


**LAUDA**

Operating Instructions

LAUDA Circulating Cooling Units  
UKT 350, UKT 600, UKT 600 P

From Series K01  
07/89  
YAWE0005

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Appendix

Circuit and pipe diagram

Accessories

1. Brief operating instructions

Even if you find these short instructions sufficient please read the following sections, especially Section 4: "Safety features and notes".

- 1.1 Check circulating cooling unit and accessories during unpacking for any transport damage and if necessary inform the carrier.
- 1.2 Assemble the unit according to Section 6 and add extra items as appropriate.
- 1.3 The spacing of the grills from any object which might obstruct the free air flow must be at least 0.5 m.
- 1.4 With the pump connectors open fill the bath up to the upper marking of the level indicator. For this the flap in the cover is opened, filler lid underneath. Check that the drain cock on the back panel is closed.
- 1.5 Fitting the tubing to the pump connections:  
Make tubing connections to the external system. Secure tubing connections with clips against slipping off.  
On the UKT 600 P only use tubing suitable for the heating liquid and for at least 6 bar operating pressure.
- 1.6 Check the supply voltage against the details on the label. Insert the mains plug.
- 1.7 Check that the tubing connections have been made in accordance with Section 1.4! Switch on the main switch (I). The temperature indication on the controller shows the actual bath temperature.
- 1.8 The selected operating temperature is indicated by pressing the key  . Selection is made with potentiometer  after the lock has been released.
- 1.9  indicates whether the compressor is running, i.e. whether the unit is cooling or not.
- 1.10  indicates insufficient level or overloading of the pump motor.

2. Data table

		UKT 350	UKT 600	UKT 600 P	
Operating temperature range	(°C)		-25 to 40		
Condenser cooling		air (controlled fan speed)			
Ambient temperature range	(°C)		0 to 40		
Temperature measurement (outflow)/ resolution/accuracy		Pt 500, green digital 7-segment-LED- display / 0.1°C / Class A to DIN 43760 + 0.2°C over working temperature range			
Temperature setting/ resolution		10-turn potentiometer with digital in- dication / 0.1°C can be locked manually			
Temperature control	(±°C)		better than 1.0		
Control		compressor on-off, with stop time control			
Cooling capacity (effective, with ethanol at 20°C ambient temperature)	(kW)				
	at	20°C	0.35	0.60	0.50
		0°C	0.24	0.45	0.35
		-25°C	0.10	0.20	0.10
Safety features		level indication, opto-electronic level sen- sor against pump running dry. Adjustable alarm contact against overtemperature and low temperature with LED indication and neutral contact (24 V; 0.2 A)			
Flow rate at pressure head 0	(l/min)	20	20	25	
Max. discharge pressure	(bar)	0.5	0.5	4	
Pump connections			M 16 x 1	10 mm int. dia.	
Pressure indication range/resolution	(bar)	----		digital 0-7/0,1	
Multi-function output	(MF)	option		standard	
Capacity	(l)	3 to 5.5		7 to 11	

		UKT 350	UKT 600	UKT 600 P
Floor area (WxD)x height	(mm)	320x490x520	380x540x610	
Weight	(kg)	46	63	
Protection to DIN 40050		IP 32; control section IP 54		
Power supply	(V; Hz)	220-240; 50 Protection Class I to VDE 0100		
Total power consumption	(kW)	0.4	0.6	0.8
Interference suppression		suppressed to VDE 0875		
Ref. No.		LWM 104	LWM 105	LWM 106

**Extra functions:**

as standard:

--- --- DR, MF

Options:

MF,RTE, FB MF,RTE, FB RTE,FB

**Details of extra functions:**

MF = Multifunction output. The following signals are available on terminals in control unit (IP 54):  
 Setpoint input 10 mV/°C  
 Effective setpoint 10 mV/°C  
 Pressure 10 mV/bar \*  
 Return flow temperature 10 mV/°C \*  
 Outflow temperature 10 mV/°C  
 Fault, neutral contact 24 V; 0,2 A

RTE = Return flow temperature measurement, Pt 500 mounted outside the unit in the pump return line. Requires MF.

FB = Remote operation. Control unit including supply ON/OFF in separate housing remote from unit.

