

LAUDA

Operating Instructions

Compact low temperature thermostats
RM 6 S, RM 6 S-DS, RML 6 S, RML 6 S-DS
RM 20 S, RM 25 S

to DIN 12 879

From Series P 02
04/93 E
YACE0032

Compact low temperature thermostats
RM 6 S, RM 6 S-DS, RML 6 S, RML 6 S-DS, RM 20 S, RM 25 S

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Enclosures

Accessories

Circuit diagram

1. Brief operating instructions

- 1.1 Even if these brief instructions are sufficient for you, be sure to read the information below, in particular section 4 "Safety system and remarks". For safe operation of the units it is necessary to read these instructions carefully.
- 1.2 Check thermostat and accessories during unpacking for possible transport damage and, if necessary, notify carrier or post office.
- 1.3 Assemble unit according to Section 6 and add items as appropriate.
- 1.4 Connect the tubing at the pump nipples. Remove the plastic screw from the pressure nipple of the pump.

Without external circulation: For a better circulation in the bath mount the olives and link together the pump nipples with the silicone tubing supplied, Viton or metallic tubing.

With external circulation: connect the external system with the tubing.

Secure tubing with clips to prevent its slipping off.



- 1.5 Use only deionized water or LAUDA bath liquids (Section 5). Fill the unit up to approx. 2 cm below the top plate.
- 1.6 Check the supply voltage against the data on the rating label. Connect the cable to the supply.
- 1.7 Operation without refrigeration unit (temperature above 30°C)

Mains switch (green)	I ON (green lamp lights up)
Switch "Cooling" (yellow) 	0 OFF

Operating with refrigeration unit (temperature below 30°C)

Mains switch (green)	I ON (green lamp lights up)
Switch "Cooling" (yellow) 	I ON




When starting the refrigeration unit after a longer period of stillstand it could take up to 30 minutes until the rated cooling capacity is available depending on the ambient temperature and model.

- 1.8 Select the required temperature.
Press key  , the set point is indicated at the digital display. Select the desired temperature by turning the potentiometer  . Unlock the fixing device first.

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- 1.9 Overtemperature cutout  to be adjusted with a tool at rotary switch above the set point. If the red fault lamp lights up, press the key  "Release" in order to reset the unit.
- 1.10 When operating with an external system ensure that the level inside the thermostat does not drop too much when the external system is being filled with the bath liquid.
- 1.11 When the bath liquid has reached the set point the yellow indicating lamp "heating"  begins to flash. After the temperature has settled down, the digital thermometer indicates the selected bath temperature.

1.12 Safety

The thermostat is a Class 2 unit. It must only be operated with liquids (see also Section 5) whose flash point is above 40°C. It is only allowed to use inflammable liquids up to 5°C below its flash point, otherwise an explosive atmosphere may be created.

1.13 Important Note

Parts of the bath cover may heat up to more than 60°C at higher operating temperatures! Pump outflow and return are at the operating temperature.

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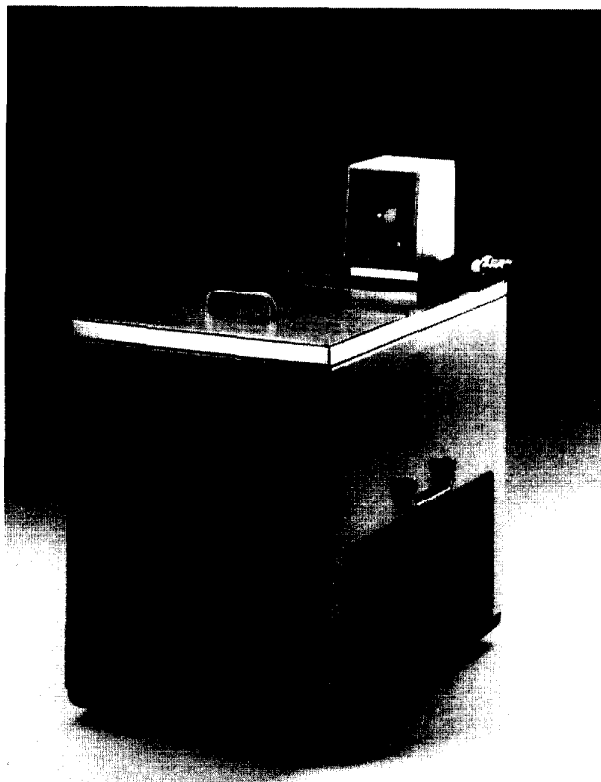
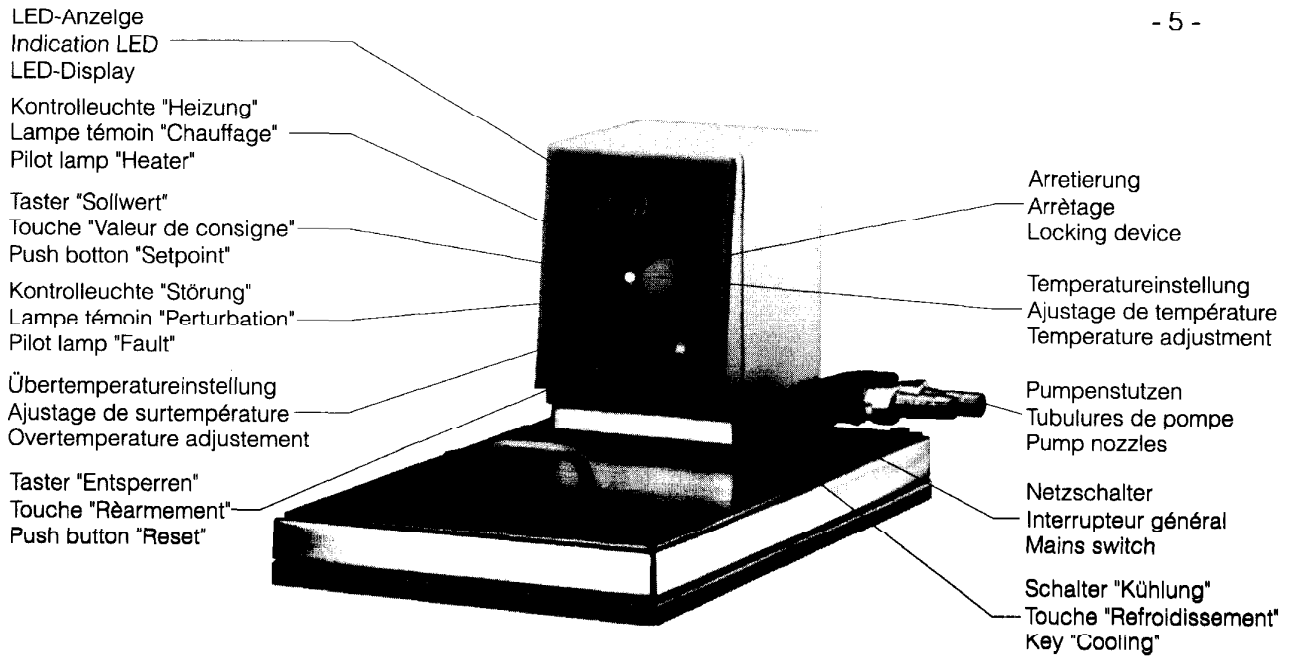
2. Table of Data according to DIN 58966

		RM 6 S	RM 6 S-DS	RML 6 S	RML 6 S-DS	RM 20 S	RM 25 S
Temperature range	(°C)	-20...150	-20...150	-30...150	-30...150	-20...150	-20...150
Ambient temperature range	(°C)			5...40 (see sect. 8.7)			
Temperature setting/resolution		digital, using 10-turn potentiometer and numerical indication; resolution of indication 0,1°C, potentiometer approx. 0,03°C					
Temperature indication/resolution		Incorporated digital thermometer; 0,1°C resolution, absolute accuracy better 0,2 % of indicated value \pm 0,2°C					
Temperature sensor/control action		Pt 100/PID					
Temperature control (at -10°C)	(\pm °C)	0,01	0,01	0,02	0,02	0,01	0,02
Heater capacity	(kW)			1,5			
Cooling capacity, effective with Ethanol at 20°C ambient temperature	(kW)						
	20°C	0,2	0,2	0,35	0,35	0,25	0,25
	0°C	0,15	0,15	0,25	0,25	0,2	0,2
	-20°C	0,05	0,05	0,15	0,15	0,1	0,1
	-30°C	---	---	0,1	0,1	---	---
Safety class according to DIN 12879				2			
Flow rate, max. Pressure/suction	(l/min)	10/-	8/6	10/-	8/6	10/-	10/-
Discharge pressure Pressure/suction	(bar)	0,25/-	0,17/0,15	0,25/-	0,17/0,15	0,25/-	0,25/-
Pump connectors		M 16 x 1; Olives 11 mm dia.					
Filling volume	(ltr.)	4...6	4...6	4...6	4...6	14...20	20...26
Bath opening (W x D)	(mm)	150 x 130	150 x 130	150 x 130	150 x 130	300 x 350	300 x 350
Depth of bath	(mm)	160	160	160	160	160	200
Usable liquid depth	(mm)	140	140	140	140	140	180
Height to upper edge of bath	(mm)	400	400	400	400	450	490
Overall dimensions (W x D x H)	(mm)	200x350x560	200x350x560	200x350x550	200x350x550	350x540x600	350x540x640
Weight, net	(kg)	24	24	28	28	34	36
Power supply	(V; Hz)			230; 50 / 230; 60			
Total power consumption	(kW)	1.8	1.8	1.9	1.9	1.9	1.9
Interference suppression		according to VDE 0875					
Ref. No.	230 V; 50 Hz	LCK 157	LCK 158	LCK 146	LCK 156	LCK 159	LCK 145
Refrigerant R 22	230 V; 60 Hz	LCK 257	LCK 258	LCK 246	LCK 256	LCK 259	LCK 245
Ref. No.	230 V; 50 Hz	LCK 163	LCK 164	-----	-----	LCK 167	LCK 168
Refrigerant R 134 a CFC free							

