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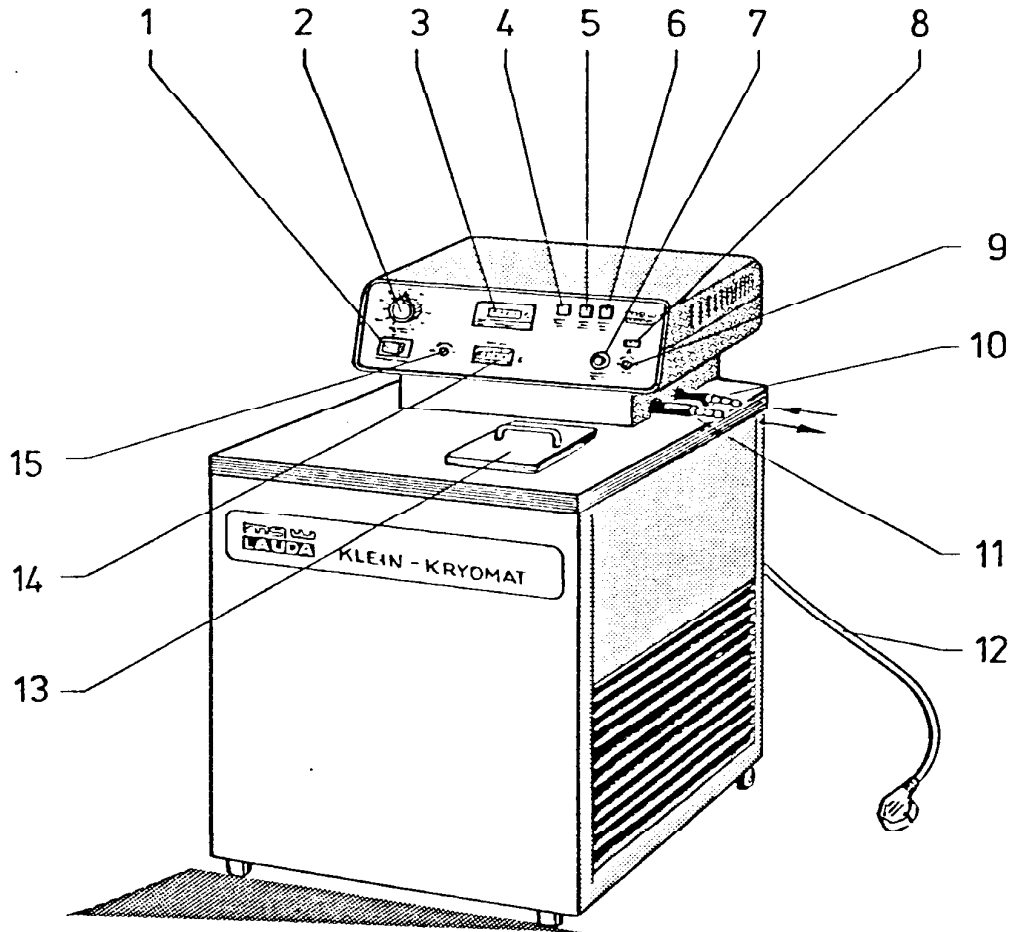
1. Short instructions

- o Check if thermostat and accessories have sustained damage. If necessary inform the forwarding agent or post office.
- o Assemble Thermostat according to section 6
- o Hose connections to the pump connectors :
Without external consuming device:
Connect the pump connectors. Instrument is delivered with pump connectors connected with insulated PVC hose and secured with hose clips.
With external consuming device:
Connect the pump connectors with the consuming device. Secure the hoses with the hose clips.
- o Fill instrument up to approx. 2 cm below cover plate.
- o Compare the voltage frequency mentioned on the rating label with your network. Put in the power-supply plug.
- o Set the desired temperature.
- o Switch on the main switch (green lamp lights up).
- o Make sure that the level in the thermostat does not fall inadmissibly by filling of the connected consuming device.
- o If the thermostating liquid has obtained the desired value the control device operates. Pilot lamp "Heating" (SK 65) and pilot lamp "Cooling" (SK 80) goes on and out. Check the operating temperature at the digital thermometer and reset the temperature, if necessary.
- o Operating reliability:
Thermostat has Class 2 according to DIN 12879. It must only be used with not inflammable liquids or liquids with a flash-point higher than 40°C. Inflammable liquids can only be used to max. 5°C below the flash-point as otherwise there could be an explosion risk.

