

LAUDA

Operating Instructions

LAUDA Compact Thermostats
RCS 5, RCS 5-D, RCS 6, RCS 6-D,
RCS 20, RCS 20-D, RKS 20, RKS 20-D
to DIN 12 879


4/89
YACE0005

LAUDA Compact Low-Temperature Thermostats
RCS 5, RCS 5-D, RCS 6, RCS 6-D,
RCS 20, RCS 20-D, RKS 20, RKS 20-D

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o Operation with external controller R 22

When using the accessory external controller R 22 the temperature at some external point (product or double jacket) can also be indicated on the digital display. In addition the thermostat control can be influenced from this external point using a Pt 100 probe.

For this purpose the switch  at the back has to be moved to "EXT". For further details see the Operating Instructions for R 22.

9. Cooling circuit

o Construction

The refrigeration unit consists essentially of a hermetically sealed compressor. Heat of condensation and motor heat are removed 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 pages 15 and 16.

The compressor runs virtually noiselessly and vibration-free. It is charged with a special oil and requires no maintenance. The refrigerant used is Freon 502. Proportional cooling is provided by one solenoid valve, on the RKS 20 units by 2 solenoid valves.

o 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.

o Overloading the refrigeration unit

The driving motor of the 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.

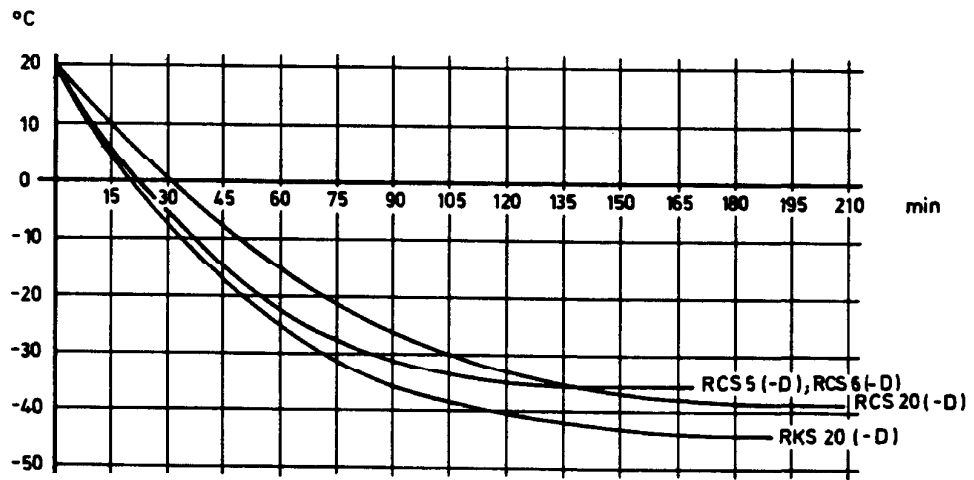
When cooling down from a high temperature the temperature cut-out of the refrigeration unit may switch on and off several times.

On RKS 20 units a pressure switch is fitted in the coolant circuit which switches off the refrigerator compressor if the pressure is too high.

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RCS 5, RCS 5-D, RCS 6, RCS 6-D,
RCS 20, RCS 20-D, RKS 20, RKS 20-D

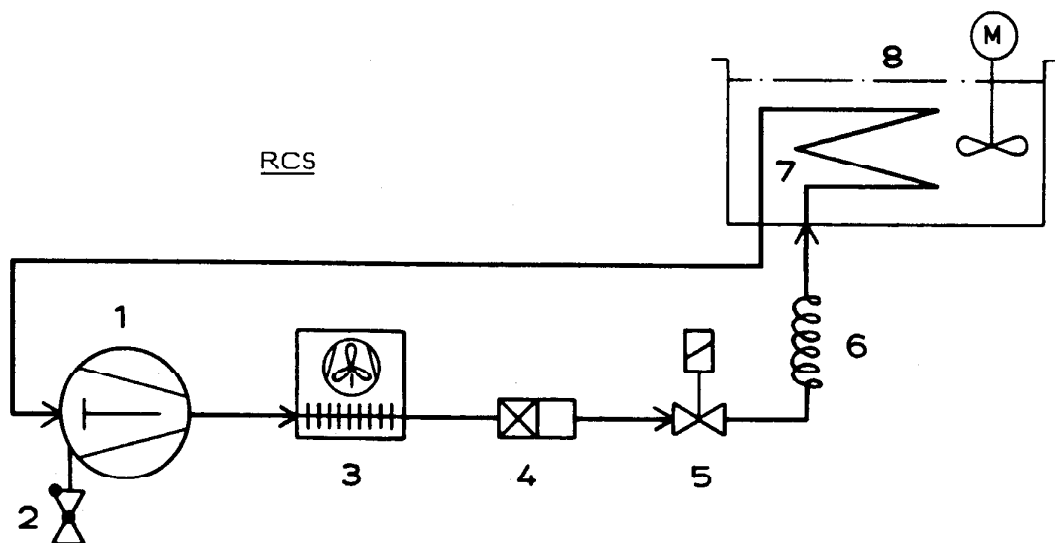
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Cooling diagrams RCS 5 (-D), RCS 6(-D), RCS 20(-D), RKS 20(-D)



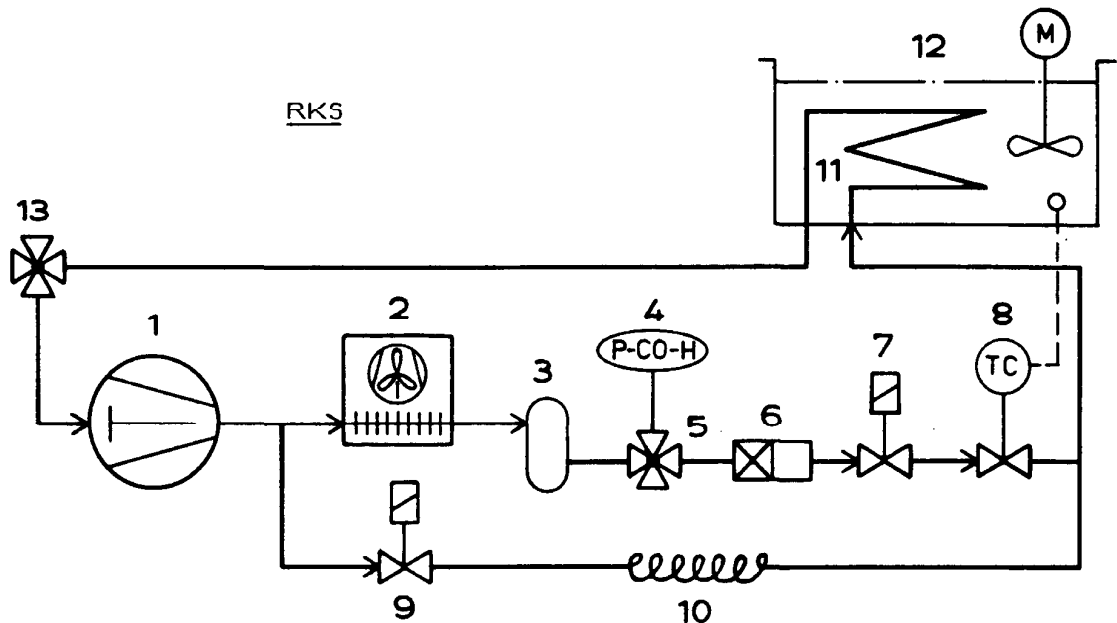
Badflüssigkeit: Methanol

Schema Kältekreislauf/Schéma circuit de réfrigération/Diagram cooling circuit



Nr.	Teil/Pièce/Part
1	Kompressor/Compresseur/Compressor
2	Rückschlagdurchgangsventil/Soupape de retenue/Non-return valve
3	Kondensator/Condensateur/Condenser
4	Trockner/Secheur/Drier
5	Magnetventil/Vanne de solenoide/Solenoid valve
6	Kapillarrohr/Tube capillaire/Capillary tube
7	Verdampferschlange/Evaporateur à serpentins/Evaporator coil
8	Flüssigkeitsbad/Bain pour liquide du thermostat/Liquid bath

Schema Kältekreislauf/Schéma circuit de réfrigération/Diagram cooling circuit






Nr. Teil/Pièce/Part

- 1 Kompressor/Compresseur/Compressor
- 2 Kondensator/Condensateur/Condenser
- 3 Sammler/Réservoir/Receiver
- 4 Überdruckschalter/Disjoncteur de surpression/Overpressure switch
- 5 Druckabsperrentil/Soupape d'arrêt de pression/Pressure shut-off valve
- 6 Trockner/Secheur/Drier
- 7 Magnetventil "Kühlen"/Vanne de solenoide "Réfrigération"/Solenoid valve "Cooling"
- 8 Expansionsventil/Vanne d'expansion/Expansion valve
- 9 Magnetventil "Heizen"/Vanne de solenoide "Chauffage"/Solenoid valve "Heating"
- 10 Kapillarrohr/Tube capillaire/Capillary tube
- 11 Verdampferschlange/Evaporateur à serpentins/Evaporator coil
- 12 Flüssigkeitsbad/Bain pour liquide du thermostat/Liquid bath
- 13 Saugabsperrentil/Vanne d'arrêt d'aspiration/Suction shut-off valve

10. Safety circuit

- o 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 can be adjusted by means of a tool between ambient temperature and the upper limit of the operating temperature range. When the safety cut-out operates the red lamp  lights up continuously and an audible warning signal is produced. The pump, heater and refrigeration unit are cut off from the supply on all poles. A fault signal is produced at the output 30 S at the back between the contact 12 (0 V) and 13 (18 V). The fault signal and the cut-off are stored after the fault has been rectified and after the mains supply has been switched off. By operating the reset key "Release"  the unit can be brought back into operation after the fault has been cleared.

