

# LAUDA

## Operating Instructions

LAUDA Circulating Cooling Units  
UKS 1000 P, UKS 1500 P, UKS 1500 WP

From Series K01  
03/91 E  
YAWE0006

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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 Water-cooled units (marked "W" in the type designation) must be connected to the mains water supply with the hoses supplied. See Section 6.  
With air-cooled units the spacing of the grills from any object which might obstruct the free air flow must be at least 0.5 m.
- 1.4 Fitting the tubing to the pump connections:  
  
Make tubing connections to the external system. Secure tubing connections with clips against slipping off.  
Only use tubing suitable for the heating liquid and for at least 6 bar operating pressure.
- 1.5 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 (at UKS 1500 P behind the right side panel, (spanner 12 a/f)) is closed.
- 1.6 Check the supply voltage against the details on the label. Insert the mains plug.
- 1.7 On water-cooled units turn on the water tap.
- 1.8 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.
- 1.9 The selected operating temperature is indicated by pressing the key  .  
Selection is made with potentiometer  after the lock has been released.
- 1.10  indicates whether the unit is cooling or not.
- 1.11  indicates insufficient level or overloading of the pump motor.

## 2. Data table

	UKS 1000 P	UKS 1500 P	UKS 1500 WP
Operating temperature range (°C)		-25 to 40	
Condenser cooling		air (controlled fan speed)	water (controlled flow rate)
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 operating temperature range	
Temperature setting/ resolution		10-turn potentiometer with digital indication / 0.1°C, can be locked manually	
Temperature control (±°C)		better than 0.1	
Control		LAUDA proportional cooling with PID action, automatic compressor control, external controller	
Cooling capacity (effective, with ethanol at 20°C ambient temperature)	(kW)	50 Hz	60 Hz
at 20°C	1.0	1.7	1.5
0°C	0.7	1.25	1.1
-25°C	0.15	0.4	0.4
Safety features		level indication, opto-electronic level sensor 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)	25	
Max. discharge pressure	(bar)	3,5	
Pump connections		M 16 x 1	10 mm int. dia.
Pressure indication range/resolution	(bar)	digital	0 ... 7 / 0.1
Capacity	(l)	15 to 25	

		UKS 1000 P	UKS 1500 P	UKS 1500 WP
Floor area (WxD)x height	(mm)	380x640x610	550 x 735 x 750	
Weight	(kg)		117	
Protection to DIN 40050			IP 32; Controls IP 54	
Power supply	(V; Hz)	220 - 240 V; 50 Hz / 230 V; 60 Hz Protection Class 1 to VDE 0100		
Total power consumption	(kW)	1.1	1.5	1.4
Interference suppression		suppressed to VDE 0875		
Ref.No				
220 - 240 V; 50 Hz		LWM 109	LWG 114	LWG 115
230 V; 60 Hz		LWM 209	LWG 214	LWG 215

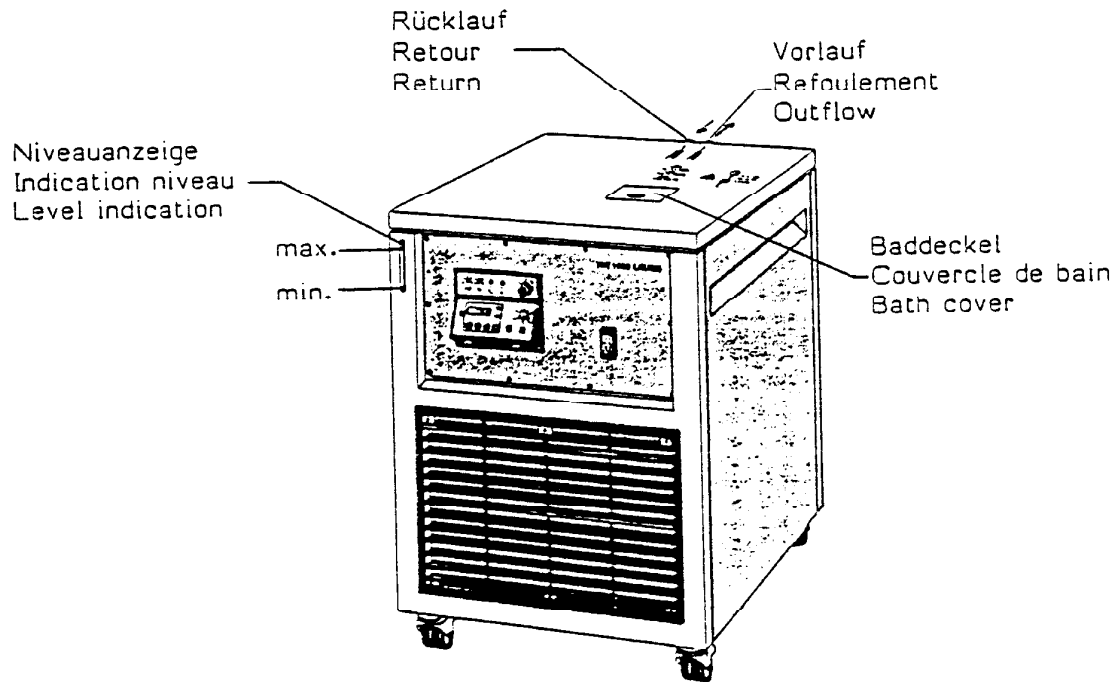
Extra functions:

