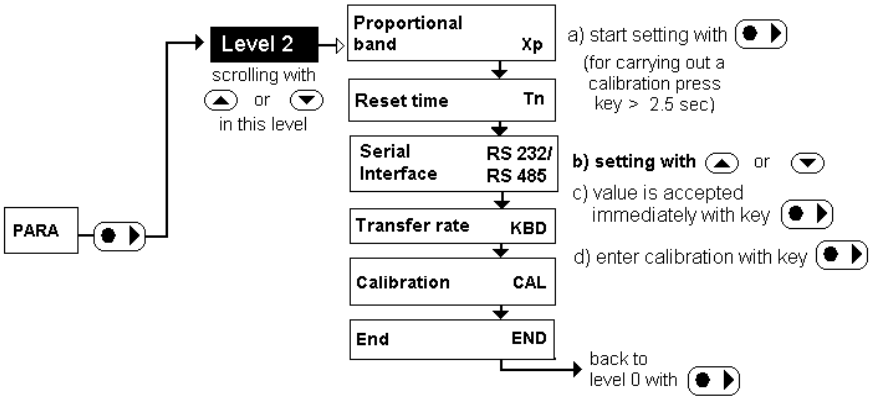
   Using a screwdriver, set the overtemperature cut-out point to a value clearly above ambient temperature (⩥ Section 6.5.1.).

5. Switch on at the mains switch

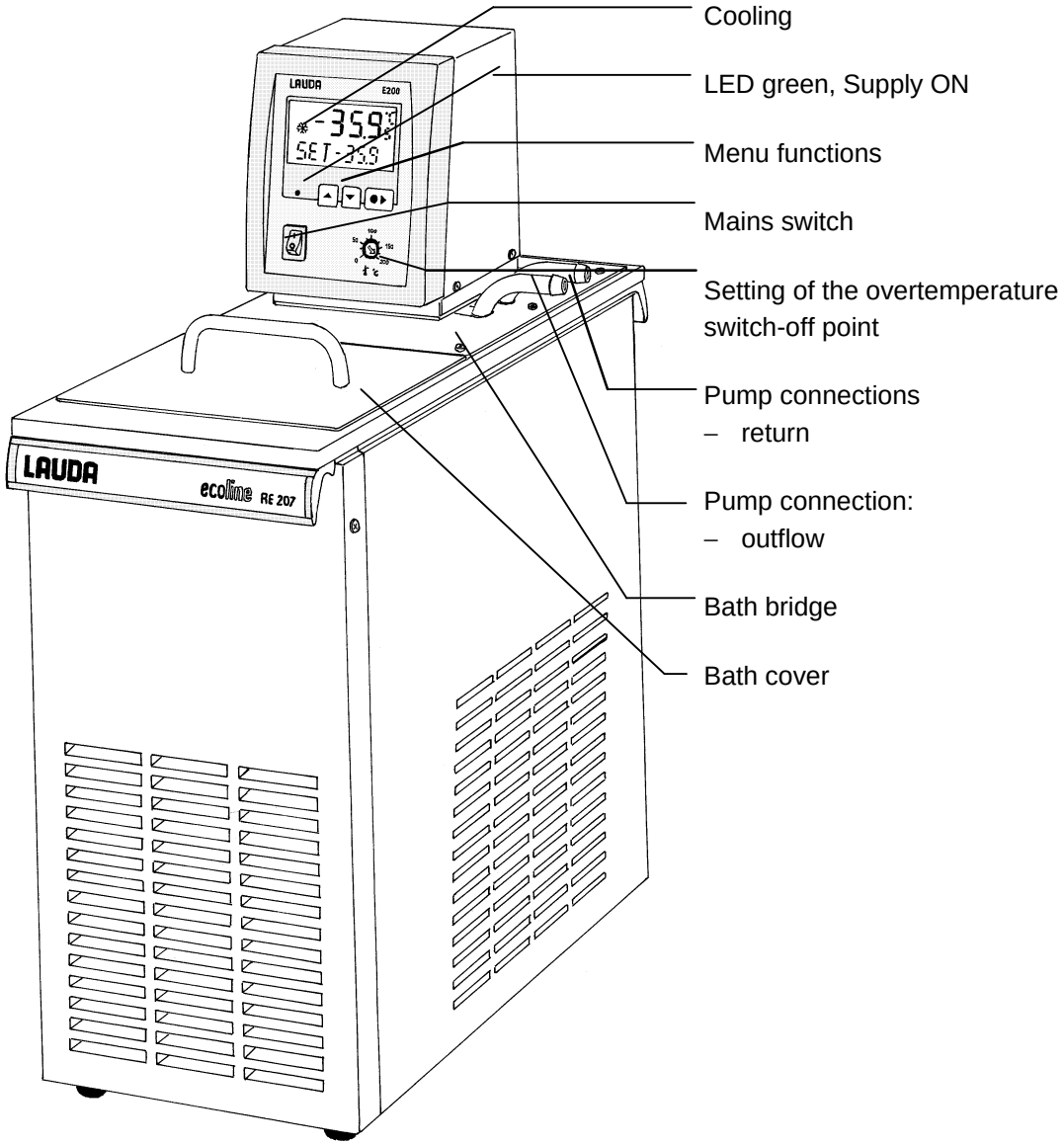
6. Setting of the functions




If programmer is activated
Level 2
scrolling with
or
in this level
RUN
or
STOP
or
STOP
PAUSE
CONT
a) start setting with
b) setting with
or
c) value is accepted
immediately with key
LOOP
PGM
EDIT
NEW
DEL
END
END
back to
level 0 with


Level 2
scrolling with
or
in this level
Proportional band Xp
Reset time Tn
Serial Interface RS 232/ RS 485
Transfer rate KBD
Calibration CAL
End END
PARA
a) start setting with
(for carrying out a calibration press key > 2.5 sec)
b) setting with
or
c) value is accepted
immediately with key
d) enter calibration with key
back to
level 0 with

2 Control and functional elements



3 Unit description

3.1 Unit types

The type designation of the Ecoline low-temperature thermostats consists of the letter R (identification as low-temperature unit), the control unit E 200 or E 300, and the type of bath and refrigeration system

Example: Control unit E 200 and bath RE 004 produces Thermostat Type RE 204.

Type RE 220 is supplied without bath cover. A bath cover is available as accessory.
(⩾ Section 10. Accessories).

3.2 Pumps

All units are equipped with a pressure pump with vario drive. The pump has an outflow with a rotatable discharge elbow. An additional outflow provides circulation inside the bath.
By turning the setting knob it is possible to choose between both outlets or to divide the flows.

The pump ca n be used up to viscosities of 150 mm²/s however, to get an optimum accuracy of control a viscosity of 30 mm²/s is recommended.

One of five pump output steps can be selected using the operating menu.
On small low-temperature thermostats (e.g. RE 204 or RE 306) and with operation as bath thermostat it is advisable to use output step 2. The advantage is a low heat generation while having a uniform circulation, that means, that the thermostat 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 rate 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 RE 3xx are fitted with M 16x1 nipples.

The pump connection outflow 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 equipped with a 2-line LCD-Display with additional symbols for indicating bath temperature and settings as well as operating states. On RE 3xx-Types the display has back-lightning. The input of the setpoint and other additional adjustments are done using either two or three keys.

Remote operation is possible via an electrically 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 protection switches off the heating on both poles in order to prevent dry operation of the heater. The pump is switched off electronically. The overtemperature switch-off point 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 in case of a 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.

3.4 Programmer (Types RE 3xx only)

Types RE 3xx incorporate a programmer which can be used to run temperature programs 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, PPS plastics and fluoride rubber.

3.6 Refrigeration system

The refrigeration system consists essentially of a hermetically sealed compressor. Heat of condensation and motor heat are dissipated by a fan-cooled finned condenser. Fresh air is drawn in at the front of the unit, warmed air is discharged at the back and to the sides. The ventilation openings must not be restricted in order to ensure proper air circulation.

At working temperatures below approx. 30 °C the refrigeration system operates continuously to remove a certain amount of heat, with the heater acting in opposition to provide automatically controlled heating power.

The compressors are fitted with a temperature monitor which responds both to the compressor temperature and to the motor current. In addition the cooling system is protected against excessive pressure by a pressure monitor. The refrigeration unit is switched on either automatically or manually through the operating menu .(⩾ Section 6.4.1.).

Types RE 207, RE 212, RE 220 as well as RE 307, RE 312 and RE 320 are additionally provided with a cooling capacity adjustment which saves energy in many operating situations, reduces the load on the refrigeration system and produces a better temperature control. This feature, too, can be operated either automatically or manually.

Cooling curves (⩾ Section 9. Technical data)

3.7 Serial Interfaces RS 232, RS 485

3.7.1 Specification and interface test

Computer					Thermostat		
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!

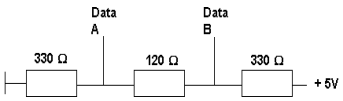
② without Hardware Handshake: The computer needs an operating mode: ”without hardware handshake”. In the plug of the thermostat a bridge has to be inserted between Pin 7 and 8.

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 programme "Terminal" and on Windows 95 with the programme "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).

3.7.2 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 3.7.1.)

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 3.7.3.).
  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 3.7.4.)

3.7.3 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 "0" = OFF, "1" = ON, "2" = ON 50 % (reduced capacity RE 207, 212, 220, 307, 312, 320 only) , "3" = Automatic operation
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 programme
RMP_RESET	Deleting the programme (all segments)
RMP_OUT_00_XXX.XX_XXX.XX	Programmer segments (max. 20) (temperature, time)
RMP_OUT_02_XXX.XX	Number of programme running: 0...255, 0= infinite

- 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				

3.7.4 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 “0“ = OFF, "1" = ON, “2“ = ON 50 % (reduced capacity RE 207, 212, 220, 307, 312, 320 only) , "3" = Automatic operation
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 ①
IN_ERR_01	fault diagnosis microcontroller 2 ①
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 programme 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 programme running (pre-set)
RMP_IN_03	Request to indicate the current programme running

① ⩾Section 6.5.5. Other error messages

3.7.5 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

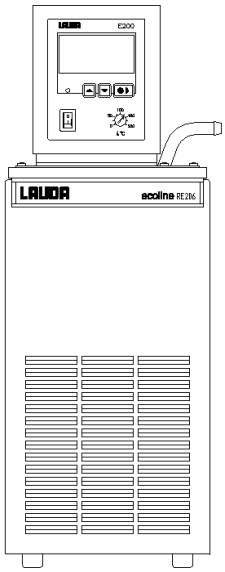
After the unit and accessories have been unpacked they have to be examined for possible transport damage. If there is any damage visible on the unit, the forwarding agent or the post office has to be notified so that the shipment can be examined.

Standard accessories:

Bath cover	on all low-temperature thermostats except RE 220
13 mm dia. nipple union nuts (M16x1)	on all types RE 3xx
Closing plugs	on all low-temperature thermostats
Warning label	on all low-temperature thermostats
Operating Instructions	on all low-temperature thermostats

5 Preparations

5.1 Assembly and setting up

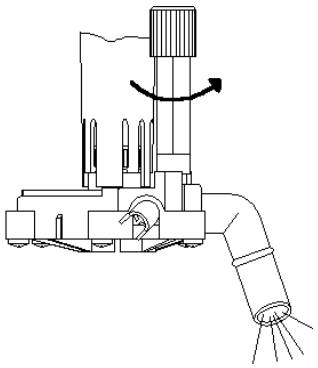


- Place the unit on a flat surface
- After transport and before starting up, store it standing in upright position for two hours if possible
- Do not cover the ventilation openings at the back of the unit and its lower part.
  Keep clear distance of at least 40 cm.
- Adjust the pump setting knob so that when using the unit as bath thermostat (no external circulation) the flow emerges at the opening for the bath circulation, or link together the pump connections.
  (See ill. 3).

