

Compact Low-temperature Thermostats
RMS 6 and RMS 20
to DIN 12879

Operating Instructions

From Series C01
8/82

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Enclosures

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Circuit diagram

Summary of LAUDA low-temperature thermostat range

1. Brief operating instructions

- o Check thermostat and accessories during unpacking for possible transport damage and, if necessary, notify carrier or post office.

- o Assemble the unit according to Section 6 and add items as appropriate.

- o Connect the tubing at the pump outlets.

Without external circulation: link together the pump outlets with the insulated silicone tubing supplied.

With external circulation: connect tubing to the external system.

Secure tubing with clips to prevent it slipping off.

- o Use only deionised water (above 5°C) or water/glycol mixture (below 5°C) (see Section 5). Fill the unit up to approx. 2 cm below the top plate.
- o Check the supply voltage against the data on the rating label. Connect the cable to the supply.

- o Operation without refrigeration unit (temperature above 30°C)

mains switch (green) ON (green lamp lights up)

switch "cooling" OFF



- o Operation with refrigeration unit (temperature below 30°C)


as above, but also

switch "cooling" ON

- o 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.

- o The digital thermometer shows the actual bath temperature.

- o To set the temperature press the button  , this changes the digital display from bath temperature to setpoint. Now select the desired temperature by turning the knob  .

For this the selector switch has to be on  . When operating with a fixed temperature (25, 35, 37 or 56°C) set to this value. If necessary adjust with a small screwdriver.

- o When the bath liquid has reached the set temperature, the yellow indicating lamp "heating" begins to flash. After the temperature has settled down the digital thermometer indicates the selected bath temperature.

- o Safety

The thermostat is a Class 1 W unit. It must only be operated with non-inflammable liquids (see also Section 5).

○ IMPORTANT NOTE

Parts of the bath cover may heat up to 60°C or more at higher operating temperatures. The outflow and return tubes of the pump reach the bath temperature.

2. Table of Data

These thermostats meet the requirements of DIN 12879.

Type	RMS 6	RMS 20
Temperature range	-15 to 100°C	-15 to 100°C
Temperature setting	digital, using 10-turn potentiometer and numerical indication; resolution of indication 0.1°C, potentiometer approx. 0.03°C	
Fixed temperatures	25, 35, 37, 56°C	
Indicating thermometer	built-in digital thermometer (LCD display) 0.1°C resolution, absolute accuracy better than 0.3% of range	
Temperature probe/ control action	Pt 500 platinum resistance thermometer/ PID	
Temperature control (at -10°C)	± 0.01°C	
Heating load	automatic adjustment as required 0 to 1 kW	
Cooling rating 20°C (kW) eff. 0°C	0.2 0.14	0.23 0.15
-10°C	0.08	0.10
-15°C	0.05	0.06
Class to DIN 12879	Class 1 W (with R 35 and TS 35-200 Class 3)	
Output (pump output)/ output pressure	8 l/min against zero head/ 0.15 bar (1.5 m WG)	
Liquid volume	4 - 6 l	14 - 20 l
Bath liquid 5 to 100°C	deionised water	
-30 to 100°C	water/ethylene glycol mixture 1:1	
Bath opening/depth	150 x 130 / 160 mm	300 x 350 / 160 mm
Usable liquid depth	140 mm	
Bench area	200 x 350 mm	350 x 540 mm
Weight	24 kg	34 kg
Power supply	220 - 240 V / 50 Hz, 1.2 kW Protection Class 1 to VDE 0100	
Interference suppression	Grade N	
Cat. No.	LCK 011	LCK 013

Justierpotentiometer
Potentiomètre d'ajustage
Balancing potentiometer

LCD-Anzeige
Indication LCD
LCD-Display

Ist-Sollwert Taster
Touche Valeur réelle
Valeur de consigne
Key Actual value - Set point

Kontrollleuchte „Heizung“
Lampe témoin "Chauffage"
Pilot lamp "Heater"

Netzschalter
Interrupteur général
Mains switch

Schalter „Kühlung“
Touche "Refroidissement"
Key "Cooling"