The reset key can also be used for optimum adjustment of the overtemperature cut-off point. Hold the key down and adjust the overtemperature cut-out while observing the fault pilot lamp. This short-cuts the switch-off of pump and heating so that the control is not affected. The overtemperature limiter can now be adjusted so that it is just above the operating temperature, a condition which may be useful in certain cases to protect the material in the bath.

The low-level cut-out and the overtemperature cut-out should be checked from time to time for 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 be checked at any time by setting the cut-out temperature below the actual bath temperature. After the "fault" has been corrected the instrument must be switched on and the key "Release" must be operated.

- o On-line warning circuit >5°C

The "Fault" lamp also produces a flashing signal when the bath temperature is more than 5°C above the set temperature. This signal does **not** switch off the unit, its purpose is simply a warning. When this safety circuit operates, the output 30 S has an 18 V signal on contact 5.

11. Multi-function output

15-pin connector 30 S at the back with multiple function.

- Contact 1: Recorder connection for bath temperature, correct sign; 10 mV/°C; $R_i = 100 \text{ Ohm}$; recorder input resistance $\approx 1 \text{ MOhm}$ (0 V contact 3).
- Contact 2: Used in conjunction with external controller R 22.
- Contact 3: 0 V reference potential for measuring signals.
- Contact 4: Programmer or external setpoint input 10 mV/°C, added to the selected setpoint. Sum is indicated as the setpoint, $R_i = 24.6 \text{ kOhm}$ (0 V contact 3).
- Contact 5: 18 V, if fault light flashes, i.e. operating temperature is more than 5°C above setpoint. $R_i = 1 \text{ kOhm}$ (0 V contact 12).
- Contact 6: Setpoint output 10 mV/°C, $R_i = 100 \text{ Ohm}$. Load resistance $\approx 10 \text{ kOhm}$ (0 V contact 3).
- Contact 7: +12 supply, max. additional load 50 mA (0 V contact 12).
- Contact 8: 9 V reference voltage for external setpoint, $R_i = 1 \text{ kOhm}$, max. load 1 mA (0 V contact 3)
- Contact 9: Actuating output, for accessory units only (0 V contact 12).
- Contact 10: -12 V supply voltage, max additional load 30 mA (0 V contact 12)
- Contact 11: Spare
- Contact 12: 0 V load reference potential
- Contact 13: 18 V, if fault lamp shows red continuously, i.e. safety circuit to DIN 12879 is activated. Max. load 20 mA (0 V contact 12)
- Contact 14: Spare
- Contact 15: Used in conjunction with external controller R 22.

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

Ref.No.

15-pole mating connector
Case for above

EQM 030
EQG 017

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RCS 5, RCS 5-D, RCS 6, RCS 6-D,
RCS 20, RCS 20-D, RKS 20, RKS 20-D

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12. Maintenance

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 through a fault in the control unit or the pump it is recommended that this part should be removed by a qualified person and returned to the factory.

The following procedure should be used:

Important Note: Before opening up the unit pull out the line supply plug.

Remove the cover after taking off the 4 screws at the side. The control unit together with the pump can now be separated from the bath after releasing the 4 nuts M 4 which are accessible from the right and left between the pump assembly chassis and the intermediate floor of the control unit.

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

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GMBH & CO. KG

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West Germany

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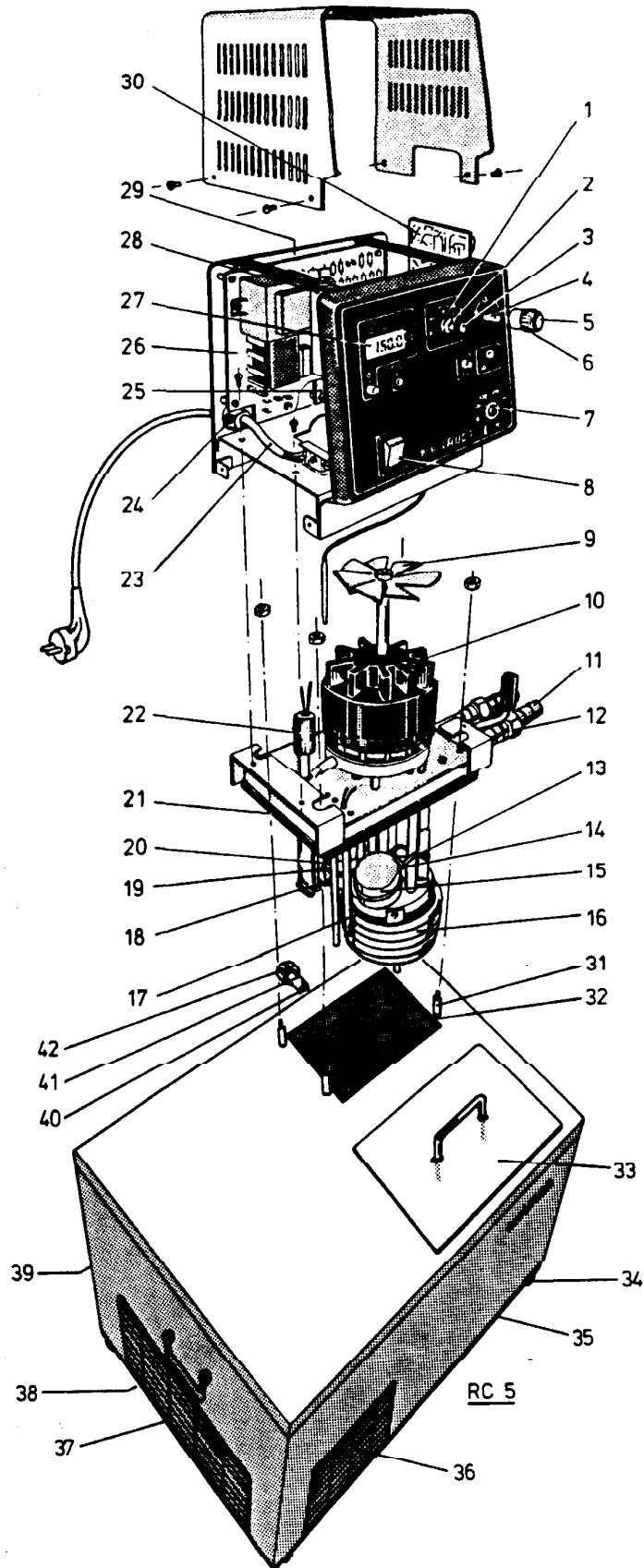
Fax: 09343/503-222

LAUDA Compact Low-Temperature Thermostats
 RCS 5, RCS 5-D, RCS 6, RCS 6-D,
 RCS 20, RCS 20-D, RKS 20, RKS 20-D

Accessories for LAUDA Compact Thermostats Series RCS and RKS

<u>Type</u>	<u>Ref.No.</u>
<u>External Controller R 22</u> To indicate the temperature at an external point (consumer) and to control the temperature according to this point. Probe for the above Pt 100 to DIN 43760.	LRT 910
<u>Programmer PM 351-1</u> Microprocessor controlled programmer with up to 50 program segments and a program range of 350°C for unrestricted individual programming of temperature courses.	LRP 012
<u>LAUDA digital thermometers</u> For a temperature range of -200 ... 800°C with 0.1 or 0.01°C resolution. Pt 100 as measure probe.	
<u>Stainless steel racks</u> for test tubes, centrifuge tubes, etc.	
Bath RC 20, up to 2 racks	
RD 13 for 56 tubes 10 - 13 dia., 80 mm immersion	UG 066
RD 18/1 for 33 tubes 14 - 18 dia., 80 mm immersion	UG 067
RD 18/2 for 33 tubes 14 - 18 dia., 110 mm immersion	UG 068
RD 30 for 14 tubes 24 - 30 dia., 110 mm immersion	UG 069
Bath RK 20, up to 2 racks	
RE 13 same as RD 13	UG 070
RE 18/1 same as RD 18/1	UG 071
RE 18/2 same as RD 18/2	UG 072
RE 30 same as RD 30	UG 073
Bath RC 5, RC 6, 1 rack	
RF 18/1 for 20 tubes 14 - 18 dia., 80 mm immersion	UG 074
RF 18/2 for 20 tubes 14 - 18 dia., 110 mm immersion	UG 075
Details on other racks available on request.	
<u>Rising platform to be mounted subsequently</u> Bench area 250 x 160 mm, height continuously adjustable	LCZ 012
Bath RC and RK 20: 1 platform possible	
<u>Socle with castors</u> Height adjustable for RM 20, RC, RK and RL units. Cover plate of the unit can be adjusted to required table height.	LCZ 036

Ersatzteile / Pièces détachées / Spare parts
RCS 5, RCS 5-D



Ersatzteile / Pièces détachées / Spare parts
RCS 5, RCS 5-D

Bestell.-Nr. / No. Réf. / Ref. No.