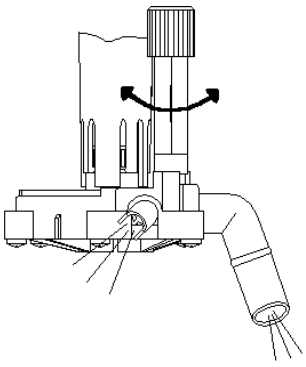
Operation with external consumer (circulation thermostat) (≥Section 5.4.)

Adjustments of the pump outflows

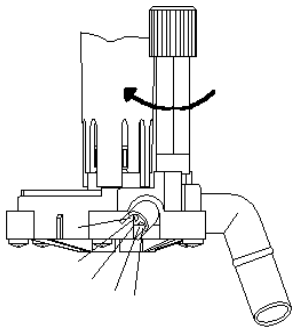
Ill 1
Pump setting knob turned anticlockwise



Ill 1
Pump setting knob medium position



Ill 3.
Pump setting knob turned clockwise

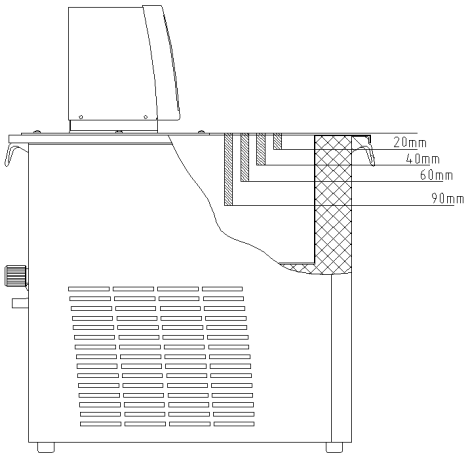


- When operating as bath thermostat without external consumer the pump connection outflow has to be closed (use closing plugs) or linked to the return.
- At bath temperature above 70°C the label supplied must be affixed on the bath in a clearly visible position!

- The unit can be operated safely up to an ambient temperature of 40°C
- Depending on the loading of the refrigeration system it may switch off temporarily especially at ambient temperatures above 35°C. Elevated ambient temperatures also result in reduced cooling capacity.
- When starting up the refrigeration system after it has been cut of operation for longer time it may take up to 30 min, depending on ambient temperature and unit type, before the nominal cooling capacity is reached.

5.2 Filling and emptying

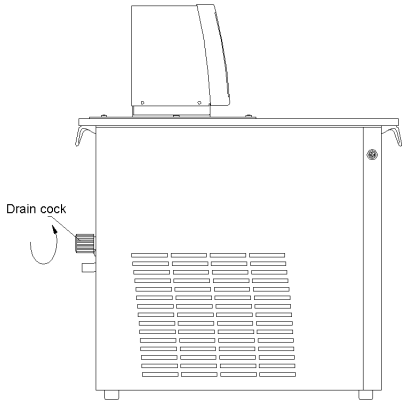
Filling



- Close the drain cock.
- 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 approx. 90 mm below the bath bridge!

- When using thermal oils it is necessary to allow for 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!

b) Drain the bath liquid through the drain cock
→ using tubing.

– 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 of used thermostating liquid.

– When connecting an external consumer take care that the level of the bath liquid does not decrease too much → fill in bath liquid if necessary.

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

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	from °C to °C	at 20°C	mm²/s	mm²/s		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 densiometer.

- 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

DIN Safety data sheets are available on request!

Hose connections

a) Elastomer tubing

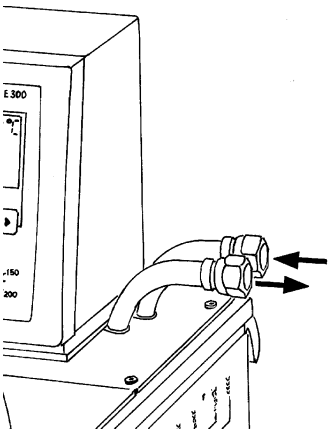
Tubing type	Int. dia. Ø mm	Temperature range °C	Application	Ref. No.
Perbunan tubing, uninsulated	9	0 to 120	for all bath liquids	RKJ 011
Perbunan tubing, uninsulated	12	-0 to 120	for all bath liquids	RKJ 012
Perbunan tubing insulated	12 ext. dia. 35mm approx.	-60 to 120	for all bath liquids	LZS 008
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

- Silicone oil causes pronounced swelling of Silicone rubber → never use Silicone oil with Silicone tubing!
- Protect tubing with hose clips against slipping off.

b) Metal hoses for Types RE 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	**LZM 040**
MC 100	100	"	**LZM 041**
MC 150	150	"	**LZM 042**
MC 200	200	"	**LZM 043**
Pump connection link	20	"	**LZM 044**
MK 50	50	with foam insulation for low temperatures	**LZM 052**
MK 100	100	"	**LZM 053**
MK 150	150	"	**LZM 054**
MK 200	200	"	**LZM 055**
Pump connection link	20	"	**LZM 045**

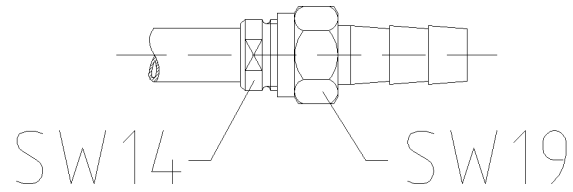
5.4 Connection of external circuits



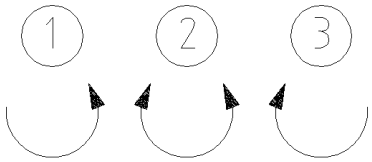
Operation as circulation thermostat

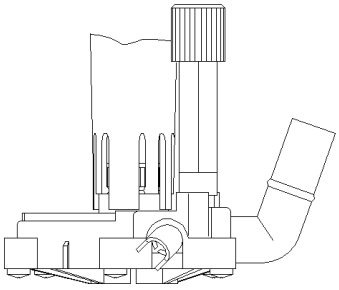
- Connect 11-12 mm int. dia. tubing (for Types RE 3xx use metal hoses) (⩥ Section 5.3.) to the pump connector
- Pump connection outflow always in front, return connection always at the back.

- 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 RE 3xx, when tightening the union nut hold on to the pump nipple with a SW 14 spanner (see ill.)!



- 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 pump connection outflow must be closed (use closing plugs) or linked to the return!





- 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 (setting knob turned anticlockwise).
- Position ②→ flow passes through pump outflow and outlet for bath circulation (setting knob in medium position).
- Position ③ → external circuit is closed and the outlet for bath circulation fully open (setting knob turned clockwise).

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

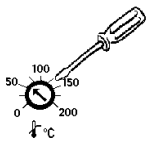
6 Starting up

6.1 Connection to the supply

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

- Connect the unit only to a grounded mains power socket (PE).
- No warranty when the thermostat is connected to a wrong supply!
- Without external circuit ensure that the pump pressure outflow is closed or linked to the pump return.
- Ensure that the unit is filled in accordance with Section 5.2.!

6.2 Switching on

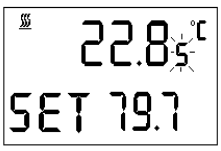


- Using a screwdriver. Set the overtemperature switch-off point to a value clearly above ambient temperature.

- Switch on at the mains switch.
  The green LED for "Supply ON" lights up.

0,25s

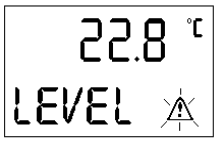
- A tone sounds for approx. 0,25 s.
- The unit self-test starts up. All display segments and symbols light up for approx. 1 s. Then the software version is indicated for approx. 1 s.



- Display shows the actual bath temperature (above) (resolution 0,05 °) and of the setpoint. The pump starts up. The values which were active before switching off are used.

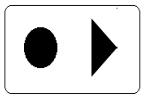
- If necessary add more bath liquid to replace the amount pumped out to the external circuit.
- If the pump does not purge the system immediately. The unit may switch off again although it is filled sufficiently (only when starting up for the first time).

– A double signal tone sounds.



– The display for LEVEL (low-level) appears.

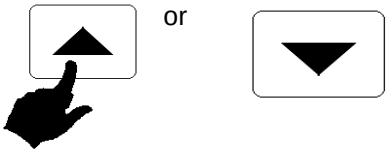
– The fault triangle is flashing



– 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)

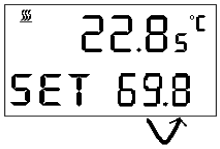


– Input the setpoint with one of the keys.

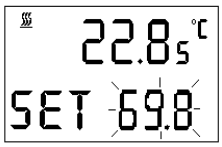
– Speeding the setting process by:

  a) continuous pressing the keys or

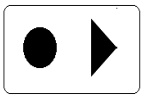
  b) pressing one key (holding it down) and shortly pressing the other key.



– Briefly releasing (1 s) the key (s) and again pressing one of the keys moves the cursor one place to the right.



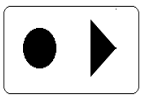
– Display flashes 4 s → the new value is accepted automatically, or



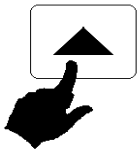
– Value is entered immediately with this key.

– 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

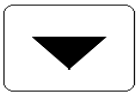
6.4 Menu functions



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

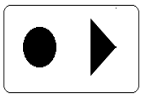


or



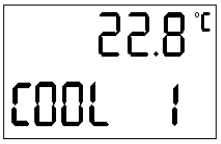
– Within one level it is possible to scroll using the keys.

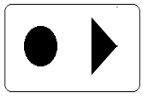
– **In principle**, after each setting has been made it is entered automatically after approx. 4 s or



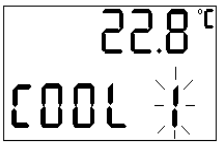
– Settings are entered immediately on operating this key

6.4.1 **Refrigeration system** (level 1)



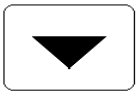


– The display shows the current bath temperature, COOL and the set operating mode. To alter the setting, press the key on the left.

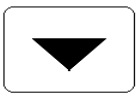


– The display flashes (approx. 4 s). During this time start to set the operating mode with one of the keys.

or



0 = Refrigeration system OFF
1 = Refrigeration system ON 100 % capacity
2 = Refrigeration ON, 50% capacity (only RE 207, 212, 220, 307, 312, 320)
A = automatic operation (≥ Section 3.6.)

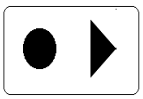


– Forward with key to "pump output" or

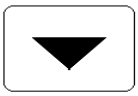
– with key back to level 0 (setpoint input).

– The refrigeration system can normally work with automatic operation = A.
The refrigeration system switches on or off depending on the temperature and operation status.
– In special cases the cooling machine can be switched off → ”0” or adjusted at permanent running → ”I”.

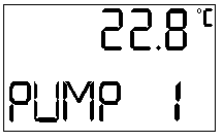
6.4.2 Pump output

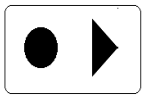

and **1x**

– For setting the pump output from level 0 press the key combination shown on the left, or

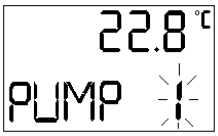


– move forward from COOL function with this key





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

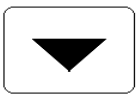


– Display flashes (approx. 4 s).

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

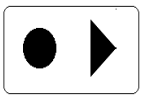
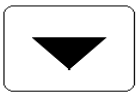
– The pump responds immediately (can be heard). (Setting is entered after approx. 4 s ⩾ Section 6.4.)



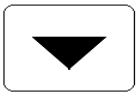
– Move forward with key to "Selecting the setpoint resolution" or

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

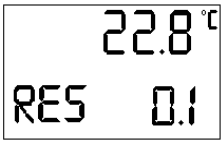
6.4.3 Setting the setpoint resolution

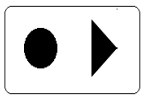

and **2x**


– To set the setpoint resolution from level 0 press the key combination on the left



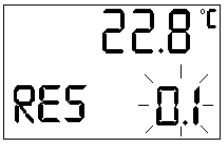
– move forward with the key from the PUMP-function.





– 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).