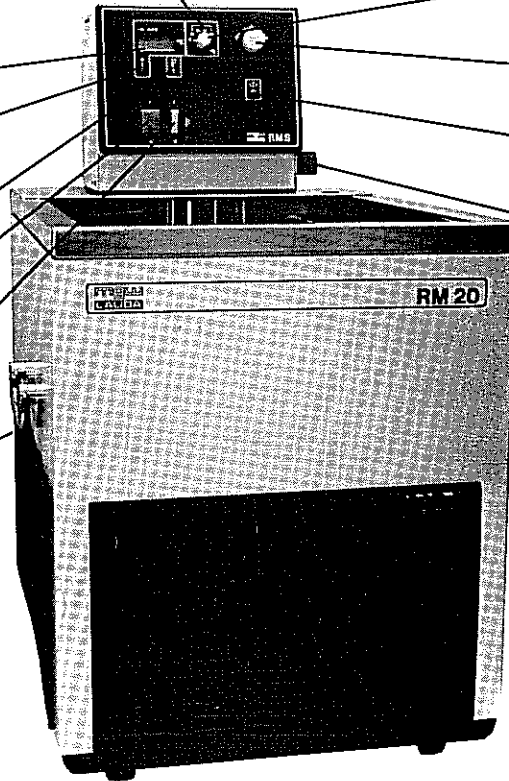
Entleerungshahn
(rückseitig)
Robinet de vidange
(à l'arrière)
Drain cock (rear)

Festtemperaturen
Températures fixes
Fixed temperatures

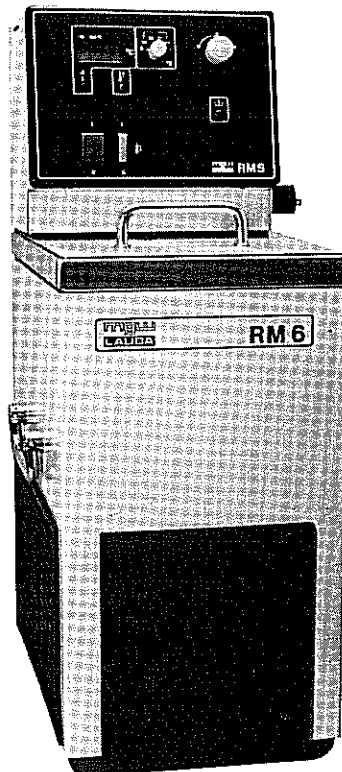
Temperatureinstellung
Ajustage de température
Temperature adjustment

„Entsperren“
"Déblocage"
"Release"

Pumpenstutzen
Tubulures de pompe
Pump nozzles



RMS 20



RMS 6

3. Basic construction

These Operating Instructions apply to 2 Compact Low-temperature Thermostats of different construction, Series RMS.

Compact low-temperature thermostat RMS 6

Compact bath/circulation thermostat with large bath opening for thermostating inside the bath.

Compact low-temperature thermostat RMS 20

Bath/circulation thermostat with large bath opening for thermostating of large items or a large number of items inside the bath.

Both models consist of the same thermostat unit RMS containing the electronics and the circulating pump, together with the appropriate cooling systems. Within the range where heat has to be removed from the bath, the temperature control operates by running the refrigeration unit continuously while the heater maintains the bath temperature at the required setting through controlled heating pulses using a solid-state proportional PID controller with a packet-switching triac relay. Built-in digital thermometer with 0.1°C resolution and digital temperature setting using 10-turn potentiometer and numerical indication. Adjustable range and 4 fixed temperatures. The Table on page 3 contains the main technical data of the thermostats.

If the heater overheats through loss of liquid a temperature limiter switches off heater and pump on all poles. Warning: the heater surface may reach temperatures up to 250°C, especially with complete loss of liquid!

4. Safety system

The DIN specification 12879 for laboratory thermostats entitled: "Liquid Thermostats. General and Safety Requirements" has been in operation since 1.5.1979. This specification 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 Series RMS as described in these Operating Instructions are to Class 1 W. They are suitable only for

o non-inflammable bath liquids, i.e. preferably water, and the non-inflammable water/glycol mixture (see Section 5).

Important Note

Even with Class 1 W 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.