Compact-Kältethermostate
 Cryothermostats
 Compact low temperature thermostats

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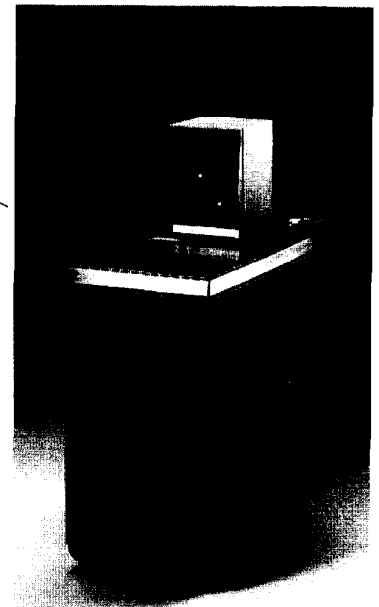
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RM 20 S
 RM 25 S

(Baddeckel Zubehör auf Wunsch)
 (Couvercle de bain accessoire en option)
 (Bath cover optional accessory)

Entleerungshahn
 (rückseitig)
 Robinet de vidange
 (à l'arrière)
 Drain cock (rear)



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3. Basic construction and technical description

- 3.1 These operating instructions is meant for 6 liquid thermostats of different construction and capacity , Series RM:

RM 6-S series have a temperature range from -20...+150°C and a bath capacity of 6 litres.

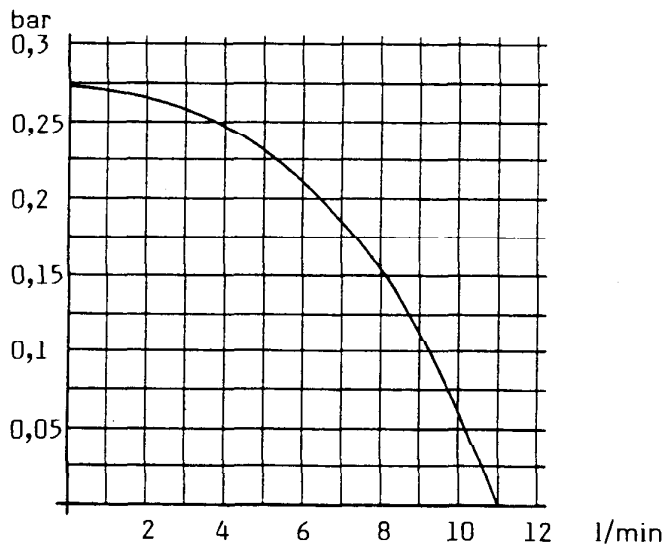
RML 6-S series offer an enlarged temperature range from -30...150°C and a better cooling capacity at a bath capacity of 6 litres.

RM 20-S series with a 20 l bath have a large bath opening. The temperature range is from -20°C ... +150°C.

RM 25 S have a bath depth of 200 mm and therefore a bath capacity of max. 26 litres.

- 3.2 The units are fitted with a submerged centrifugal pump with rotor (except DS) for circulation of the bath medium and for circulation to closed external systems. (Series DS also to open external consumers). The pumps are driven by a split pole motor with traversing shaft, bearingless within the bath. The pressure nipple of the pump can be closed without damage to the pump. The pumps operate perfectly with liquids up to a viscosity of approx. 25 mm² /s.

Performance diagram 230V, 50Hz



measured with H₂O

- 3.3 The temperature is measured by a Pt 100 resistance thermometer and a PID controller. The units have a 10-turn precision potentiometer for set point adjustment. Digital indication of set point during setting. Actual bath temperature is indicated at a LED display. The heating capacity is electronically controlled by a zero voltage packet switching triac.

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A tubular heater with a heating capacity of 1,5 kW and a max. surface capacity of approx. 7 W/cm² is used. By the multifunction output an external setpoint input and actual value output of 10 mV/°C as well as a fault signal is possible which can be used for further applications.

3.4 Cooling aggregate

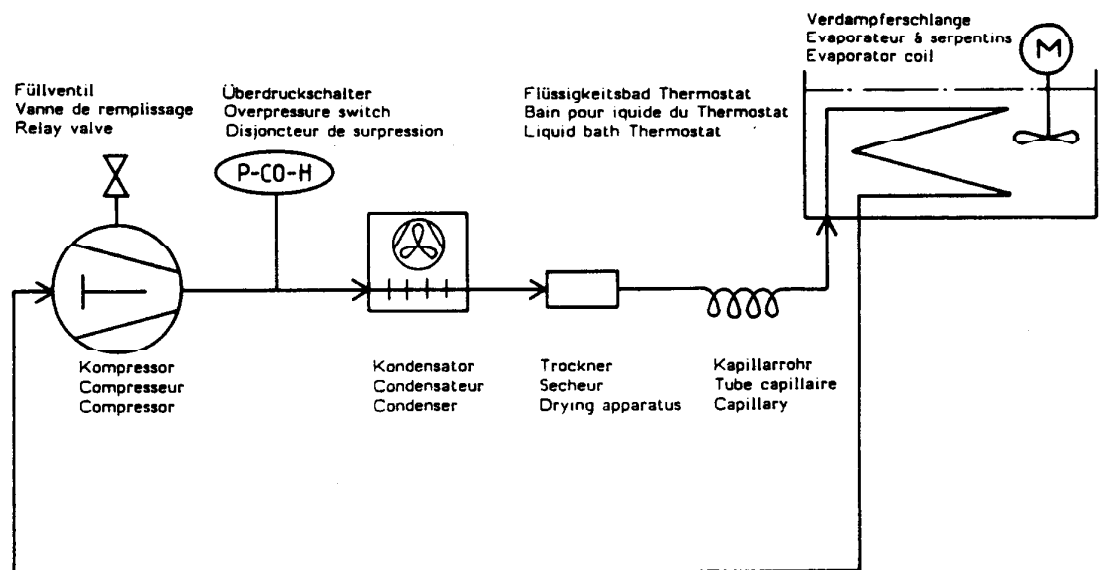
Construction

The refrigeration unit consists essentially of a hermetically sealed compressor. Heat of condensation and motor heat are dissipated through a finned condenser with fan cooling. The fresh air is drawn in at the front of the unit, the heated is discharged to the back and to the side. In order to ensure effective air circulation the ventilation openings must not be obstructed.

At temperatures below 30°C the refrigeration unit runs continuously to remove a certain amount of heat from the bath, while the heater operates against this with an output which is adjusted by the control system. The compressor runs virtually noiselessly and vibration-free. The noise level of series RML is a little higher, because more capacity has to be carried-off, and the dimensions of RML types are the same than RM types.

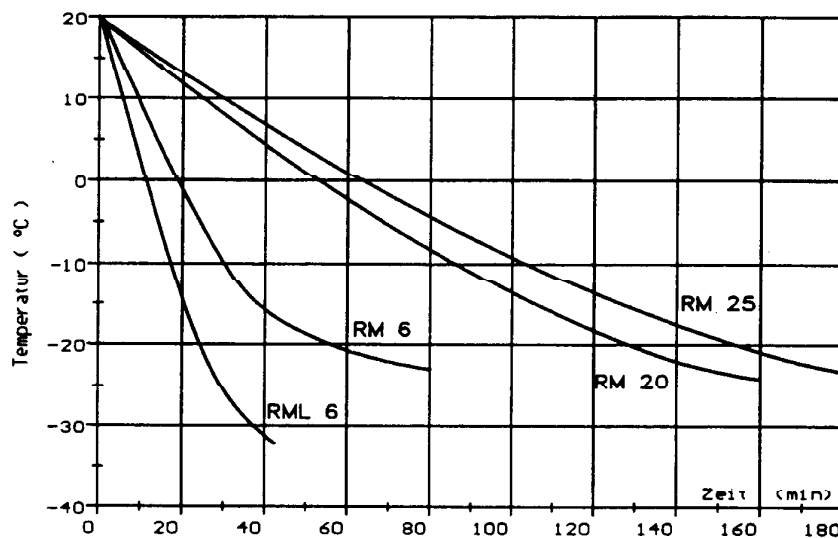
The compressors have a temperature protector, which acts on compressor temperature and current consumption of compressor. Furthermore the cooling system is protected by a pressure protector against overpressure.

Schema Kaltekreislauf / Schéma circuit de réfrigération / Diagram refrigerating circuit



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Cooling diagram



Bath liquid: ethanol


Coolant

time of diagram

water-glycol 1:1 = x 1,7
 (ab to -25°C)
 Ultratherm SK Frigor = x 0,8

3.5 Safety devices

According to DIN 12879 the incorporated overtemperature cut-out can be adjusted between 0...150°C by means of a tool (screwdriver). The actual bath temperature is measured by a separate Pt 100-probe and given to an independent electronics. The thermostat is switched-off on all poles permanently (limiter function) when an adjusted switch-off temperature is exceeded. The red lamp Δ lights up and a fault signal of 8 V is produced at contact 8 of the multifunction output 19 S. According to class 2 of DIN 12879 also a float switch acting as low-level protector switches off the thermostat (pump, heating and cooling machine) on all poles permanently.

Also in case of failure of mains supply or switching off the cut out of the safety circuit is stored. The unit can only be reset after the fault has been cleared by operating the reset key "Release"  .

The pump motor is equipped with a temperature protector which avoids an overtemperature of the motor winding. In that case also the heating will be switched off. This fault could be recognised if the LED indication is also switched off. After motor winding has cooled down the thermostat starts automatically.

