

## Operating Instructions

LAUDA Compact  
Low-Temperature Thermostat  
RLS 6 / H  
to DIN 12879






01/95  
Valid from Series T01  
YACE0027

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Annex:

Circuit diagram

1. Brief description

- 1.1 Check the thermostat and accessories during unpacking for any transport damage and if necessary inform the forwarding agent.
- 1.2 Assemble the unit according to Section 6 and add extra items as appropriate.
- 1.3 Make necessary hose connections to the external system.  
Secure hoses with hose clips to prevent them from slipping off.
- 1.4 Fill the bath up to a level approx. 1 cm below the plastic cover. For bath liquids see Section 5.
- 1.5 The spacing of the grill from any object which might interfere with free air flow must be at least 0.5 m.
- 1.6 Check the supply voltage against the details on the label. Insert the mains plug.
- 1.7 Switch on the mains switch. The green signal lamp in the switch lights up. Turn selector switch to cooling . The unit will then cool down to the lowest temperature possible. The refrigerator starts running.
- 1.8 Overtemperature cut-out point  is permanently fixed to 35°C. To release the safety circuit lock-out it may be necessary to operate the unlocking key .
- 1.9 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.
- 1.10 The digital thermometer shows the actual bath temperature.
- 1.11 If bath liquid is to be heated up (e.g. for draining), the selector switch must be turned to . Then push the button "Heating-up boost". Pilot lamp "Heating"  lights up until the temperature has risen to approx. 25°C. Then the heating turns off automatically and the unit maintains roughly this temperature.

1.12 Safety features

The thermostat conforms to Class 2. It must only be operated with liquids (see Section 5) whose flashpoint is above 40°C. Inflammable liquids must only be used to 5°C below the flashpoint, otherwise there is a danger of an explosive atmosphere.

2. Data table

This thermostat meets the requirements of DIN 12879

Technical data (to DIN 58966)		RLS 6 / H
Operating temp. range	(°C)	-80 ... 20
Temperature measurement/ resolution		digital indication by green LED / 0.1°C resolution; accuracy $\pm 0.2\%$ of reading $\pm 0.2^\circ\text{C}$ .
Temperature probe		Pt 500
Heating capacity max.	(kW)	1.2; automatic heating-up
Cooling capacity, effective at:	(kW)	
20°C		0.70
10°C		0.64
0°C		0.59
-10°C		0.54
-20°C		0.49
-30°C		0.45
-40°C		0.40
-50°C		0.35
-60°C		0.30
-70°C		0.20
-80°C		0.08
		Refrigerator is switched on and off as required.
Class to DIN 12879		2
<u>SIMPLEX pump</u>		
Flow rate at zero pressure (pump capacity) with olive 11/13 dia.	(l/min)	11 / 15
max. manometric pressure	(bar)	0.25

Technical data (to DIN 58966)