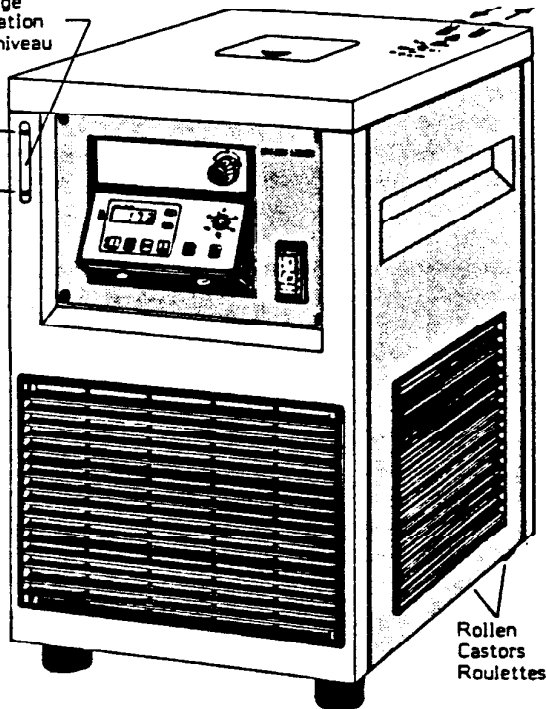
DR = Discharge pressure indication 0...7 bar; 0,1 bar resolution

\* = only on units with the appropriate function

Niveauanzeige  
Level indication  
Indication niveau

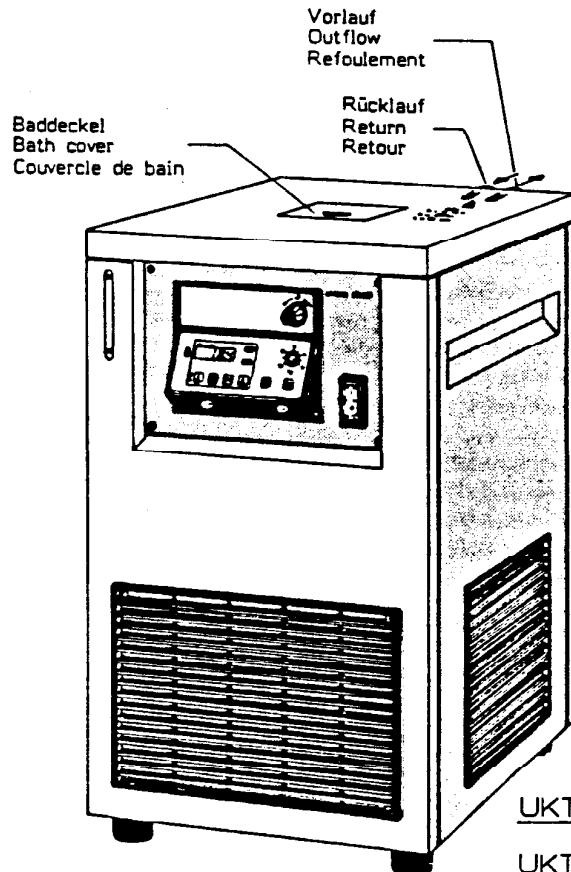
max.

min.



UKT 350

Rollen  
Castors  
Roulettes



UKT 600,

UKT 600 P

Digitalanzeige  
Digital display  
Affichage digital

Anzeige "Kühlen"  
Display "Cooling"  
Affichage "Refroidissement"

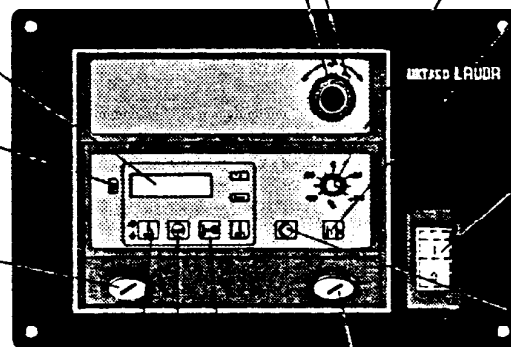
Blindstopfen für Multi-  
funktionsausgang (Option)  
Plug for multi-function  
outlet (optional)  
Bouchon pour connecteur  
d'entrées-sorties (option)

Vorlauftemperatur/Sollwert  
Outflow temperature/Setpoint  
Température de refoulement/Valeur de consigne

Druckanzeige (nur bei entsprechender Ausstattung)  
Pressure indication (with according equipment only)  
Affichage digital de la pression (seulement en cas  
d'un équipement respectif)

Arretierung  
Locking device  
Arrêtage

Sollwerteneinstellung  
Setpoint adjustment  
Ajustage de la valeur de consigne



Meldekontakteneinstellung  
Alarm contact adjustment  
Ajustage de l'interrupteur d'alarme

Meldekontaktssignalleuchte  
Alarm contact pilot lamp  
Lampe témoin de l'interrupteur d'alarme