5. Bath liquids and tubing

According to Section 4 only non-inflammable liquids may be used.

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

Operating range 5 to 100°C

Use deionised water. Make up evaporation losses at higher temperatures. Losses may be reduced by using suitable bath covers (see Accessories, page 13).

Operating range -30 to 100°C

Use water/ethylene glycol mixture, preferably Glycoshell P 300, in the ratio 1:1.

Operating range	-30 to 100°C
Boiling point	110°C
Viscosity at 20°C	4 mm ² /sec
Non-inflammable	

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.

Tubing (continuous lengths)

Perbunan tubing, uninsulated

Cat. No. RKJ 011

9 mm internal dia. Application range 0 to 100°C. For water and water/glycol mixtures.

Silicone tubing, uninsulated Cat. No. RJK 016
8 mm internal dia. Application range -30 to 120°C.
For water and water/glycol mixtures.

Silicone tubing, insulated Cat. No. LZS 001
8 mm internal dia. With foam rubber
insulation. External dia. 30 mm approx.
Use as for uninsulated silicone tubing.

Silicone tubing, uninsulated Cat. No. RJK 037
4 mm internal dia. Use as for silicone
tubing 8 mm internal dia.

Pump reducer fitting for tubing 4 mm i.d. Cat. No. HKO 018
Secure tubing with clips to prevent it slipping off.

6. Unpacking, assembly and setting up

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 accessories

1 m Silicone tubing, insulated, 8 mm i.d.
Operating Instructions

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

If not external circulation is required the pump nipples are linked together with the silicone tubing supplied. The yellow cap must first be removed; it is only intended to prevent the thermostat contents being pumped out unintentionally and is not suitable as a permanent closure. Pressure connection always at the front, return flow connection at the back. When connecting up an external system proceed according to Section 7.

7. Connecting 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. When operating with photometers, refractometers etc. which have nipples for 4 mm i.d. tubing the reducer fittings (Cat. No. HKO 018) are screwed onto the nipples. Suitable silicone tubing is Cat. No. RKJ 037. 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.

When starting up the thermostat ensure that the liquid level does not drop too much. Top up with liquid until the correct level is reached.

Secure tubing with clips to prevent it slipping off.

8. Starting up

Before starting up allow the unit to stand for at least half an hour in its normal operating position so that any oil which may have run out of the compressor during transport can return to it.

1. Filling

Fill the unit with deionised water or water/glycol mixture according to Section 5. The liquid volume is indicated on page 3 (Table of Data). The thermostats should never be filled higher than 2 cm below the cover.

While the thermostat is in use, the heater and the evaporator coil of the refrigerator must always be covered with liquid. When it 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.

The low-temperature thermostat RMS 20 can be covered with a flat bath cover or with a gable cover even when there is glassware or other items in the bath (see Accessories, page 13). This is advisable especially at higher temperatures.

2. Connect the unit only to a grounded socket. Check the details on the rating label against the supply voltage.
3. Ensure that the pump outlets are linked together when there is no external system.
4. Operation without refrigerator (temperatures above 30°C)

mains switch (green)	ON (green lamp lights up)
switch "cooling"	OFF

The digital display indicates the actual bath temperature. Set the selector switch for \mathcal{S} and fixed temperatures (25, 35, 37 and 56°C) to \mathcal{S} . Press key $\boxed{\mathcal{S} \downarrow}$, the setpoint now appears on the digital display. Select the desired temperature by turning the knob $\boxed{\mathcal{S}}$ (10-turn potentiometer). Then release the key, the display shows again the actual bath temperature. The fixed temperatures can be selected directly irrespective of the setting of knob . The fixed temperatures can be re-adjusted by inserting a small screwdriver into the opening above the knob. Pressing the key also displays the fixed temperatures. When the set temperature has been reached the yellow indicating lamp "heating" begins to flash. After the unit has settled down the digital thermometer indicates the selected temperature. When changing rapidly from a high to a low temperature the refrigerator can also be switched on in the heating range.

5. Operation with refrigerator (temperature below 30°C)

as under 4. above, but also

switch "cooling" ON (yellow lamp lights up)

The thermostat is switched off with the mains switch.