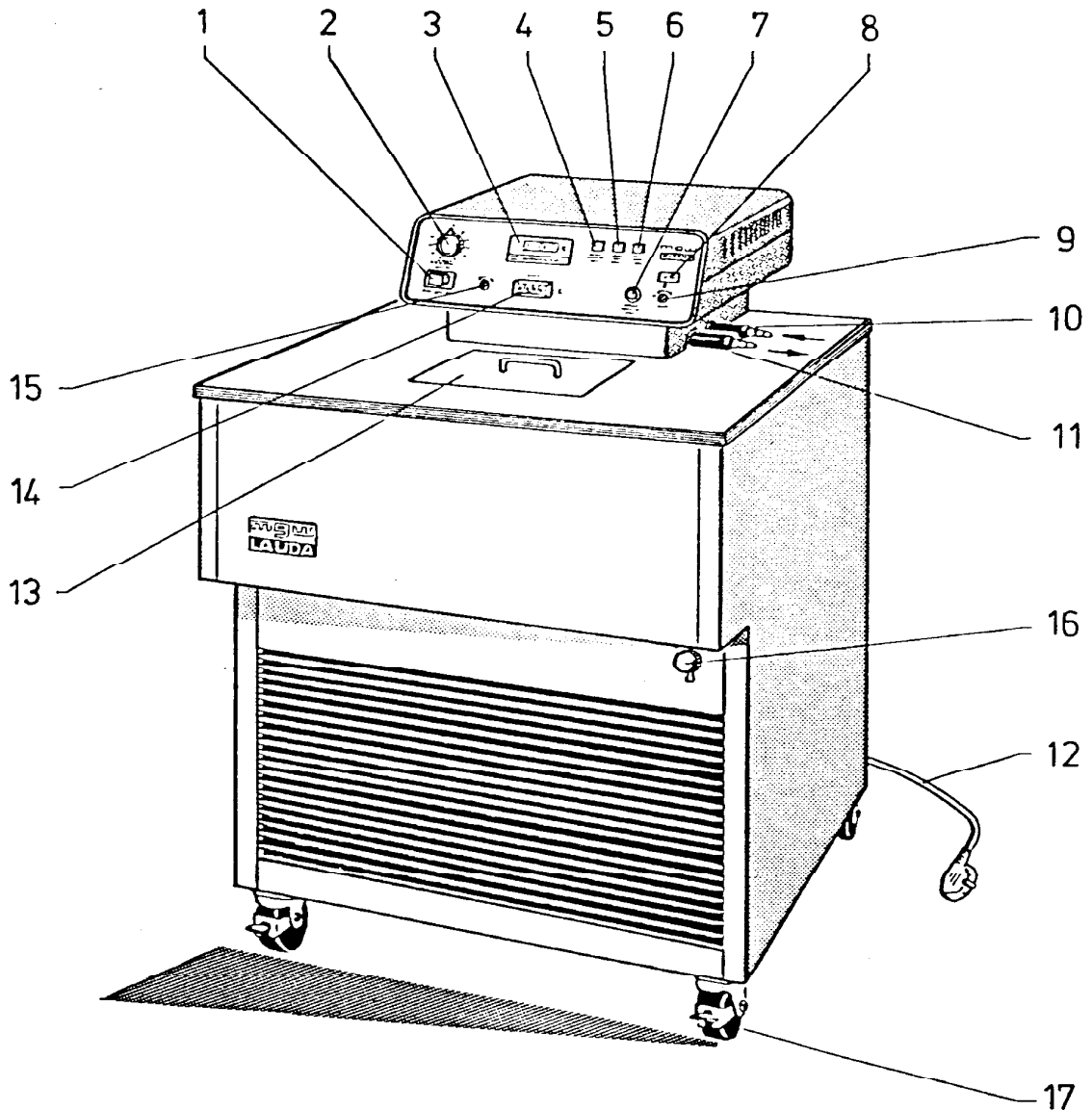
2. Tabular Summary

These Thermostats fulfil the requirements of DIN 12879

Type	SK 65	SK 80	SK 80 D
Operating temperature range	-70/40°C		-80/40°C
Indication of actual value	Digit-Thermometer, resolution 0,1°C Accuracy 0,2% v.M. ± 1 Dig.		
Probe/ Controller action	Pt 100 PID action	Pt 100 Two-point controller (PD action)	
Temperature accuracy (at -10°C)	± 0,05°C		
Heater output	0...1 kW		1 kW
Cooling output (kW)	20	0,25	1,10
	0	0,19	0,90
	-20	0,17	0,70
	-40	0,10	0,50
	-60	0,06	0,25
	-80		0,07
Class according to DIN 12 879	2		
Pump output	8 l/min	15 l/min at pressure head 0	8 l/min
Discharge pressure	0,3 bar	0,4 bar	0,3 bar
Filling capacity	5 l	13 l	
Bath liquid	see section 5		
Bath opening/mm	90 x 110	250 x 160	
Usable liquid height/mm	140	150	
Base/mm	450x560x715	755x605x1090	
Weight	84 kg	162 kg	
Power supply	220-240V, 50 Hz 1,9 kW	220-240V, 50Hz 2,0 kW	
	Safety class 1 according to VDE 0100		
Interference level	N		
Ref. No.	LUK 004	LUK 005	LUK 006



- | | | | | | |
|---|---|----|---|----|--|
| 1 | Netzschalter
Main switch
Interrupteur général | 6 | Kontroll-Lampe "Störung"
Pilot lamp "Fault"
Lampe témoin "Panne" | 11 | Vorlauf
Flow
Refolement |
| 2 | Schaltuhr
Switch clock
Interrupteur horaire | 7 | Taste "Entsperren"
Unlocking key
Touche de déblocage | 12 | Netzkabel
Mains cable
Cable secteur |
| 3 | Digital-Thermometer
Thermometer
Thermomètre | 8 | Skalenscheibe Abschalttemperatur
Dial cut-off temperature
Cadran de température de disjonction | 13 | Baddeckel
Bath cover
Couvercle de bain |
| 4 | Kontroll-Lampe "Heizung"
Pilot lamp "Heater"
Lampe témoin "Chauffage" | 9 | Einstellung Abschalttemperatur
Adjustment cut-off temperature
Ajustage température de disjonction | 14 | Temperatureinstellung
Temperature adjustment
Ajustage de température |
| 5 | Kontroll-Lampe "Kühlung"
Pilot lamp "Cooling"
Lampe témoin "Froid" | 10 | Rücklauf
Return
Retour | 15 | Nullabgleich
Zero adjust
Ajustage de zéro |




- | | | | | | |
|---|---|----|---|----|--|
| 1 | Netzschalter
Main switch
Interrupteur général | 7 | Taste "Entsperren"
Unlocking key
Touche de déblocage | 13 | Baddeckel
Bath cover
Couvercle de bain |
| 2 | Schaltuhr
Switch clock
Interrupteur horaire | 8 | Skalenscheibe Abschalttemperatur
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Ajustage température de disjonction | 15 | Nullabgleich
Zero adjust
Ajustage de zéro |
| 4 | Kontroll-Lampe "Heizung"
Pilot lamp "Heater"
Lampe témoin "Chauffage" | 10 | Rücklauf
Return
Retour | 16 | Entleerungshahn
Drain cock
Robinet de vidange |
| 5 | Kontroll-Lampe "Kühlung"
Pilot lamp "Cooling"
Lampe témoin "Froid" | 11 | Vorlauf
Flow
Refoulement | 17 | Laufrollen mit Feststeller
Castors
Roulettes |
| 6 | Kontroll-Lampe "Störung"
Pilot lamp "Fault"
Lampe témoin "Panne" | 12 | Netzkabel
Mains cable
Cable secteur | | |

3. General design

This Operating Instructions is valid for 3 Small Kryomats of different design.


Small Kryomat SK 65

Compact bench unit. Thermostatic bath/circulator with SIMPLEX pump for thermostating in the bath and in an external closed circuit.

Operating temperature is digitally adjusted at a decade switch with a resolution of $0,1^{\circ}\text{C}$. By means of the adjustable resistor at the front -  - the desired value can be re-adjusted. A PID controller serves for control; the cooling unit is continuously operating and the heater is controlled in accordance with the required output. Pilot lamp "Heater" (4) is blinking. The rhythm of blinking continuously changes and is proportional to the respective heating energy (burst-firing). Bath temperature is indicated by a digital thermometer with a resolution of $0,1^{\circ}\text{C}$ and an accuracy of $0,2\% \text{ v.M. } \pm 1 \text{ digit}$.