4. Safety devices and warning

- 4.1 The DIN specification 12879 for laboratory thermostats entitled: "Liquid Thermostats. General and Safety Requirements" lays down the safety devices required and divides thermostats into different safety classes.

Why can it be dangerous to operate a thermostat?

1. Thermostats are fitted with heaters which provide the necessary heating energy for the thermostatic liquid. If the temperature control fails, or if the liquid level is too low, the heater may reach a temperature which in combination with inflammable thermostatic liquids can cause a fire in the laboratory.
2. When using the thermostat with external circulation, failure of the tubing can cause discharge of hot liquid and endanger persons and material. The classification of thermostats depends on:
 - o whether non-inflammable or inflammable thermostatic liquids are used;
 - o whether the thermostat is operated under supervision or unsupervised.

The units as described in these Operating Instructions are to Class 2. They are protected against overtemperature and underlevel. Class 2 requires

- o a temperature limiter as overtemperature protection which switches off the thermostat on all poles of the supply when an adjustable switch-off temperature is exceeded;
- o a level limiter as low-level protection which switches off the thermostat on all poles of the supply when the liquid volume falls below a minimum value;
- o only those bath liquids are allowed to be used whose flashpoint is above 40°C. The operating temperature must not be higher than 5°C below the flashpoint. Non-inflammable liquids can, of course, be used.

Important Note

Even with Class 2 units the user is only protected against hazards from excess temperature and low level. Further hazards may arise from the type of product being thermostated, e.g. a shift above or below certain temperature levels or breaking of the container followed by reaction with the thermostatic liquid etc. It is impossible to provide protection against all possible cases and they remain largely within the decision and responsibility of the user.

4.2 Warning

Parts of the bath cover may heat up to more than 60°C at higher operating temperatures. Pump outflow and return nipples reach the operating temperature.

5. Bath liquids and tubing

The operating ranges of the bath liquids and tubing represent general data which may be limited by the operating temperature range of the unit.

5.1 Bath liquids

Operating range 5 to 90°C

Use deionized water. Make up evaporation losses at higher temperatures. Losses may be reduced by using suitable bath covers (see Accessories).

Temperatures close to zero and below:

Water/ethylene glycol mixture, preferably Glycoshell P 300, in ratio 1:1.

Operating range	-30 to 100°C	
Boiling point	110°C	
Viscosity at 20°C	4 mm ² /sec	<u>Ultra-Therm G 100</u>
Non-inflammable		<u>Cat.-No. LZB 009</u>

When working for extended periods at higher temperatures the proportion of water drops slowly. The mixture then approaches the properties of pure glycol and therefore becomes inflammable (flashpoint 128°C). The mixture ratio must therefore be checked from time to time, e.g. against the original mixture, or with a hydrometer.

5.2 Tubing (continuous lengths)

Perbunan tubing, not insulated Cat. No. RKJ 011
9 mm internal dia. Application range up to 120°C.
For water and water/glycol mixtures.

Silicone tubing, not insulated Cat. No. RKJ 016
8 mm int. dia. Application range -30...100°C
For water and water-glycol mixtures

Silicone tubing, insulated Cat. No. LZS 001
8 mm int. dia.. With foam rubber insulation
External dia. approx. 30 mm, Application range -60...100°C
Use as for uninsulated silicone tubing.

Perbunan tubing, not insulated Cat. No. RKJ 012
12 mm int. dia. Application range 0...120°C

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Silicone tubing, not insulated Cat. No. RKJ 059
11 mm internal dia., Application range -30...100°C
For water and water/glycol mixtures

Silicone tubing, insulated Cat. No. LZS 007
11 mm internal dia. Ext. dia. approx. 35 mm.
Suitable as silicone tubing, not insulated
Application range -60...100°C

Attention: Do not use silicone tubes together with silicone oil bath liquid !

Secure tubing with clips to prevent it slipping off.

Tubing olive 13 mm dia. for tubings 11 mm dia. Cat.-No. HKO 026

Metal tubing (single insulation)

Application range 0...400°C

Metal tubing MC 50	(50 cm long)	Cat.-No. LZM 040
Metal tubing MC 100	(100 cm long)	Cat.-No. LZM 041
Metal tubing MC 150	(150 cm long)	Cat.-No. LZM 042
Metal tubing MC 200	(200 cm long)	Cat.-No. LZM 043

Metal tubing with special insulation (multiple insulation)

Application range 0...350°C

Metal tubing MC 50 S	(50 cm long)	Cat.-No. LZM 046
Metal tubing MC 100 S	(100 cm long)	Cat.-No. LZM 047
Metal tubing MC 150 S	(150 cm long)	Cat.-No. LZM 048
Metal tubing MC 200 S	(200 cm long)	Cat.-No. LZM 049

Metal tubing connection for linking together the pump
connectors (insulated) MC 18
Application range 0...400°C

Cat.-No. LZM 044

Highly flexible thermally insulated stainless steel (V2A) metal tubing with
M 16x1 mm thread connection. Internal dia. 10 mm. This tubing offers maximum
safety.

Further details on thermostat liquids and tubing are contained in our special
Information Bulletin.

6. Unpacking, assembly and setting up

- 6.1 Goods are packed carefully to prevent transport damage. If the unit should arrive
damaged the carrier or the post office has to be informed so that it can be
inspected.

Standard accessory

Bath cover (RM 6 and RML 6 only)
1 mm silicone tubing 8 mm int. dia., insulated
Operating instructions

6.2 Assembly and setting up

The units are set up to suit the application. Ensure that the ventilation openings to the refrigeration unit are not obstructed.

If no external circulation is required the pump connectors must be linked together with the silicone tubing supplied. First remove the plastic screws. Mount the olives. Outflow tube always at the front, return tube or suction tube at the back.

7. Connection of external systems

7.1 Closed external systems

For operation above 10°C use uninsulated perbunan tubing (Cat. No. RKJ 011); for operation below 10°C the insulated silicone tubing (Cat. No. LZS 001) is recommended.

The tubing is connected to the standard pump nipples. Pressure nipple always at the front, return nipple at the back. If necessary use reducer fittings. An adequate flow rate is required to ensure reliable thermostating of the external apparatus. Where the flow cross-section is severely restricted there may be a temperature drop between bath and external system due to the low flow rate. In that case the bath temperature has to be suitably increased. With external systems placed higher than the thermostat, entry of air in the thermostatic circuit while the pump is stopped may cause the external volume to drain resulting in flooding of the thermostatic bath !

Always ensure maximum flow in the external circulation (connectors, tubing, external system). This produces a larger flow rate and therefore improves thermostating.

7.2 Open external consumer

The units RM 6 S-DS and RML 6 S-DS are fitted with a combined pressure-suction pump (DS). The powerful circulating pump permits the thermostating of closed external systems at higher pump rates, and in particular the thermostating of open external systems. There are two possibilities for maintaining a constant level when connecting open systems:

1. The suction pipe in the external bath has to be fastened in such a way that its end is positioned at the required liquid level. When reducing the pump capacity of the pressure stage by using a pipe clamp at the connection pressure nozzle-external bath, the flow rate of the pressure stage will drop slightly below the flow rate of the suction stage. That can be noticed when the suction pipe sucks in air.
2. A better and more professional solution is the application of a LAUDA Level Controller (LPZ 901) which provides level control with float, screw nozzle for external bath and possibility for manual ventilation.

Mounting of the Level Controller (Ref. No. LPZ 901)

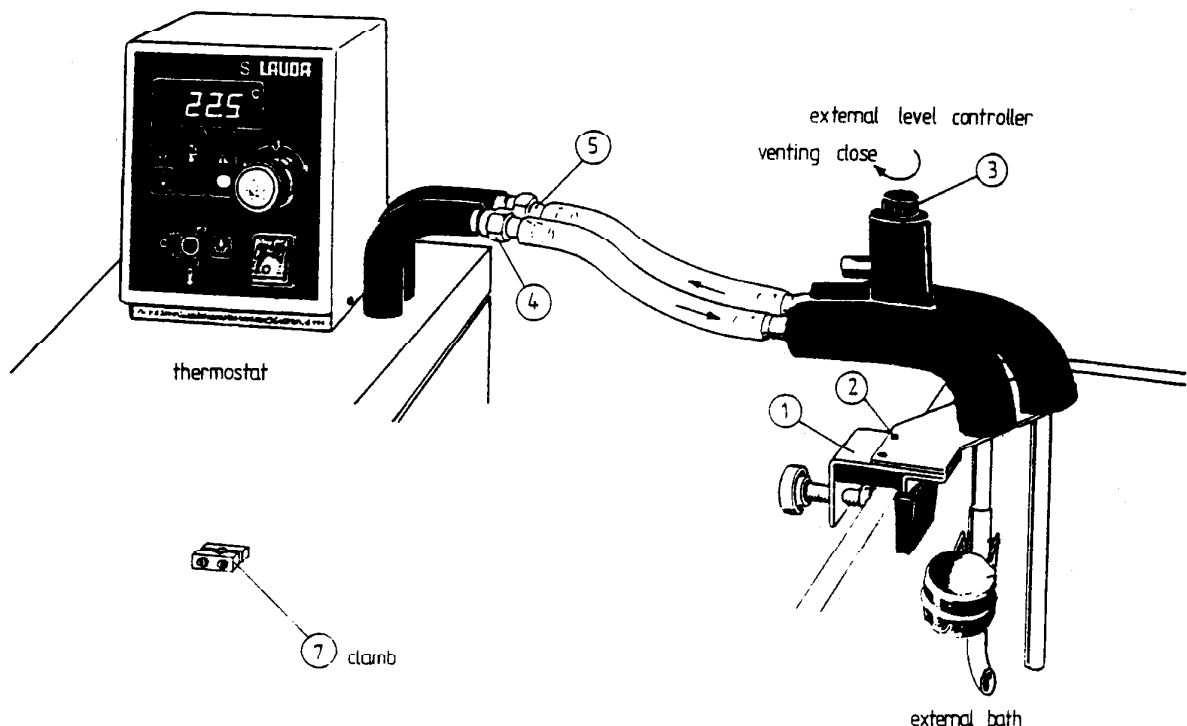
Mount the level controller in the external bath by means of screw clamp ①. This method is appropriate for round and rectangular baths. Another possibility for mounting the controller is provided by the two threaded bores M 4 ②, which are accessible after removing the screw clamp.