1	Zeiger/Aiguille/Pointer	EZD	048
2	Drehknopf/Bouton rotatif/Rotary knob	EZD	053
3	Kappe/Calotte/Cover	EZD	047
4	Potentiometer/Potentiomètre/Potentiometer 1 kOhm	EWD	042
5	Kappe/Calotte/Cover	EZD	051
6	Drehknopf/Bouton rotatif/Rotary knob	EZD	050
7	Temperaturbegrenzer/Limiteur de température/Temperature limiter	ETS	020
8	Hauptschalter/Interrupteur général/Main switch	EST	032
9	Lüfterflügel/Ailette de ventilateur/Wing fan	EMZ	004
10	Motor/Moteur/Motor 220-240 V	EM	046
11	Olive/Olive/Nipple		
	Ø 13	HKO	026
	Ø 11	HKO	025
12	Überwurfmutter/Ecrou à chapeau/Screwed cap	HKM	032
13*	Schwimmerhalter/Support de flotteur/Float holder	HI	021
14*	Klammer/Attache/Clamp	HI	001
15*	Schwimmer/Flotteur/Float	EZ	064
16	Heizkörper/Corps de chauffe/Heater 220-240 V	EH	090
17	Temperaturfühler Pt 500/ Sonde et température Pt 500/ Temperature probe Pt 500	ETP	022
18	Schwimmerhalter/Support de flotteur/Float holder	HI	022
19	Klammer/Attache/Clamp	HI	001
20	Schwimmer/Flotteur/Float	EZ	064
21	Dichtung/Joint/Gasket	EDP	007
22	Niveauschutz/Protection de niveau/Level protection	US	024
23	Netzkabel mit Schukostecker/Câble secteur avec fiche à contact de protection/Mains cable with earthed plug 220 V	EKN	008
24	Zugentlastung/Décharge de traction/Pull discharge	EKZ	014
25	Leiterplatte "Ausgang 30 S"/Circuit imprimé "Sortie 30 S"/ Printed circuit "Output 30 S"	UL	198
26	Leiterplatte "Netz"/Circuit imprimé "Secteur"/ Printed circuit "Mains" ab Serie E 70/à partir de la série E 70/from serie E 70	UL	195
		UL	228
27	Leiterplatte "LED-Anzeige"/Circuit imprimé "LED-Affichage"/ Printed circuit "LED-Indication"	UL	210
28	Motor Kondensator/Condensateur de moteur/Motor capacitor 1,5 µF	ECA	012
29	Triac/Triac/Triac	EYY	008
30	Leiterplatte "Kälte"/Circuit imprimé "Refrigeration" Printed circuit "Cooling"	UL	182
31	Gewindebolzen/Tige filetée/Threaded bolt	HKB	192
32	Temperiereinheit kompl. (Innenkessel, Deckplatte, Verdampfer, Kapillare und Isolierung)/ Unité de thermostatisation compl. (Cuve interieure, Couvercle de bain, Evaporateur, Capillaire et Isolation)/ Thermostatic unit compl. (Inner vessel, Cover plate, Evaporator, Capillary and Insulation)	UU	047
33	Baddeckel/Couvercle de bain/Bath cover	Hdq	042
34	Gummifuß/Pied en caoutchuc/Rubber foot	EZG	005
35	Bodenwanne/Fond de la cuve/Bath bottom	HGB	103

Ersatzteile / Pièces détachées / Spare parts
RCS 5, RCS 5-D

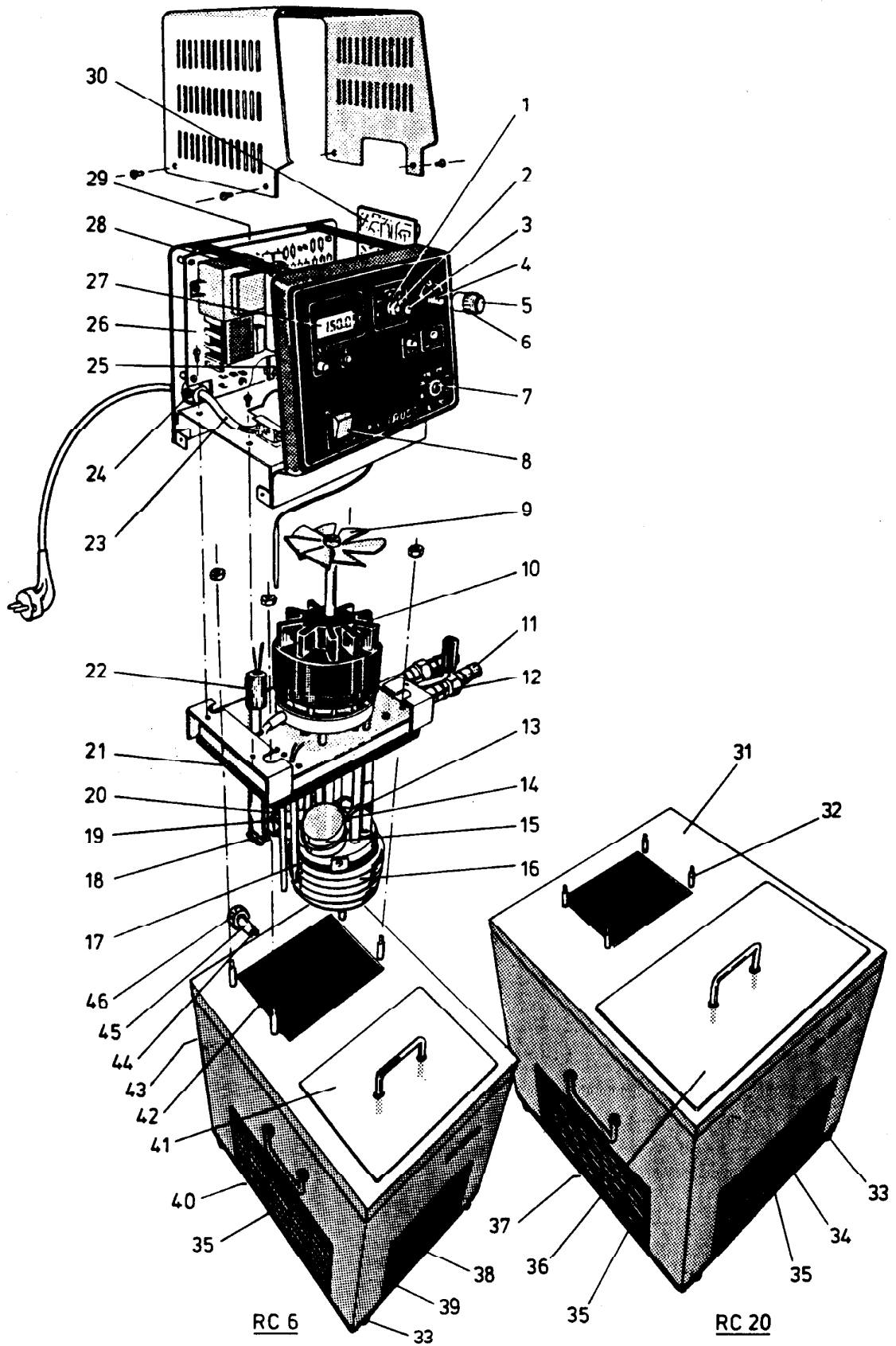
36	Gitter/Grille/Grating		HGW 133
37	Gitter/Grille/Grating		HGW 132
38	Kälteaggregat/Groupe frigorifique/Refrigerator	RC 20	EMK 044
	Magnetventil/Vanne de solenoide/Solenoid valve		EVM 027
39	Gummitülle/Douille en caoutchuc/Rubber piece		EDT 007
40	O-Ring/O-Ring/Joint torique		EDO 018
41	Entleerungshahn kompl./Robinet de vidange compl./ Drain cock compl.		UD 070
42	Drehknopf/Bouton rotatif/Rotary knob		EZD 001

* nur bei RCS 5-D/seulement en RCS 5-D/only on RCS 5-D

04/89 D

ab/à partir/from serie D 50

Ersatzteile / Pièces détachées / Spare parts
 RCS 6, RCS 6-D, RCS 20, RCS 20-D



Ersatzteile / Pièces détachées / Spare parts
RCS 6, RCS 6-D, RCS 20, RCS 20-D

Bestell.-Nr. / No. Réf. / Ref. No.

1	Zeiger/Aiguille/Pointer	EZD	048
2	Drehknopf/Bouton rotatif/Rotary knob	EZD	053
3	Kappe/Calotte/Cap	EZD	047
4	Potentiometer/Potentiomètre/Potentiometer 1 kOhm	EWD	042
5	Kappe/Calotte/Cover	EZD	051
6	Drehknopf/Bouton rotatif/Rotary knob	EZD	050
7	Temperaturbegrenzer/Limiteur de température/Temperature limiter	ETS	020
8	Hauptschalter/Interrupteur général/Main switch	EST	032
9	Lüfterflügel/Ailette de ventilateur/Wing fan	EMZ	004
10	Motor/Moteur/Motor 220-240 V	EM	046
11	Olive/Olive/Connector	13 mm dia. 11 mm dia.	HKO 026 HKO 025
12	Überwurfmutter/Écrou à chapeau/Union nut	HKM	032
13*	Schwimmerhalter/Support de flotteur/Float holder	HI	021
14*	Klammer/Attache//Clamp	HI	001
15*	Schwimmer/Flotteur/Float	EZ	064
16	Heizkörper/Corps de chauffe/Heater 220-240 V	EH	090
17	Temperaturfühler Pt 500/Sonde de température/Temperature probe	ETP	022
18	Schwimmerhalter/Support de flotteur/Float holder	HI	022
19	Klammer/Attache/Clamp	HI	001
20	Schwimmer/Flotteur/Float	EZ	064
21	Dichtung/Joint/Gasket	EDP	007
22	Niveauschutz/Protection de niveau/Level protection	US	024
23	Netzkabel mit Schukostecker/Câble secteur avec fiche à contact de protection/Mains cable with earthed plug 220 V	FKN	008
24	Zugentlastung/Protection pour câble/Cable tension relief	EKZ	014
25	Leiterplatte "Ausgang 30 S"/Circuit imprimé "Sortie 30 S"/ Printed circuit board "Output 30 S"	UL	198
26	Leiterplatte "Netz"/Circuit imprimé "Secteur"/Printed circuit board "Mains" 220 V ab Serie E 70/à partir de la série E 70/from serie E 70	UL	195 228
27	Leiterplatte "LED-Anzeige"/Circuit imprimé "LED-Affichage"/ Printed circuit board "LED-Indication"	UL	210
28	Motorkondensator/Condensateur de moteur/Motor capacitor 1.5 µF	ECA EYY	012 008
29	Triac/Triac/Triac		
30	Leiterplatte "Kälte"/Circuit imprimé "Refrigeration"/ Printed circuit board "Cooling"	UL	182
31	Gewindebolzen/Tige fileté/Threaded bolt	HKB	192
32	Temperiereinheit kompl. (Innenkessel, Deckplatte, Verdampfer, Kapillare und Isolierung/Unité de thermostatisation compl. (Cuve interieure, Couvercle de bain, Evaporateur, Capillaire et Isolation)/Thermostatic unit compl. (Inner vessel, Cover plate, Evaporator, Capillary and Insulation)	UU EZG	047 005
33	Gummifuß/Pied en caoutchuc/Rubber butt		