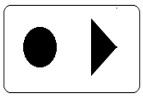
or

– During this time, start to set the required resolution with one of the two keys.
0,1 = 0,1 °C setpoint resolution, normal setting
0,01 = 0,01 °C setpoint resolution. During setpoint input only S is indicated instead of SET.

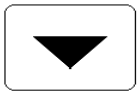
– Forward with the key to "parameter level" (RE 2xx only) or to "programmer" (RE 3xx only) or

– with key back to "PUMP“.

6.4.4 Programmer (Types RE 3xx only)



and **3x**

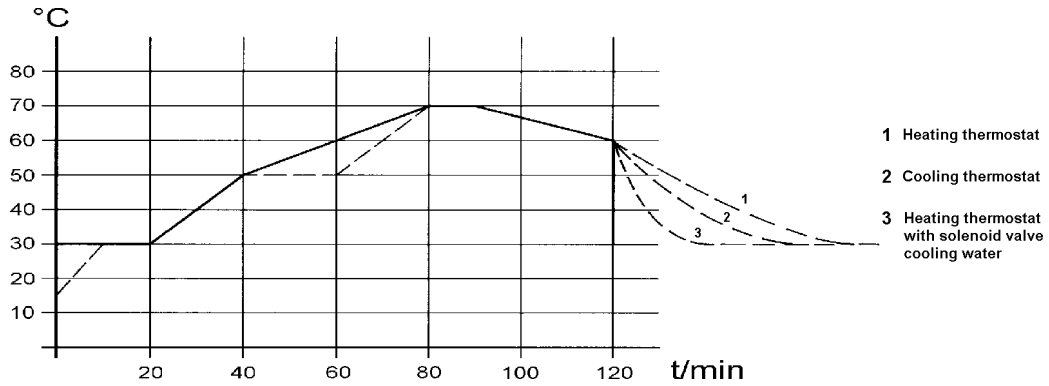


– To view or to set the programmer, starting from level 0 (setpoint input) press the key combination on the left, or

– from RES function scroll with this key.

– The display shows PGM (programmer). Data for up to 20 programme segments can be input there.

6.4.4.1 Programme example



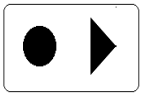
Segment	1	2	3	4	5	6	7
Temperature	30,0	50,0	70,0	70,0	60,0	30,0	
Time	20	20	40	10	30	0	

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

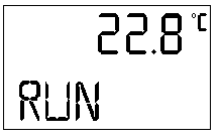
① A new segment has been inserted after segment No. 2 (≥ Section 6.4.4.5.)

② The time at segment No. 3 has been altered (≥ Section 6.4.4.2.)

6.4.4.2 Indicating/ altering of programme segments

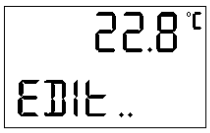


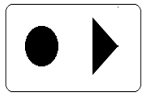
– When PGM appears on the display (therefore proceed as described in 6.4.4.) press the key on the left.



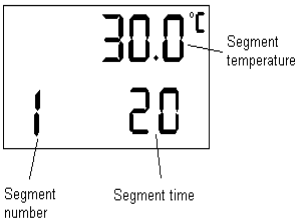
– The display shows RUN. Here the programmer can be started (⩾ Section 6.4.4.4.)

– Forward with key until EDIT appears..





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



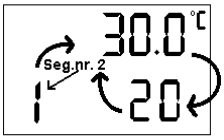
– The display indicates 3 variables: segment number (a), segment end temperature (b) and segment time (c).

– **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.

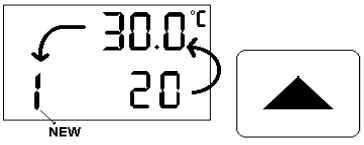
– When having deleted the programme example the variables on the display show 0. Before altering the segments it is necessary to insert new segments (⩾ Section 6.4.5.5.)

or

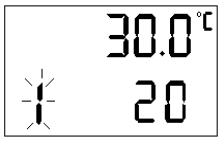
– These keys can be used to scroll through the different variables.



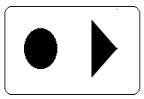
– Sequence with the key: : 1 (a) → 30,0 °C (b) → 20 (c) → 50,0 ° (2. Segment), → 20 (2. Segment).



– 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.

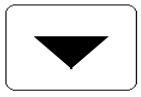


– The variable currently activated flashes quickly (here the segment number).



– To alter the required variable start with this key

or



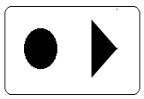
– If e.g. the segment number is flashing, all segments can be indicated in sequence by pressing one of the two keys, or

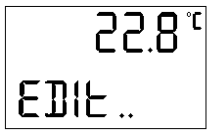
– if segment temperature or segment time are flashing, the required temperature or time can be input by pressing the key and then using the other two keys:

– Segment temperature.: 2 °C max. above the upper limit of the operating temperature range of the particular thermostat type.

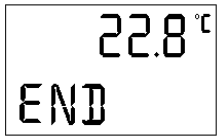
– Segment time: 0...255 min.

– After having changed the segments move forward with key to END

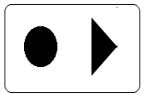




1. Forward with the key to EDIT..



– with the key to END and then



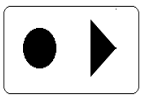
– back to level 0 with the key, or

2. with the key back to LOOP (➢ Section 6.4.4.3.) resp. to RUN (➢ Section 6.4.4.4.)

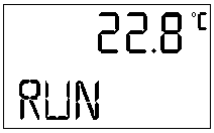
– While the programmer is in operation segments can be altered (including the current segment) and new segments can be inserted. All segments can also be deleted at each time (except the current segment) (≫ Section 6.4.4.5.)
BUT: If the new segment time is shorter than the segment time which has already elapsed, the next segment is activated. (≫ Section 6.4.4.1. graph b.)

– 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 programme running



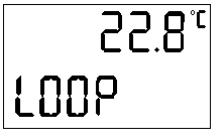
– From level 0 proceed as described under 6.4.4. When PGM appears on the display, press the key on the left

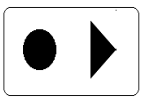


– The display first shows RUN.

– Forward with key until LOOP appears, or

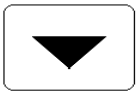
– from EDIT with this key to LOOP.



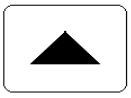


– Here the number of programme running can be input. Therefore press the key. The display is flashing for approx. 4 s.

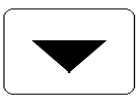
or

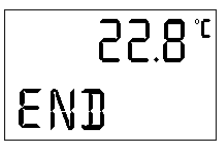


– During this time start to set the required number of running with one of the two keys. Input possibility: 0...255 (0 = infinite).

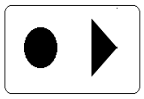


– Then with the key back to RUN (≫ Section 6.4.4.4.), or



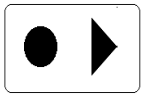


– with key until END and then

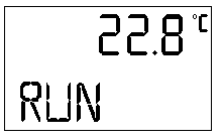


– with key back to "setpoint selection". (level 0).

6.4.4.4 Starting of the programmer

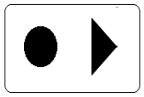


– From level 0 proceed as described under 6.4.4. When PGM appears on the display, press the key on the left.



– The display shows RUN, or

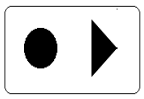
– forward with key from EDIT resp. LOOP until RUN appears, then



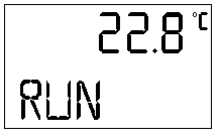
– start the programme with the key on the left. The setpoint level (level 0) is then on display.

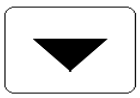
– During the start the current setpoint is accepted as the starting value.
– If the programmer is activated:
level 0 shows PGM XXX.XX instead of SET XXX.XX (setpoint temperature), with PGM flashing short **(short off, long on)**.
– Setpoint can not be input with 0,01 °C resolution (only possible via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

6.4.4.5 Inserting/ deleting of programme segments

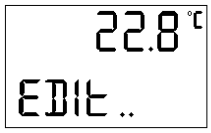


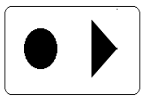
1. From level 0 proceed as described under 6.4.4. When PGM appears on the display, press the key on the left.



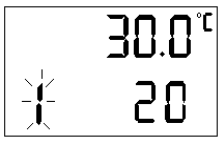


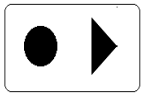
2. The display shows RUN (or STOP if the programmer had been started). Scroll with this key until EDIT appears.





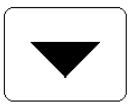
3. The display shows EDIT, press the key.



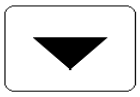


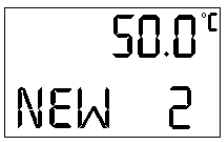
4. Segment number is flashing, press the key

or

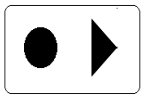


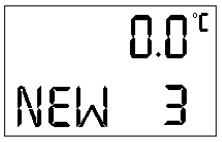
– Using the keys, select the segment number **behind** which the new segment has to be inserted.
EXAMPLE: Section 6.4.4.1.:
A new segment has to be inserted after segment 2.
Select segment 2 with the keys.



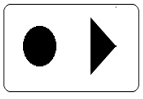


– With the key forward until NEW appears. The segment number ”2” behind which the new segment and the segment temperature are indicated.



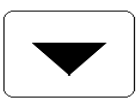


– Press the key, the display shows NEW as well as the segment number and temperature of the new segment.



– 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).

– When a new segment is inserted, all subsequent segments are shifted on by one position.(⩾ example Section 6.4.4.1).

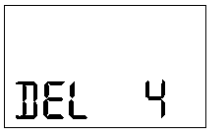
– When 20 segments are inserted, the last one will disappear when a new segment will be input.

– New segments can also be inserted while the programmer is activated.

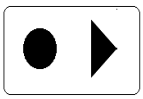
or

– In order to delete a segment, proceed as above step 1-4.

– Using the keys, select the segment number which has to be deleted.

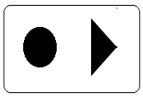


– Scroll forward with the key until DEL appears. Next to it the segment number to be deleted is shown.

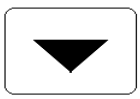
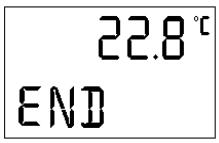


– Press the key, the segment is deleted.

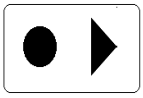
5. Then with the key forward to END



6. with the key to EDIT, then

7. with the key to END and



8. with the key back to level 0.

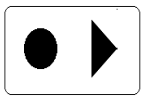
– When a segment is deleted, all subsequent segments move forward by one position.

– When the programmer is activated, the currently active segment cannot be deleted.

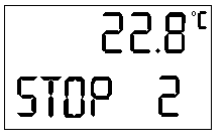
– **To input a segment time longer than 255 min it has to be split between several consecutive segments.**

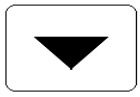
6.4.4.6 Holding/continuing the programme

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

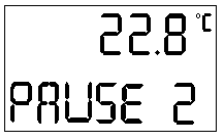


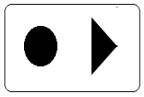
1. When the programmer is activated, the programme can at any time be held and be continued again. For this





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

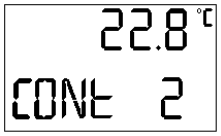




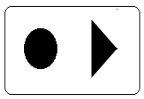
– The currently running segment is shown after PAUSE, press the key.

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

– When the programme 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 programme, 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 programme was held, is shown after CONt.

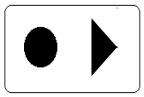


– Press the key, the programme continues, the programmer jumps back to level.

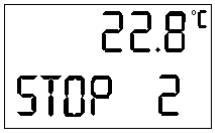
– When the programme is continued, the display PGM XXX.XX at level 0 is again flashing.

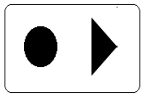
– If there is a fault, the programme is stopped by PAUSE. After the fault has rectified, the system has to be reset with CONt.