Small Kryomat SK 80 (D)

Compact floor unit. Thermostatic bath/circulator with SIMPLEX pump (SK 80) for thermostating in the bath and in the external closed circuit or with DUPLEX pump (SK 80 D) for thermostating in the bath or in connected consuming devices, either closed or open.

Operating temperature is digitally adjusted at a decade switch with a resolution of $0,1^{\circ}\text{C}$. By means of the adjustable resistor at the front -  - the desired value can be re-adjusted. A two-point controller with PD action serves for control which acts upon a solenoid valve in the refrigerant line. Sensitivity of response $0,01^{\circ}\text{C}$. Instrument operates with controlled cooling pulses by intermittent opening of the solenoid valve.

When heating up a heater is automatically switched on after approx. 1,5 minutes, after a further minute the compressor R 13 is stopped. When the higher temperature has been reached the heater is switched off and the compressor R 13 is started. Operation is fully automatical.

4. Safety measures

With effect from May 1979 laboratory thermostats are subject to the DIN Standard 12879 with the title: "Liquid thermostats. General and safety requirements". In this standard safety measures are determined and thermostats are classified in classes of different safety.

Why a thermostat might be dangerous?

1. Thermostats are equipped with heaters which supply the necessary filament energy to the tempering liquid. In case of failure of the temperature control or insufficient liquid level the heater could get so hot that laboratory could be set in fire especially when using inflammable thermostating liquids.
2. When the thermostat is used as thermostatic circulator a hose might break and hot liquid might become dangerous for persons and materials.

Therefore the classification depends on

- o the use of not inflammable or inflammable liquids
- o supervised or unsupervised operation

Instruments of series SK 65 and SK 80 described in this operating instructions have the class 2: they are protected against overtemperature and low-level. For class 2 is required:

- o a temperature limiter as overtemperature protection which switches off the thermostat on all poles, as soon as an adjusted cut-off temperature is exceeded. Adjustment is done by means of a screw driver. The adjusted value is indicated on the scale over it.
- o a level limiter as low-level protection which switches off the thermostat on all poles as soon as the level falls below a minimum mark.
- o when the safety circuit operates pilot lamp disturbance is on and a sound signal is produced.

reset to service only after eliminating the disturbance by pressing key "Unlocking" (7). Take care that the instrument can only be operated again when the bath temperature has fallen under the adjusted value. If necessary the limiting value must be adjusted higher for reset.

Note

The overpressure switch of the first stage of cooling circuit also serves as safety circuit. It may be released by insufficient ventilation of the air-cooled condenser.

Important note

Safety class 2 protects only against dangers which result from too high temperature or too low level.

Further sources of danger can result from the tempering article e.g. exceeding or falling below certain temperatures or in case of breakage of the vessel and reaction with the liquid. It is not possible to dispose of all eventual risks. The operator must be responsible for himself.

5. Bath liquids and hose connections

The ranges of application of the bath liquids and hoses are general indications which may be limited by the operating temperature range of the instrument.

Range of application 5...100°C

Use decalcified water

Replace losses of evaporation at higher operating temperatures.

Range of application -60...50°C

Viscosity at 20°C: 3 mm²/s

Flash point: 70°C

Ultra-Therm SK Frigor (Silicone oil)

Range of application -30...100°C

Boiling point: 110°C

Viscosity at 20°C: 4 mm²/s

Not inflammable

Mixture water/monoethylenglycol

We recommend Glycoshell P 300

in proportion 1:1

Range of application -95...40°C Methyl alcohol
Boiling point: 65°C
Viscosity at 20°C: 0,6 mm²/s
Flash point: 11°C
Freezing point: -98°C

For operating temperatures below -60°C methyl alcohol is normally used. As the flash point of methyl alcohol is at 11°C, the standard DIN 12879 is not fulfilled. If the DIN 12879 should be fulfilled at operating temperatures below -60°C please contact us for suitable bath liquids.

Hose connections

Perbunan hose Ref. No. RKJ 011

9 mm i.d. Suitable up to 120°C.
Can be used with all above mentioned liquids.

Perbunan hose, insulated Ref. No. LZS 004

9 mm i.d. Outer diameter approx 30 mm.
Suitable up to 120°C. Especially suitable
for operation in the cooling range.

Silicone hose, insulated Ref. No. LZS 001

8 mm i.d. With foam rubber insulation.
Outer diameter approx. 30 mm. Can be
used up to 100°C. Especially suitable as
flexible connection in the cooling range
when using a mixture of water/glycol.

Attention: Do not use silicone hose in connection with silicone oils (SK Frigor, SK Super Frigor)!

6. Unpacking, Assemblage and Set-up

The careful packing largely protects from damages during transport. If, however, the thermostat is damaged, inform the forwarding agent or the post office.

Assemblage and Set-up

The instrument must not be started before 30 minutes' rest so that the oil can flow back to the compressor.

Take care that the instrument is placed at least 0,5 m from the wall in order to guarantee good ventilation.

Close the drain cock.

If no external consuming devices are tempered connect the outflow and return nipples (11) and (10) with a short insulated piece of hose.

Note that the pump always pumps during operation. So switch off the instrument when changing the hose.

7. Connection of external consuming devices

Thermostat connected with an external closed circuit: switch on the instrument and refill liquid up to the correct liquid level. For suitable hoses see section 5.

Thermostat connected with an external open circuit (bath vessel): put the hoses into the bath, if possible at opposite sides (make sure that they cannot slip out). Notch the suction hose at its end so that it cannot become attached by suction at the wall or at the bottom. Before switching on the instrument fill the bath vessel with liquid up to the desired level. If thermostat and open bath are not placed on the same level, switch off the instrument and put out the hoses for venting in order to prevent overflowing.