Always ensure good circulation and free movability of the float !

Close venting valve ③ (clockwise direction).

Perform tubing connections to the thermostat, connect pressure nozzle ④ to the delivery side, suction nozzle ⑤ to the suction side (see figure below).

Clamp ⑦ is not required with these units !



Note: When thermostat and external bath are not set up at the same level the connecting pipes must be ventilated in order to prevent the bath to overflow when the pump is switched off.

When using the Level Controller in connection with a higher external bath level, the venting can be performed by opening valve ③ at the Level Controller.

Secure the tubing with clips to prevent them from slipping off or use stainless steel tubing with screw fitting.

Attention: For tightening the union nuts (SW 19) on the tubing connectors use fork wrench SW 14 at the outlet nipple.


8. Starting up

8.1 Filling

Fill the unit with decalcified water or another LAUDA bath liquid according to the desired operating temperature. The filling volume is indicated in the technical data. Generally the thermostats should never be filled higher than 2 cm below the cover.

When the thermostat is connected up to an external system, check during starting up that the liquid level in the thermostat does not drop too low due to filling up the external system. If necessary, top up with liquid until the correct level is reached, at least 20 mm above the upper heater winding.

The bathes RM 20 or RM 25 can be covered with a flat bath cover (see Accessories) or with a gable cover even when there is glassware or other items in the bath. This is advisable especially at higher temperatures.

- 8.2 Connect the unit only to a grounded socket. Check the details on the rating label against the supply voltage.
- 8.3 Ensure that the pump connectors are linked together when there is no external system.
- 8.4 Set the overtemperature cut-out  a little higher than the desired operating temperature. At least above the bath temperature when unit is started up.

Operation without refrigeration unit (temperatures above 30°C)

Mains switch (green) I (ON) green lamp lights up
switch "cooling" (yellow) 0 (OFF)

If the red fault lamp lights up, see Section 8.9.

The digital display indicates the actual bath temperature. The yellow lamp "heating" is on continuously. When the set point has been reached, the yellow lamp "heating" begins to flash. If the operating temperature is below the actual temperature, the yellow lamp "heating" only begins to flash after temperature is cooled down to set value.


After the temperature has settled down, the digital thermometer indicates the selected bath temperature.

You can further optimize the control parameter by changing the position of the Xp potentiometer on the back side which is set as standard to 4. A lower value indicates a smaller proportional range Xp. For small bath volumina the optimum adjustment is a higher Xp value, for bigger bath volumina it is better to adjust a smaller Xp value i.e. stronger control amplification.


8.5 Operation with refrigeration unit (temperature below 30°C)

Mains switch (green) I (ON) green lamp lights up
Switch "cooling" (yellow) I (ON) yellow lamp lights up

The thermostat is switched off with the mains switch (green) The switch "cooling" can remain on.




- 8.6 Select the desired temperature at the temperature selector knob. Press key , the set point is indicated at the digital display. The set value is adjusted at a 10-turn precision potentiometer  . The rotary knob includes a locking device by which an unintentional modification of the set value is avoided. Unlocking to left upper side, after adjustment of set value lock to right lower side.
- 8.7 The units work up to an ambient temperature of max. +40°C. Depending on the load of the cooling machine it is possible that the compressor is switched off, especially at ambient temperatures above +35°C. Furthermore a high ambient temperature leads to a decreased cooling capacity ! When starting the refrigeration unit after a longer period of stillstand it could take up to 30 minutes until the rated cooling capacity is available depending on the ambient temperature and model.

8.8 Operation with Programmer

At the multifunction output 19 S it is possible to connect up a programmer type PM 351-1 with which the setpoint of the thermostat can be varied according to a selected program. In order to ensure that the system operates correctly it is necessary that the energy budget of the thermostat (heating, cooling, load) matches the requirement of the program (heating rate, cooling rate, operating temperatures). Set the unit set point to the lowest temperature in the program. The 19 S plug must not be connected. This temperature is also used as value A when programming the programmer. Now this setpoint must not be changed anymore. Insert plug from the connection cable at the programmer. When operating the key  the digital display shows the actual setpoint which is provided by the programmer and to which the unit operates. For further details see the Operating Instructions for PM 351-1.

8.9 Safety circuit

The functioning of the safety circuit has already been described in Section 3.5. After the unit has been started up it is advisable to check the correct operation of the safety devices to DIN 12879. At unsupervised operation we recommend a daily check.


- 8.9.1 Correct functioning of the low level protection requires satisfactory operation of the float switch. This can be checked by changing the level in the bath by draining some liquid. If the bath level falls below the minimum level (approx. 20 mm above the upper heater winding) the pump, the heater and cooling machine are switched-off on all poles. The red LED "Fault"  lights up. For putting again into operation refill the bath and press the reset key .
- 8.9.2 To check the overtemperature protection lower its switch-off point slowly. As soon as the setting is below the value shown on the digital thermometer the unit must switch-off as explained under 8.9.1. In order to distinguish between the fault indications "Overtemperature" and "Level", which are both indicated on the same display, the point on the far right side on the temperature display will start blinking in case of overshooting the overtemperature cut-out. Adjust the switch-off point again above the bath temperature and operate the unlocking key "Reset" .
- 8.9.3 If the safety devices according to 8.9.1 and 8.9.2 do not operate correctly the unit must be stopped immediately and checked by a specialist otherwise safe operation cannot be guaranteed.

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9. Multifunction output

9-pin plug connection 19 S with threaded sockets for screwing at the back side with multiple function.

- Contact 1: recorder connection for bath temperature, correct sign;
10 mV/°C, $R_i \approx 100 \text{ Ohm}$; internal recorder resistance $\geq 1 \text{ MOhm}$ (0 V contact 3)
- Contact 2: 0 V load reference potential
- Contact 3: 0 V reference potential for signals
- Contact 4: Program or external setpoint input 10 mV/°C added to setpoint selected internally. Sum is indicated with push button .
 $R_i = 20 \text{ kOhm}$ (0 V contact 3)
- Contact 5: approx. 8 V when fault lamp shows red continuously, i.e. safety circuit to DIN 12879 is activated. $R_i \approx 0,5 \text{ kOhm}$;
 $I_{\text{max}} = 10 \text{ mA}$ (0 V contact 2)
- Contact 6: Setpoint output 10 mV/°C; $R_i \approx 100 \text{ Ohm}$, Load resistance = 10 kOhm (0 V contact 3)
- Contact 7: + 5 V supply voltage, max. additional load 10 mA
- Contact 8: free
- Contact 9: - 5 V supply voltage, max. additional load 10 mA

In case of a fault the signals at this plug connector can be used for an initial fault diagnosis.

9-pole mating connector
Case for above

Ref. No. EQM 042
Ref. No. EGG 020

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10. Maintenance

LAUDA thermostats operate largely without maintenance. Contaminated bath liquid should be drained out through the drain cock and replaced with fresh liquid. If the unit operates under dusty conditions we recommend that the refrigerator condenser is cleaned every 4 to 6 months. This is done best with compressed air or nitrogen which is blown into the ventilation openings for a few minutes. If necessary unscrew the front ventilation grill.

Clean the units with a cloth, wetted with water and some drops of tensids (washing-up liquid). No water must enter the control part. The main fuses at the back side are accessible from outside. If one fuse acts, the green lamp in the mains switch will be off. Insert only fuses as indicated (T 12,5 A, size 6,3 x 32).

Safety remarks in case of repair

Before repair or cleaning is to be done, pull out the mains plug. Repairs at the control part and the lower part of the unit should only be executed by an electrician.

Note for the electrician: All indication and control circuits are on unprotected mains supply circuit !