Ersatzteile / Pièces détachées / Spare parts
 RCS 6, RCS 6-D, RCS 20, RCS 20-D

34	Bodenwanne/Fond de la cuve/Bath bottom	HGB	103
35	Gitter/Grille/Grill	HGW	133
36	Baddeckel/Couvercle de bain/Bath cover	HDQ	039
37	Kälteaggregat/Groupe frigorifique/Refrigeration unit RC 20 Magnetventil/Vanne de solenoide/Solenoid valve	EMK	044
38	Gitter/Grille/Grill	EVM	027
39	Bodenwanne/Fond de la cuve/Bath bottom	HGW	132
40	Kälteaggregat/Groupe frigorifique/Refrigeration unit RC 6 Magnetventil/Vanne de solenoide/Solenoid valve	HGB	102
41	Baddeckel/Couvercle de bain/Bath cover	EMK	043
42	Temperiereinheit kompl. (Innenkessel, Deckplatte, Verdampfer, Kapillare und Isolierung/Unité de thermostatisation compl. (Cuve interieure, Couvercle de bain, Evaporateur, Capillaire et Isolation)/Thermostatic unit compl. (Inner vessel, Cover plate, Evaporator, Capillary and Insulation)	EVM	027
43	Gummitülle/Douille en caoutchouc/Rubber piece	HKQ	042
44	O-Ring/Joint Torique/O-Ring	UU	046
45	Entleerungshahn kompl./Robinet de vidange compl./Drain cock compl.	EDT	007
46	Drehknopf/Bouton rotatif/Rotary knob	EDO	018
		UD	070
		EZD	001

* nur bei/seulement en/only on RCS 6-D und/et/and RCS 20-D
 4/89 ab/à partir/from serie D 50

Ersatzteile / Pièces détachées / Spare parts
RKS 20, RKS 20-D

Bestell.-Nr. / No. Réf. / Ref. No.

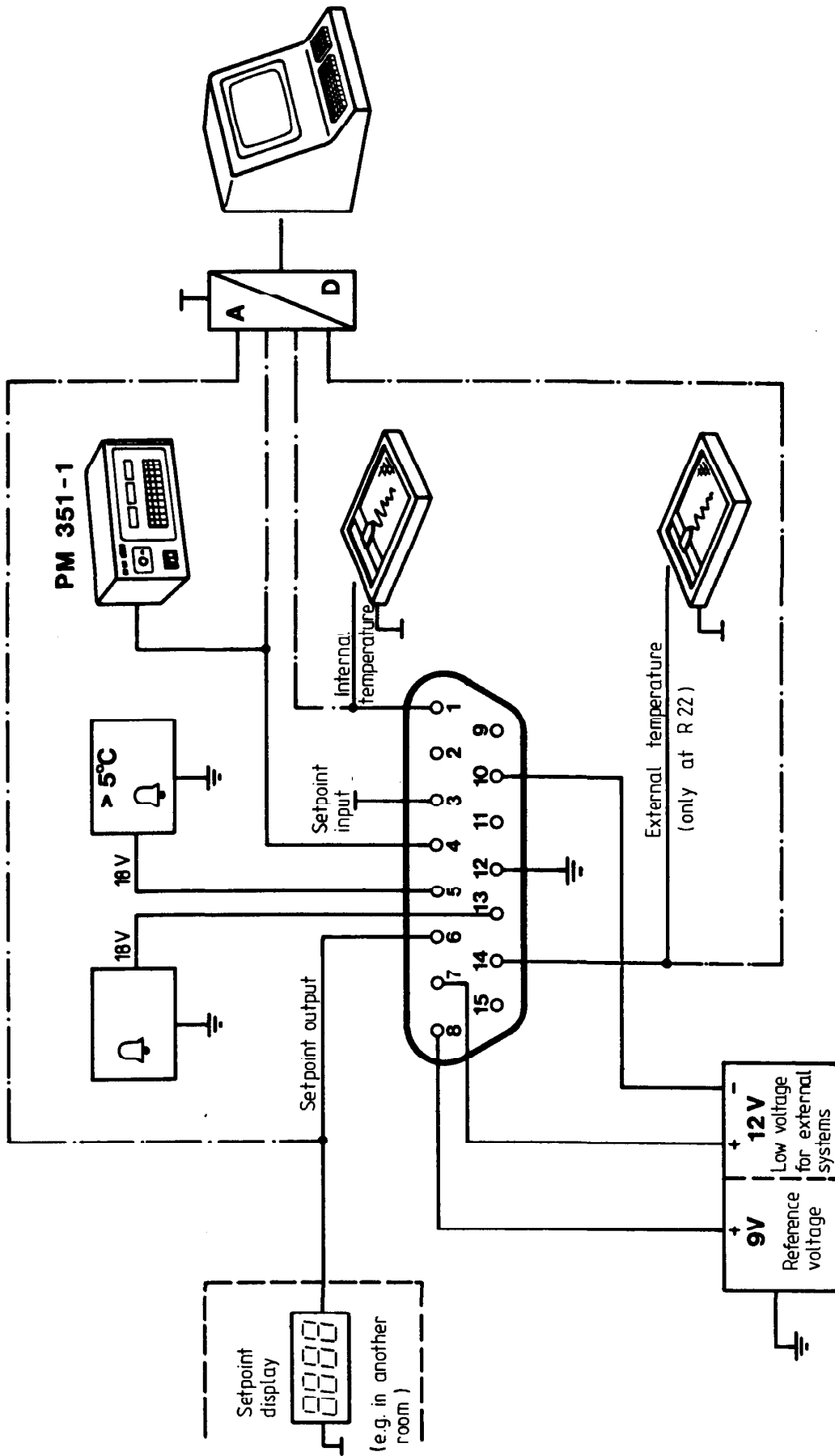
1	Zeiger/Aiguille/Pointer	EZD	048
2	Drehknopf/Bouton rotatif/Rotary knob	EZD	053
3	Kappe/Calotte/Cap	EZD	047
4	Potentiometer/Potentiomètre/Potentiometer 1 kOhm	EWD	042
5	Kappe/Calotte/Cover	EZD	051
6	Drehknopf/Bouton rotatif/Rotary knob	EZD	050
7	Temperaturbegrenzer/Limiteur de température/Temperature limiter	ETS	020
8	Hauptschalter/Interrupteur général/Main switch	EST	032
9	Lüfterflügel/Ailette de ventilateur/Wing fan	EMZ	004
10	Motor/Moteur/Motor 220-240 V	EM	047
11	Olive/Olive/Connector	13 mm dia. 11 mm dia.	HKO 026 HKO 025
12	Überwurfmutter/Ecrou à chapeau/Union nut	HKM	032
13*	Schwimmerhalter/Support de flotteur/Float holder	HI	021
14*	Klammer/Attache//Clamp	HI	001
15*	Schwimmer/Flotteur/Float	EZ	064
16	Heizkörper/Corps de chauffe/Heater 220-240 V	EH	091
17	Temperaturfühler /Sonde de température/Temperature probe Pt 500	ETP	022
18	Schwimmerhalter/Support de flotteur/Float holder	HI	022
19	Klammer/Attache/Clamp	HI	001
20	Schwimmer/Flotteur/Float	EZ	064
21	Dichtung/Joint/Gasket	EDP	007
22	Niveauschutz/Protection de niveau/Level protection	US	024
23	Netzkabel mit Schukostecker/Câble secteur avec fiche à contact de protection/Mains cable with earthed plug 220 V	EKN	008
24	Zugentlastung/Protection pour câble/Cable tension relief	EKZ	014
25	Leiterplatte "Ausgang 30 S"/Circuit imprimé "Sortie 30 S"/Printed circuit board "Output 30 S"	UL	198
26	Leiterplatte "Netz"/Circuit imprimé "Secteur"/Printed circuit board "Mains" 220	UL	195
	ab Serie E 70/à partir de la série E 70/from serie E 70	UL	228
27	Leiterplatte "LED-Anzeige"/Circuit imprimé "LED-Affichage"/Printed circuit board "LED-Indication"	UL	210
28	Motorkondensator/Condensateur de moteur/Motor capacitor 1.5 µF	ECA	004
29	Triac/Triac/Triac	EYY	008
30	Leiterplatte "Kälte"/Circuit imprimé "Refrigeration"/Printed circuit board "Cooling"	UL	182
31	Gewindebolzen/Tige filetée/Threaded bolt	HKB	192
32	Temperiereinheit kompl. (Innenkessel, Deckplatte, Verdampfer, Kapillare und Isolierung/Unité de thermostatisation compl. (Cuve interieure, Couvercle de bain, Evaporateur, Capillaire et Isolation)/Thermostatic unit compl. (Inner vessel, Cover plate, Evaporator, Capillary and Insulation)	UU	050