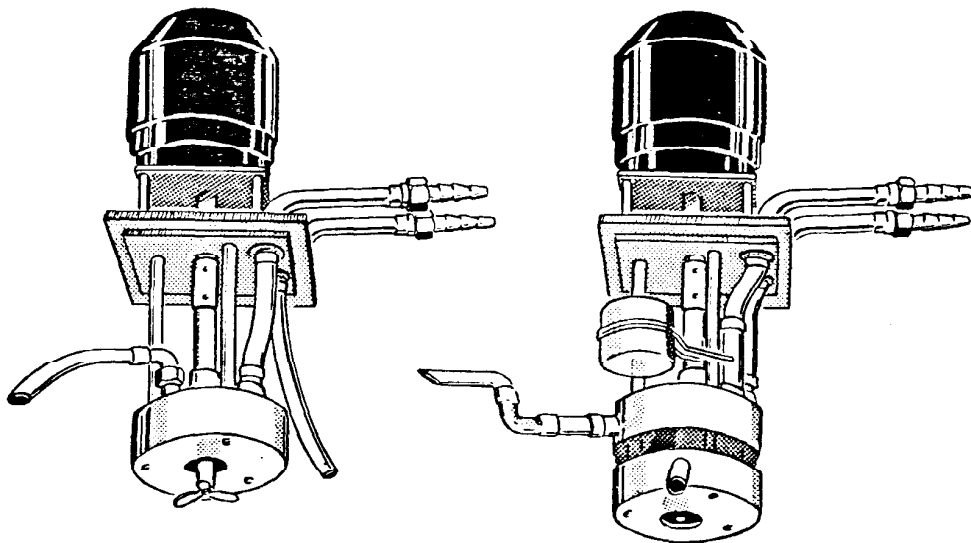
Fasten the hoses by means of hose clips.

Circulating pumps

Principally there are two different types of pumps :

SIMPLEX-pumps
 (pressure pumps)

DUPLEX-pumps
 (pressure/suction pumps)



SIMPLEX pumps are used for the connection of external closed circuits. They require pressure-tight double walled consuming devices.

DUPLEX pumps are mainly used for the connection of open external circuits, e.g. bath tanks. Unlike the SIMPLEX pump they have a pressure and additionally a suction stage as well as a float for automatic level control. The DUPLEX pump automatically maintains the level in the thermostat, independent from the level of the connected open bath. Fill in liquid into this open bath until a liquid level is obtained in the thermostat at which the output of the pressure and the suction stages are fully identical. Of course DUPLEX pumps can be also used for the connection of closed external circuits. They offer the advantage of a nearly pressureless flow through the consuming device (important for thin-walled glass tanks).

All motors are equipped with an overload cut-out (KLIXON) installed in the motor winding. In case of overload e.g. caused by high-viscous bath liquids, current supply is automatically interrupted so that burning out is impossible.

8. Start

8.1 Filling

Fill in the bath liquid which is suitable for the desired operating temperature (see section 5). Filling capacity is indicated on page 3. Generally thermostats have to be filled to a maximum of 2 cm below the cover plate.

During operation the heater must be covered with liquid. Take care that the liquid level will not fall inadmissibly by filling of the consuming device when starting the thermostat. Eventually refill liquid up to the correct level.

8.2 Connect the instrument only at an earthed wall socket. Compare the voltage and the frequency mentioned on the rating label with your network.

8.3 Connect the pump nipples with the supplied hose when operating without external circuit.

8.4 Adjust the desired temperature at the decade switch.

8.5 Switch on the mains switch. The green pilot lamp goes on.

8.6 Automatic start

The Small Kryomat can also be started automatically. Switch on the main switch (1), adjust the time which should pass until the desired automatic start at the switch clock (2). The instrument is switched off and automatically started after expiration of the pre-selected time (up to 24 hours max.).

8.7 Adjustment of the cut-off temperature (overtemperature)

The cut-off temperature has been set to 40°C in our firm which is indicated at the dial (8). Do not adjust the cut-off temperature to a lower value before the bath temperature has fallen below the desired value. Otherwise the instrument is switched off.

8.8 Safety circuit

The instrument is switched off on all poles in case that:

- o the liquid level falls inadmissibly
- o the set cut-off temperature (limiting temperature) has been exceeded
- o the ventilation of the cooling unit is insufficient and the refrigerant pressure is too high
- o the compressor of the first stage has become too hot caused by insufficient ventilation

In all cases the pilot lamp "Disturbance" (6) lights up and a signal is produced. Return to service only by pressing the key "Unlocking" (7) after elimination of the cause.

In case of disturbance at the condensing unit, please contact MGW LAUDA or our agency in your country.

8.9 Operation with programming unit

Instruments are equipped at the rear with a socket for connection of a LAUDA programming unit P 120/25. When operating without programming unit the corresponding switch must be on position SK 65/80. The programming unit serves for a linear decrease and with some reservation increase of the bath temperature.

9. Cooling circuits

9.1 Cooling circuit SK 65

In the lower part of the instrument a cooling unit consisting of 2 fully hermetical compressors with approx. 200 W each are installed. Both cooling circuits are switched in cascade (safety refrigerant R 12 and R 13). The condensing heat and the motor heat are eliminated by means of a fan-vented finned-tube condenser. Fresh air is sucked at the right side and the warmed air is removed at the left. In order to guarantee good air circulation the venting slots must be free. The distance should be at least 50 cm.

Furthermore it should be guaranteed that the ambient temperature does not importantly increase. Higher ambient temperatures result in lower capacities.

The cooling unit is protected against all possible faults (overtemperature cut-out, overpressure switch). The cut-outs are adjusted to the limiting values. Operation of any cut-out is indicated by lighting up of the pilot lamp "fault" (6). At the same time a signal is produced in case of fault. The corresponding parts are switched off on all poles.

9.2 Cooling circuit SK 80/SK 80 D

In the lower part of the instrument a cooling unit consisting of 2 fully hermetical compressors of 900 Watt each is mounted. Both cooling circuits are switched in cascade (safety refrigerants R 22 and R 13). The condensing heat and the motor heat are eliminated by means of a fan-vented finned-tube condenser. Fresh air is sucked at the right side and the warmed air is removed at the left. In order to guarantee a good air circulation the venting slots must be free. The distance should be at least 50 cm.