Remarks on repair and disposal

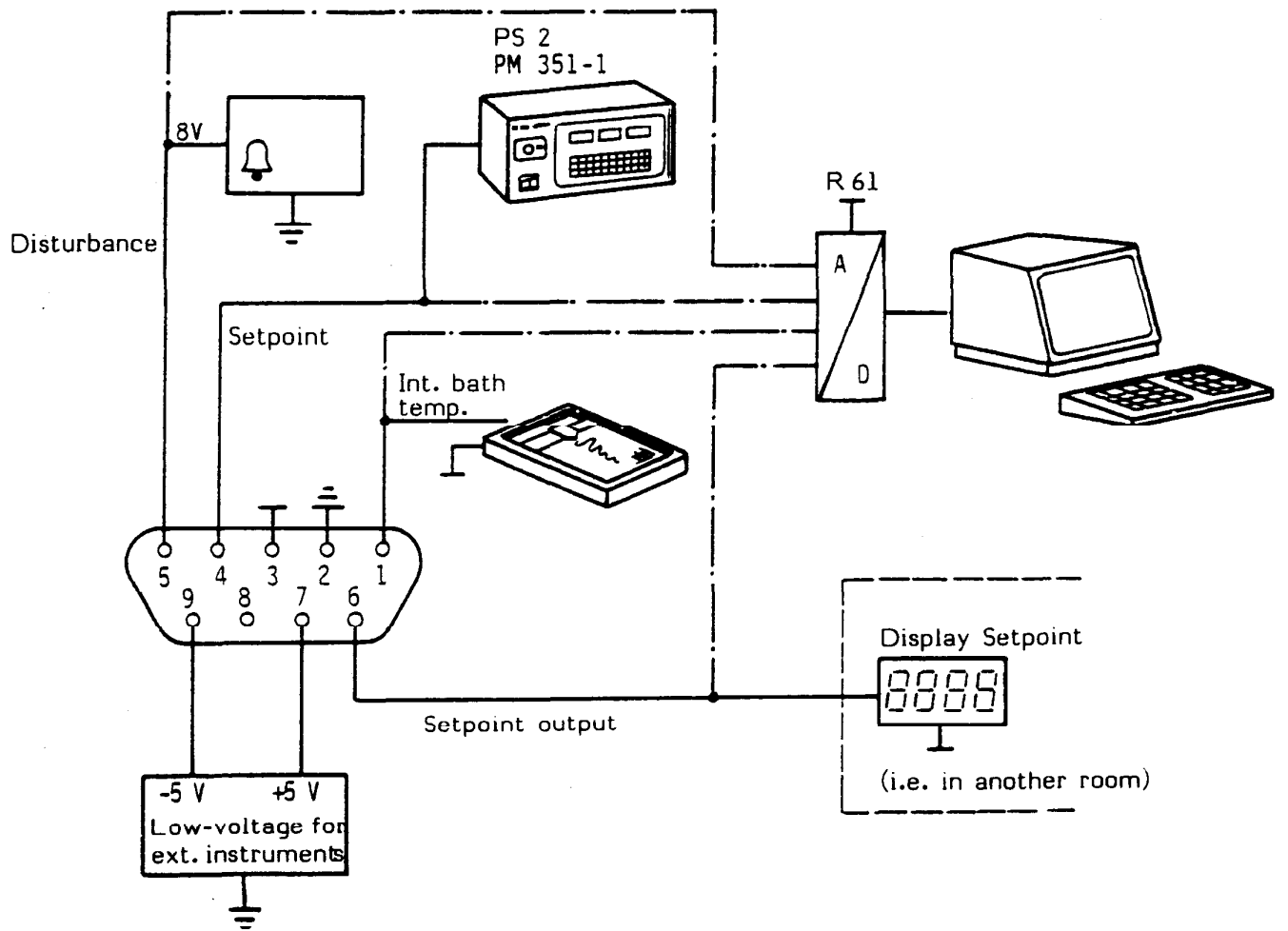
The cooling circuit of the units up to serial number R59 999 as well as all units type RM is filled with partly halogenated chlorofluorocarbon R 22. The units type RM beginning with serial number R 61 are filled with the non-polluting fluorocarbon R 134 a. Repair and disposal should only be executed by a qualified refrigeration engineer.

Spare parts order

In case of spare parts requirement, please always indicate type and serial no. as indicated on the type label. This avoids further questions and wrong deliveries.

We shall always be happy to deal with queries, suggestions and complaints.

LAUDA DR. R. WOBSE
GMBH & CO. KG



Multifunction output for M-Line
with pump and control head "S"

Compact-Low temperature thermostats
RM 6 S, RM 6 S-DS, RML 6-S, RML 6 S-DS, RM 20 S, RM 25 S

Accessories for Compact Low-temperature thermostat RM-Series with S-Control

Olive 13 mm dia. for tubing 11 mm diameter HKO 026

Stainless steel racks for RM 20

for test tubes, centrifuge tubes etc.
Bath RM 20, max. 4 racks

RD 13	for 56 tubes 10 to 13 dia.,	80 mm immersion	UG 066
RD 18/1	for 33 tubes 14 to 18 dia.,	80 mm immersion	UG 067
RD 18/2	for 33 tubes 14 to 18 dia.,	110 mm immersion	UG 068
RD 30	for 14 tubes 24 to 30 dia.,	110 mm immersion	UG 069

for bath RM 25, max. 4 racks

RE 13	for 56 tubes 10 to 13 dia.,	80 mm immersion	UG 070
RE 18/1	for 33 tubes 14 to 18 dia.,	80 mm immersion	UG 071
RE 18/2	for 33 tubes 14 to 18 dia.,	110 mm immersion	UG 072
RE 30	for 14 tubes 24 to 30 dia.,	110 mm immersion	UG 073

Bath cover (flat,) stainless steel for RM 20 and RM 25
2 parts LCZ 009

Rising platform to be mounted subsequently. RM 20 and RM 25
can be fitted with max. 2 platforms
Bench area 250 x 160 mm, height continuously adjustable LCZ 012

Gable cover stainless steel, for RM 20 and RM 25 LCZ 011

Stainless steel racks for RM 6 and RML 6

RF 18/1	for 20 tubes 14 to 18 dia.,	80 mm immersion	UG 074
RF 18/2	for 20 tubes 14 to 18 dia.,	110 mm immersion	UG 075

Tubing (continuous lengths)

Silicone tubing, 8 mm int. dia.	RKJ 016
Silicone tubing, 4 mm int. dia.	RKJ 041
Silicone tubing, insulated, 8 mm int. dia.	LZS 001
Perbunan tubing, 9 mm int. dia.	RKJ 011

Compact-Low temperature thermostats
RM 6 S, RM 6 S-DS, RML 6-S, RML 6 S-DS, RM 20 S, RM 25 S

Special racks for Type RM 6 and RML 6 - Makrolon

Type	Description	Cat. No.
Test tubes 160 mm	20 test tubes 160 x 16/17 mm	UE 020
Test tubes 100 mm	20 test tubes or centrifuge tubes 100 x 16/17 mm	UE 022
Hemolysis tubes	13 int. dia. (30 tubes)	UE 023
Eppendorf tubes (max. 1)	74 tubes	UG 085

Programmer PM 351-1

LRP 012

Microprocessor controlled programmer with 50 program segments max. and a program range of 350°C for individual programming of temperature courses.
Programmable control of range of tolerance.
External controllable start, stop and reset function.

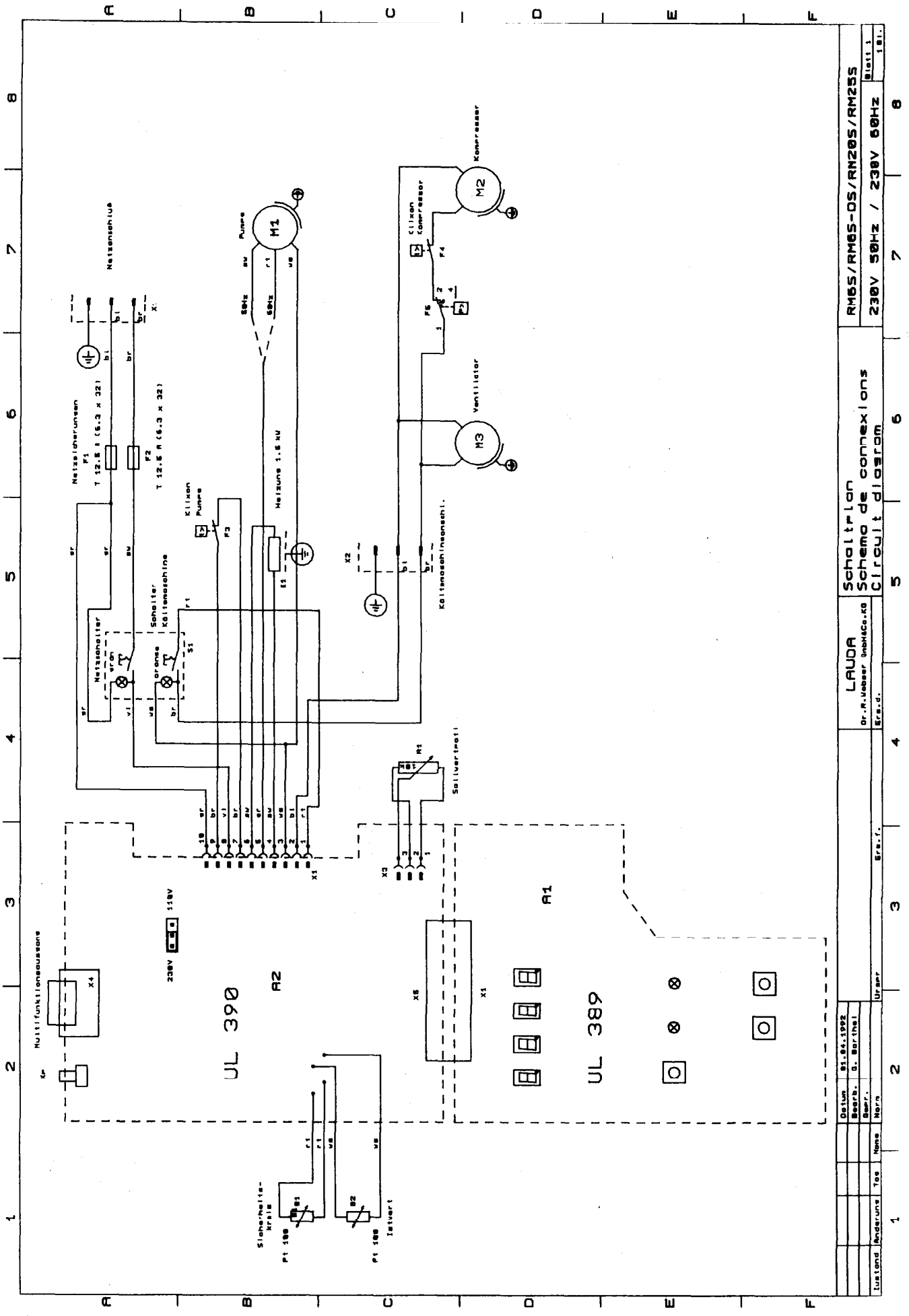
RS 232 interface R 61/2

serial interface with A/D and D/A converter for transfer of thermostat temperature to an appropriate computer and set point temperature to the thermostat as well as alarm signals.