6.4.4.7 Terminating the programme

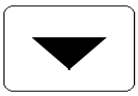


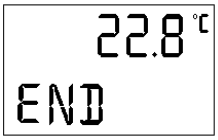
– From level 0 proceed as described under 6.4.4. When the display shows PGM, press the key.



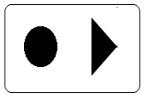


– The display shows STOP. The current segment is indicated after STOP. Press the key, the programme is terminated immediately



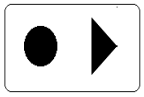


– With the key, forward to END, then



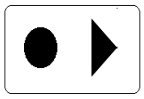
– with the key back to level 0.

6.4.5 Parameters



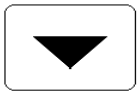
and **4x**

– Directly from level 0 (setpoint selection) press the key combination on the left (on RE 3xx)

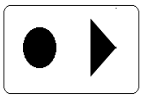


and 3**x**

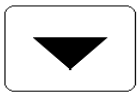
– on RE 2xx , **or**



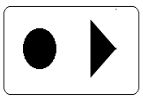
– forward with the key from PGM function.



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

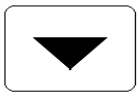


– with key to step END.



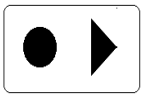
– End of the menu.

– Return to level 0 (setpoint selection) with the key on the left, or



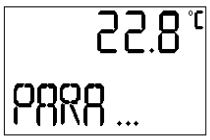
– with key back to programmer (RE 3xx only) or to "Setting the setpoint resolution" (RE 2xx).

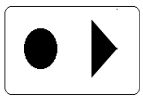
6.4.5.1 Setting the proportional band of the PID-controller



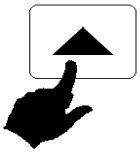
and 4**x**
and **3x**

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



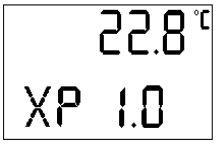


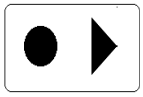
– switch to level 2 from PARA (see above) with key on the left.



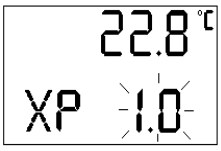
or

– 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).

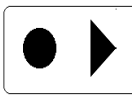
or

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

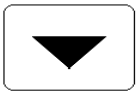
– Forward with the key to "Setting the reset time" or

– with the key back to "PARA".

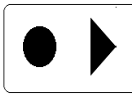
6.4.5.2 Setting the reset time of the PID-controller



and **4x**
and **3x**

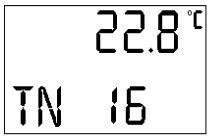


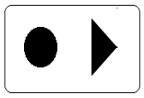
– Directly from level 0 (setpoint selection), press the key combination on the left (top one on RE 3xx, bottom one RE 2xx), until the PARA function is reached, then



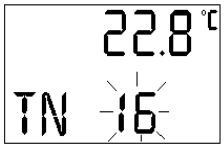
and **1x**

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

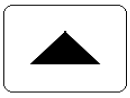




– The display shows the current bath temperature, Tn and the current setting. To alter the setting, press the key on the left.
→ Possible adjustment from 5 to 60 s

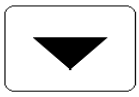


– The display is flashing (approx. 4 s).

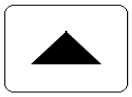


or

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



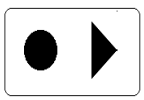
– Forward with the key to "Selection of the interface" or



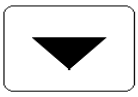
– with key back to "Setting the proportional band".

– 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

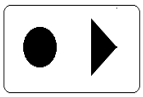


and **4x**
and **3x**

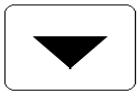


– Directly from level 0 (setpoint selection), press the key combination on the left (top one on RE 3xx, bottom one

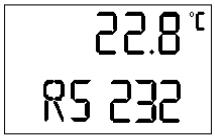
RE 2xx), until the PARA function is reached, then

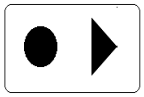


and **2x**



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

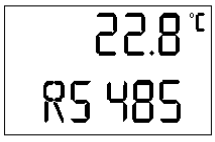




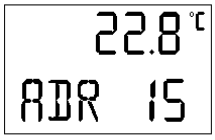
– The display shows the current bath temperature and the currently set interface. To alter the setting press the key.

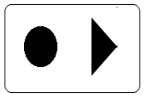
or

– Display flashes (approx. 4 s.). During this time start to set the required interface.



– 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.)

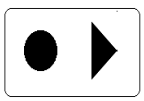
or

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

– Forward with key to ”Setting the baud rate” or

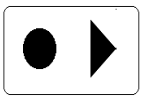
– back with key to ”Selection of the interface” resp. when pressing the key twice you return to ”Setting the reset time...”“

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

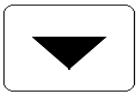


and **4x**
and **3x**

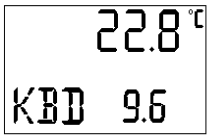
– Directly from level 0 (setpoint selection), press the key combination on the left (top one on RE 3xx, bottom one RE 2xx), until the PARA function is reached, then

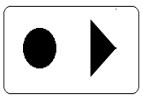


and **3x**

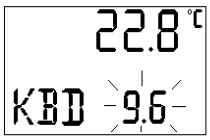


– switch to level 2 and move forward with key on the left.

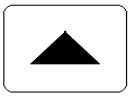




– The display shows the current bath temperature, KBD and the current setting. To alter the setting press the key.

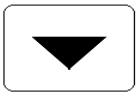


– Display flashes (approx. 4 s).



or

– During this time, start to set the required value with one of the two keys.
Settings available: 2400, 4800, 9600 or 19200 baud

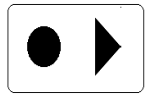


– Forward with key to "user calibration" **or**

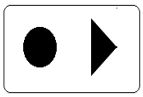
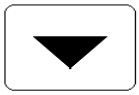
– Forward with key to "user calibration" **or**.

6.4.5.5 User calibration

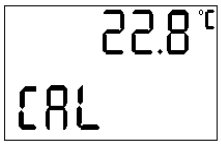
- Remove the external consumers and switch the setting knob of the pump to right side. (⩾Section 5.4).
- A reference thermometer with necessary accuracy is required. Otherwise the factory calibration should not be altered. The reference thermometer has to be inserted far enough and long enough into the bath.
- It is not allowed to calibrate to more than ± 3 °C. Multiple calibration to more than ± 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 **3x**

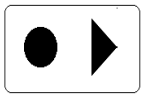
– Directly from level 0 (setpoint selection), press the key combination on the left (top one on RE 3xx, bottom one RE 2xx), until the PARA-function is reached, then


and **4x**


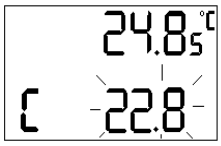
– switch to level 2 and move forward with key on the left..



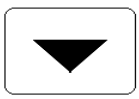
>2,5 s



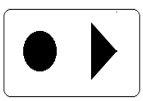
1. The display shows CAL and the current bath temperature. To carry out a calibration, press the key longer than 2.5 s.



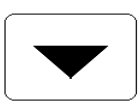
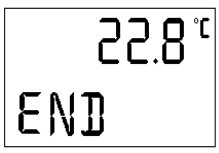
2. The actual value appears

or


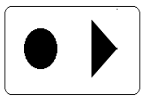
3. Input the value indicated on the reference thermometer with one to the two keys.



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

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.

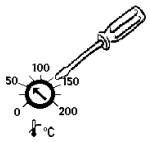
e) Remove the reference thermometer, which shows e.g. 44,8 °C.

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

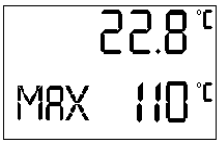
6.5.1 Overtemperature protection and testing

– 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. max. 110°C

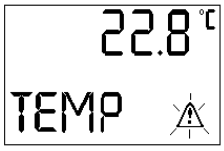
– When the switch-off point is being adjusted by more than 2°C → display shows MAX and actual overtemperature switch-off point with 1°C resolution for approx. 4 s.

– 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



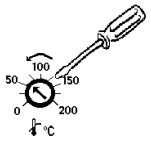
2. The display shows the indication for overtemperature (TEMP) the fault triangle is flashing
   → heating is switched off on both poles,
   → pump and refrigeration system are switched off by the electronics.

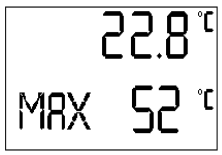
– Rectify the cause of the fault.

– 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.

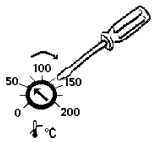
– Reset with the key

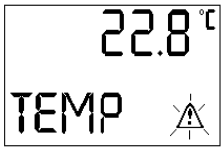
– Before the unit is running unattended for longer periods **overtemperature protection** should be tested. **Therefore**





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





– Step 1 - 2 (see above) must follow.

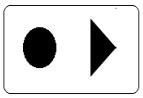
– Set the overtemperature switch-off point again above the bath temperature and wait until the indication TEMP appears on the display, then

– 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 and refrigeration system are 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 !

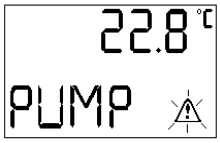
– If there is any irregularity when testing the safety devices, switch off the unit immediately and pull out the mains plug !

– Have the unit checked by the LAUDA service or the local service organisation!

6.5.3 Pump motor monitoring

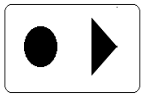
– In case of pump motor overload or a blockage the heating and the pump are switched off.

– Double signal tone sounds.



– The display shows PUMP and the fault triangle is flashing

– Rectify the cause of the fault, e.g. clean the pump or check the viscosity, then

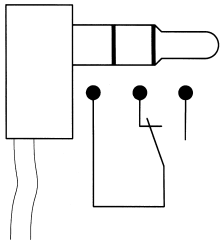


– reset with the key.

– If several faults appear simultaneously, they have to be reset individually

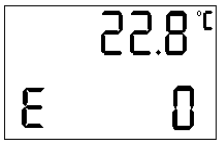
6.5.4 Connection floating contact ”Combination fault” 31 N

(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).

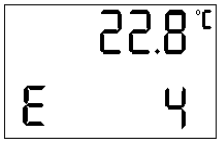


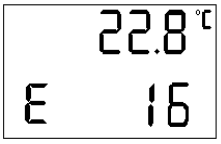
– Contact operates in case of error at overtemperature protection, low-level protection, pump monitoring or any other error message.

6.5.5 Other error messages

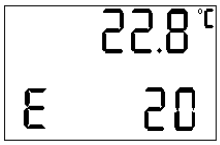


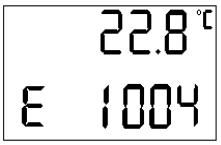
– E 0 etc. is flashing in the bottom line

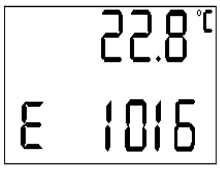


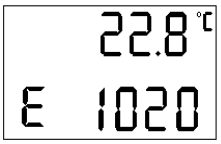


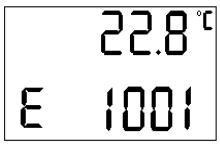
→ various temperature probe faults.





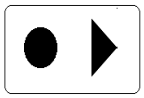






→ pump fault, proceed as in Section 6.5.3.

– 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 only to grounded mains power (PE).
- 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 must be closed (use closing plugs) or linked to the return!
- Allow for expansion of the bath oil at elevated temperatures!