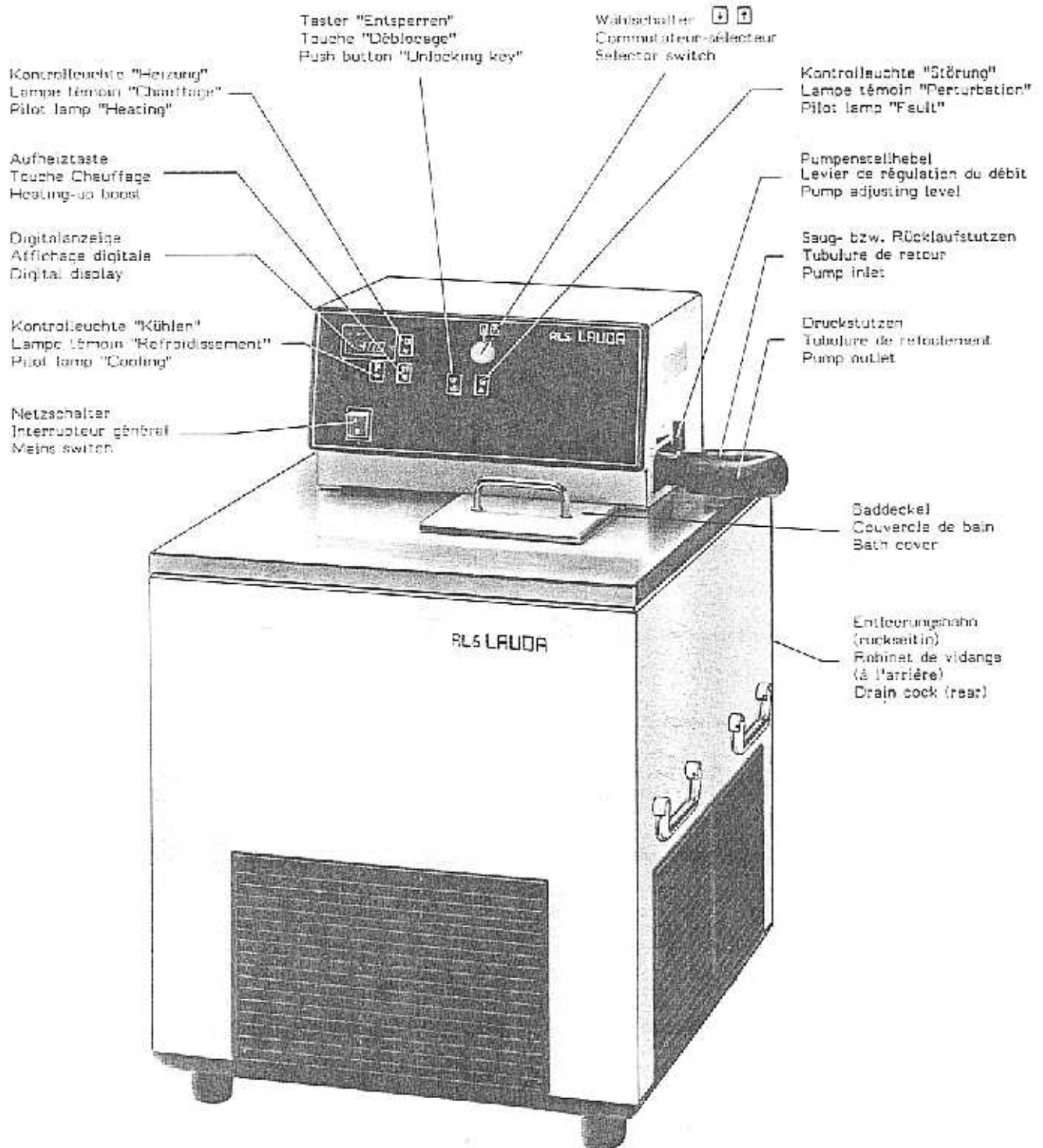
RLS 6 / H

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Charging capacity	(l)	4.0 ... 6.0
Bath opening W x D	(mm)	120 x 105
Depth of bath	(mm)	190
Usable bath depth	(mm)	150
Floor area (W x D) x height	(mm)	470 x 555 x 720
Weight	(kg)	92.0
Power supply		220 - 240 V, 50 Hz 1.4 kW Protection Class I to VDE 0100
Interference suppression		Class N
Ref.No. 220 - 240 V, 50 Hz		LSO 1035

LAUDA Compact Low-Temperature Thermostat  
 RLS 6 / H

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### 3. Basic construction

This Operating Instruction applies to:

Bath / Circulating thermostat RLS 6 / H

With SIMPLEX pump for thermostating in the bath and in closed external systems at -80 to 20°C operating temperature.

On all units the metal parts in contact with the bath liquid are made from stainless chrome nickel steel. Furtheron the plastic (POM) and Teflon are used which are both resistant at working temperature range.

The two-stage refrigerator switches on automatically when required. Controlled cooling only possible when selector switch is in position  , so as to compensate the energy brought into the bath by the pump.

The units consist of a bath and refrigerator assembly and the control and pump assembly which can be separated from each other (see Section 12).

The control assembly contains the complete electronics with digital display for actual temperature, triggering controls for the refrigerator, temperature probe, heater, safety system and pump. The main data of the thermostat are summarised in Section 2.

#### 4. Safety system

- 4.1 The DIN specification 12879 for laboratory thermostats entitled "Liquid Thermostats, General and Safety Requirements" has been in operation since May 1, 1979. This specification lays down the safety devices required and divides thermostats into different safety classes.

The unit RLS 6 / H as described in these Operating Instructions is to Class 2; it is protected against overtemperature and low level.

Class 2 requires:

- o a temperature limiter as overtemperature protection which switches off the thermostat on all poles of the line supply when an adjustable switch-off temperature is exceeded.

Since the maximum operating temperature of the RLS 6 / H is approx. 20°C and no inflammable bath liquids with a flash point below 40°C must be used, the overtemperature limiter is fixed permanently to 35°C.