The switch "cooling" can remain on.

9. Cooling circuit

9.1 Construction

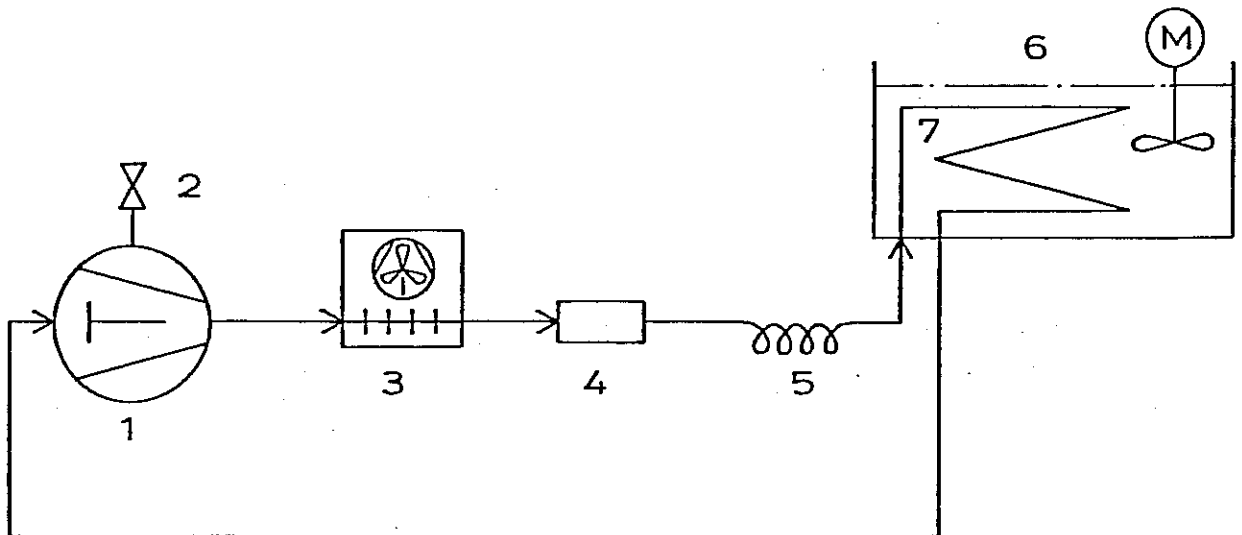
The refrigerator consists essentially of a hermetically sealed compressor. Heat of condensation and motor heat are dissipated through a finned condenser with fan cooling. The fresh air is drawn in at the front of the unit, heated and discharged to the back and to the side. In order to ensure effective air circulation the ventilation openings must not be obstructed. The cooling circuit is shown schematically on page 10.

At temperatures below 30°C the condenser runs continuously to remove a certain amount of heat from the bath, while the heater operates against this with an output which is automatically adjusted by the control system. The compressor runs virtually noiselessly and vibration-free. It is charged with a special oil and requires no maintenance. The refrigerant used is Freon 12 (R 12).

9.2 Maintenance

The refrigerator operates to a large extent without maintenance. 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

Schema Kältekreislauf/ Schéma circuit de réfrigération/Diagram refrigerating circuit



Nr.	Teil/Pièce/Part
1	Kompressor Compresseur Compressor
2	Füllventil Vanne de remplissage Relay valve
3	Kondensator Condensateur Condenser
4	Trockner Secheur Drier
5	Kapillarrohr Tube capillaire Capillary
6	Verdampferschlange Evaporateur à serpentins Evaporator coil
7	Flüssigkeitsbad Thermostat Bain pour liquide du Thermostat Liquid bath Thermostat

a few minutes. If necessary unscrew the ventilation grill.

9.3 Overloading the refrigerator

The driving motor of the refrigerator compressor is protected against overload by a double-action bimetal switch (KLIXON). The overload switch responds both to the capsule temperature and to the current taken by the compressor motor. With insufficient ventilation the housing temperature rises and with it the condensation pressure. Both effects lead to overload on the driving motor and cause the thermostat to be switched off. The unit switches on again automatically as soon as the compressor housing has cooled down.