- Depending on the bath liquid used and the mode of operation it is possible for toxic vapours to be produced. Ensure appropriate ventilation!
- 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!
- 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

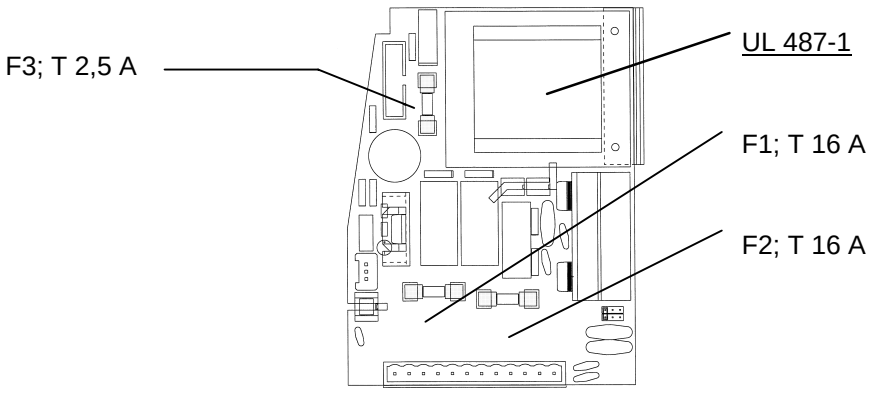
- Carry out appropriate detoxification if dangerous material has been spilled on or inside the unit.
- Method of cleaning and detoxification are decided by the special knowledge of the user. In case of doubt please contact the manufacturer

8.2 Maintenance and repair

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

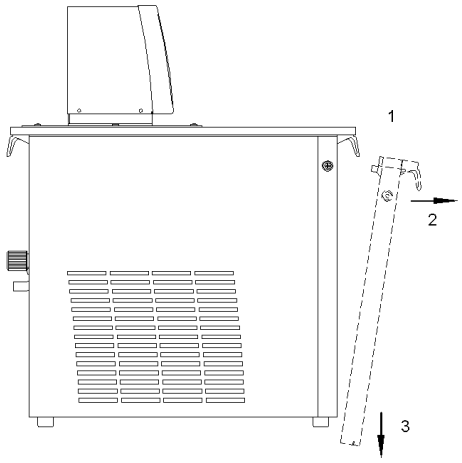
LAUDA thermostats are largely maintenance-free. If the thermostating liquid becomes dirty it has to be replaced (⩥ Section 5.2.).

- 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).



8.2.1 Maintenance of the refrigeration unit

The refrigeration unit operates largely without maintenance. Depending on the ambient dust conditions and the operating time, any dust on the heat exchanger (condenser) must be removed at intervals on 2 weeks or longer. This is done after taking off the front grille. Brush off the condenser and if necessary blow through with compressed air.



8.2.2 Note on repair and disposal

The refrigeration circuit is filled with a CFC-free refrigerant. Type and charging quantity are indicated on the unit. Repair and disposal by a qualified refrigeration engineer only!

If the equipment does have to be returned to the factory, it may only be necessary to dismantle the thermostat unit and return it.

- If the equipment has to be returned to the factory, please ensure that it is carefully and properly packed. LAUDA accepts no responsibility for damage due to unsatisfactory packing.

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.

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GERMANY
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9 Technical data (to DIN 58966)

Low-temperature thermostats

			RE 204	RE 206	RE 207	RE 212	RE 220
Operating temperature range		°C	-10 to 200	-20 to 200	-35 to 200	-30 to 200	-30 to 200
Ambient temperature range		°C	5...40 (⇨Section 5.1)				
Setting resolution		°C	0.01				
Indication resolution		°C	0.05				
Indication accuracy			±0.2 °C ③ additive re-calibration				
Temperature control		± °C	0.01	0.01	0.02	0.02	0.02
Safety features ①			FL				
Additional functions			2-line LCD-display				
			autom. compressor control		autom. compressor control + cooling adjustments		
Heater power	230 V; 50/ 60 Hz	kW	2.25				
	115 V; 60 Hz		1.3				
	100 V; 50/60 Hz		1.0				
Cooling capacity (eff.)	20°C	kW	0.15	0.20	0.30	0.30	0.35
@ with ethanol at 20 °C	0°C		0.10	0.15	0.22	0.23	0.25
ambient temperature	-20°C		0.05*	0.05	0.10	0.13	0.10
	-30°C		----	----	0.06	0.04	0.04
Pump type			pressure pump with choice of 5 output steps				
Max. discharge pressure ②		bar	0.4				
Max. flow rate ②		l/min	17				
Pump connections		mm	nipples 13 mm dia.				
Max. bath volume		l	3 to 4.5	4 to 6	4 to 6	9 to 12	14 to 20
Bath opening (W x D)		mm	130x105	150x130	150x130	200x200	300x350
Bath depth		mm	160	160	160	200	160
Usable depth		mm	140	140	140	180	140
Height top edge of bath		mm	363	396	396	441	441
Overall size (W x D x H)		mm	180x320x524	200x400x557	200x400x557	250x400x602	350x530x602
Weight		kg	21	24	26	30	34
Power con- sumption	230 V; 50/ 60Hz	kW	2.5	2.6	2.7	2.7	2.8
	115 V; 60 Hz		1.4	1.4	1.4	1.4	1.4
	100 V; 50/60 Hz		1.1	1.1	1,1	1.1	1.2
Ref. No.	**230 V; 50/60 Hz**			**LCK 0865**			
	230 V; 50 Hz		**LCK 1862**		**LCK 1868**	**LCK 1871**	**LCK 1874**
	230 V; 60 Hz		**LCK 2862**		**LCK 2868**	**LCK 2871**	**LCK 2874**
	115 V; 60 Hz		**LCK 4862**	**LCK 4865**	**LCK 4868**	**LCK 4871**	**LCK 4874**
	100 V; 50/60 Hz		**LCK 6862**	**LCK 6865**	**LCK 6868**	**LCK 6871**	**LCK 6874**

*@ -10°C

① FL: suitable for flammable and non-flammable liquids ② at pump output step 5

③ ⇨ Section 7.2 last item

We reserve the right to make technical alterations!

			RE 306	RE 307	RE 312	RE 320
Operating temperature range		°C	-20...200	-35...200	-30...200	-30...200
Ambient temperature range		°C	5...40 (⇨ Section 5.1.)			
Setting resolution		°C	0.01			
Indication resolution		°C	0.05			
Indication accuracy			±0.2 °C ③ additive re-calibration			
Temperature control		±°C	0.01	0.02	0.02	0.02
Safety features ①			FL			
Additional function			2-line LCD-display and back-lightning. programmer			
			autom. compressor control	autom. compressor control + cooling adjustment		
Heater power	230 V; 50/ 60 Hz	kW	2.25			
	115 V; 60 Hz		1.3			
	100 V; 50/60 Hz		1.0			
Cooling capacity (eff.)	20°C	kW	0.20	0.30	0.30	0.35
@ with ethanol	0°C		0.15	0.22	0.23	0.25
at 20°C ambient	-20°C		0.05	0.10	0.13	0.10
temperature	-30°C		----	0.06	0.04	0.04
Pump type			pressure pump with choice of 5 output steps			
Max. discharge pressure ②		Bar	0.4			
Max. flow rate②		l/min	17			
Pump connections		mm	nipples 13 mm dia. (M 16 x 1)			
Max. bath volume		l	4 to 6	4 to 6	9 to 12	14 to 20
Bath opening (W x D)		mm	150x130	150x130	200x200	300x350
Bath depth		mm	160	160	200	160
Usable depth		mm	140	140	180	140
Height top edge of bath		mm	396	396	441	441
Overall size (W x D x H)		mm	200x400x557	200x400x557	250x400x602	350x530x602
Weight		kg	24	26	30	34
Power con-	230 V; 50/ 60Hz	kW	2.6	2.7	2.7	2.8
sumption	115 V; 60 Hz		1.4	1.4	1.4	1.4
	100 V; 50/60 Hz		1.1	1.1	1.1	1.2
Ref. No.	**230 V; 50/60 Hz**		**LCK 0866**			
	230 V; 50 Hz			**LCK 1869**	**LCK 1872**	**LCK 1875**
	230 V; 60 Hz			**LCK 2869**	**LCK 2872**	**LCK 2875**
	115 V; 60 Hz		**LCK 4866**	**LCK 4869**	**LCK 4872**	**LCK 4875**
	100 V; 50/60 Hz		**LCK 6866**	**LCK 6869**	**LCK 6872**	**LCK 6875**

*@ -10°C

① FL suitable for flammable and non-flammable liquids ② at pump output step 5

③ → Section 7.2 last item

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

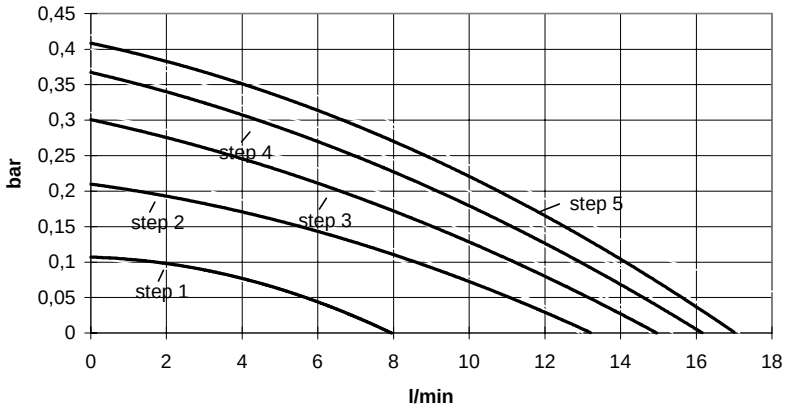
We reserve the right to make technical alterations!

Standard settings of control parameters and pump ⩥ Section 6.4.5.1. and 6.4.5.2. and 6.4.2.

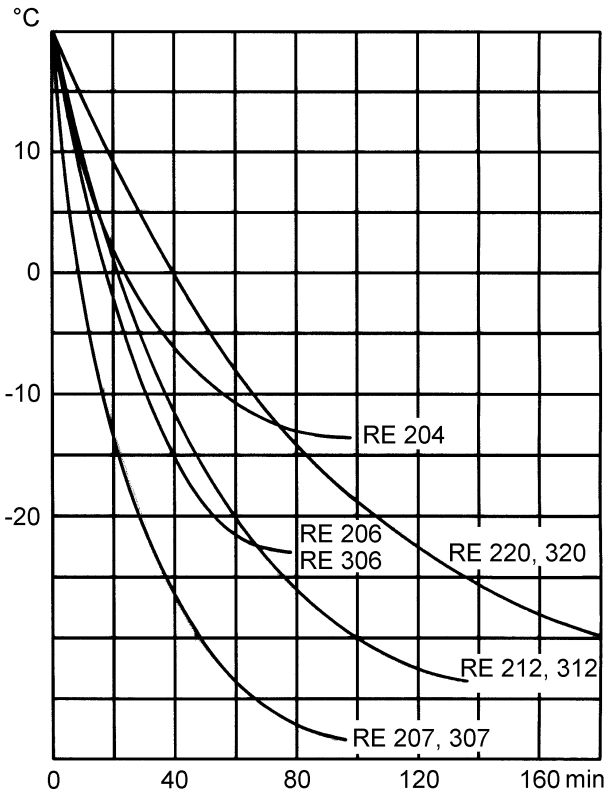
Unit Type	Xp (°C)	Tn (s)	Pump outflow step
RE 104, RE 204	7,0	20	2
RE 106, RE 206, RE 306	4,0	20	2
RE 107, RE 207, RE 307	3,0	25	3
RE 112, RE 212, RE 312	4,5	30	4
RE 120, RE 220, RE 320	2,0	25	5