- o a liquid level limiter as low-level protection which switches off the thermostat on all poles of the line supply when the liquid level falls below a minimum filling volume.
- o only those bath liquids can 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 the user is only protected against hazards resulting from excess temperature and low level.

Other hazards may arise from the type of products 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.

## 5. Bath liquids and tubing

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

Operating range -60 ... 50°C Ultra Therm-SK Frigor LZB 002  
(Silicone oil)

Viscosity at 20°C	3 mm <sup>2</sup> /sec
Flashpoint	70°C

Depending on requirements regarding accuracy of temperature control and heat transfer, Ultra-Therm SK Frigor can be used down to approx. -75°C.

Operating range -95 ... 40°C Ethanol

Boiling point	78°C
Viscosity at 20°C	1.5 mm <sup>2</sup> /sec
Flashpoint	12°C
Freezing point	-114°C

### Important note!

Ethanol is commonly used at operating temperatures below -60°C. Since the flashpoint of ethanol is 12°C, its use does not conform to the regulations of DIN 12879.

5.2	<u>Tubing</u> (continuous lengths)	Ref.No.
	<u>Silicone tubing, uninsulated</u> 8 mm internal dia. Application range -30 ... 100°C. For water, water-glycol mixture and alcohol.	RKJ 016
	<u>Silicone tubing, insulated</u> 8 mm internal dia. With foam rubber insulation, external dia. 30 mm approx. Use as for uninsulated Silicone tubing. Application range -60 ... 100°C.	LZS 001
	<u>Silicone tubing, heavy insulation (Zellcoror)</u> 8 mm internal dia. With foam rubber insulation, external dia. 50 mm approx. Use as for uninsulated Silicone tubing. Application range -130 ... 100°C.	LZS 002
	<u>Silicone tubing, uninsulated</u> 11 mm internal dia. Application range -30 ... 100°C. For water and water-glycol mixture.	RKJ 059
	<u>Silicone tubing, insulated</u> 11 mm internal dia. With foam rubber insulation, external dia. 35 mm approx. Use as for uninsulated Silicone tubing. Application range -60 ... 100°C.	LZS 007
	<u>Silicone tubing, heavy insulation (Zellcoror)</u> 11 mm internal dia. With foam rubber insulation, external dia. 55 mm approx. Use as for uninsulated Silicone tubing. Application range -130 ... 100°C.	LZS 009
	<u>Perbunan tubing, uninsulated</u> 11 mm internal dia. Application range 0 ... 120°C.	RKJ 012

Note: Silicone tubing must not be used with Silicone oils!

Secure tubing with clips to prevent it slipping off.

For further information on thermostat liquids and tubing please refer to our special Information Bulletin.

## 6. Unpacking, assembly and setting up

- 6.1 The units are packed carefully to prevent transport damage. If, however, the unit should arrive damaged, the forwarding agent has to be informed so that it can be inspected.

### Standard accessories

1 Bath cover	HDQ	057
2 Olives 13 dia. (fitted)	HKO	026
2 Olives 11 dia.	HKO	025
1 m Silicone tubing, insulated, 11 mm int.dia.	LZS	007

### Operating Instructions

- 6.2 The unit is best set up so that the narrow side is to the front and the air flow to the refrigerator (grills in the lower part) is not obstructed. Close the drain cock.

If no external circulation is required the pump connections are linked together with a piece of tubing; the pump adjusting lever should be open to improve the circulation inside the bath. For permanent use, the link tubing (Ref.No. LZM 045) offers the best and most reliable solution.

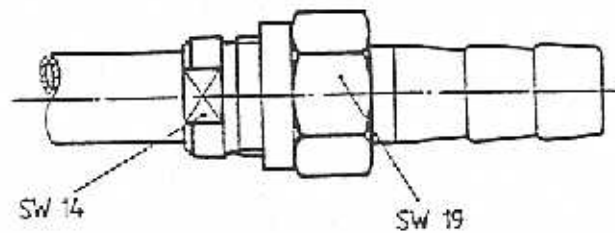
## 7. Connecting external systems

- 7.1 If the thermostat is connected to closed external systems, liquid must be added to the unit until the bath level remains at the correct height (approx. 2 cm below the cover plate). For suitable tubing material refer to Section 5. With a high-level external system, 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 area in the external circulation (olives, tubing, external system). This produces a larger flow rate and thereby improves the thermostating action.