The refrigerator can of course also be used at higher temperatures to produce rapid cooling. The KLIXON cut-out may switch the compressor on and off several times.

10. Operation of the safety circuit

The following three faults could occur:

- 10.1 The thermostat is started up without bath liquid or with the liquid level too low (heater partly uncovered).
- 10.2 The liquid level drops too much during operation, especially at high temperatures. The same fault may be caused by failure of the tubing and liquid being pumped out of the thermostat.
- 10.3 Failure of the control system, resulting in continuous heating. The liquid eventually reaches the boiling point and evaporates.

If any of the above faults occur, the safety circuit comes into operation. A built-in temperature probe measures the surface temperature of the heater and switches off the thermostat if a certain limiting temperature is exceeded. According to DIN 12879 this type of protection is called over-temperature protection. Since the heater surface can reach very high temperatures up to 250°C, especially when the thermostat runs completely dry, only water or a water/glycol mixture may be used in the thermostat; otherwise it is impossible to prevent a fire under all circumstances despite the use of a safety system.

Operation of the safety circuit switches off the thermostat on all poles (heater and pump); the reset button "Entsperren"

jumps out approx. 3 mm. The thermostat can only be restarted after

- o the temperature probe on the heater has cooled down to below 60°C
- o the fault has been corrected (liquid level too low, faulty control circuit, burst tubing)
- o the reset button has been pushed in.

This ensures that the thermostat cannot start up again automatically, for example through a reduction in the temperature which could suggest that the fault has been rectified.

11. Maintenance

LAUDA thermostats are designed for continuous operation. They require no regular maintenance. Contaminated bath liquid should be drained out through the drain cock and replaced with fresh liquid. If the unit should become defective it is recommended that the thermostat unit is removed and returned to the works. Pull out the mains plug and remove the cover.

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

MESSGERÄTE-WERK LAUDA
Dr. R. Wobser KG
Postbox 1251

D-6970 Lauda-Königshofen
West Germany

Phone: 09343/503-0
Telex: 689 523

Accessories for Compact low-temperature thermostats

Type	Cat. No.
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Reference thermometers

-30/100°C, graduated 0.5°C	ET 032
0/100°C, graduated 0.5°C	ET 031
0/70°C, graduated 0.5°C	ET 030

Mounting for reference thermometer	HKF 036
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Stainless steel racks, for Model RM 20

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

RD 13 for 52 tubes 10 - 13 dia., 80 mm immersion	UG 066
RD 18/1 for 27 tubes 14 - 18 dia., 80 mm immersion	UG 067
RD 18/2 for 27 tubes 14 - 18 dia., 110 mm immersion	UG 068
RD 30 for 12 tubes 24 - 30 dia., 110 mm immersion	UG 069

Bath cover (flat), stainless steel, for Model RM 20

2-piece	LCZ 009
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<u>Gable cover</u> , stainless steel, for Model RM 20	LCZ 011
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Tubing (per metre)

Silicone tubing, 8 mm i.d.	RKJ 016
Silicone tubing, 4 mm i.d.	RKJ 037
Silicone tubing, insulated, 8 mm i.d.	LZS 001
Perbunan tubing, 9 mm i.d.	RKJ 011

<u>Reducer fitting</u> for pump, for 4 mm i.d. tubing	HKO 018
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Special racks for Model RM 6, Makrolon