Pump characteristics

measured with water



Cooling curve
measured with ethanol



Bath liquid:
water/glycol 1:1
(to -25°C) as bath liquid

Time from graph
x 1,7

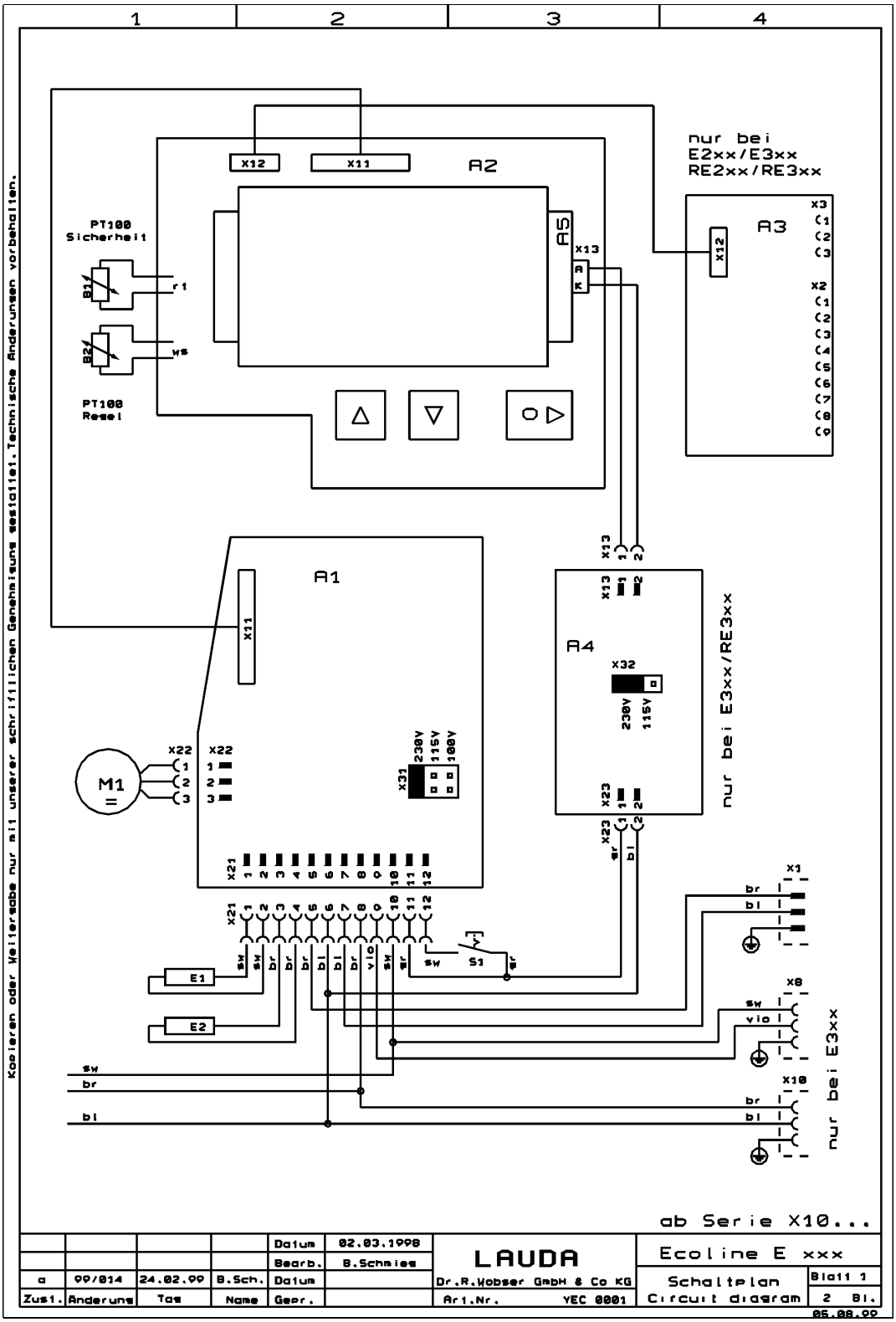
We reserve the right to make technical alterations!

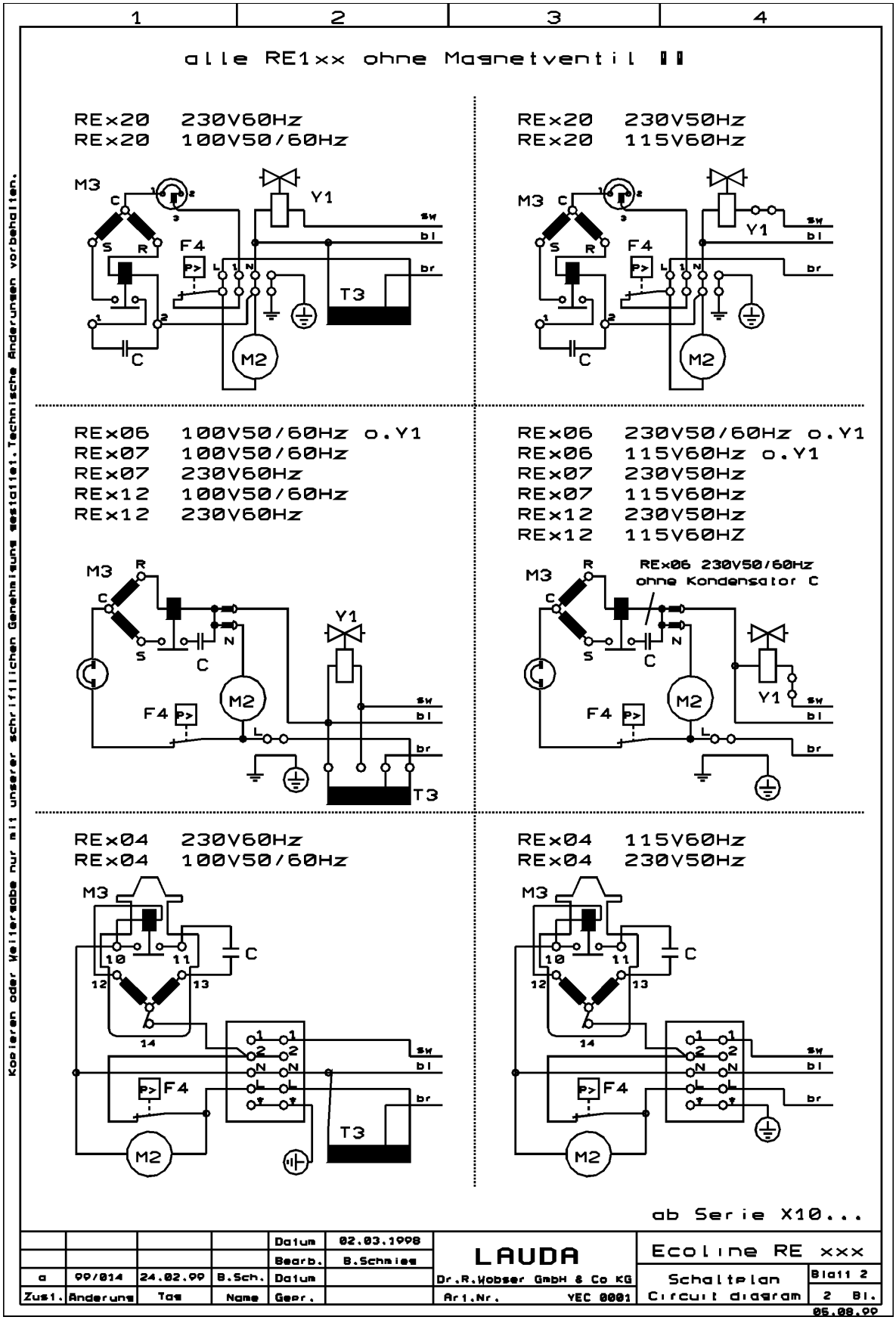
10 Accessories

Accessories	suitable for	Ref. No.
Bath cover two parts	RE 220	LCZ 0633
Gable cover	RE 220, RE 320	LCZ 011
Rising platform 8 steps	RE 206, RE 306, RE 207, RE 307	LCZ 0646
Rising platform 8 steps	RE 212, RE 312	LCZ 0647
Rising platform 8 steps	RE 220, RE 320	LCZ 0635
Pump short circuit	all RE 3xx models	LZM 045
3-pole locking connector (floating contact „Combination fault“ 31 N)	for all models	EQS 054
Wintherm Software under Windows	for all units	LDSE 4001

For further accessories please contact us.

11 Circuit diagram




1
2
3
4
alle RE1xx ohne Magnetventil !!
RE×20 230V60Hz
RE×20 100V50/60Hz
RE×20 230V50Hz
RE×20 115V60Hz
RE×06 100V50/60Hz o.Y1
RE×07 100V50/60Hz
RE×07 230V60Hz
RE×12 100V50/60Hz
RE×12 230V60Hz
RE×06 230V50/60Hz o.Y1
RE×06 115V60Hz o.Y1
RE×07 230V50Hz
RE×07 115V60Hz
RE×12 230V50Hz
RE×12 115V60HZ
RE×06 230V50/60Hz
ohne Kondensator C
RE×04 230V60Hz
RE×04 100V50/60Hz
RE×04 115V60Hz
RE×04 230V50Hz
ab Serie X10...
Kopieren oder Weitergabe nur mit unserer schriftlichen Genehmigung gestattet. Technische Änderungen vorbehalten.
LAUDA
Dr.R.Wobser GmbH & Co KG
Ecoline RE xxx
Schaltplan
Circuit diagram
Blatt 2
2 Bl.
Datum 02.03.1998
Bearb. B.Schmies
99/014 24.02.99 B.Sch.
Änderung Tag Name
Ar1.Nr. YEC 0001
05.08.99

230V; 50Hz ◆ 230V; 50/60Hz ◆ [230V; 60Hz] at Serialno.: X01

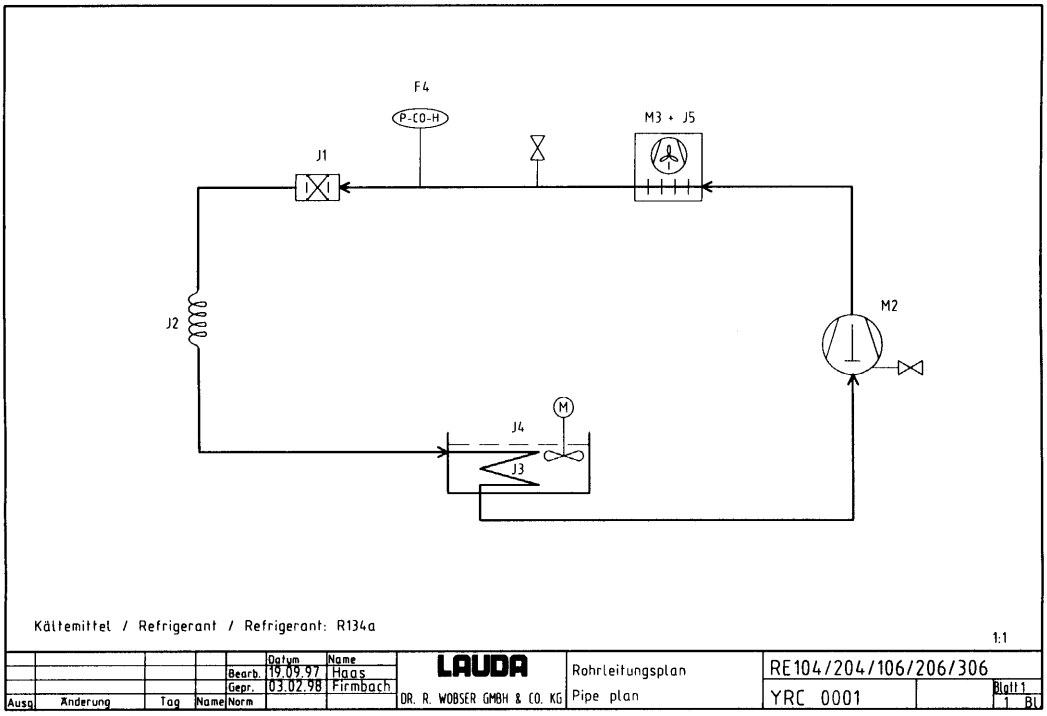
				RE 1xx	RE 2xx	RE 3xx
	A 1	Printed circuit board „Mains“		UL 487-1	UL 487-1	UL 487-1
	A 2	Printed circuit board „Display“		UL 488-1A	UL 488-1B	UL 488-1C
	A 3	Printed circuit board serial interface RS 232/RS 485		----------	UL 490	UL 490
	A 4	Printed circuit board Mains LED-Backlight		---------	---------	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
RE 004	F 4	Pressure switch		ES 045	ES 045	----------
	M 2	Compressor		EMK 176	EMK 176	----------
	M 3	Fan				
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 006	F 4	Pressure switch		ES 045	ES 045	ES 045
	M 2	Compressor		EMV 011	EMV 011	EMV 011
	M 3	Fan		EML 007	EML 007	EML 007
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 007	F 4	Pressure switch		ES 045	ES 045	ES 045
	M 2	Compressor		EMV 011	EMV 011	EMV 011
	M 3	Fan		EML 042	EML 042	EML 042
	U 3	SSR (BRT22H)	Y 1 output A1	---------	EYI 158	---------
	Y 1	Solenoid valve		---------	EVM 079	EVM 079
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 012	F 4	Pressure switch		ES 045	ES 045	ES 045
	M 2	Compressor		EMV 011	EMV 011	EMV 011
	M 3	Fan		EML 042	EML 042	EML 042
	U 3	SSR (BRT22H)	Y 1 output A1	---------	EYI 158	---------
	Y 1	Solenoid valve		---------	EVM 079	EVM 079
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 020	F 4	Pressure switch		ES 045	ES 045	ES 045
	M 2	Compressor		EMK 146	EMK 146	EMK 146
	M 3	Fan				
	U 3	SSR (BRT22H)	Y 1 output A1	---------	EYI 158	---------
	Y 1	Solenoid valve		---------	EVM 079	EVM 079
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]