Ersatzteile / Pièces détachées / Spare parts
 RKS 20, RKS 20-D

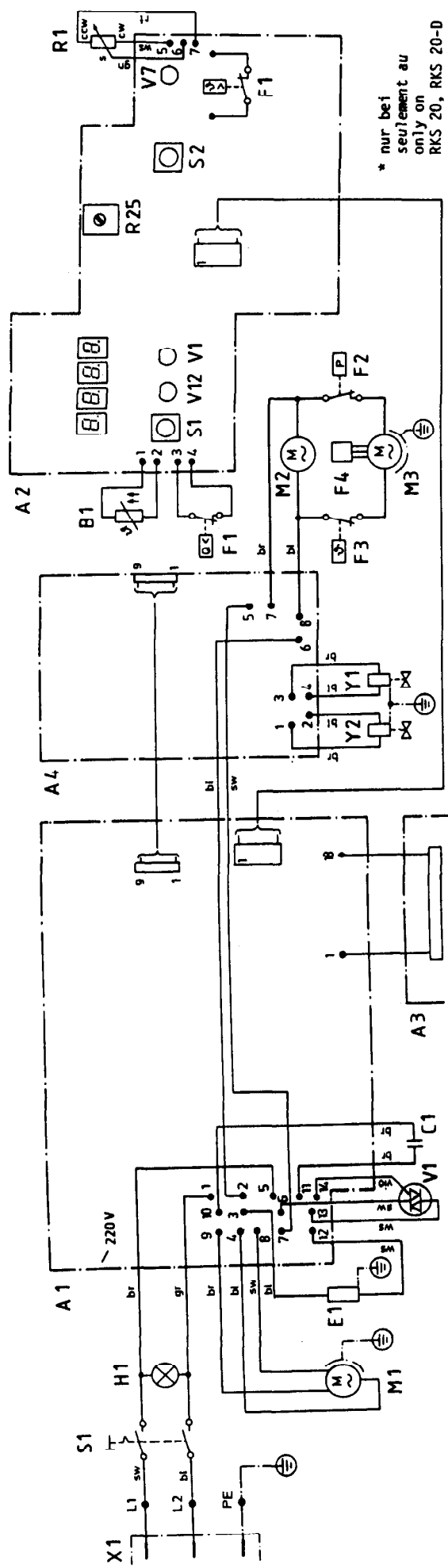
33	Baddeckel/Couvercle de bain/Bath cover	HDQ	039
34	Gummifuß/Pied en caoutchuc/Rubber butt	EZG	005
35	Gitter/Grille/Grill	HGW	133
36	Bodenwanne/Fond de la cuve/Bath bottom	HGB	104
37	Kälteaggregat/Groupe frigorifique/Refrigeration unit	EMK	045
	Magnetventil/Vanne de solenoide/Solenoid valve	EVM	027
	Einspritzventil/Vanne d'injection/Injection valve	EV	040
38	Gummitülle/Douille en caoutchouc/Rubber piece	EDT	007
39	O-Ring/Joint Torique/O-Ring	EDO	018
40	Entleerungshahn kompl./Robinet de vidange compl./ Drain cock compl.	UD	070
41	Drehknopf/Bouton rotatif/Rotary knob	EZD	001

* nur bei/seulement en/only on RKS 20-D

04/89



Multi-function output for CS, KS, RCS, RKS, RLS and External controller R 22



* nur bei
seulement au
only on
RKS 20, RKS 20-D

- A 1 Leiterplatte Netz UL 195 / UL 228
Circuit imprimé Secteur
Printed circuit Mains
- A 2 Leiterplatte LED-Anzeige UL 210
Circuit imprimé Affichage LED
Printed circuit LED-Indication
- A 2-F 1 Temperaturbegrenzer 0...150°C
Limiteur de température
Temperature limiter
- A 2-R25 Sollwert Feineinstellung 10 k Ohm
Réglage fin de la valeur de consigne
Setpoint fine adjustment
- A 2-S 1 Taster: Istwert / Sollwert
Touche: Valeur réelle / Valeur de consigne
Key: Actual value / Setpoint
- A 2-S 2 Taster: Entsperren
Touche: Déblocage
Push button: Reset
- A 2-V 1 LED-Anzeige Heizimpuls
Affichage LED Impulsion chauffage
LED-Indication Heating impulse
- A 2-V 7 LED-Anzeige Störung
Affichage LED Perturbation
LED-Indication Disturbance
- A 2-V12 LED-Anzeige Kühlen
Affichage LED Refroidissement
LED-Indication Cooling
- A 3 Leiterplatte Ausgang 30 S UL 198
Circuit imprimé Sortie 30 S
Printed circuit Output 30 S
- A 3-R 7 Xp-Abgleich 20 k Ohm
Xp-Adjustage
Xp-Adjustment
- A 3-S 1 Wahlschalter: Regelung extern / intern
Commutateur de sélection: Réglage ext/int
Selector: Control extern / intern
- A 3-S 2 Wahlschalter: Xp 1/2
Commutateur de sélection: Xp 1/2
Selector: Xp 1/2
- A 3-S 3 Wahlschalter: Programmbetrieb Ein/Aus
Commutateur de sélection: Programmation M/A
Selector: Program operating On/Off
- A 3-X 2 Ausgang 30 S
Sortie 30 S
Output 30 S
- A 4 Leiterplatte Kälte UL 182
Circuit imprimé Refroidissement
Printed circuit Cooling
- B 1 Temperaturfühler Pt 500
Sonde de température
Temperature probe
- C 1 Kondensator 1,5µF (RCS) / 7µF (RKS)
Condensateur
Capacitor
- E 1 Heizung 2kW
Chauffage
Heater
- F 1 Niveauschutz
Protection de niveau
Level protection
- F 2* Oberdruckschalter
Disjoncteur de surpression
Overpressure switch
- F 3 Klixon
Anlaufvorrichtung
Starting device
- F 4 Anlaufvorrichtung
Dispositif de démarrage
- H 1 Lampe Netz
Lampe Secteur
Lamp Mains
- M 1 Pumpermotor
Moteur de pompe
Pump motor
- M 2 Ventilator
Ventilateur
Fan
- M 3 Kompressor
Compresseur
Compressor
- R 1 SollwertEinstellung 1 k Ohm
Ajustage de la valeur de consigne
Setpoint adjustment
- S 1 Netzschalter
Interrupteur général
Mains switch
- V 1 Triac 15 A 700 V
Netzanschluß
Branchement secteur
Mains connection
- Y 1 Magnetventil Kühlen
Vanne solénoïde Refroidissement
Solenoid valve Cooling
- Y 2* Magnetventil Heizen
Vanne solénoïde Chauffage
Solenoid valve Heating

Schaltplan Schéma de connexions Circuit diagram		RCS 6, RCS 6-D, RCS 20, RCS 20-D RCS 5, RCS 5-D, RKS 20, RKS 20-D	
LAUDA Dr. R. Wobser GmbH & Co. KG Ers. 1.		ab/ à partir/ from Serie D 50	
Norm.	Norm.	Datum	20. 3. 84.
Erstg.	Erstg.	Bearb.	Erstg.
		Gepr.	27.3.84 T.

Summary of the range of LAUDA Heating Thermostats to DIN 12879

Compact thermostats

Series M Operating temperature range -20 to 100°C (with external cooling). Immersion thermostat and bath/circulation thermostats, Series MT and MS. With Simplex pump, 8 l/min, 0,15 bar. Solid-state proportional temperature control, **MS** with built-in digital thermometer and digital setpoint selection through 10-turn potentiometer and digital indication. Class 1 W.

- | | | |
|---|----------------------------------|--------------------------|
| o | MT, MT/2, MS, MS/2 | Immersion thermostats |
| o | MT 3 and MS 3 | Bath volume 2,5 to 3,5 l |
| o | MT 12 and MS 12 | Bath volume 9 to 13 l |
| o | MT 20 and MS 20 | Bath volume 14 to 20 l |
| o | MT 20 S and MS 20 S | Shaking thermostats |
| o | Medico thermostats MT 6 and MS 6 | Bath volume 4 to 6 l |

Series C Operating temperature range -30 to 200°C (with external cooling). Bath/circulation thermostats, choice of powerful pressure pump (15 l/min) or pressure/suction pump (9 l/min) with adjustment lever. Digital thermometer and digital setpoint selection through 10-turn potentiometer and digital indication. Multi-function output for programmer, recorder etc. Heating load 2 kW. Temperature control +/-0,01°C. Class 2.

- | | | |
|---|---------------------------|--|
| o | CS 6 | Bath volume 4 to 6 l |
| o | CS 20 | Bath volume 15 to 20 l |
| o | CSG | Bridge thermostat |
| o | CSD 15, CSD 20 and CSD 30 | Compact Clear-view thermostats
(temp. range -20 to 200°C) |

Series K Operating temperature range -30 to 250°C (with external cooling). Digital thermometer up to 250°C with 0,1°C resolution. Very powerful pressure pump (22 l/min) or pressure/suction pump (15 l/min).

- | | | |
|---|-------|------------------------|
| o | KS 6 | Bath volume 6 to 7,5 l |
| o | KS 20 | Bath volume 14 to 18 l |
| o | KSG | Bridge thermostat |

Otherwise as Series C.

KP 20 with microprocessor control and built-in programmer. Otherwise as thermostats Series KS.

Ultra-Thermostats - the modular thermostat system

Common features:

The most perfect solution to every thermostating problem in the laboratory up to 300°C. Comprehensive modular construction. Complete separation between basic equipment (bath and pump) and electronic control unit R 400 with digital indication and setting of the temperature. Can be extended with Module EXT, for external control, and with Module MV, for controlled tap water cooling. Complies with the strictest safety requirements to DIN Class 3. Available as:

- | | |
|---|--|
| o | Bath/circulation thermostats circular and rectangular design |
| o | High-temperature thermostats |
| o | Clear-view thermostats |
| o | Bridge thermostats |
| o | Calibrating thermostats |

Please ask for our special leaflets.

Summary of the range of LAUDA Refrigerated Thermostats to DIN 12879

Compact low temperature thermostats

Series RM

Range -15 to 100°C. SIMPLEX pump 8 l/min - 0.15 bar; Class 1 W. Economy series: **RMT** with electronic proportional controller and analog temperature setting; temperature control $\pm 0.1^\circ\text{C}$. **RMS** with built-in digital thermometer and digital set-point selection through 10-turn potentiometer and digital indication; PID controller; temperature control $\pm 0.01^\circ\text{C}$; **RMT 6-DS** and **RMS 6-DS** with pressure-suction-pump (8/5 l/min; 0,17/0,15 bar).