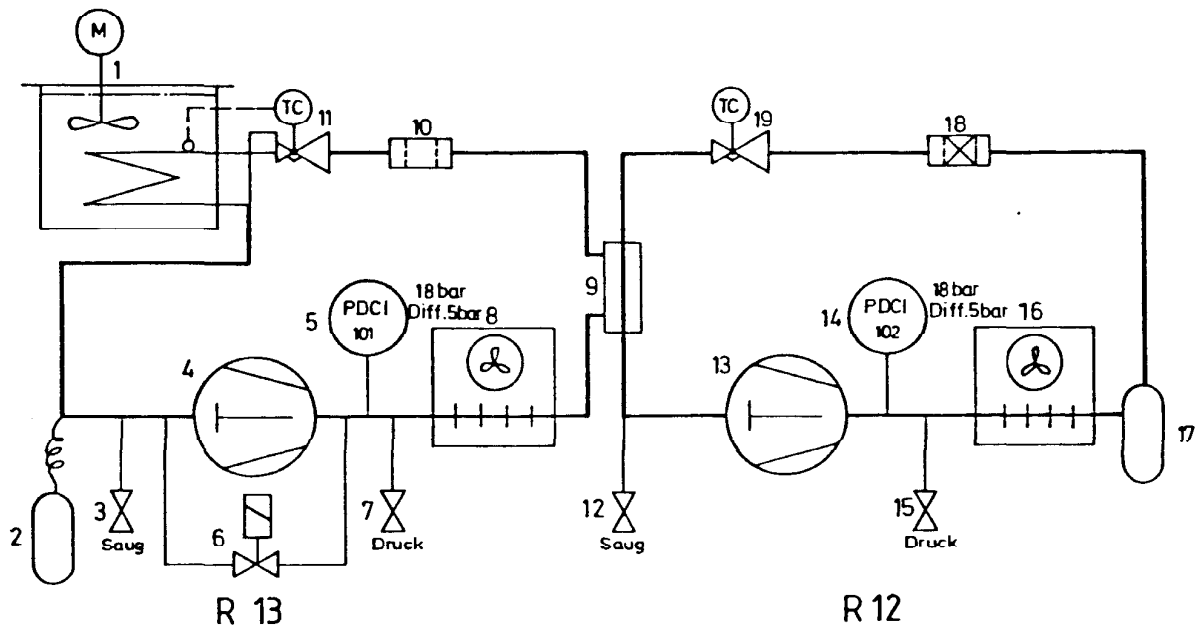
Furthermore it should be guaranteed that the ambient temperature does not importantly increase. Higher ambient temperatures result in lower capacities.

The cooling unit is protected against all possible faults (overtemperature cut-out, overpressure switch). The cut-outs are adjusted to the limiting values. Operation of any cut-out is indicated by lighting up of the pilot lamp "Fault" (6). At the same time a signal is produced in case of fault. The corresponding parts are switched off on all poles.

9.3 Maintenance

The cooling unit operates nearly maintenance-free. If the ambient of the thermostat is dust-laden we recommend to clean the condenser of the cooling unit every 4 or 6 months. For this reason blow compressed air or nitrogen into the venting slots for some minutes.

LAUDA thermostats are designed for continuous operation. They do not require maintenance routine. Polluted bath liquid should be replaced.

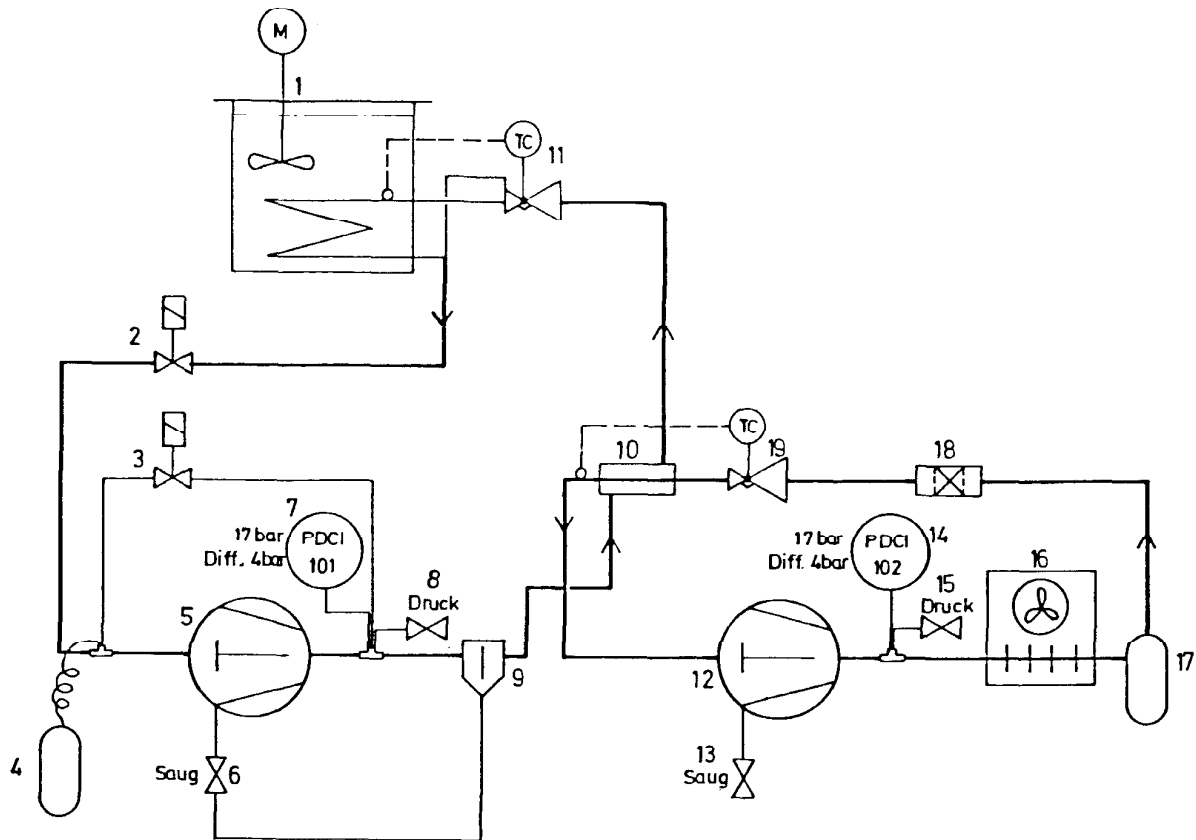


Nr./No. Teil/Part/Pièce

1	Flüssigkeitsbad Liquid bath Bain pour liquide	11	Expansionsventil Expansion valve Vanne d'expansion
2	Sammler 1,2l Collector 1,2l Collecteur 1,2l	12	Kontrollventil Saug Control valve suction Vanne de contrôle aspiration
3	Kontrollventil Saug Control valve suction Vanne de contrôle aspiration	13	Kompressor R12 Compressor R12 Compresseur R12
4	Kompressor R13 Compressor R13 Compresseur R13	14	Überdruckschalter Overpressure switch Disjoncteur de surpression
5	Überdruckschalter Overpressure switch Disjoncteur de surpression	15	Kontrollventil Druck Control valve pressure Vanne de contrôle pression
6	Magnetventil Druckausgleich Solenoid valve pressure compensation Vanne magnétique compensation de pression	16	Luftgekühlter Kondensator Air cooled condenser Condenseur refroidi par air
7	Kontrollventil Druck Control valve pressure Vanne de contrôle pression	17	Sammler 0,7l Collector 0,7l Collecteur 0,7l
8	Luftgekühlter Kondensator Air cooled condenser Condenseur refroidi par air	18	Trockner Dryer Désydrateur
9	Doppelrohr - Wärmetauscher Double tube - heat exchanger Echangeur thermique à double tube	19	Expansionsventil Expansion valve Vanne d'expansion
10	Filter Filter Filtre		