Circuit diagram

115V; 60Hz ◆ [100V; 50/60Hz] at Serialno.: X01

				RE 1xx	RE 2xx	RE 3xx
	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
RE 004	F 4	Pressure switch		ES 045	ES 045	----------
	M 2	Compressor		EMK 176	EMK 176	----------
	M 3	Fan				
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 006	F 4	Pressure switch		ES 045	ES 045	ES 045
	M 2	Compressor		EMV 012	EMV 012	EMV 012
	M 3	Fan		EML 033	EML 033	EML 033
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 007	F 4	Pressure switch		ES 045	ES 045	ES 045
	M 2	Compressor		EMV 012	EMV 012	EMV 012
	M 3	Fan		EML 033	EML 033	EML 033
	U 3	SSR (BRT22H)	Y 1 output A1	---------	EYI 158	---------
	Y 1	Solenoid valve		---------	EVM 079	EVM 079
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 012	F 4	Pressure switch		ES 045	ES 045	ES 045
	M 2	Compressor		EMV 012	EMV 012	EMV 012
	M 3	Fan		EML 033	EML 033	EML 033
	U 3	SSR (BRT22H)	Y 1 output A1	---------	EYI 158	---------
	Y 1	Solenoid valve		---------	EVM 079	EVM 079
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 020	F 4	Pressure switch		ES 045	ES 045	ES 045
	M 2	Compressor		EMK 181	EMK 181	EMK 181
	M 3	Fan				
	U 3	SSR (BRT22H)	Y 1 output A1	---------	EYI 158	---------
	Y 1	Solenoid valve		---------	EVM 079	EVM 079
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]

12 Pipe plan


F4
P-CO-H
M3 + J5
J1
J2
M2
M
J4
J3
Kältemittel / Refrigerant / Refrigerant: R134a
1:1
Datum
Name
Bearb. 19.09.97 Haas
Gepr. 03.02.98 Firmbach
Ausg Änderung Tag Name Norm
LAUDA
DR. R. WOBSER GMBH & CO. KG
Rohrleitungsplan
Pipe plan
RE104/204/106/206/306
YRC 0001
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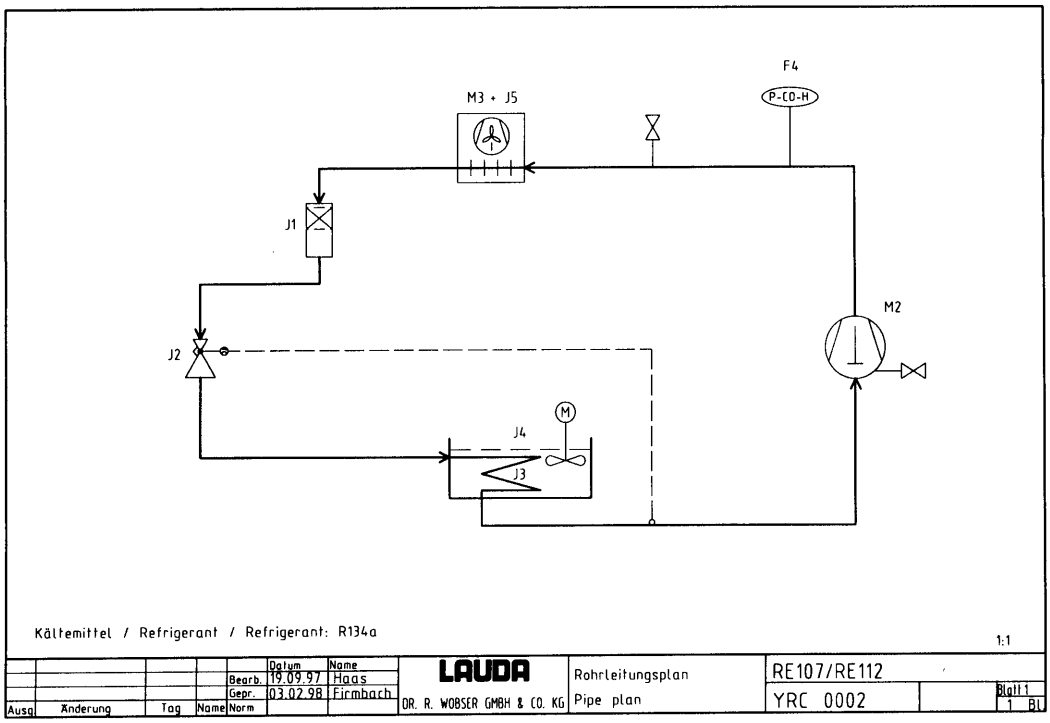
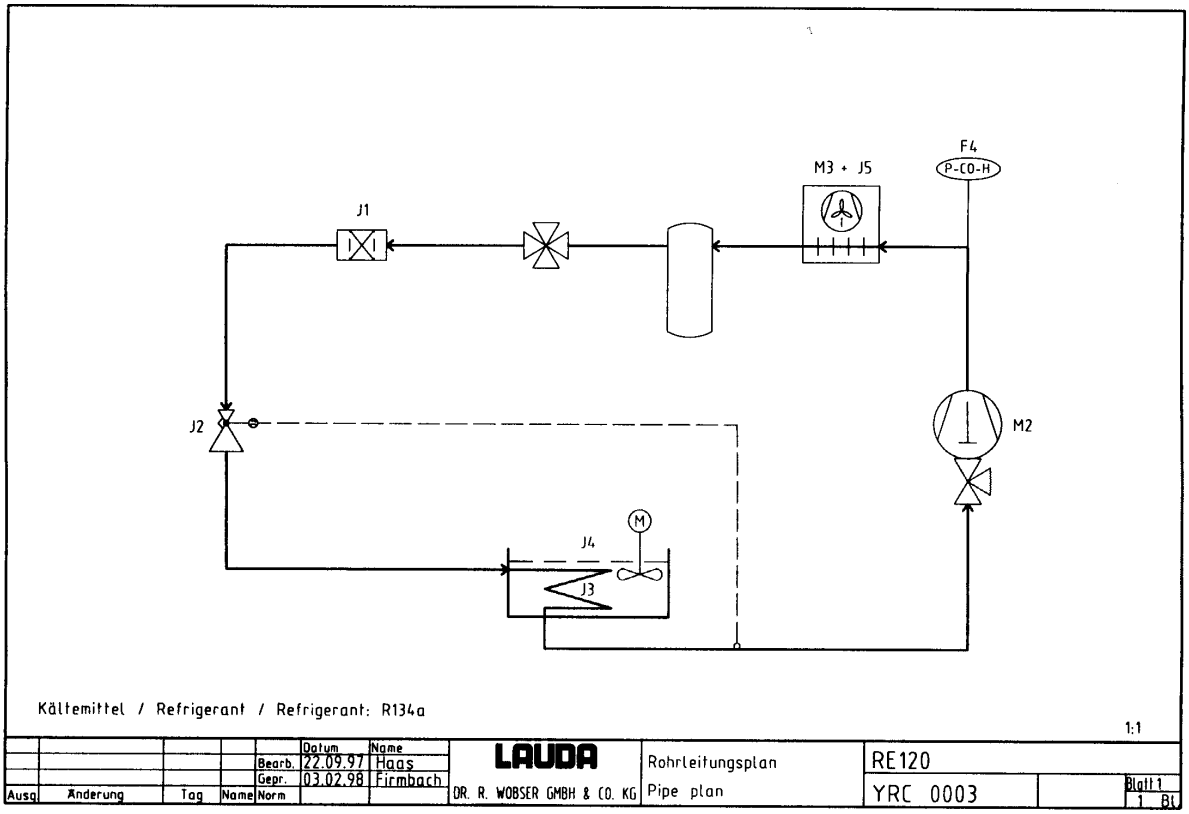
1 BL


F4
P-CO-H
M3 + J5
J1
J2
M2
M
J4
J3
Kältemittel / Refrigerant / Refrigerant: R134a
1:1
Datum
Name
Bearb. 19.09.97 Haas
Gepr. 03.02.98 Firmbach
Ausg Änderung Tag Name Norm
LAUDA
DR. R. WOBSER GMBH & CO. KG
Rohrleitungsplan
Pipe plan
RE107/RE112
YRC 0002
Blatt 1
1 BL