Hauptschalter/  
Sicherungsautomat  
Main switch/  
Automatic fuse  
Interrupteur général/  
Coupe circuit automatique

Signalleuchte "Störung"  
Pilot lamp "Fault"  
Lampe témoin "Perturbation"

Blindstopfen für  
EIN/AUS - Fernbedienung  
Plug for Remote Control ON/OFF  
Bouchon pour commande à distance MARCHÉ/ARRÊT

Rücklauftemperaturanzeige (Option)  
Temperature indication of Return (Optional)  
Affichage de la température de retour (option)

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3. General construction and technical description

3.1 Type selection

The circulating cooling units Class UKT are compact cooling units which can be located on top or below the laboratory bench. There is a choice of two performance classes, UKT 350 and UKT 600. The models UKT 600 and UKT 600 P differ through a more powerful pump (on units with a P in the type designation).

3.2 Construction

The refrigeration system is mounted inside the lower part of the unit. The liquid tank with the pump located behind it is mounted on top. All components are mounted inside an enamelled steel housing whose side panels are easily removable for servicing. The feet at the back are arranged as castors so that the unit can easily be moved after lifting the front. The sides have recesses. The electronics for the indication of temperature and pump output with the controller and the compressor control electronics are located in a control box behind the front panel. The indications and controls are arranged mainly on this front panel.

3.3 Thermostatic bath

The bath tank of high-grade stainless steel is insulated with polyurethane foam in accordance with the operating temperature range. All parts in contact with the bath liquid are high-grade stainless steel, copper or plastic (PVC) which can withstand the operating temperature range. The bath drain cock is located at the back of the unit!

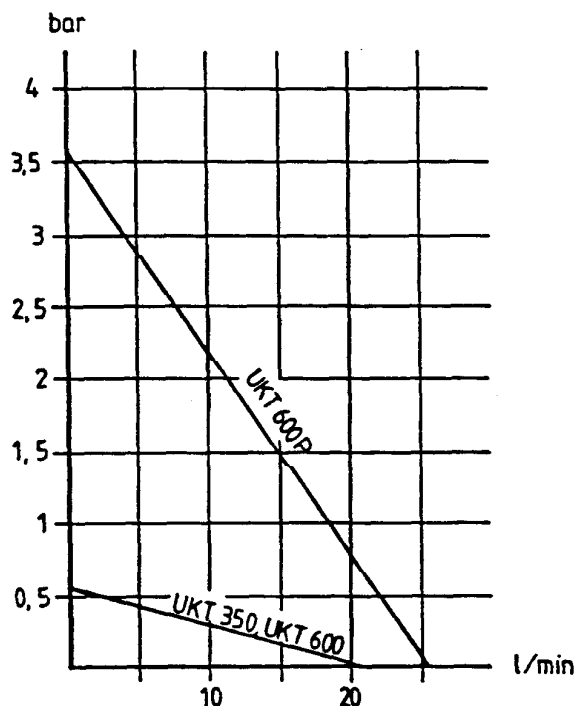
3.4 Circulating pump

The units are fitted with a free-standing normal suction pump and the units Type P with a side channel pump with sliding ring seal. This pumps the bath liquid through the outflow connection on the back of the unit through the pressure-tight external system. The return flow connection leads back into the bath.

Caution:

With a restricted or closed circuit it is possible for pressures up to 5 bar to build up with Type P (glass!).

Performance diagrams



3.5 Refrigeration system

3.5.1 The refrigeration system removes heat from the bath liquid through the evaporator mounted in the bath. The units operate with compressor cooling.