Type	Description	Cat. No.
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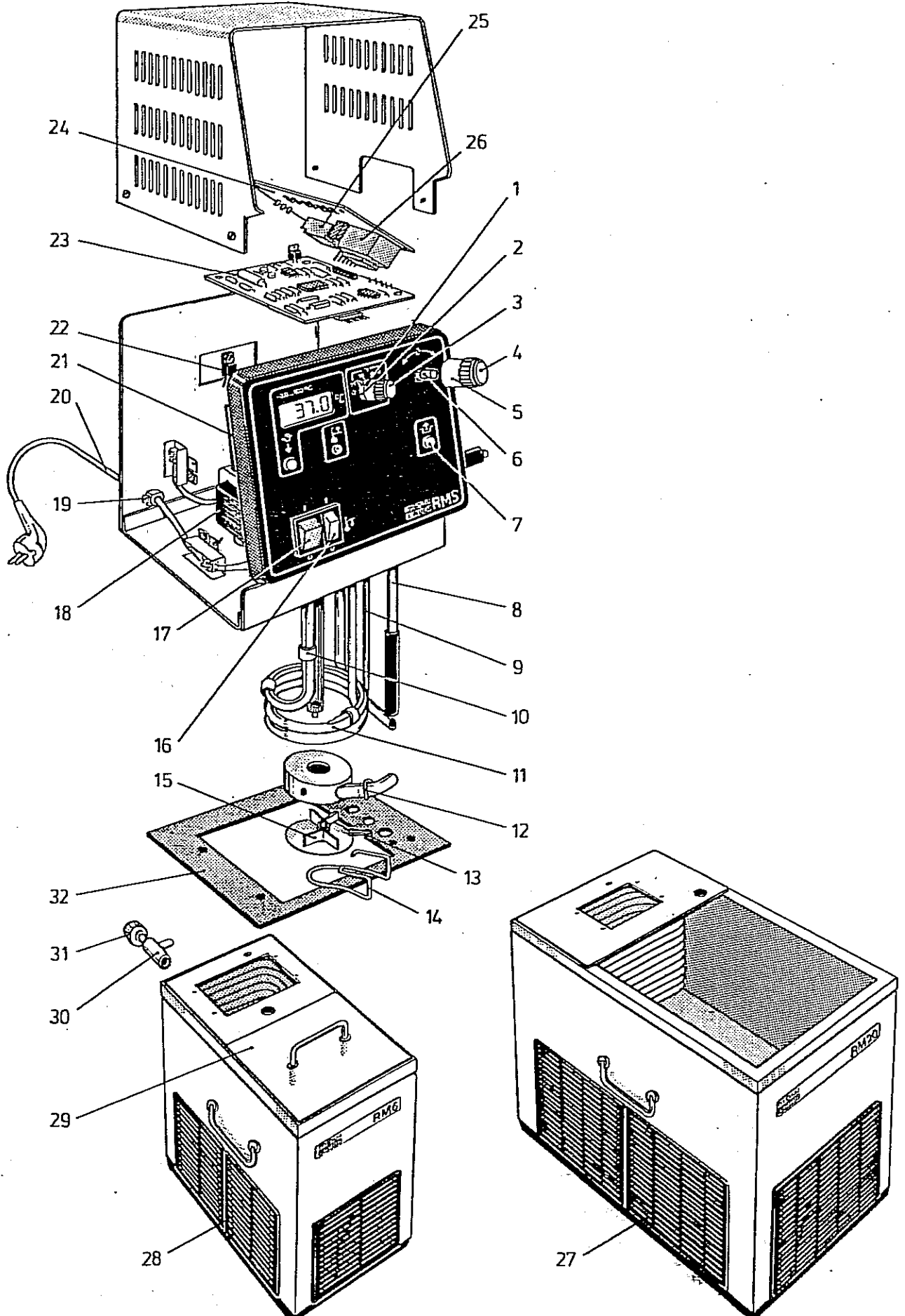
Boehringer Mannheim Monotest	8 Monotest 2 Monotest 6 square cells	UE 001
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Merck - 1 - test	12 Merck 1-test 1 buffer solution 6 square cells	UE 002
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Enzymediagnos- tics Behringwerke	8 Properzyme 1-test 3 Properzyme 5-test 6 square cells	UE 003
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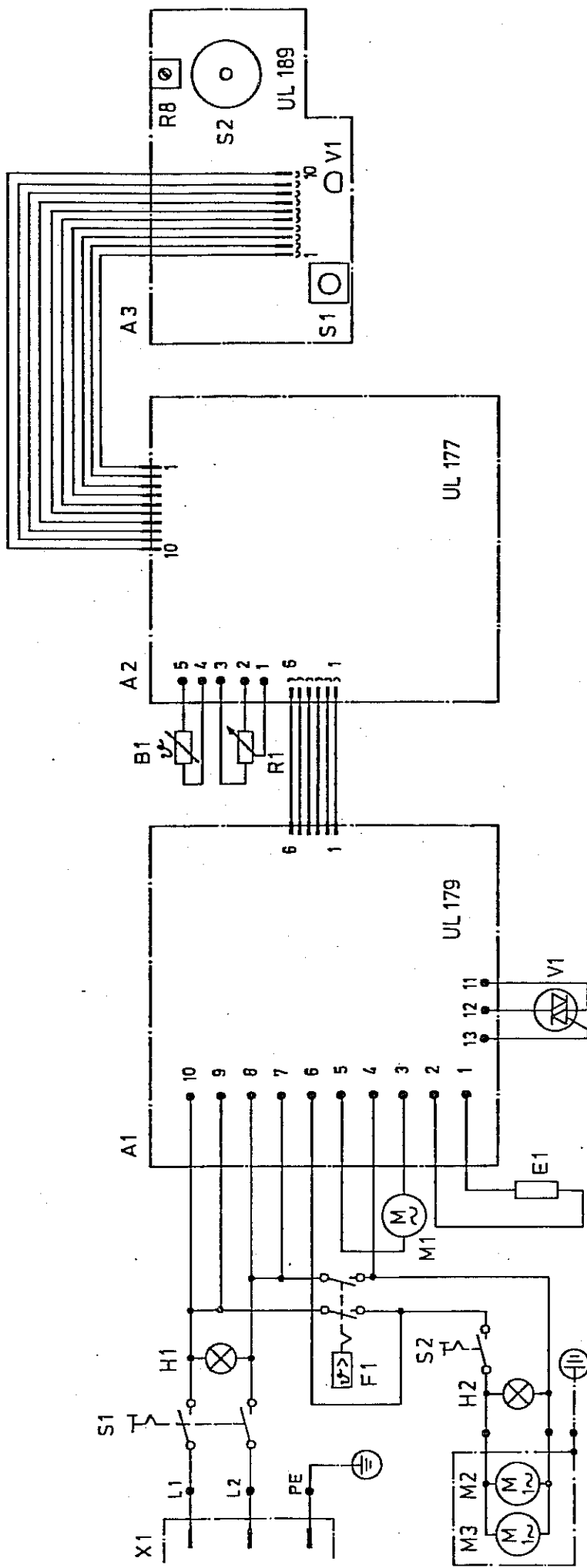
Gödecke Dr. Haury	15 centrifuge or conical tubes, 100 x 16/17 mm 6 square cells	UE 004
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Type	Description	Cat. No.
Dr. B. Lange Cuvette test	10 NP tubes, 100 x 19 mm 9 cuvettes	UE 005
Geigy	8 centrifuge or conical tubes, 100 x 16/17 mm 16 Uhlenhut tubes 100 x 9 x 10 mm	UE 021
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
Haemolysis tubes	13 dia. (30)	UE 023
Bio Merienx, Type BD 30 (SCOT, SGPT)	6 square cells	UE 009
Bio Merienx, Type BD 31 (SOPT, SGPT)	6 square cells	UE 010
<u>UNIPROTECT R 35</u>		LRS 002
<p>Universal over-temperature and low-level protection. Retrofitting with R 35 provides every thermostat with protection to Class 3 DIN 12879. Accessories required: immersion probe TS 35-200 and special holder.</p>		
<u>Immersion probe TS 35-200</u>		US 014
<u>Clamping holder for TS 35-200</u>		UD 049