Kältemittel: R12 0,5kg
R13 0,24kg

Ölmenge: Renolin KM 550cm³
Fluisil 550cm³

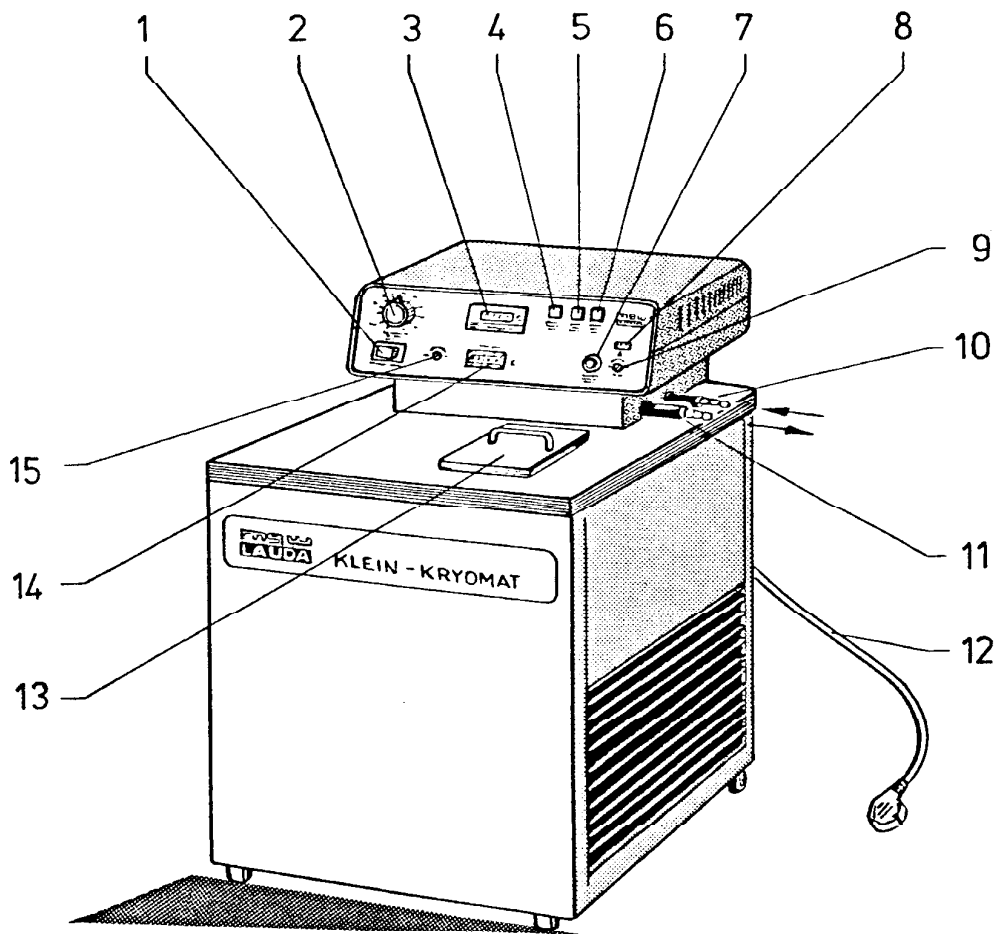


Nr./No. Teil/Part/Pièce

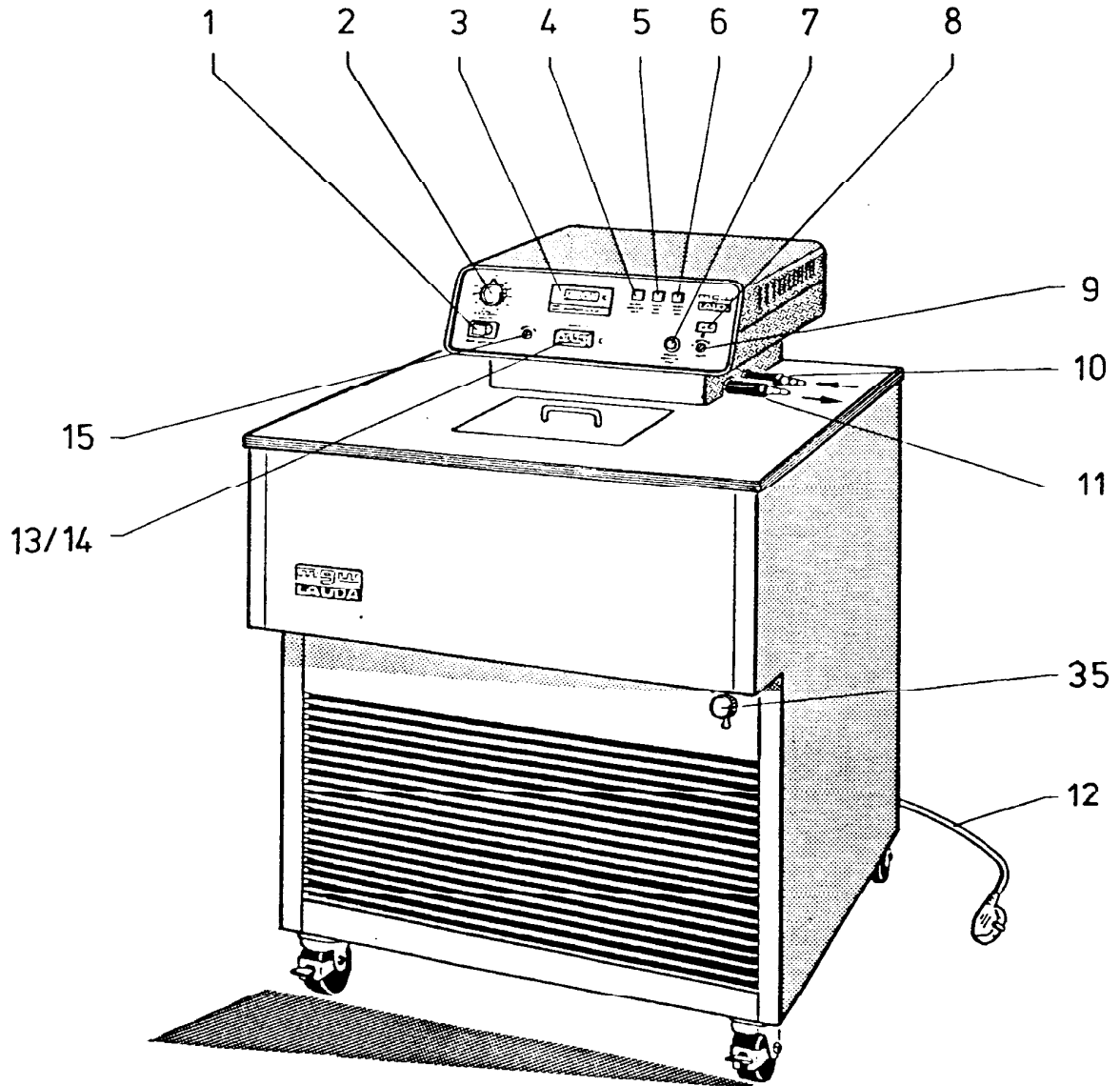
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|----|--|----|--|
| 1 | Flüssigkeitsbad
Liquid bath
Bain pour liquide | 11 | Einspritzventil
Injection valve
Vanne d'injection |
| 2 | Magnetventil
Solenoid valve
Vanne magnétique | 12 | Kompressor R22
Compressor R22
Compresseur R22 |
| 3 | Magnetventil Druckausgleich
Solenoid valve pressure compensation
Vanne magnétique compensation de pression | 13 | Kontrollventil Saug
Control valve suction
Vanne de contrôle aspiration |
| 4 | Druckausgleichsgefäß 0,9l
Tank for pressure compensation 0,9l
Vase pour compensation de pression 0,9l | 14 | Überdruckschalter
Overpressure switch
Disjoncteur de surpression |
| 5 | Kompressor R13
Compressor R13
Compresseur R13 | 15 | Kontrollventil Druck
Control valve pressure
Vanne de contrôle pression |
| 6 | Kontrollventil Saug
Control valve suction
Vanne de contrôle aspiration | 16 | Luftgekühlter Kondensator
Air cooled condenser
Condenseur refroidi par air |
| 7 | Überdruckschalter
Overpressure switch
Disjoncteur de surpression | 17 | Sammler 1,2l
Collector 1,2l
Collecteur 1,2l |
| 8 | Kontrollventil Druck
Control valve pressure
Vanne de contrôle pression | 18 | Trockner
Dryer
Déshydrateur |
| 9 | Ölabscheider
Oil separator
Séparateur d'huile | 19 | Expansionsventil
Expansion valve
Vanne d'expansion |
| 10 | Doppelrohr - Wärmeaustauscher
Double tube - heat exchanger
Exchangeur thermique à double tube | | |