Protect the tubes with hose clips against slipping off or use stainless steel tubing with screw fittings.

Note: For tightening the union nuts (SW 19) at the tube connectors hold up the threaded nipple with fork wrench SW 14.



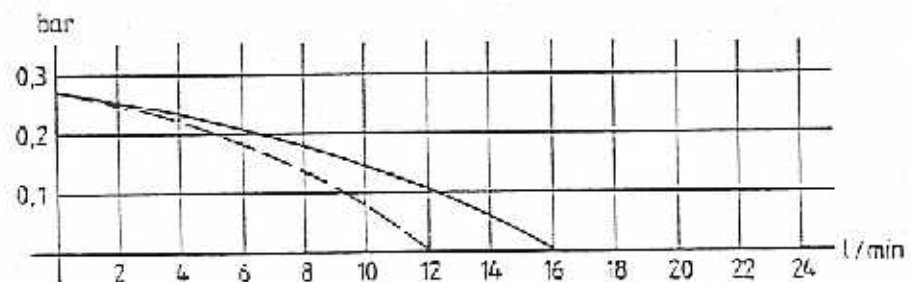
### 7.3 Circulating pump

SIMPLEX pumps are used for operation with closed external systems. They require a pressure-tight external system.

All LAUDA circulating pumps are fitted with a lever to permit continuous adjustment of the flow rate (pump capacity) through the external system from zero up to the maximum. All driving motors are fitted with overload protection which is embedded in the motor winding.

The pumps operate perfectly with liquids whose viscosity does not exceed approx. 150 mm<sup>2</sup>/sec.

#### Performance diagram



———— Olive 13 mm int. dia.  
----- Olive 11 mm int. dia.  
measured according to DIN 58 966

## 8. Starting up

### 8.1 Filling




Fill the unit with a suitable bath liquid depending on the operating temperature as discussed in Section 5. For charging volume refer to Section 2 (Data Table). Charge the bath preferably up to the maximum level indication, i.e. approx. 1 cm below the cover plate.


Note: When cooling down the bath level decreases!

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! (Metal tubing link LZM 045)

8.4 Switch on the mains switch. The green lamp inside the mains switch lights up. The refrigerator starts up. The second stage of the cooling aggregate switches on after 10 sec to 5 min depending on the precooling of the heat exchanger.

If the selector switch is set to the position  the unit will cool down to the lowest temperature possible. If selector switch is set to position  the preselected setpoint of approx. 25°C is valid. This ensures that the refrigerator switches off at lower temperatures and that the heater can be switched on with button . At approx. 25°C the heater switches off automatically and the unit controls the temperature at approx. 25°C by turning the refrigerator on and off in intervals of approx. 5 minutes.

The digital display indicates the actual bath temperature. If the unit was disconnected by a fault, the safety circuit lock must be unlocked by pressing push button "Reset" .

## 9. Cooling Circuit

- 9.1 The refrigeration system removes heat from the bath liquid through the evaporator mounted in the bath. The units operate with compressor cooling with 2-stage refrigeration systems in cascade.

The refrigeration circuits are charged ready for use with safety refrigerants (Frigen or Freon) and special low-temperature oils and require no maintenance. The compressors are fully-hermetically sealed units.

The second stage only starts up after suitable pre-cooling. Depending on previous operation and the standstill time this can take 10 sec up to 5 min.

The heat of condensation and the heat losses of the motor are removed through a finned condenser cooled by a powerful fan. Fresh air is drawn in at the front of the unit and discharged at the back.

The air flow must never be restricted; the spacing between the ventilation grills and any walls must therefore be at least 0.5 m. The units should also not be operated close to sources of heat (such as heating radiators etc.). The ratings specified in the technical data are based on 20°C ambient temperature. Higher temperatures result in reduced performance. Above 35°C the refrigerator is switched off automatically. The specified heat dissipation to ambient includes both the heat removed from the bath and the power supplied through the line supply.

## 9.2 Safety devices of refrigerator

Every compressor is equipped with a protection switch (Klixon). An over-temperature cut-out controls the voltage load and the temperature of the casing. It disconnects the compressor in case a certain limit value is exceeded.