Ersatzteile/Pièces détachées/Spare parts
RMS 6, RMS 20

Teilbezeichnung/Designation		Best-Nr./Ref.No.	
1	Drehknopf/Bouton rotatif/Rotary knob	EZD	046
2	Zeiger/Aiguille/Pointer	EZD	048
3	Kappe/Calotte/Cover	EZD	047
4	Kappe/Calotte/Cover	EZD	051
5	Drehknopf/Bouton rotatif/Rotary knob	EZD	050
6	Potentiometer/Potentiomètre/Potentiometer 1 kOhm	EWD	042
7	Temperaturbegrenzer/Limiteur de température/ Temperature limiter	US	026
8	Druck- und Rücklaufstutzen/Tubulures de refoulement et de retour/Outlet-Inlet connection	UO	040
9	Temperaturfühler Pt 100/Sonde de température Pt 100/ Temperature probe Pt 100	ETP	021
10	Klemme/Pince/Clamp	HIB	012
11	Heizkörper/Corps de chauffe/Heater 220-240 V, 50-60 Hz Heizkörper/Corps de chauffe/Heater 115 V, 60 Hz	EH	088
12	Feder/Ressort/Spring	EH	092
13	Splint/Goupille/Splint	HI	012
14	Spange/Agraphe/Clasp	DIS	003
15	Rührpropeller/Hélice/Stirrer	HI	014
16	Schalter "Kühlung"/Touche "Refroidissement"/Key "Cooling"	HX	102
17	Hauptschalter/Interrupteur général/Main switch	EST	056
18	Motor/Moteur/Motor 220-240 V, 50 Hz	EST	032
19	Zugentlastung/Décharge de traction/Pull discharge	EM	039
20	Netzkabel mit Schukostecker/Cable secteur avec fiche à contact de protection/Mains cable with earthed plug	EKZ	009
21	Leiterplatte "Display"/Circuit imprimé "Indication"/ Printed circuit "Display"	EKN	009
22	Triac/Triac/Triac	UL	189
23	Leiterplatte "Regelung"/Circuit imprimé "Réglage"/ Printed circuit "Control"	EYY	008
24	Leiterplatte "Netzteil"/Circuit imprimé "Secteur"/ Printed circuit "Mains" 220 V	UL	177
25	Zündübertrager/Translateur d'ignition/Ignition translator	UL	179
26	Transformator/Transformateur/Transformer 220 V	EIZ	005
27	Kälteaggregat/Groupe frigorifique/Condensing unit RM 20	EIT	068
28	Kälteaggregat/Groupe frigorifique/Condensing unit RM 6	EMK	042
29	Baddeckel/Couvercle de bain/Bath cover	EMK	041
30	Entleerungshahn/Robinet de vidange/Drain cock	HDQ	041
31	Drehknopf/Bouton rotatif/Rotary knob	UD	070
32	Dichtung/Joint/Gasket	EZD	001
		EDF	048



A1	Leiterplatte Netzteil UL 179 Circuit imprimé Secteur Printed circuit Electric mains	F1	Überhitzungsschutz Protection de surchauffe Thermal cutout	M1	Pumpenmotor Moteur de pompe Motor pump	M2	Ventilator Ventilateur Fan	M3	Kompressor Compresseur Compressor	R1	SollwertEinstellung 1 k Ohm Ajustage de la température de consigne Desired value adjustment	R8	Justierpotentiometer 100 Ohm Potentiomètre d'ajustage Balancing potentiometer	S1	UL 189 Taster Ist-Sollwert Touche Valeur réelle-valeur de consigne Key Actual value - set point	S2	UL 189 Schalter Festtemperaturen Interrupteur températures fixes Switch fixed temperatures	V1	Triac Triac Triac	V1	UL 189 LED-Anzeige Heizung LED-affichage Chauffage LED-indication Heater	X1	Netzanschluß Secteur Mains
A2	Leiterplatte Regelung UL 177 Circuit imprimé Réglage Printed circuit Control	H1	Kontrollleuchte Netz Lampe témoin Secteur Pilot lamp Mains	H2	Kontrollleuchte Kühlung Lampe témoin Refroidissement Pilot lamp Cooling																		
A3	Leiterplatte Digitalanzeige UL 189 Circuit imprimé Indicateur digital Printed circuit Digital indicator																						
B1	Temperaturfühler Pt 500 Sonde de température Temperature sensor																						
E1	Heizung 1 kW Chauffage Heater																						
MESSGERÄTE - WERK LAUDA Dr. R. Wobser KG								Schaltplan Schéma de connexions Circuit diagram								RMS 6, RMS 20		220 - 240 V 50 - 60 Hz					
Zustand	Änderung	Datum	Name	Norm.	Urspr.	Ers. f.	Ers. d.	Datum		26.10.82		Bearb.		AZ		Gepr.				Blatt		B1	