Kältemittel: R13 0,5kg
R22 1,6kg

Ölmenge: Fluissil 1100cm³
Renolin KM 900cm³

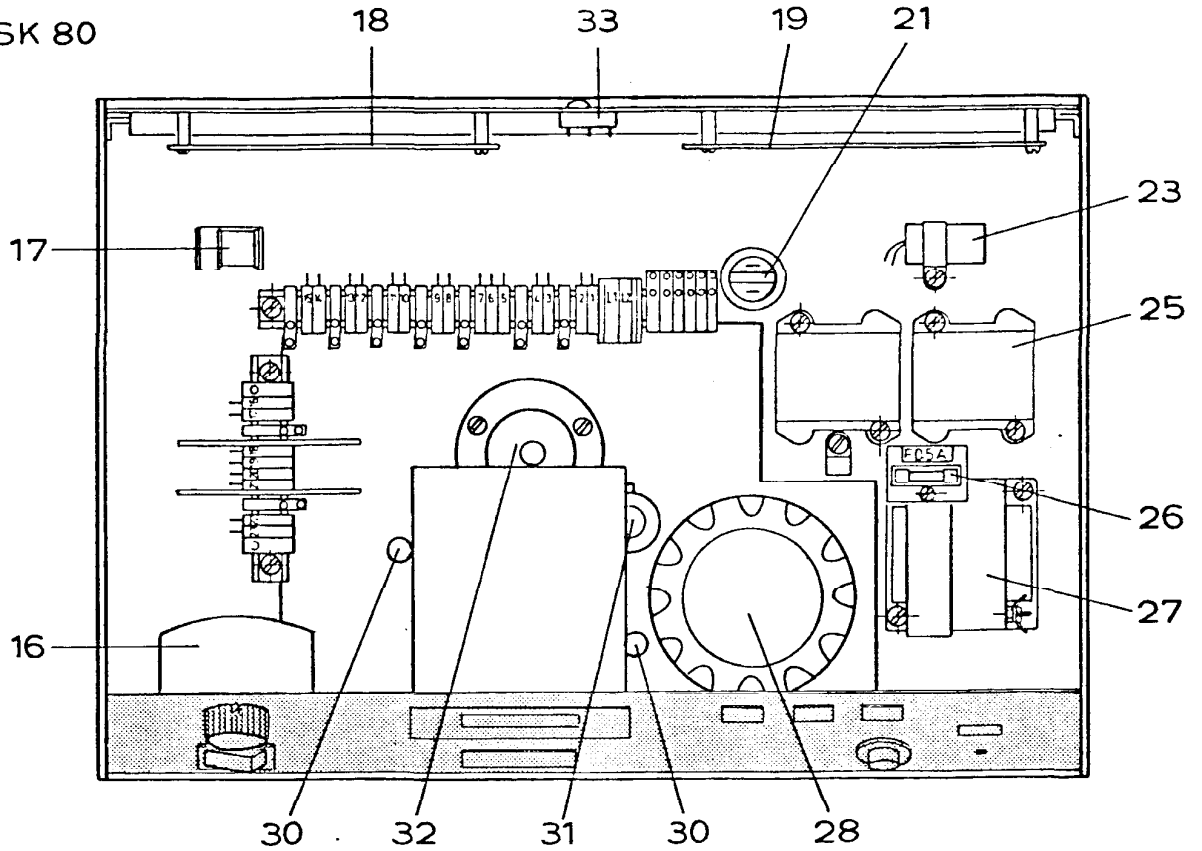


SK 65

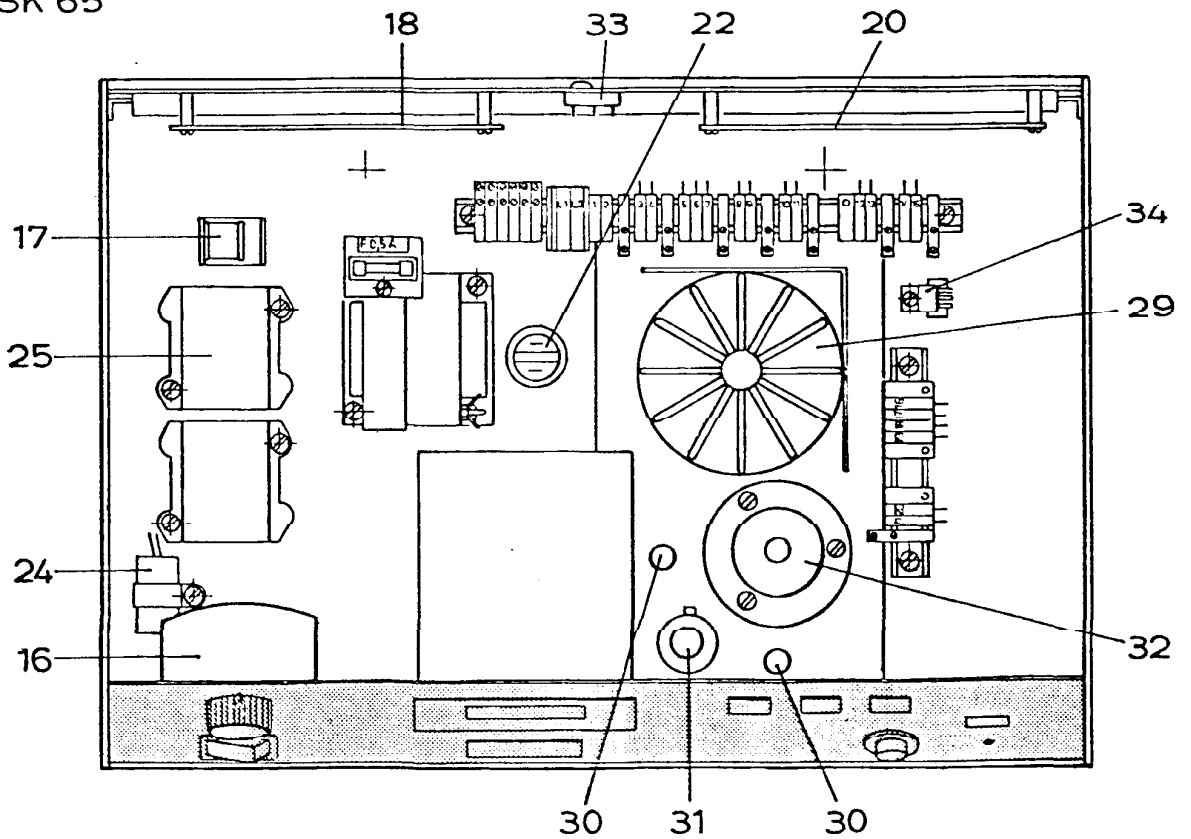


SK 80

SK 80



SK 65



No.	Designation	Ref. No.
1	Switch	EST 032
2	Rotary switch	EZD 005
3	Digital temperature indicator	EAO 044
4/5	Pilot lamp	EXS 011
6	Pilot lamp	EXS 017
7	Unlocking key	EST 033
8	Glass	EGS 012
9	Potentiometer 10 kOhm	EWD 031
10	Hose olive	HKO 009
11	Loose nut	HKM 019
12	Mains cable with earthing contact plug	EKN 008
13	Decade switch "Temperature adjustment" complete	UB 002
14	Printed circuit "Temperature adjustment"	UL 070
15	Potentiometer 2 Ohm	EWD 012
16	Timer	EAO 001
17	Buzzer E 2772/220 V	EAA 002
18	Printed circuit "Overtemperature and level protection"	UL 083
	Transformer BV 18 125	EI 036
	Relay 57 500 284 - 32	ER 027
	Relay 014-6-001	ER 030
	Rectifier B 30 C 300	EYG 001
	Amplifier operation TAA 761 A	EYI 005
	Amplifier operation TAA 2761 A	EYI 024
	Trimmer potentiometer 2 kOhm	EWT 030