Program and automatic operation of ramps and contact programming is possible.

Connection cable PM 351-1 resp. R 61/2 to thermostat S

UK 197



Distanz		51.04.1992		RMBS/RMBS-OS/RN20S/RM25S		Blatt 1.1	
Beorb.		D. Barthel		Schaltplan		230V 50Hz / 230V 60Hz	
Bearf.				Schema de connexions			
Name		Urser		Circuit diagram			
Tos				LAUDA			
Anderung				Dr. R. Jöcher GmbH & Co			
Te				Ers.d.			
1				5		6	
				7		8	

Geräteliste Schaltplan
 List of parts Circuit diagram
 Liste de pièces schéma de connexions

RM 6 S / RM 6 S-DS / RM 20 S / RM 25 S
 230 V; 50 Hz /
 230 V; 60 Hz

Blatt 1

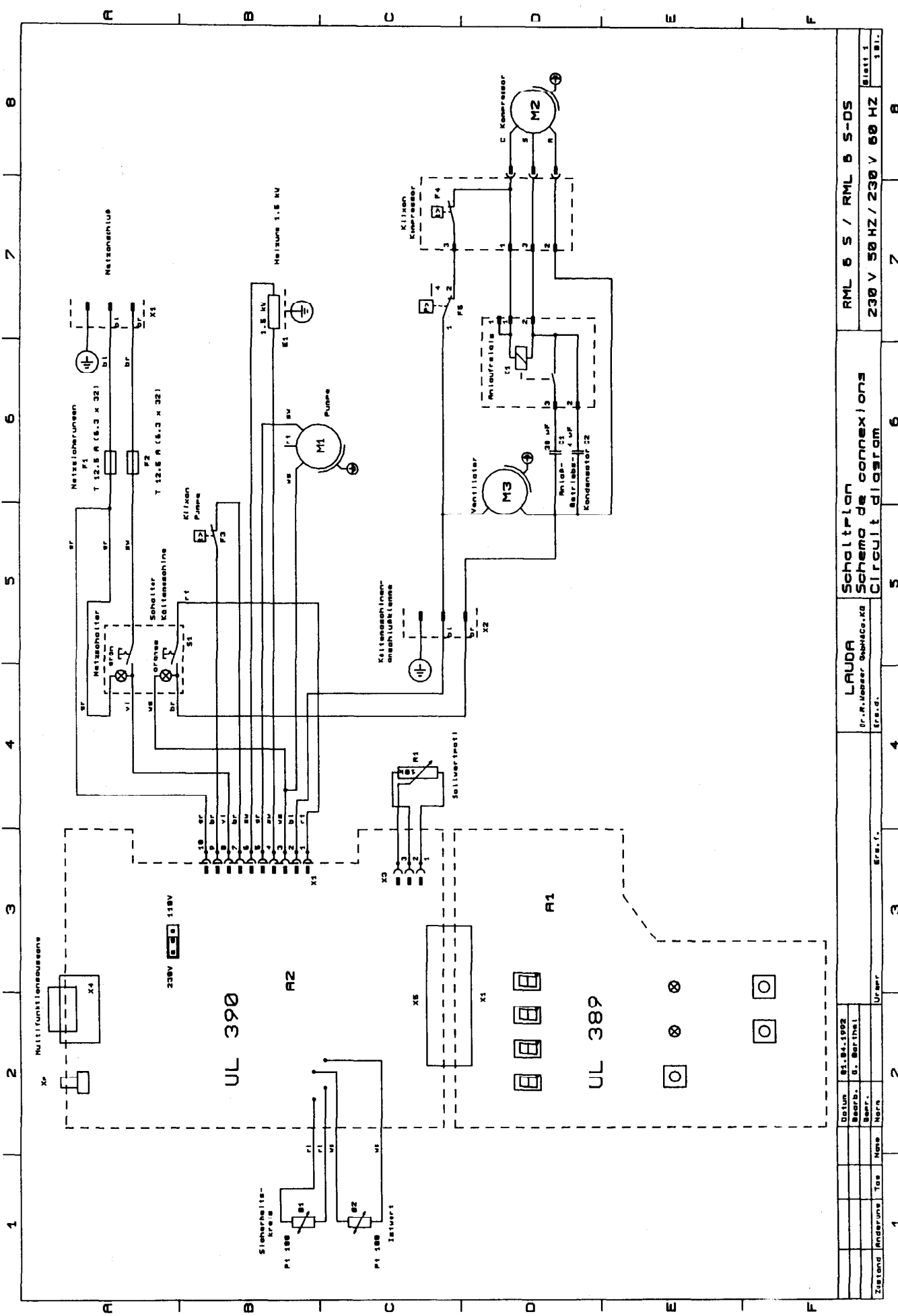
Teil Nr. Part No. Piéc. No.	Bezeichnung Designation Désignation	Typ Type Type	Ersatzteilbestell-Nr. Order No. for spares No. Réf. pièces détachées
A 1	Leiterplatte "Anzeige" Printed circuit board "Indication" Circuit imprimé "Affichage"		UL 389
A 2	Leiterplatte "Netz/Regelung" Printed circuit board "Mains/Control" Circuit imprimé "Secteur/Régulation"		UL 390
B 1	Pt 100 Fühler Übertemperatur Pt 100 Probe Overtemperature Pt 100 Sonde Surtempérature		ETP 044
B 2	Pt 100 Fühler Regler Pt 100 Probe Controller Pt 100 Sonde Régulateur		ETP 044
E 1	Heizung Heater Corps de chauffe	1,5 kW	EH 152
F 1	Netzsicherung Mains Fuse Secteur fusible	T 12,5 A	EES 051
F 2	Netzsicherung Mains Fuse Secteur fusible	T 12,5 A	EES 051
F 3	Klixon Pumpe Klixon Pump Klixon Pompe		
F 4	Klixon Kompressor Klixon Compressor Klixon Compresseur		
F 5	Überdruckschalter Over-pressure switch Disjoncteur de surpression		ES 035
M 1	Pumpenmotor Pump motor Moteur de pompe		EM 091

Geräteliste Schaltplan
 List of parts Circuit diagram
 Liste de pièces schéma de connexions

RM 6 S / RM 6 S-DS / RM 20 S / RM 25 S
 230 V; 50 Hz /
 230 V; 60 Hz

Blatt 2

Teil Nr. Part No. Piéc. No.	Bezeichnung Designation Désignation		Typ Type Type	Ersatzteilbestell-Nr. Order No. for spares No. Réf. pièces détachées
M 2	Kompressor Compressor Compresseur	bis Serie R59 999 RM 6 S RM 20 S/RM 25 S ab Serie R 61 RM 6 S RM 20 S/RM 25 S	B 5132 A B 6165 ER 22 BP 1111 Z B 2116 Z	EMK 124 EMK 122 EMV 003 EMV 004
M 3	Ventilator Fan Ventilateur	RM 6 S RM 20 S/RM 25 S		EML 007 EML 011
R 1	Potentiometer Sollwert Setpoint potentiometer Potentiomètre Valeur de consigne		10 kOhm	UD 306
S 1	Netzschalter, Schalter Kältemaschine Mains switch, Switch Cooling unit Interrupteur secteur, Commutateur Groupe frigorifique			EST 082
X 1	Netzanschluß/Netzkabel Mains connection/Mains cable Branchement secteur/Cable de secteur			EKN 001
X 2	Anschluß Kältemaschine Connection cooling unit Branchement Groupe frigorifique			



Zustand		Änderung		Tag		Name		Urspr.		Erstf.		4		5		6		7		8	
Datum		Bearb.		Bear.		Name		Urspr.		Erstf.		4		5		6		7		8	
91.04.1982		G. Barthel								LAUDA		Schaltplan		RML 6 S / RML 6 S-DS		230 V 50 HZ / 230 V 60 HZ		Blatt 1		1/1	
Dr. R. Jäger, GmHCo. AG		Erstf.								Schaltplan		RML 6 S / RML 6 S-DS		230 V 50 HZ / 230 V 60 HZ		Blatt 1		1/1			

Geräteliste Schaltplan
 List of parts Circuit diagram
 Liste de pièces schéma de connexions

RML 6 S / RML 6 S-DS
 230 V; 50 Hz /
 230 V; 60 Hz

Blatt 1

Teil Nr. Part No. Piéc. No.	Bezeichnung Designation Désignation	Typ Type Type	Ersatzteilbestell-Nr. Order No. for spares No. Réf. pièces détachées
A 1	Leiterplatte "Anzeige" Printed circuit board "Indication" Circuit imprimé "Affichage"		UL 389
A 2	Leiterplatte "Netz/Regelung" Printed circuit board "Mains/Control" Circuit imprimé "Secteur/Régulation"		UL 390
B 1	Pt 100 Fühler Übertemperatur Pt 100 Probe Overtemperature Pt 100 Sonde Surtempérature		ETP 044
B 2	Pt 100 Fühler Regelung Pt 100 Probe Controller Pt 100 Sonde Réglage		ETP 044
C 1	Anlaufkondensator Starting condenser Condensateur démarrage		
C 2	Betriebskondensator Running capacitor Condensateur de service		
E 1	Heizung Heater Corps de chauffe	1,5 kW	EH 152
F 1	Netzsicherung Mains Fuse Secteur fusible	T 12,5 A	EES 051
F 2	Netzsicherung Mains Fuse Secteur fusible	T 12,5 A	EES 051
F 3	Klixon Pumpe Klixon Pump Klixon Pompe		
F 4	Klixon Kompressor Klixon Compressor Klixon Compresseur		