- o RMT 6 (DS) and RMS 6 (DS) Bath volume 4 - 6 l
(DS = pressure-suction pump for thermostating open external systems with constant level control)
- o RMT 20 and RMS 20 Bath volume 14 - 20 l

Series RC

Operating temperature range -30 to 150°C. Bath/circulation thermostats with LAUDA Proportional cooling and automatic refrigerator switching, resulting in maximum energy saving. Choice of powerful pressure pump (15 l/min) or pressure/suction pump (9 l/min) with adjustment lever. Digital thermometer and digital setpoint selection through 10-turn potentiometer and digital indication. Multi-function output for programmer, recorder etc. Heating power 2 kW. Temperature control $\pm 0.02^\circ\text{C}$. Class 2.

- o RCS 6 and RCS 6-D Bath volume 4 - 6 l
- o RCS 5 and RCS 5-D (lower form) Bath volume 4 - 6 l
- o RCS 20 and RCS 20-D Bath volume 10 - 14 l

Series RK

Bath volume 14 - 18 l. RKS operating temperature range -40 to 150°C. Increased cooling capacity combined with very powerful pressure pump (22 l/min) or pressure/suction pump (15 l/min). Temperature control $\pm 0.02^\circ\text{C}$. Other data as RCS. **RKP 20** with microprocessor control and built-in programmer. Otherwise as RKS. **RKT 20** very rugged and powerful low-temperature thermostat. Operating temperature range -40 to 20°C. Automatic heating-up system. Temperature control $\pm 0,5^\circ\text{C}$.

Series RL

Operating temperature range -75 to 100°C. Compact 2 stage low-temperature aggregate with proportional cooling. Control, pump capacity etc. as RCS. Bath volume 4 - 6 l.

Summary of the range of LAUDA Refrigerated Thermostats to DIN 12879

-2-

Floor mounted Ultra-Kryomat^R

Removable digital Controller R 410 which can be extended with Module EXT for external control. Proportional cooling.

Series RUL

Very compact. Temperature control $\pm 0,02 \dots 0,05^\circ\text{C}$. Simplex or Duplex pump. Bath volume 9 - 14 l. Heater power 1,2 kW.

RUL 40 and RUL 40-D	-40 to 100°C. Cooling capacity at 0°C 1,0 kW
RUL 80 and RUL 80-D	-80 to 100°C. Cooling capacity at 0°C 0,8 kW

Series RUK

With higher cooling capacity. Temperature control $\pm 0,02 \dots 0,05^\circ\text{C}$. Simplex or Duplex pump, air or water (W) cooled. Bath volume 19 - 27 l. Heater power 2 kW.

RUK 50 (W) and RUK 50-D (W-D)	-50 to 100°C. Cooling cap. 2,2 kW (W 2,5 kW)
RUK 60 W and RUK 60 W-D	-60 to 100°C. Cooling cap. 2,1 kW
RUK 90 (W) and RUK 90-D (W-D)	-90 to 100°C. Cooling cap. 2,0 kW (W 2,0 kW)

Series RUK/S

With extra-large cooling capacity and very powerful pump 50 l/min. Air or water (W) cooled. Bath volume 19 - 27 l.

RUK 40 S and RUK 40 SW	-40 to 100°C. Cooling cap. 3,9 kW (SW 4,8 kW)
RUK 90 S and RUK 90 SW	-90 to 100°C. Cooling cap. 3,6 kW (SW 3,6 kW)

K 120 without digital controller R 410. Range -125 to 20°C. Temperature control $\pm 0,1 \dots 0,8^\circ\text{C}$. Cooling capacity 2,1 kW. Heater power 1,0 kW. Pump 12 l/min.

LAUDA Circulation cooling units

Series UKT

Various models with different size, cooling capacity, pump output and options available.

UKT 350, UKT 600 (P) - UKT 1500 (W)/(WP), UKS 1500 (W)/(WP)/(WPH) - UKT 3000 (W), UKT 6000 (W), UKS 3000 (W)/(H)/(WH), UKS 6000 (W)/(H)/(WH)

Please ask for our special leaflets!

3. Basic construction

These operating instructions apply to 8 Compact liquid thermostats of different construction, Series **RCS** and **RKS**.

Bath/circulation thermostats RCS 5, RCS 6 and RCS 20

with SIMPLEX pump for thermostating inside the bath and in closed external systems at -30 to 150°C operating temperature.

Bath/circulation thermostats RCS 5-D, RCS 6-D, and RCS 20-D

with DUPLEX pump for thermostating inside the bath and in closed and open external systems at -30 to 150°C operating temperature.

Bath/circulation thermostat RKS 20

with more powerful SIMPLEX pump and extended temperature range from -40 to 150°C.

Bath/circulation thermostats RKS 20-D

with more powerful DUPLEX pump and temperature range from -40 to 150°C.

On all units the metal parts in contact with the bath liquid are made of chrome nickel steel. DUPLEX pumps have a suction and a pressure stage with level control.

The refrigeration unit is switched on automatically as required. Cooling is controlled by solenoid valves which are operated from the electronics through the PID controller.

The units consist of the bath and refrigeration 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 and setpoint, PID controller with triac packet-switching relay, controls for the refrigeration unit and the solenoid valves, temperature probe, heater, safety system and pump. All units have at the back a multi-function socket with inputs for programmer and accessory units and with outputs for recorder, fault signal etc. (see Sections 8 and 10). The main data of the thermostats are summarised in Section 2.

4. Safety system

4.1 The DIN specification 12 879 for laboratory thermostats entitled "Liquid Thermostats, General and Safety Requirements" has been in operation since 1 May 1979. This specification lays down the safety devices required and divides thermostats into different safety classes.

4.2 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.
- 4.3 The units Series RCS and RKS as described in these Operating Instructions are to Class 2, they are 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 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 level;
 - o only those bath liquids may 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.

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.

LAUDA Compact Low-Temperature Thermostats
RCS 5, RCS 5-D, RCS 6, RCS 6-D,
RCS 20, RCS 20-D, RKS 20, RKS 20-D

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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 ... 100°C

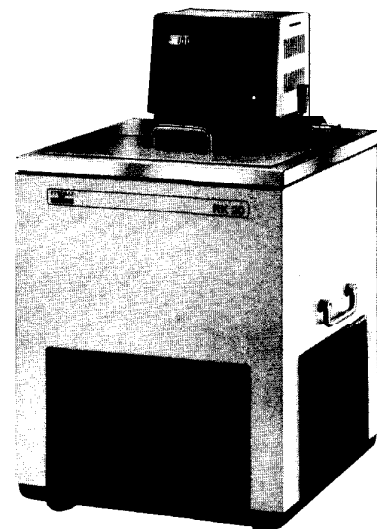
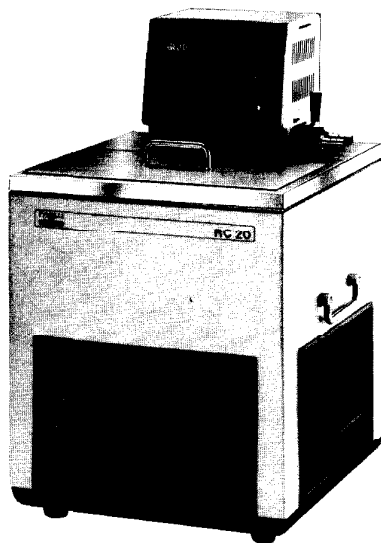
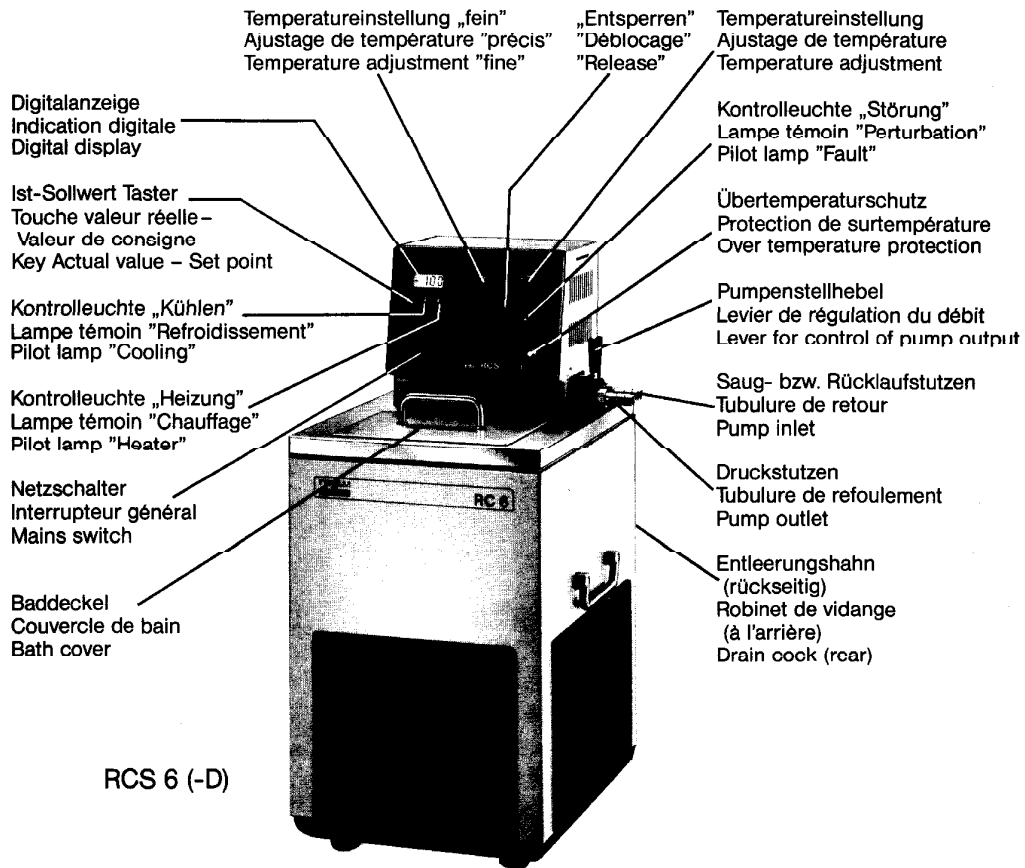
Use decalcified water. Remember to make up losses through evaporation at elevated temperatures. Losses may be reduced by using suitable bath covers (see Accessories).