	Trimmer potentiometer 1 M Ohm	EWT 015
19	Printed circuit "Control"	UL 079
	Transformer BV 220-0-035 14	EI 065
	Relay 014-6-001	ER 030
	Relay KH/8 3-H	ER 035
	Amplifier operation TAA 761 A	EYI 005
	Amplifier operation TAA 2761 A	EYI 024
	Amplifier operation MP 5505	EYI 026
	Optically coupled isolator CNY 21	EYI 025
	Triac T 2301 D	EYY 007
20	Printed circuit "Control"	UL 083
	Transformer BV 17 797	EI 032
	Burst-firing BV 282-1-00054	EIZ 005
	Rectifier B 30 C 300	EYG 001
	Amplifier U 106 BS	EGI 003
21	Condenser 7 uF	ECA 004
22	Condenser 2 uF	ECA 009
23	Condenser 0,1 uF + 47 Ohm	ECF 003
24	Condenser 0,2 uF + 2x2500 pF	ECF 002
25	Contacteur DIL 0040	ERL 003
26	Fuse F 0,5 A	EEF 008
27	Transformer BV 17 209	EI 040
28	SIMPLEX-circulating pump	LPS 025
	DUPLEX-circulating pump	LPD 025
29	SIMPLEX-circulating pump	LPS 023
30	Platinum resistance thermometer Pt 100	ETP 015
31	Temperature and level protection	US 013
32	Heater 1000 W/220 V	UH 034
33	Commutator	ESS 003
34	Triac IT 615	EYY 008
35	Drain cock	UD 002
	Rotary knob	EZD 001