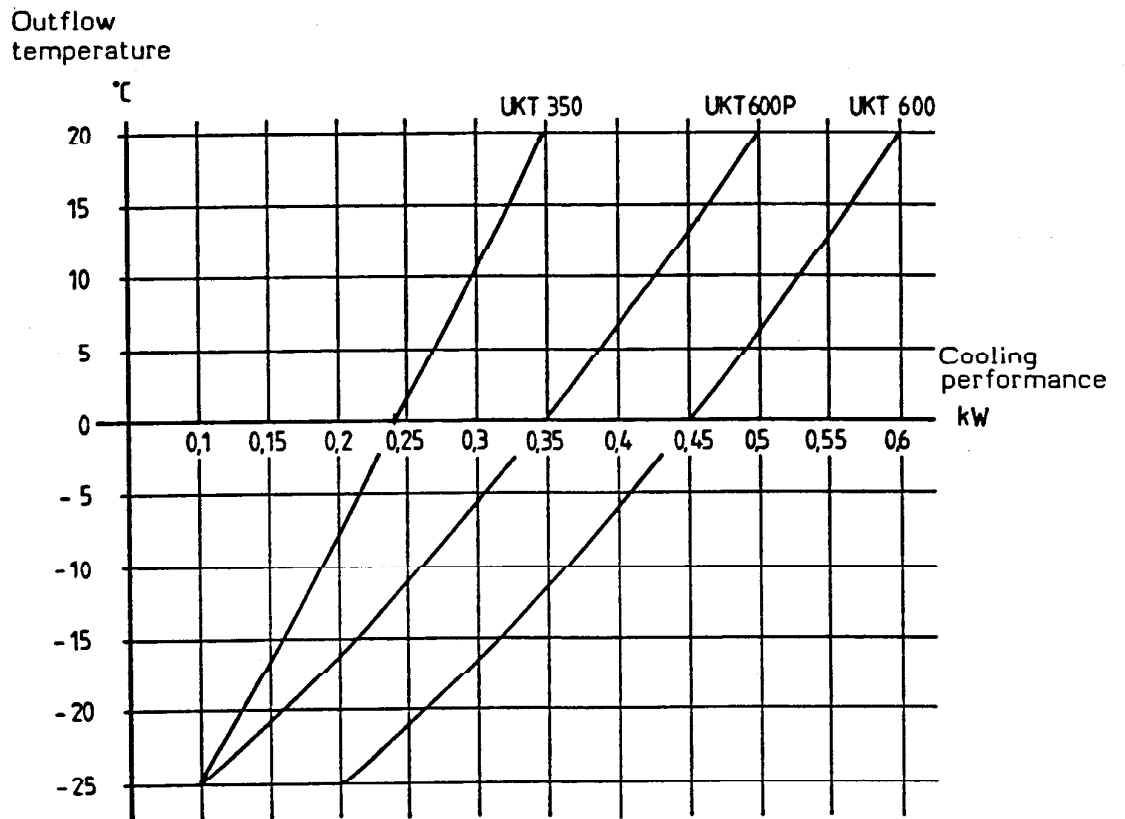
The refrigeration circuits are charged ready for use with safety refrigerants (Frigen or Freon) and special low-temperature oil and require no maintenance. The compressors are hermetically sealed units.

3.5.2 The heat of condensation and the heat losses of the motor are removed through a finned condenser cooled by a powerful fan. The fan speed is electronically controlled in accordance with the loading of the cooling circuit. Fresh air is drawn in at the front of the unit and discharged at the back and partially at the sides. The air flow must never be restricted; the spacing between the ventilation grills and any walls must therefore be at least 0.5 m. The units should also not be operated close to sources of heat (such as heating radiators etc.).