Temperatures close to zero and below:

Use water-monoethylene glycol mixture, preferably Glycoshell P 300, in the ratio 1:1.

		Ref.No.
<u>Operating range -30 to 100°C</u>	<u>Ultra-Therm G 100</u>	LZB 009
Boiling point	110°C	
Viscosity at 20°C	4 mm ² /sec	
Non-inflammable		
Prolonged operation at elevated temperatures results in a decreasing proportion of water in the mixture which gradually approaches the properties of pure glycol and thus becomes <u>inflammable</u> (flashpoint 128°C). The mixture ratio must therefore be checked from time to time, e.g. against the original mixture, or with a hydrometer.		
<u>Operating range -60 to 50°C</u> (silicone oil)	<u>Ultra-Therm SK Frigor</u>	LZB 002
Viscosity at 20°C	3 mm ² /s	
Flashpoint	70°C	
<u>Operating range 20 to 180°C</u> (synthetic heat transfer liquid)	<u>Ultra-Therm 330 SCB</u>	LZB 007
Viscosity at 20°C	34 mm ² /sec	
Flashpoint	190°C	
Boiling point	390°C	

Compact-Kältethermostate, RC- und RK-Reihe
 Thermostats Compacts de réfrigération, Série RC et RK
 Compact Low-Temperature Thermostats, Series RC and RK



LAUDA Compact Low-Temperature Thermostats
RCS 5, RCS 5-D, RCS 6, RCS 6-D,
RCS 20, RCS 20-D, RKS 20, RKS 20-D

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5.2 Tubing (continuous lengths)

Ref.No.

Silicone tubing, uninsulated
8 mm int. dia. Application range -30 ... 100°C
For water and water-glycol mixture.8
RKJ 016

Silicone tubing, insulated
8 mm int. dia. With foam rubber insulation,
ext. dia. approx. 30 mm. Use as for uninsulated
silicone tubing. Application range -60 ... 100°C.
LZS 001

Silicone tubing, uninsulated
11 mm int. dia. Application range -30 to 100°C. For
water and water-glycol mixtures.
RKJ 059

Silicone tubing, insulated
11 mm int. dia. With foam rubber insulation,
approx. 35 mm ext. dia. Use as for uninsulated
silicone tubing. Application range -60 to 100°C.
LZS 007

Perbunan tubing, uninsulated
11 mm in. dia. Application range 0 to 120°C.
RKJ 012

Note: Silicone tubing **must not** be used with silicone oils.

Secure tubing with clips to prevent it slipping off.

Metal tubing (single insulation)

Application range 0 ... 350°C

Metal tubing MC 50 (50 cm long)	LZM 040
Metal tubing MC 100 (100 cm long)	LZM 041
Metal tubing MC 150 (150 cm long)	LZM 042
Metal tubing MC 200 (200 cm long)	LZM 043

Metal tubing (multiple insulation)

Application range 0 ... 350°C

Metal tubing MC 50 S (50 cm long)	LZM 046
Metal tubing MC 100 S (100 cm long)	LZM 047
Metal tubing MC 150 S (150 cm long)	LZM 048
Metal tubing MC 200 S (200 cm long)	LZM 049

LAUDA Compact Low-Temperature Thermostats
RCS 5, RCS 5-D, RCS 6, RCS 6-D,
RCS 20, RCS 20-D, RKS 20, RKS 20-D

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Metal tubing pump connector for linking together the LZM 045
pump connectors (insulated). Application range -50 to 150°C.

Highly flexible thermally insulated stainless steel (VZA) metal tubing with
M 16 x 1 mm connecting threads. Internal dia. 10 mm. This tubing offers ma-
ximum safety, especially above 100°C.

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

6. Unpacking, assembly and setting up

- o The units are packed carefully to prevent transport damage. If, however, the
unit should arrive damaged, the carrier or the railway authorities have to be
be informed so that it can be inspected.

<u>Standard accessories</u>	<u>Ref.No.</u>	
1 Bath cover	HDQ 042	on RCS 5, RCS 5-D, RCS 6, RCS 6-D
1 Bath cover	HDQ 039	on RCS 20, RCS 20-D RKS 20, RKS 20-D
2 Connectors 13 dia. (fitted)	HKO 026	
2 Connectors 11 dia.	HKO 025	
1m Silicone tubing insulated 11 mm i.d.	LZS 007	
Operating Instructions		

- o The units are best set up so that the narrow side is to the front and the
ventilation to the refrigeration unit (grill in the lower part) is not obstructed.
Close the drain cock.

If no external circulation is required the pump connectors must be linked
together with a piece of tubing. The pump output adjusting lever should be
open to improve the circulation inside the bath. We recommend to use the
metal tubing pump connector (Ref.No. LZM 045) which offers the best and
most reliable solution.

7. Connecting external systems

- o If the thermostat is connected to closed external systems, liquid must be added after the unit is switched on until the bath level remains at the correct height (approx. 2 cm below the cover). For suitable tubing material refer to Section 5. 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!
- o When thermostating open external systems (bath vessel) the tubes are placed into the external bath vessel (protect them against slipping out), preferably on opposite sides. The suction tube should have a notch cut into it at the end so that it does not suck itself to the side or the bottom of the bath. Before switching on the unit the bath is filled with liquid to the required height. If thermostat and external bath are not at the same level, the connecting tubing must be vented after switching off the thermostat by pulling them out of the liquid, otherwise the thermostat may flood.

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

Protect the tubing with clips to prevent it slipping off or use stainless steel tubing with screw fittings.

o Circulating pumps

Essentially there are two different types: SIMPLEX pumps, e.g. on RCS 5, RCS 6, RCS 20, RKS 20 and DUPLEX pumps, e.g. on RCS 5-D, RCS 6-D, RCS 20-D, RKS 20-D.

SIMPLEX pumps are used for operation with closed external circulating systems. They require that the external system is pressure-tight.

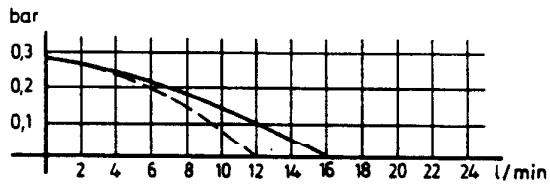
DUPLEX pumps are used mainly with open external systems, e.g. open baths. They differ from SIMPLEX pumps by having a pressure and a suction stage as well as a float for level control. The DUPLEX pump automatically maintains a constant level in the thermostat independently of the level in the external bath. The open bath is filled with liquid until a level is reached in the thermostat at which the pressure and suction stages have identical output. If the level difference between open external bath and thermostat bath exceeds 0.5 m there is a possibility that the control range of the level control is insufficient. A tubing clip is then used to restrict one of the tubes, the suction tube if the external level is higher, or the discharge tube if the external level is lower, until the thermostat reaches a constant level at which the pump float is within its control range.

DUPLEX pumps can of course also be used with closed external systems. There they offer the advantage that the liquid flows through the external system virtually without pressure (important with thin-walled glass vessels). When operating with closed systems or as a bath thermostat, the bath should be filled to the highest level (to 2 cm below the cover).

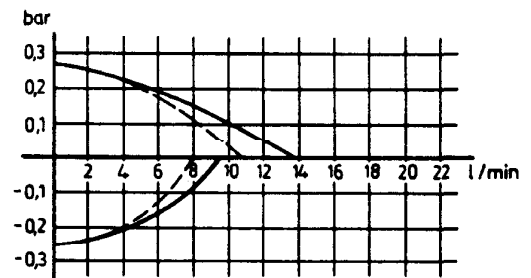
LAUDA Compact Low-Temperature Thermostats
 RCS 5, RCS 5-D, RCS 6, RCS 6-D,
 RCS 20, RCS 20-D, RKS 20, RKS 20-D

Performance diagrams

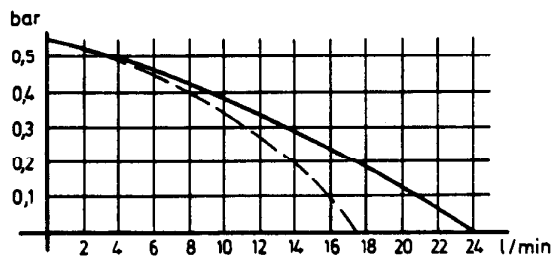
RCS 5, RCS 6, RCS 20



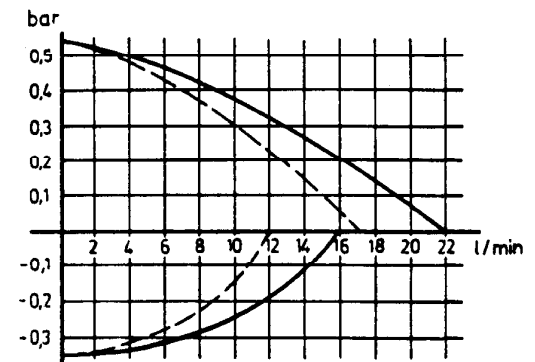
RCS 5-D, RCS 6-D, RCS 20-D



RKS 20



RKS 20-D



_____ connector 13 mm int. dia.

- - - - - connector 11 mm int. dia.