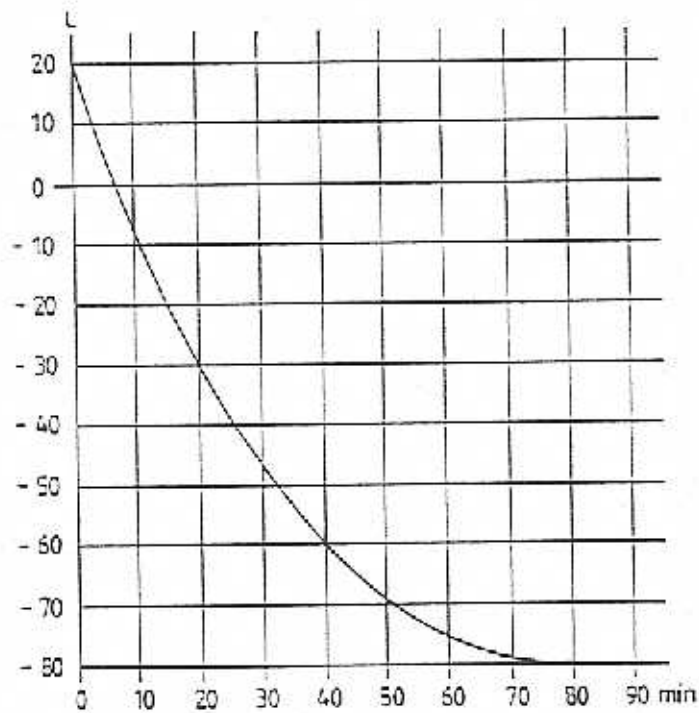
Every refrigeration cycle is equipped with a pressure switch and is thus protected against excessively high condensation pressure. This fault might occur due to insufficient condenser cooling, e.g. if the lamella condenser is contaminated.

### 9.3 Maintenance

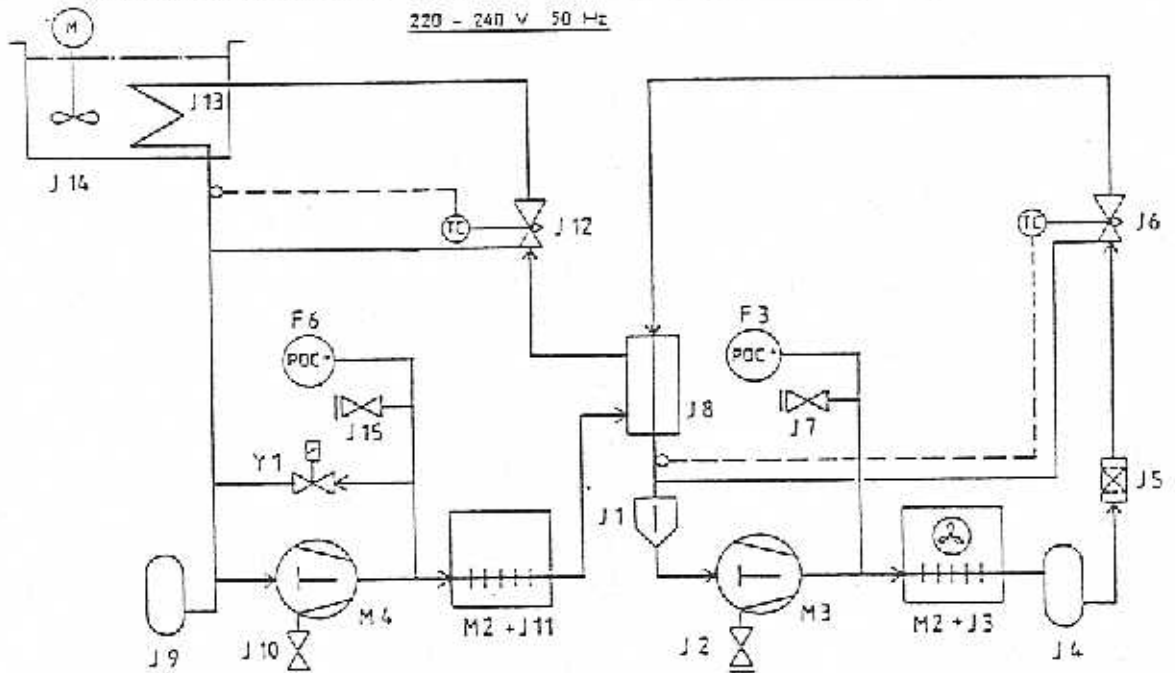
The refrigeration unit operates to a large extent without maintenance. If the unit operates under dusty conditions we recommend that the condenser is cleaned every 4 to 6 months. This is done best with compressed air or nitrogen which is blown into the ventilation openings for a few minutes. If necessary unscrew the ventilation grill.