Geräteliste Schaltplan
 List of parts Circuit diagram
 Liste de pièces schéma de connexions

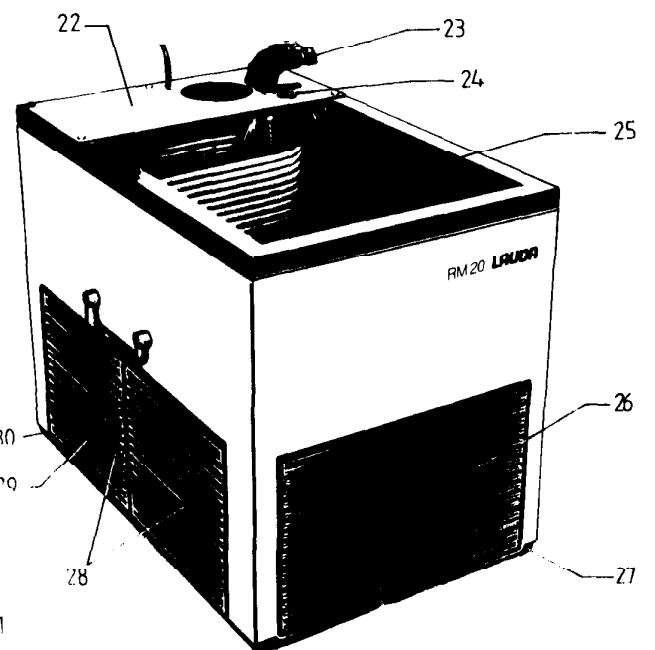
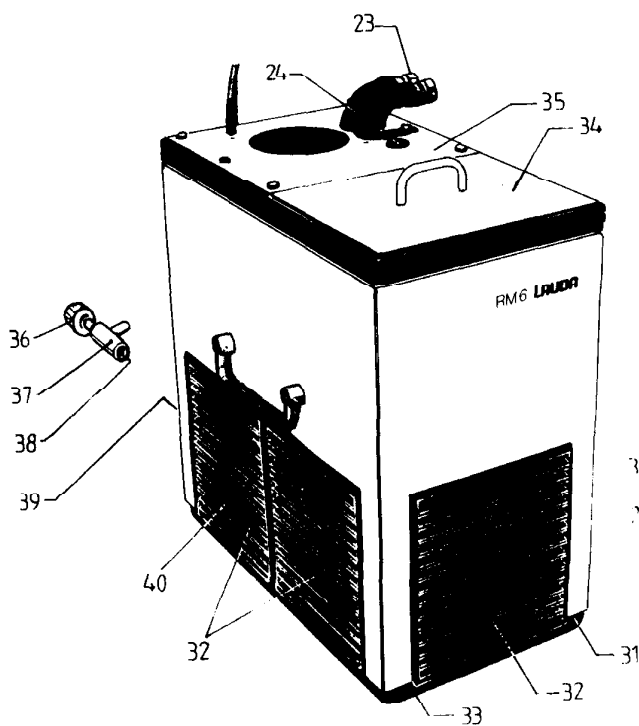
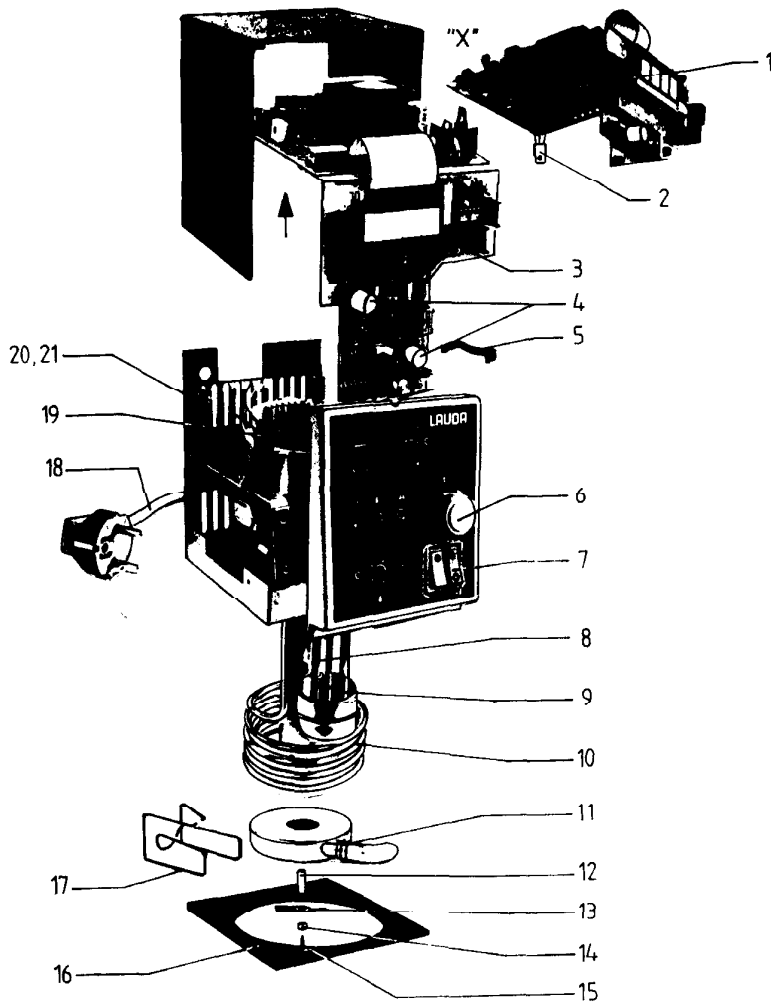
RML 6 S / RML 6 S-DS
 230 V; 50 Hz /
 230 V; 60 Hz

Blatt 2

Teil Nr. Part No. Piéc. No.	Bezeichnung Designation Désignation	Typ Type Type	Ersatzteilbestell-Nr. Order No. for spares No. Réf. pièces détachées
F 5	Überdruckschalter Over-pressure switch Disjoncteur de surpression		ES 035
K 1	Anlaufrelais Starting relay Relais démarrage		
M 1	Pumpenmotor Pump motor Moteur de pompe		EM 091
M 2	Kompressor Compressor Compresseur	C-2S350 L5E	EMK 123
M 3	Ventilator Fan Ventilateur		EML 032
R 1	Potentiometer Sollwert Setpoint potentiometer Potentiomètre Valeur de consigne	10 kOhm	UD 306
S 1	Netzschalter, Schalter Kältemaschine Mains switch, Switch Cooling unit Interrupteur secteur, Commutateur groupe frigorifique		EST 082
X 1	Netzanschluß/Netzkabel Mains connection/Mains cable Branchement secteur/Cable de secteur		EKN 001
X 2	Anschluß Kältemaschine Connection cooling unit Branchement Groupe frigorifique		

Ersatzteile / Spare parts / Pièces détachées
 Compact-Kältethermostate / Compact low-temperature thermostats /
 Cryothermostats RM 6 S, RML 6 S, RM 20 S, RM 25 S

E 1



Ersatzteile / Spare parts / Pièces détachées
 Compact-Kältethermostate / Compact low-temperature thermostats /
 Cryothermostats RM 6 S, RML 6 S, RM 20 S, RM 25 S

		E 2	
1	Leiterplatte "Regelung" / Printed circuit "Control" / Circuit imprimé "Réglage"	UL	390-1
2	Triac / Triac / Triac	EYY	008
3	Leiterplatte "Anzeige" / Printed circuit "LED indication" / Circuit imprimé "Indication"	UL	389 *
	Triackoppler / Triac connector / Connecteur triac	UL	422 **
4	Taster / Push button / Touche	EYI	155
5	Transistorklammer / Transistor clamp / Agrafe pour transistor	EST	083
6	Drehknopf / Rotary knob / Bouton rotatif	EYZ	055
	Potentiometer / Potentiometer / Potentiomètre	EZD	063
7	Netzschalter / Main power switch / Interrupteur secteur	UD	306
8	PT-Fühler / PT probe / Sonde PT	EST	082
9	Schwimmer / Float / Flotteur	ETP	044
		US	051 *
		US	056 **
10	Heizkörper / Heater / Corps de chauffe	EH	152
11	Feder / Spring / Ressort	HI	012
12	Hülse / Sleeve / Gaine	HKB	406
13	Propeller / Propeller / Helice	HZF	074
14	Kappe / Cover / Calotte	HKB	407
15	Schraube / Screw / Bouton	DK	306
16	Dichtung / Gasket / Joint	EDF	108
17	Spange / Clip / Agrafe	HI	037
18	Netzkabel mit Stecker / Mains power cord with plug / Cable secteur avec fiche	EKN	001
19	Motor / Motor / Moteur	EM	091
20	Sicherung / Fuse / Fusible	EES	014
21	Sicherungshalter / Fuse holder / Porte fusible	EEH	016
	Verschlusskappe / Close up cover / Calotte de fermeture	EEH	018
22	Deckplatte / Bridge plate / Couvercle	HPD	157
23	Pumpenstutzen kpl. / Pump connector cpl. / Tubulures de pompe cpl.	UO	076
24	Blindtülle / Rubber grommet / Douille d'obturation	EZV	016
25	Innenkessel mit Verdampfer kpl. / Stainless steel vessel with evaporator cpl. / Cuve intérieure	UU	098
	avec évaporateur cpl. RM 6, RML 6	UU	112
	RM 20	UU	114
	RM 25	HGW	133
26	Gitter / Grill / Grille	HGB	154
27	Bodenwanne / Black plastic tray / Fond de la cuve	HGW	132
28	Gitter / Grill / Grille	BKA	010 #
29	Kälteaggregat kpl. / Refrigeration unit cpl. / Groupe frigorifique cpl.	EMK	138 ##
	Verdichter / Compressor / Compresseur	EMK	122 #
		EMV	004 ##
	Druckwächter / Pressure control device / Controleur de pression	ES	035
	Lüfter / Fan / Ventilateur	EML	011