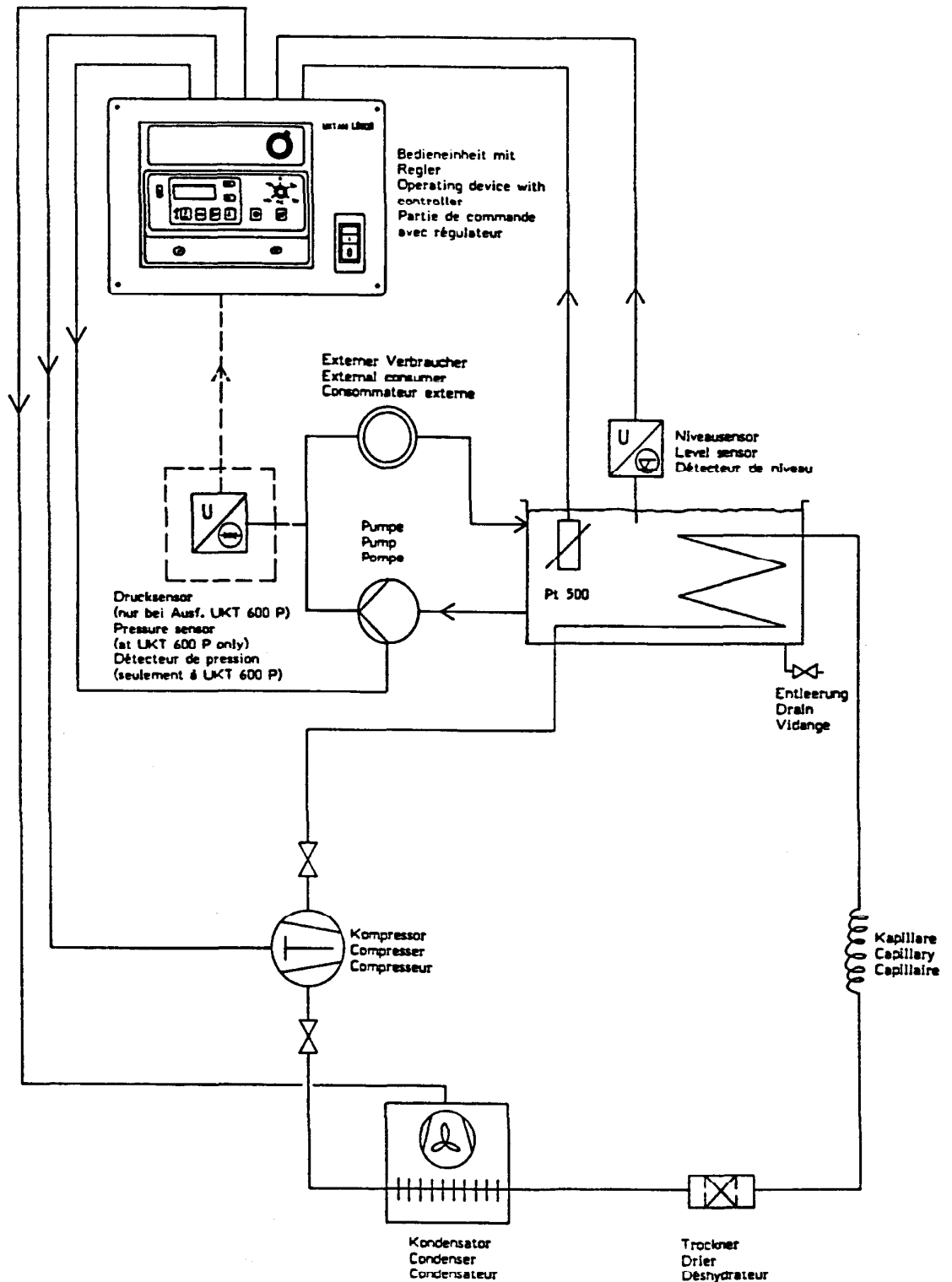
The ratings specified in the technical data are based on 20°C ambient temperature. Higher temperatures result in reduced performance. Above 40°C the refrigerator is switched off automatically because of overload. The heat dissipated to the air includes both the heat removed from the bath and the power supplied through the mains supply.

3.5.3 The compressor is fitted with a temperature cut-out which responds to the compressor temperature and the current loading.



Cooling performance diagrams



Cooling and temperature control circuit diagram




### 3.6 Control

The units operate with a Pt 500 conforming to 5 x DIN 43760 to sense the bath temperature. The bath temperature is indicated digitally with a resolution of 0.1°C. The setpoint is selected on a precision 10-turn-potentiometer with lock. At the same time the key  must be pressed to indicate the setpoint. The value from the programmer input (setpoint, see description of multi-function output; UKT 600 P only, otherwise optional) is added to the selected setpoint. The sum can be displayed by operating the key .

The comparison between setpoint and actual value is followed by an on-off controller which switches the compressor through a triac. A stop monitoring circuit ensures a minimum stopping period of approx. 1 min.

### 3.7 Pressure measurement (UKT 600 P only)

A pressure sensor is connected to the pump outlet which senses the pressure built up in the remaining thermostating circuit. It is indicated in bar by operating the key . The pressure measurement provides information on the liquid flow rate (see pump characteristic 3.4) and shows changes in the external thermostating circuit.