#### Cooling diagram

Bath liquid: Methanol



Schema Kältkreislauf / Schéma circuit de réfrigération / Diagram refrigeration circuit





- |      |   |      |   |
|------|---|------|---|
| F 3  | Oberdruckschalter Stufe I<br>Disjoncteur de surpression Etage I<br>Overpressure switch Stage I                | J 12 | Expansionsventil Stufe II<br>Vanne d'expansion Etage II<br>Expansion valve Stage II                             |
| F 6  | Überdruckschalter Stufe II<br>Disjoncteur de surpression Etage II<br>Overpressure switch Stage II             | J 13 | Verdampfer<br>Échangeur<br>Exchanger  |
| J 1  | Flüssigkeitsabscheider<br>Séparateur de liquide<br>Liquid separator   | J 14 | Flüssigkeitsbad<br>Bain de liquide<br>Liquid bath   |
| J 2  | Kontrollventil / Saug Stufe I<br>Vanne de contrôle / Aspiration Etage I<br>Control valve / Suction Stage I    | J 15 | Kontrollventil / Druck Stufe II<br>Vanne de contrôle / Pression Etage II<br>Control valve / Pressure Stage II   |
| J 3  | Kondensator Stufe I<br>Condensateur Etage I<br>Condenser Stage I  | M 2  | Ventilator<br>Ventilateur<br>Fan  |
| J 4  | Sammeiflasche 0,9 l<br>Receveur<br>Receiver   | M 3  | Kompressor Stufe I<br>Compresseur Etage I<br>Compressor Stage I   |
| J 5  | Trockner<br>Déshydrateur<br>Drier   | M 4  | Kompressor Stufe II<br>Compresseur Etage II<br>Compressor Stage II  |
| J 6  | Expansionsventil Stufe I<br>Vanne d'expansion Etage I<br>Expansion valve Stage I                              | Y 1  | Magnetventil Druckausgleich<br>Vanne solénoïde Compensation de pression<br>Solenoid valve Pressure compensation |
| J 7  | Kontrollventil / Druck Stufe I<br>Vanne de contrôle / Pression Etage I<br>Control valve / Pressure Stage I    |      |   |
| J 8  | Wärmetauscher<br>Échangeur thermique<br>Heat exchanger  |      |   |
| J 9  | Sammeiflasche 0,9 l<br>Receveur<br>Receiver   |      |   |
| J 10 | Kontrollventil / Saug Stufe II<br>Vanne de contrôle / Aspiration Etage II<br>Control valve / Suction Stage II |      |   |
| J 11 | Kondensator Stufe II<br>Condensateur Etage II<br>Condenser Stage II   |      |   |

Kältemittel / Réfrigérant / Refrigerant  
 Stufe / Etage / Stage I - R 502  
 Stufe / Etage / Stage II - R 503 + R 12



10. Safety circuit

10.1 Safety circuit to DIN 12879 Class 2.

The unit is protected against low level by a float switch set permanently to minimum level, and against overtemperature by a cut-out which is permanently fixed to 35°C. When the safety cut-out operates the red lamp  lights up continuously and an audible warning signal is produced. The pump, the heater and refrigerator are cut off from the supply on all poles. The fault signal and the cut-off are maintained even after the fault has been rectified and after the mains supply has been switched off. By operating the "Unlocking" key  the unit can be brought back into operation after the fault has been cleared.

The low-level cut-out and the overtemperature cut-out should be checked from time to time to ensure correct operation.

The low-level cut-out can be tested simply by switching the unit on briefly before charging it while the user is present; the overtemperature cut-out must of course be set well above ambient temperature and it is essential to ensure that there is no explosive mixture in the bath which could ignite at the heater in case the low-level cut-out switch does not operate correctly and the heating is switched on. The unit must immediately go to "Fault" (audible signal, red lamp on).

The overtemperature cut-out can only be checked by heating the bath filled with water to over 35°C using an extra heater. At approx. 35°C the unit switches to "Fault". In order to cool down, the "Unlocking" key  must be pressed for such a long time, until the bath temperature drops below approx. 32°C. After the "fault" has been rectified the instrument must be switched on and the "Unlocking" key  has to be operated.