Ersatzteile / Spare parts / Pièces détachées
 Compact-Kältethermostate / Compact low-temperature thermostats /
 Cryothermostats RM 6 S, RML 6 S, RM 20 S, RM 25 S

E 3

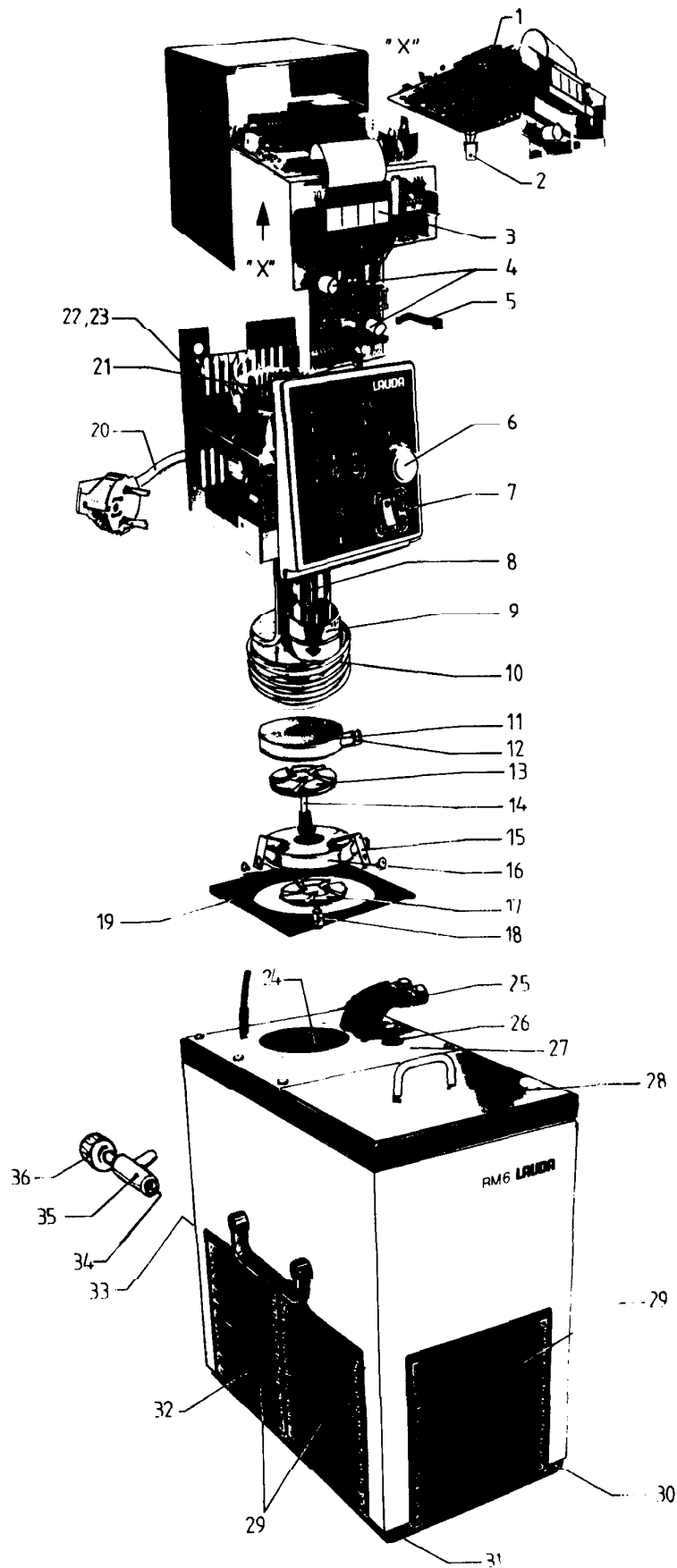
30	Gummifuß / Rubber butt / Pied en caoutchouc		EZG	005
31	Bodenwanne / Black plastic tray / Fond de la cuve		HGB	152
32	Gitter / Grill / Grille		HGW	131
33	Gummifuß kpl. / Rubber butt cpl. / Pied en caoutchouc cpl.		HX	413
34	Deckel / Cover / Couvercle		HDQ	069
35	Deckplatte / Bridge plate / Couvercle		HPD	163
36	Drehknopf / Rotary knob / Bouton rotatif		EZD	001
37	Entleerungshahn kpl. / Drain cock cpl. / Robinet de vidange		UD	070
38	O-Ring / O-Ring / Joint torique		EDU	U18
39	Gummitülle / Rubber grommet / Douille en caoutchouc		EDT	007
40	Kälteaggregat kpl. / Refrigeration unit	RM 6	BKA	050 #
	cpl. / Groupe frigorifique cpl.		EMK	137 ##
		RML 6	BKA	051
	Verdichter / Compressor / Compresseur	RM 6	EMK	124 #
			EMV	003 ##
		RML 6	EMK	123
	Druckwächter / Pressure control device / Controleur de pression		ES	035
	Lüfter / Fan / Ventilateur	RM 6	EML	007
		RML 6	EML	032

* bis Serie P09 / Up to Serie P09 / jusqu'à Série P09
 ** ab Serie P10 / from serial number P10 / à partir de série P10

bis Serie R61 / Up to Serie R61 / jusqu'à Série R61
 ## ab Serie R62 / from serial number R62 / à partir de série R62

Ersatzteile / Spare parts / Pièces détachées
 Compact-Kältethermostate / Compact low-temperature thermostats /
 Cryothermostats RM 6 S-DS, RML 6 S-DS

E 4



Ersatzteile / Spare parts / Pièces détachées
 Compact-Kältethermostate / Compact low-temperature thermostats /
 Cryothermostats RM 6 S-DS, RML 6 S-DS

		E 5
1	Leiterplatte "Regelung" / Printed circuit "Control" / Circuit imprimé "Réglage"	UL 390-1
2	Triac / Triac / Triac	EYY 008
3	Leiterplatte "Anzeige" / Printed circuit "LED indication" / Circuit imprimé "Indication"	UL 389 *
	Triackoppler / Triac connector / Connecteur triac	UL 422 **
4	Taster / Push button / Touche	EYI 155
5	Transistorklammer / Transistor clamp / Agrafe pour transistor	EST 083
6	Drehknopf / Rotary knob / Bouton rotatif	EYZ 055
	Potentiometer / Potentiometer / Potentiomètre	EZD 063
7	Netzschalter / Main power switch / Interrupteur secteur	UD 306
8	PT-Fühler / PT probe / Sonde PT	EST 082
9	Schwimmer / Float / Flotteur	ETP 044
		US 051 *
		US 056 **
10	Heizkörper / Heater / Corps de chauffe	EH 152
11	Druckkammer kpl. / Pressure chamber cpl. / Chambre de pression cpl.	HGP 100
12	Feder / Spring / Ressort	HI 012
13	Lauftrad, Druck kpl. / Pressure impeller cpl. / Roue de roulement, pression cpl.	HQL 029
14	Hülse / Sleeve / Gaine	HKB 424
15	Klammer / Clamp / Agrafe	HI 038
16	Saugkammer kpl. / Suction chamber cpl. / Chambre d'aspiration	HGP 101
17	Lauftrad, Saug kpl. / Suction impeller cpl. / Roue de roulement aspiration cpl.	HQL 028
18	Schraube / Screw / Bouton	DK 306
	Druckscheibe / Fixing plate / Disque de fixation	HKR 193
19	Dichtung / Gasket / Joint	EDF 108
20	Netzkabel mit Stecker / Mains power cord with plug / Cable secteur avec fiche	EKN 001
21	Motor / Motor / Moteur	EM 091
22	Sicherung / Fuse / Fusible	EES 014
23	Sicherungshalter / Fuse holder / Porte fusible	EEH 016
	Verschlußkappe / Close up cover / Calotte de fermeture	EEH 018
24	Innenkessel mit Verdampfer kpl. / Stainless steel vessel with evaporator cpl. / Cuve intérieure avec évaporateur cpl.	UU 098
25	Pumpenstutzen kpl. / Pump connector cpl. / RM 6	UO 077
	Tubulures de pompe cpl. / RML 6	UO 076
26	Blindtülle / Rubber grommet / Douille d'obturation	EZV 016
27	Deckplatte / Bridge plate / Couvercle	HPD 163
28	Deckel / Cover / Couvercle	HDQ 069
29	Gitter / Grill / Grille	HGW 131
30	Bodenwanne / Black plastic tray / Fond de la cuve	HGB 152
31	Gummifuß kpl. / Rubber butt cpl. / Pied en caoutchouc cpl.	HX 413

Ersatzteile / Spare parts / Pièces détachées
Compact-Kältethermostate / Compact low-temperature thermostats /
Cryothermostats RM 6 S-DS, RML 6 S-DS

E 6

	Druckwächter / Pressure control device / Controleur de pression	ES	035
	Lüfter / Fan / Ventilateur	RM 6	EML 007
		RML 6	EML 032
33	Gummitülle / Rubber grommet / Douille en caoutchouc	EDT	007
34	O-Ring / O-Ring / Joint torique	EDO	018
35	Entleerungshahn kpl. / Drain cock cpl. / Robinet de vidange	UD	070
36	Drehknopf / Rotary knob / Bouton rotatif	EZD	001

* bis Serie P09 / Up to Serie P09 / jusqu'à Série P09
** ab Serie P10 / from serial number P10 / à partir de série P10

bis Serie R61 / Up to Serie R61 / jusqu'à Série R61
ab Serie R62 / from serial number R62 / à partir de série R62