Measured according to DIN 58 966

All LAUDA circulating pumps are fitted with a lever to permit continuous adjustment of the flow rate (pump output) 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 can operate with liquids whose viscosity does not exceed approx. 150 mm²/sec.



8. Starting up

o Filling

The unit has to be filled with suitable bath liquid depending on the operating temperature, as discussed in Section 5. The liquid volume is indicated in Section 2, Table of Data. The thermostats should never be filled higher than 2 cm below the cover.

When using thermostat oil (e.g. Ultra-Therm 330 SCB) the level should be slightly lower to allow the expansion of the bath liquid. The liquid must obviously not be below the minimum level, otherwise the unit is switched off by the low-level cut-out (see Safety system). The same applies when an external system is filled by the pump during starting up.

- o Connect the unit only to a grounded socket. Check the details on the rating label against the supply voltage.
- o Ensure that the pump connectors are linked together when there is no external system (metal tubing pump connector Ref.No. LZM 045).
- o Switch on the mains switch. The green pilot lamp inside the mains switch lights up. The refrigeration unit starts up and switches off again automatically after about 10 min. if it is not required. The refrigeration unit switches on and off completely automatically so that temperature programs can be operated over a wide range without any manual action. In addition, temperature control is by heating only **or** by cooling only (proportional cooling), depending on whether heat has to be added or removed.

The digital display indicates the actual bath temperature. Set the overtemperature switch-off point  a little higher than the desired operating temperature. When operating at temperatures below ambient temperature, the overtemperature switch-off point must of course first be set above ambient temperature until the actual operating temperature is obtained. Then the overtemperature switch-off point may be set slightly above the desired operating temperature (minimum approx. 0°C), as described in Section 10. To reset the safety cut-out circuit, the reset key  "Release" may have to be operated if the unit has been switched off by a fault.

- o The three slide switches on the back of the unit should normally (if no accessory unit is connected) be in the bottom position. The Xp selector (proportional range) is moved to position 1 only if there are excessive fluctuations in the temperature control due to low thermal capacity or excessively high viscosity of the used bath liquids.





You can further optimize the control parameter by changing the position of the Xp potentiometer which is located next to the Xp switch. At the factory the unit is set to a middle Xp position which is approx. 4. Most common applications do not require a different adjustment. The proportional range Xp and the integral part (Tn) of the PID controller are both switched over by the Xp switch.

The following value combinations are possible:


Xp switch position	Potentiometer setting	
	1	5
1	Xp = 3.5°C Tn = 45 sec	Xp = 21°C Tn = 45 s
2	Xp = 3°C Tn = 20 sec	Xp = 15°C Tn = 20 sec

Special demands on the transient response might require a readjustment of the Xp potentiometer.

Basically a larger proportional range results in a damping of the control circuit, i.e. the hunting reduces, whereas a reduction of the Xp results in faster settling time and lower overshoot, but can cause huntings.

- o Press key  , the selected setpoint now appears on the digital display. Select the desired temperature by rotating the knob  (10-turn potentiometer). The fine adjustment ($\pm 0.2^\circ\text{C}$) is also active and simplifies the adjustment by increased resolution. Then release the key again, the display now shows the actual bath temperature. The digital display ends at 199.9°C ; above this value only the number 1 appears.
- o When the set temperature has been reached the yellow pilot lamp "heating"  begins to flash at a frequency of 0.5 to 1 Hz, or the green pilot lamp "cooling"  at a frequency of 0.2 Hz. The ratio of the ON-time to the cycle-time provides an indication of the energy introduced into or abstracted from the bath. After the system has settled down the digital thermometer indicates the previously selected setpoint.
- o Operating with Programmer

At the multi-function output 30 S it is possible to connect up a Programmer type PM 351 with which the thermostat setpoint 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).

The switch PROGR at the back is in position "0", i.e. the programmer connected at this point does not affect the setpoint. Set the unit setpoint to the lowest temperature in the program, this temperature is also used as value A when programming the programmer. Now this setpoint must not be changed; Then set the switch PROGR to "I". 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.

LAUDA Compact Low-Temperature Thermostats
RCS 5, RCS 5-D, RCS 6, RCS 6-D,
RCS 20, RCS 20-D, RKS 20, RKS 20-D

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Enclosures

Accessories

Spares

Circuit diagram

Summary of LAUDA Heating Thermostats and LAUDA
Low-temperature thermostats





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 unit according to Section 6 and add items as appropriate.
- o Connect the tubing at the pump connectors:

Without external circulation: Link together the pump connectors with the insulated silicone tubing supplied (-60 to 100°C), or with perbunan tubing (up to 120°C), viton or metal tubing. Note: do not use silicone tubing with silicone oil (SK Frigor, SK Super Frigor)!



With external circulation: Connect tubing to the external system.

Secure tubing with clips to prevent it slipping off.

- o Use decalcified water only or LAUDA bath liquids (See section 5). Fill the unit up to approx. 2 cm below the top plate.
- o Set up the unit so that there is free ventilation to the refrigeration (ventilation grill in the lower section).
- o Check the supply voltage against the data on the rating label. Connect the cable to the supply.
- o Switch on the unit with the mains switch (green lamp inside mains switch lights up). The refrigeration unit start up and switches off again automatically after about 10 min if it is not required.
- o Overtemperature cut-out  has to be set according to bath temperature and bath liquid (see Section 4). To release the safety circuit lock-out it may be necessary to operate the reset button .
- 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 . The fine adjustment ($\pm 0.2^\circ\text{C}$) is also effective and simplifies setting up through its greater resolution. The refrigeration unit switches on automatically as required.
- o Under normal conditions, i.e. when no accessory units are connected to the thermostat, the three slide switches on the back of the unit should be in the bottom position (see Section 8).

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- o When the bath liquid has reached the set temperature, the yellow pilot lamp "Heating"  or the green pilot lamp "Cooling"  begins to flash. After the temperature has settled down, the digital thermometer indicates the selected bath temperature.
- o The red lamp always flashes when the bath temperature is more than 5°C higher than the set temperature.
- o 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. Inflammable liquids may only be used up to 5°C below the flash point, otherwise an explosive atmosphere may be created.
- o 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.

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2. Table of Data

These thermostats meet the requirements of DIN 12 879.

Type	RCS 5 RCS 5-D	RCS 6 RCS 6-D	RCS 20 RCS 20-D	RKS 20 RKS 20-D
Temperature range (°C)		-30 ... 150		-40 ... 150
Temperature setting	digital, using 10-turn potentiometer and numerical indication; resolution of indication 0.1°C, 10-turn potentiometer approx. 0.08°C; fine adjustment 0.01°C			
Indicating thermometer	built-in digital thermometer (LED-Display), 0.1°C resolution, absolute accuracy better than +/-0.2% of reading +/-0.2°C. Max. reading 199.9°C			
Temperature probe/ Control action	Pt 500 platinum resistance thermometer/PID Xp ≈ 3°C...21°C, Tn1 ≈ 45 s, Tn2 ≈ 20 s, Tv ≈ 40 s			
Temperature control (at -10°C) (°C)			+/-0.02	
Heating load	automatic adjustment as required 0 ... 2 kW			
Cooling rating (kW) eff.				
20°C	0.24	0.35	0.6	
0°C	0.18	0.28	0.5	
-20°C	0.09	0.15	0.35	
-30°C	0.05	0.09	0.15	
-40°C	---	---	0.05	
Class to DIN 12 879		Class 2		

SIMPLEX

Output against zero head
(Pump output)

RCS 5, RCS 6, RCS 20, RKS 20

with connector	11 mm	Pressure 11 l/min	Pressure 16 l/min
with connector	13 mm	Pressure 15 l/min	Pressure 22 l/min
Max. head		0.25 bar	0.5 bar

DUPLEX

Output against zero head
(Pump output)

RCS 5-D, RCS 6-D, RCS 20-D, RKS 20-D

with connector	11 mm	Pressure 10 l/min Suction 8 l/min	Pressure 15 l/min, Suction 11 l/min
with connector	13 mm	Pressure 13 l/min Suction 9 l/min	Pressure 20 l/min Suction 15 l/min
Max. head		Pressure 0.25 bar Suction 0.23 bar	Pressure 0.5 bar Suction 0.33 bar

Pump connections

M 16 x 1

10 mm int. dia

Capacity (l)

4 - 6

10 - 14

14 - 18

Bath liquid

5 to 100°C

below 5°C to -30°C

decalcified water
water-monoethylene glycol mixture 1:1
(for other bath liquids see Section 5)

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Type	RCS 5 RCS 5-D	RCS 6 RCS 6-D	RCS 20 RCS 20-D	RKS 20 RKS 20-D
Dimensions				
Bath opening (LxW) (mm)		150 x 130	300 x 175	300 x 175
Bath depth (mm)		160	160	200
Usable liquid depth (mm)		140		180
Overall dimensions				
Bench area (W x D) (mm)	520 x 375 x	280 x 375	375 x 415	400 x 440
Height (mm)	455	630	630	690
Weight (kg)		34	43	52
Power supply (V/Hz) (kW)		220 - 240 V / 50 Hz 2.4	230 V, 60 Hz 2.5	230 V, 60 Hz 2.7
Protection Class I to VDE 0100				
Interference suppression	N			
Ref.No.:				
220-240 V, 50 Hz				
SIMPLEX	LCK 129	LCK 114	LCK 116	LCK 120
DUPLEX	LCK 135	LCK 115	LCK 117	LCK 121
230 V, 60 Hz				
SIMPLEX	LCK 229	LCK 214	LCK 216	
DUPLEX	LCK 235	LCK 215	LCK 217	
100 V, 50/60 Hz				
SIMPLEX	LCK 629			
DUPLEX	LCK 635			