## 11. Maintenance

### 11.1 Safety notes in case of repairs

Always pull out the mains plug during all repair and cleaning operations! Repairs on the control unit with cover removed must only be carried out by a qualified electrician.

### 11.2 Repair

LAUDA thermostats are designed for continuous operation. They require no regular maintenance. Contaminated bath liquid should be discharged through the drain cock and replaced by fresh liquid. If the instrument should become defective it is recommended that the defective part should be removed by a qualified person and returned to the factory.

### 11.3 Maintenance of the refrigeration system

The refrigeration system operates largely without maintenance. If the unit is being operated in a dusty atmosphere we recommend cleaning of the refrigeration system condenser at intervals of 4 to 6 months. This best done with compressed air or nitrogen by blowing for a few minutes into the ventilation openings. If necessary, unscrew the front grills.

### 11.4 Repair and disposal of the refrigerant

The refrigerant circuit of the high-temperature stage is filled with HCFC refrigerant R 22; the low-temperature stage is filled with FC refrigerant mixture TP5 R3. Repair and disposal only by a refrigeration specialist (frigorist)!

### 11.5 Cleaning

The unit can be cleaned using a cloth moistened with water with the addition of a few drops of a (domestic) detergent. No water must find its way into the control unit.

The user is responsible for any necessary decontamination if dangerous materials have been spilled on or inside the unit. This applies in particular if the unit is removed for a different use, for repair, storage, etc.

The method of cleaning or decontamination is determined by the expertise of the user himself. If the user has any doubts on whether this may damage the unit he can contact the manufacturer.

#### 11.6 Spares ordering

When ordering spares please specify the equipment type and number on the label. This avoids queries and prevents supply of incorrect goods!

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

LAUDA DR. R. WOBSEK  
GMBH & CO. KG



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

RLS 6 / H

A 1	Leiterplatte / Netz Circuit imprimé / Secteur Printed circuit / Mains	ULX 226 A	F 2	Niveauschutz Protection de niveau Level protection
A 2	Leiterplatte / Regelung Circuit imprimé / Réglage Printed circuit / Control	ULX 227 A	F 3	Überdruckschalter Stufe I Disjoncteur de surpression Etage I Overpressure switch Stage I
A 2-F 1	Temperaturbegrenzer 0...100°C Limiteur de température Temperature limiter		F 4	Klixon Stufe I Klixon Etage I Klixon Stage I
A 2-S 2	Taster: Entsperrern Touche: Déblocage Push button: Reset		F 5	Anlaufvorrichtung Stufe I Dispositif de démarrage Etage I Starting device Stage I
A 2-S 3	Taster: Aufheizen Touche: Chauffage Push button: Heating up		F 6	Überdruckschalter Stufe II Disjoncteur de surpression Etage II Overpressure switch Stage II
A 2-V 1	LED-Anzeige Aufheizen Affichage LED Chauffage LED-Indication Heating up		F 7	Klixon Stufe II Klixon Etage II Klixon Stage II
A 2-V 7	LED-Anzeige Störung Affichage LED Perturbation LED-Indication Disturbance		F 8	Anlaufvorrichtung Stufe II Dispositif de démarrage Etage II Starting device Stage II
A 2-V 12	LED-Anzeige Kühlen Affichage LED Refroidissement LED-Indication Cooling		H 1	Lampe Netz Lampe Secteur Lamp Mains
A 3	Leiterplatte / Kompressorsteuerung Circuit imprimé / Commande compresseur Printed circuit / Control Compressor	ULX 276 A	K 1	Schütz Kompressor Contacteur Compresseur Contactor Compressor
B 1	Temperaturfühler Pt 500 Sonde de température Temperature probe		M 1	Pumpenmotor Moteur de pompe Pump motor
B 2	Temperaturfühler KTY 81 Sonde de température Temperature probe		M 2	Ventilator Ventilateur Fan
C 1	Kondensator 1,5 µF Condensateur Capacitor		M 3	Kompressor Stufe I Compresseur Etage I Compressor Stage I
E 1	Heizung 1,2 kW Chauffage Heater		M 4	Kompressor Stufe II Compresseur Etage II Compressor Stage II
F 1	Sicherung T 12,5 A Fusible Fuse		S 1	Netzschalter Interrupteur général Mains switch
			S 2	Schalter Kühlen Interrupteur Refroidissement Switch Cooling
			X 1	Netzanschluß Branchement secteur Mains connection