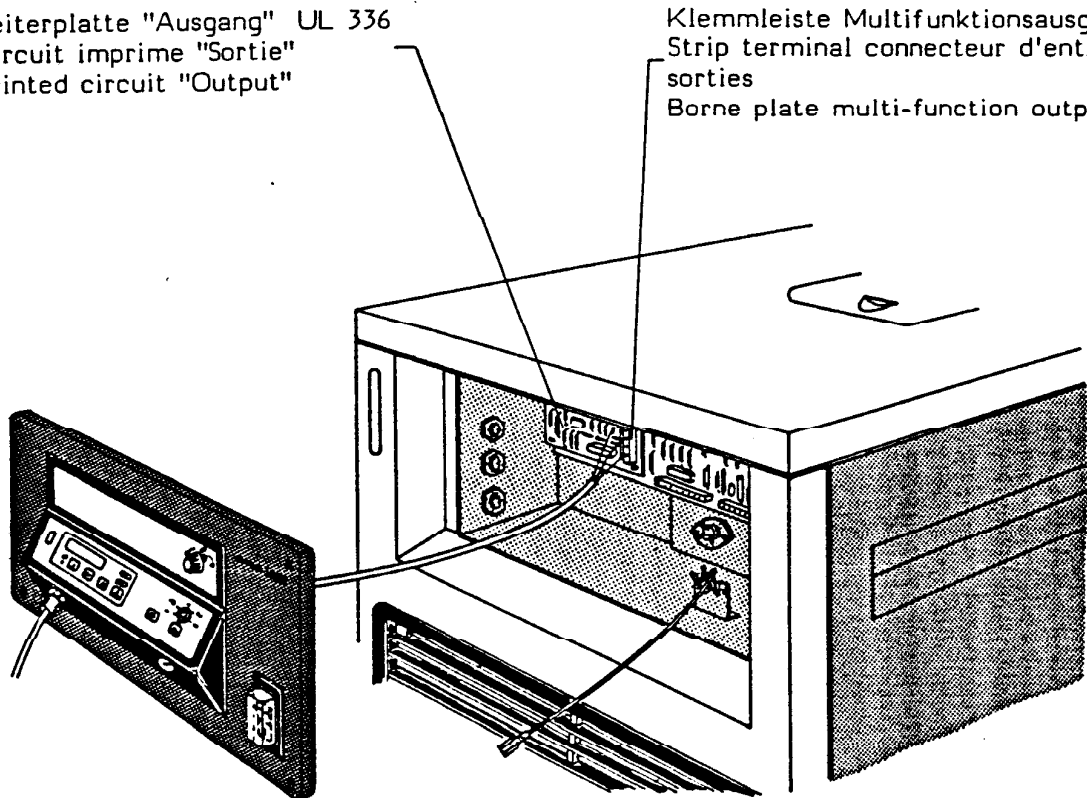
### 3.8 Multi-function output (UKT 600 P only, otherwise optional)

As the control unit is designed to Protection IP 54 the multi-function output is arranged on terminals in the control box. The external connections must be made through appropriate cable glands.






Important: Connections in the control unit must only be made with the mains plug removed and only by a qualified electrician.

Leiterplatte "Ausgang" UL 336  
 Circuit imprime "Sortie"  
 Printed circuit "Output"


Klemmleiste Multifunktionsausgang  
 Strip terminal connecteur d'entrees-  
 sorties  
 Borne plate multi-function output



- Terminal 1: Control deviation 100 mV/°C approx. for service purposes only (0 V terminal 5)
- Terminal 2: spare
- Terminal 3: Setpoint output 10 mV/°C,  $R_i \approx 100 \text{ Ohm}$  approx.; load resistance  $\geq 10 \text{ kOhm}$  min. (0 V terminal 5)
- Terminal 4: -12 V supply, max. additional load 20 mA (0 V terminal 7)
- Terminal 5: 0 V reference potential for measurement signals
- Terminal 6: +12 V supply, max. additional load 20 mA
- Terminal 7: 0 V load reference potential
- Terminal 8: Reference output 10 V + 0.1 V;  $R_i = 1 \text{ kOhm}$ ; load resistance  $\geq 10 \text{ kOhm}$  min. (0 V terminal 5)
- Terminal 9: +18 V un stabilised, additional load 20 mA max.

- Terminal 10: Recorder connection for (int.) outflow temperature, correct sign 10 mV/°C; Ri = 100 Ohm; internal recorder resistance  $\geq$  1 MOhm min. (0 V terminal 5)
- Terminal 11: Recorder connection for return flow temperature (  ), correct sign 10 mV/°C; Ri = 100 Ohm, internal recorder resistance  $\geq$  1 MOhm min. (0 V terminal 5).  
Only if option RT is fitted!
- Terminal 12: 12 V when red LED  alight; Ri = 10 kOhm; I max 1 mA (0 V terminal 7)
- Terminal 13/14: Floating contact, closed when red LED  alight; 24 V max. 0.2 A (SELV)
- Terminal 15: Recorder connection for outflow pressure signal (  ), correct sign 10 mV/bar; Ri = 10 Ohm; internal recorder resistance  $\geq$  1 MOhm min. (0 V terminal 5)
- Terminal 16: Programmer or external setpoint input 10 mV/°C; added to setpoint selected internally. Sum is displayed with key  ; Ri = 24 kOhm (0 V terminal 5)


### 3.9 Return flow temperature measurement RTE (option)

The units can be fitted with return flow temperature measurement as an option. In that case a measuring unit with built-in Pt 500 resistance thermometer is screwed to the return flow connection outside of the unit. After operating the key  the return flow temperature is shown on the display. This requires the multi-function output circuit board. See also 3.8, terminal 11.