Pipe plan


F4
P-CO-H
M3 + J5
J1
M2
J2
M
J4
J3
Kältemittel / Refrigerant / Refrigerant: R134a
1:1
Datum
Name
Bearb. 22.09.97 Haas
Gepr. 03.02.98 Firmbach
Ausg. Änderung Tag Name Norm
LAUDA
DR. R. WOBSER GMBH & CO. KG
Rohrleitungsplan
Pipe plan
RE120
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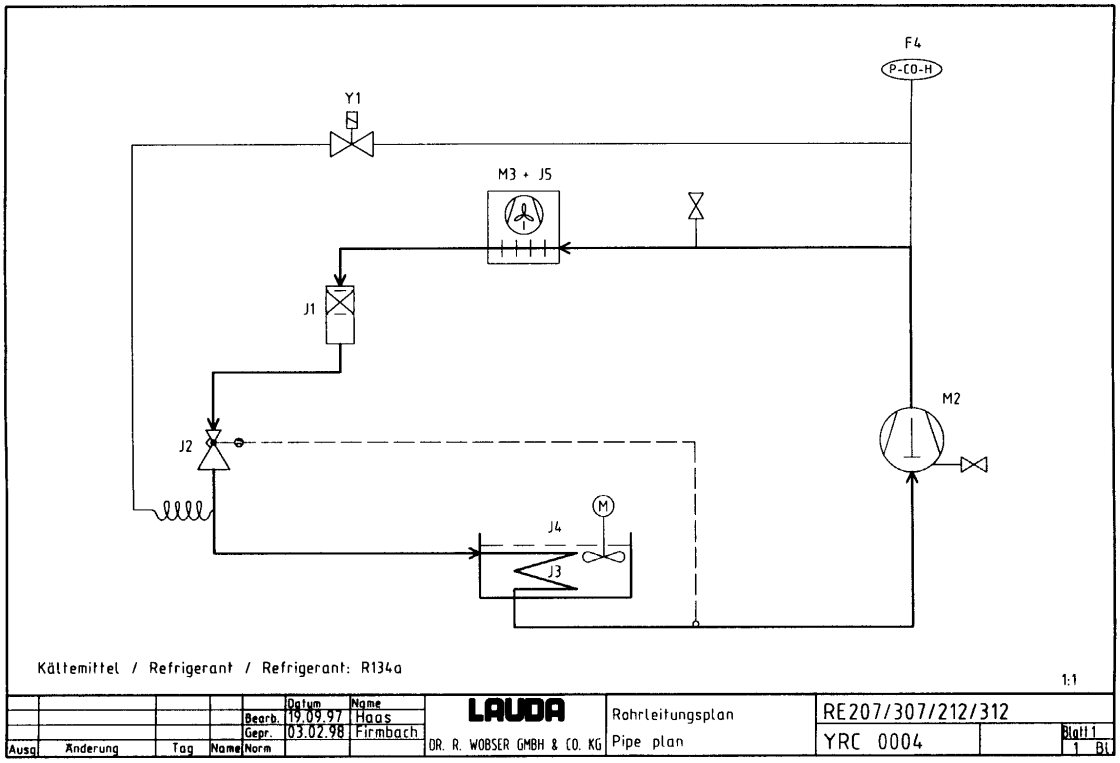
F4
P-CO-H
Y1
M3 + J5
J1
M2
J2
M
J4
J3
Kältemittel / Refrigerant / Refrigerant: R134a
1:1
Datum
Name
Bearb. 19.09.97 Haas
Gepr. 03.02.98 Firmbach
Ausg Änderung Tag Name Norm
LAUDA
DR. R. WOBSER GMBH & CO. KG
Rohrleitungsplan
Pipe plan
RE207/307/212/312
YRC 0004
Blatt 1
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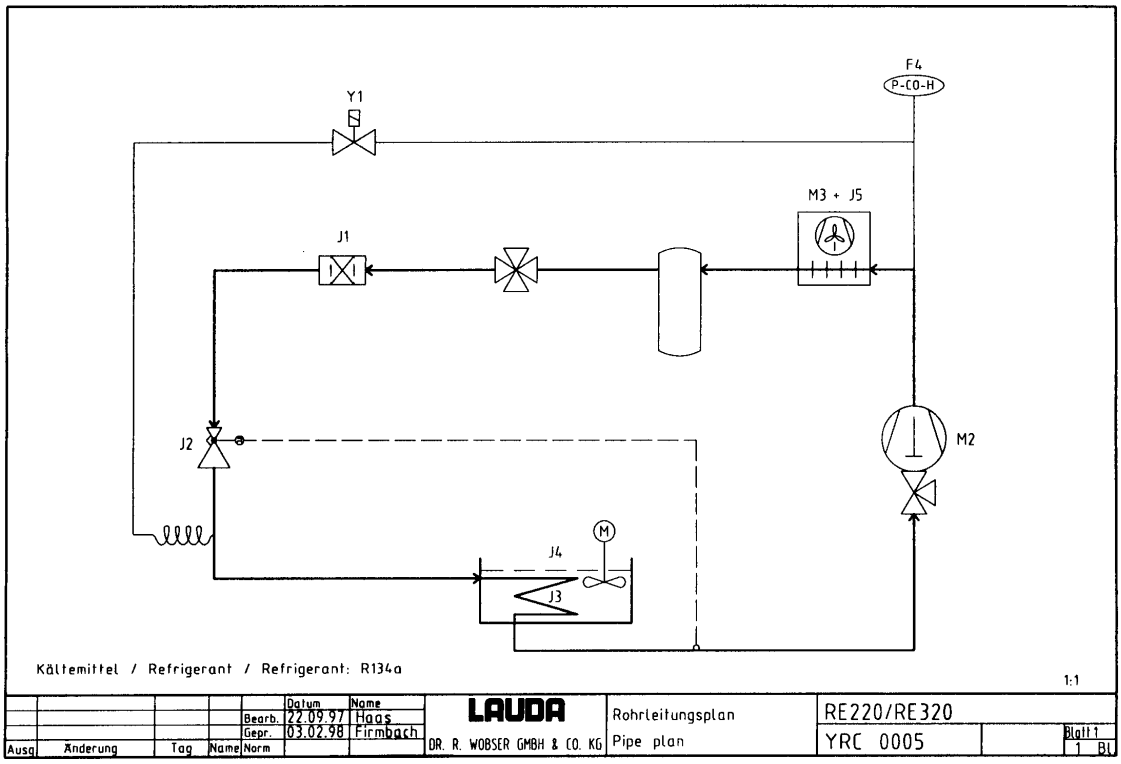
F4
P-CO-H
Y1
M3 + J5
J1
M2
J2
M
J4
J3
Kältemittel / Refrigerant / Refrigerant: R134a
1:1
Datum
Name
Bearb. 22.09.97 Haas
Gepr. 03.02.98 Firmbach
Ausg Änderung Tag Name Norm
LAUDA
DR. R. WOBSER GMBH & CO. KG
Rohrleitungsplan
Pipe plan
RE220/RE320
YRC 0005
Blatt 1
1 Bl

Pipe plan

230V; 50Hz ◆ 230V; 50/60Hz ◆ [230V; 60Hz] at Serialno.: X01

			Typ	RE 1xx	RE 2xx	RE 3xx
RE 004						
	F 4	Pressure switch	CC20 24/17 bar	ES 045	ES 045	----------
	M 2+M 3+J 5	Cooling unit	PL 50 FX NO	EMK 173	EMK 173	----------
	J 1	Drier	EO 003	EO 003	----------	
	J 2	Capillary	HKA 114	HKA 114	----------	
	J 3	Evaporator	----------	----------	----------	
	J 4	Bath	----------	----------	----------	
	[T 1	Trafo		EIT 124	EIT 124	----------]
RE 006						
	F 4	Pressure switch	CC20 24/17 bar	ES 045	ES 045	ES 045
	M 2	Compressor	AZ 411	EMV 011	EMV 011	EMV 011
	M 3	Fan	W2S-115-AB07-16	EML 007	EML 007	EML 007
	J 1	Drier		EO 003	EO 003	EO 003
	J 2	Capillary		HKA 114	HKA 114	HKA 114
	J 3	Evaporator	----------	----------	----------	
	J 4	Bath	----------	----------	----------	
	J 5	Condenser		EOW 084	EOW 084	EOW 084
RE 007						
	F 4	Pressure switch	CC20 24/17 bar	ES 045	ES 045	ES 045
	M 2	Compressor	AZ 411	EMV 011	EMV 011	EMV 011
	M 3	Fan	W2S-130-AA75-(A2)	EML 042	EML 042	EML 042
	J 1	Filter drier / receiver	CNO 432 s	EO 040	EO 040	EO 040
	J 2	Injection valve	TEL 0,5 R404A MOP 3,0	EVE 111	EVE 111	EVE 111
	J 3	Evaporator	----------	----------	----------	
	J 4	Bath	----------	----------	----------	
	J 5	Condenser		EOW 085	EOW 085	EOW 085
	Y 1	Solenoid valve	2/2Wege 6mm Löt Typ: 1028/2	----------	EVM 077	EVM 077
	[T 1	Trafo		EIT 125	EIT 125	EIT 125]
RE 012						
	F 4	Pressure switch	CC20 24/17 bar	ES 045	ES 045	ES 045
	M 2	Compressor	AZ 411	EMV 011	EMV 011	EMV 011
	M 3	Fan	W2S-130-AA75-(A2)	EML 042	EML 042	EML 042
	J 1	Filter drier / receiver	CNO 432 s	EO 040	EO 040	EO 040
	J 2	Injection valve	TEL 0,5 R404A MOP 3,0	EVE 111	EVE 111	EVE 111
	J 3	Evaporator	----------	----------	----------	
	J 4	Bath	----------	----------	----------	
	Y 1	Solenoid valve	2/2Wege 6mm Löt Typ: 1028/2	----------	EVM 077	EVM 077
	[T 1	Trafo		EIT 125	EIT 125	EIT 125]
RE 020						
	F 4	Pressure switch	CC20 24/17 bar	ES 045	ES 045	ES 045
	M 2+M 3+J 5	Cooling unit	UB 6144 Z	EMK 146	EMK 146	EMK 146
	J 1	Drier	DN 032 s	EO 041	EO 041	EO 041
	J 2	Injection valve	TEL 0,5 R404A MOP 3,6	EVE 112	EVE 112	EVE 112
	J 3	Evaporator	----------	----------	----------	
	J 4	Bath	----------	----------	----------	
	Y 1	Solenoid valve	2/2Wege 6mm Löt Typ: 1028/2	----------	EVM 077	EVM 077
	[T 1	Trafo		EIT 125	EIT 125	EIT 125]

1150V; 60Hz ◆ [100V; 50/60Hz] at Serialno.: X01

			Typ	RE 1xx	RE 2xx	RE 3xx
RE 004						
	F 4	Pressure switch	CC20 24/17 bar	ES 045	ES 045	----------
	M 2+M 3+J 5	Cooling unit	PL 50 FX NO	EMK 176	EMK 176	----------
	J 1	Drier	EO 003	EO 003	----------	
	J 2	Capillary	HKA 114	HKA 114	----------	
	J 3	Evaporator	----------	----------	----------	
	J 4	Bath	----------	----------	----------	
	[T 1	Trafo		EIT 123	EIT 123	----------]
RE 006						
	F 4	Pressure switch	CC20 24/17 bar	ES 045	ES 045	ES 045
	M 2	Compressor	AZ 4419 Y-A	EMV 012	EMV 012	EMV 012
	M 3	Fan	W2S-115-AB07-07	EML 015	EML 015	EML 015
	J 1	Drier		EO 003	EO 003	EO 003
	J 2	Capillary		HKA 114	HKA 114	HKA 114
	J 3	Evaporator	----------	----------	----------	
	J 4	Bath	----------	----------	----------	
	J 5	Condenser		EOW 084	EOW 084	EOW 084
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 007						
	F 4	Pressure switch	CC20 24/17 bar	ES 045	ES 045	ES 045
	M 2	Compressor	AZ 4419 Y-A	EMV 012	EMV 012	EMV 012
	M 3	Fan	W2E-142-CC13-16	EML 033	EML 033	EML 033
	J 1	Filter drier / receiver	CNO 432 s	EO 040	EO 040	EO 040
	J 2	Injection valve	TEL 0,5 R404A MOP 3,0	EVE 111	EVE 111	EVE 111
	J 3	Evaporator	----------	----------	----------	
	J 4	Bath	----------	----------	----------	
	J 5	Condenser		EOW 085	EOW 085	EOW 085
	Y 1	Solenoid valve	2/2Wege 6mm Löt Typ: 1028/2	----------	EVM 079	EVM 079
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 012						
	F 4	Pressure switch	CC20 24/17 bar	ES 045	ES 045	ES 045
	M 2	Compressor	AZ 4419 Y-A	EMV 012	EMV 012	EMV 012
	M 3	Fan	W2E-142-CC13-16	EML 033	EML 033	EML 033
	J 1	Filter drier / receiver	CNO 432 s	EO 040	EO 040	EO 040
	J 2	Injection valve	TEL 0,5 R404A MOP 3,0	EVE 111	EVE 111	EVE 111
	J 3	Evaporator	----------	----------	----------	
	J 4	Bath	----------	----------	----------	
	Y 1	Solenoid valve	2/2Wege 6mm Löt Typ: 1028/2	----------	EVM 079	EVM 079
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]
RE 020						
	F 4	Pressure switch	CC20 24/17 bar	ES 045	ES 045	ES 045
	M 2+M 3+J 5	Cooling unit	UB 6144 Z/2	EMK 181	EMK 181	EMK 181
	J 1	Filter drier	DN 032 s	EO 041	EO 041	EO 041
	J 2	Injection valve	TEL 0,5 R404A MOP 3,6	EVE 112	EVE 112	EVE 112
	J 3	Evaporator	----------	----------	----------	
	J 4	Bath	----------	----------	----------	
	Y 1	Solenoid valve	2/2Wege 6mm Löt Typ: 1028/2	----------	EVM 079	EVM 079
	[T 1	Trafo		EIT 122	EIT 122	EIT 122]

BESTÄTIGUNG / CONFIRMATION / CONFIRMATION

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

Von / From / De :

Firma / Company / Entreprise: _____

Straße / Street / Rue: _____

Ort / City / Ville: _____

Tel.: _____

Fax: _____

Betreiber / Responsible person / Personne responsable: _____

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

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

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

_____

_____

_____

_____

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

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

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

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

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