### 3.10 Remote operation FB (option)

On the version for remote operation the control unit is arranged outside the unit in a separate bench housing which also includes a mains switch for the remote operation of the unit. The green mains switch remains on the unit itself. The connection between unit and remote control is made with two separate cables for mains voltage and low voltage.

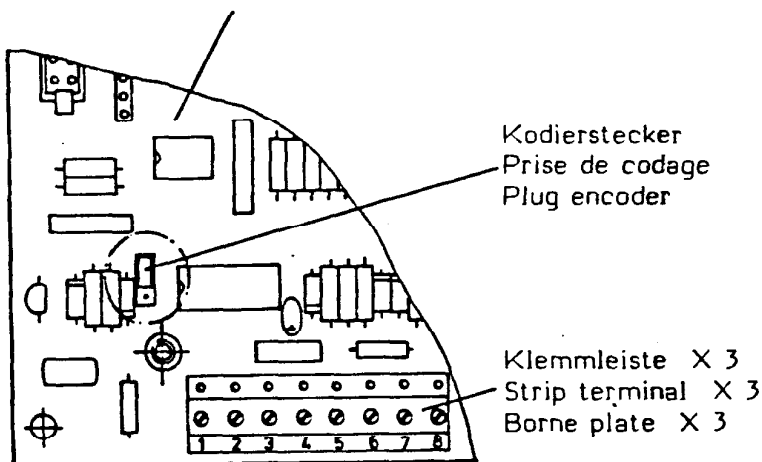
## 4. Safety features and notes

- 4.1 The red LED  (see 3.8, terminal 13/14) lights up in case of the following fault conditions.
- 4.1.1 The units are fitted with an opto-electronic level cut-out. When the liquid level drops below the minimum level the refrigeration compressor and the pump are switched off.

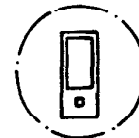
- 4.1.2 The circulating pump is fitted with a winding temperature cut-out which switches off compressor and pump in case of a pump overload. It is reset automatically after cooling down.
- 4.2 The complete unit is protected by a 2-pole thermal safety cut-out which is built into the mains switch.
- 4.3 A signal contact which is adjustable with a screwdriver within the operating temperature range, indicates in the base setting on the yellow LED if the selected temperature has been exceeded. At the same time the neutral contact (signal contact 24 V; 0.2 A SELV) is closed. This contact is located in the control unit on the main circuit board A 2 connector X 3 contact 1/2.

The direction of the signal contact function can be reversed by setting the cooling plug near the contacts to the other position - LED is alight and the neutral contact closes when the temperature falls below the set limit.

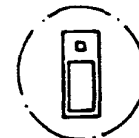
Leiterplatte "Netz/Regelung" UL 334  
 Circuit imprimé "Secteur/Réglage"  
 Printed circuit "Mains/Control"



Übertemperaturmeldung  
 Indication pour surtempérature  
 Overtemperature indication



Untertemperaturmeldung  
 Indication pour température insuffisante  
 Undertemperature indication



4.4 The control unit is designed to Protection Class IP 54. In order to safeguard this, the cables must be introduced into the unit through appropriate cable glands.

4.5 Important!  
Any work in the control unit must only be done by a qualified electrician and after the mains plug has been pulled out!

5. Bath liquids and tubing connections

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

5. Bath liquids

Operating range 5-100°C

Use de-calcified water. Make up losses through evaporation at elevated temperatures.

Temperatures close to zero and below:

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

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

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 inflammable (flashpoint 128°C). The mixture ratio must therefore be checked from time to time against the original mixture, e.g. with a hydrometer.

<u>Operating range -60 to 50°C</u> (Silicone oil)	<u>Ultra-Therm-SK Frigor</u>	Ref. No. LZB 002
------------------------------------------------------	------------------------------	------------------

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

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

5.2 Tubing (continuous lengths)

Rubber tubing with fabric reinforcement  
1/2", uninsulated  
-40 to 100°C. For water, water-glycol mixture, alcohols and silicone oils  
Operating pressure 10 bar max.

Ref. No. RKJ 031

Insulation tubing

(22 mm int. dia; 9 mm thick)  
in length of 2 m for insulating 1/2" rubber  
tubing

Ref. No. RKJ 009

Perbunan tubing, uninsulated

11 mm internal dia., application range  
0 to 120°C. Not suitable for UKT 600 P!

Ref. No. RKJ 012

Perbunan tubing, insulated

11 mm internal dia. With foam insulation.  
Ext. dia. approx. 35 mm. Application range  
-60 to 120°C. For water, water-glycol mixture  
and alcohols.

Ref. No. LZS 008

Not suitable for UKT 600 P!

Secure tubing with clips to prevent it slipping off!

Further information on thermostatic liquids and tubing are contained in our special Information Bulletin.

6. Unpacking, assembly and setting up

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

Standard accessories:

1 Bath cover for filler opening

EZU 070

2 Nipples 13 dia.

HKO 026

2 Cable glands PG 11 with reinforcement

EKV 042

Operating Instructions

- 6.2 The unit is best set up so that the control unit is to the front and the air flow to the refrigerator (grills in the lower part) is not obstructed. Keep a minimum spacing of 0,5 m between ventilation grills and any wall (see 3.5.2).

Check that the drain cock is closed.

7. Filling and connection of external systems

- 7.1 With the pump nipples open the unit is filled with a suitable bath liquid depending on the operating temperature as discussed in Section 5. The filler opening is located under a flap in the cover. When starting up the unit for the first time, fill the bath preferably up to the maximum level indication. After charging an external system the bath may have to be topped up.

- 7.2 Link the pump connections on the back of the unit to the external system. Only pressure-tight systems may be connected.

Attention: Pressures of up to 5 bar may occur on units type P if the return flow is accidentally closed.






Apparatus made of glass normally only withstand very much lower pressures!

For suitable tubing material please refer to Section 5. With a high-level external system, entry of air into the thermostatic circuit while the pump is stopped may cause the external volume to drain down even with a closed circuit, resulting in flooding of the thermostatic bath!


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

Secure the tubing with clips to prevent it slipping off!

## 8. Starting up

- 8.1 The unit must only be connected to a line supply with ground connection. Check the line voltage and frequency against the data on the unit!
- 8.2 Switch on the main switch on the right of the control panel (I). The green digital display indicates the actual outflow temperature.
- 8.3 If there is no flow of bath liquid despite sufficient liquid level the pump cannot fill with liquid due to a build-up of air. Venting the external system at its highest point will rectify this!
- 8.4 Remove the lock of the setpoint selector  (anticlockwise at the top). Operate the key , the setpoint is displayed. The setpoint can now be set by rotating the knob . Then release the key and tighten the lock in a clockwise direction. Depending on the temperature selected the compressor starts up (possibly after a delay). The cooling lamp  at the control unit then lights up. The unit now controls the selected temperature by switching the compressor on and off.
- 8.5 On units type P the pressure which builds up at the external system can be indicated by pressing the key  (see Section 3.7 and 3.8).

8.6 Operation with programmer  
(with option MF or UKT 600 P)

A programmer Type PM 351 or an external setpoint selector can be connected to the terminals of the multi-function output (see Section 3.8) so that the setpoint of the circulating cooling unit can be varied according to a preset programme. This requires that the energy balance (heating, cooling, load) of the circulating cooling unit matches the requirements of the programme (heating rate, cooling rate, operating temperatures). The programmer output or setpoint selector output is set to 0 Volt. Adjust the unit setpoint to the lowest temperature of the programme; this value is entered as value A when programming the programmer. The unit setpoint is not changed any more. Operation of the key  indicates on the digital display the current setpoint which is provided by the programmer and on which the unit is operating. For further details refer to the Operating Instructions for the PM 351.

8.7. Operation with Interface RS 232 (V24) R 61  
(MF necessary)

If a computer can be connected to the Interface RS 232 C (V24) R 61 with A/D-converter and D/A-converter, it is possible to transfer 3 signals of 10mV-scale from the multifunction output of the circulating cooler to the computer and to transmit one value as setpoint value from the computer to the circulating cooler. Error signal can also be determined.

Depending on type and kind of equipment of the circulating cooler the below mentioned actual value signals are at disposal (see multi-function output 3.8):

1. Setpoint output (terminal 3)
2. Outflow temperature (terminal 10)
3. Return flow temperature (terminal 11)
4. Outflow pressure (terminal 15)
5. External temperature (terminal 2)

If required, the R 61-inputs IN 1 (brown), IN 2 (red) and IN 3 (white) can be connected to 3 signals of those 5 ones mentioned above.

9. Maintenance

- 9.1 LAUDA circulating cooling units operate largely without maintenance. Contaminated bath liquid should be drained through the drain cock and replaced by fresh liquid.
- 9.2 On air-cooled units the ventilation grill mounted at the front should be unscrewed approximately every 6 months, depending on the amount of dust, and the finned condenser of the refrigerator behind it should be cleaned to remove dust.
- 9.3 If the unit should become defective through a fault it is recommended that the defective component or module should be removed by a qualified person and returned to the factory.

Note: Before opening the control unit pull out the line supply plug!

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

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