Standard:  
Options

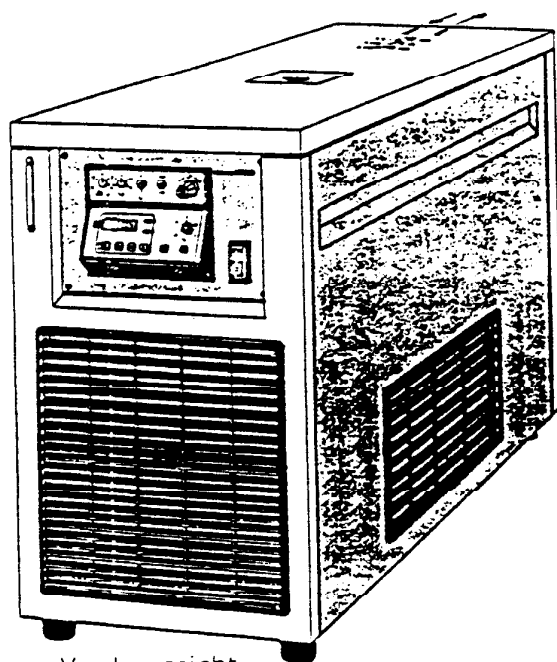
RT,ER,MF,DR MF,RT,ER,UL,DR  
 FB, (UP at UKS 1500 (W)P only)

Details of extra functions:

- RT = Return flow temperature measurement, Pt 500 mounted inside the unit.
- ER = External Controller for controlling from measuring point in external systems with Pt 100. Master controller PID, slave controller PD.
- MF = Multifunction output on terminals.
- FB = Remote control. Control unit including supply ON/OFF in separate housing remote from unit.
- UP = Additional pump for internal tank circulation. Required to ensure good temperature control and performance in external systems with high backpressure. Pump for external circulation can be switched off by push-button.
- DR = Digital pressure indication
- UL = Stand pipe as bath overflow (normally closed). 1" hose connection possible.

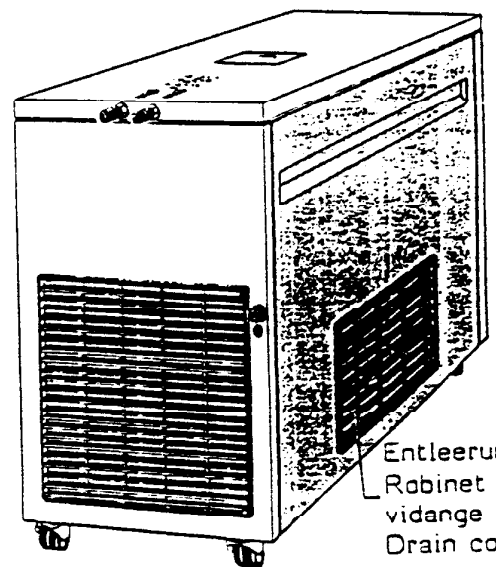


UKS 1500 P, UKS 1500 WP



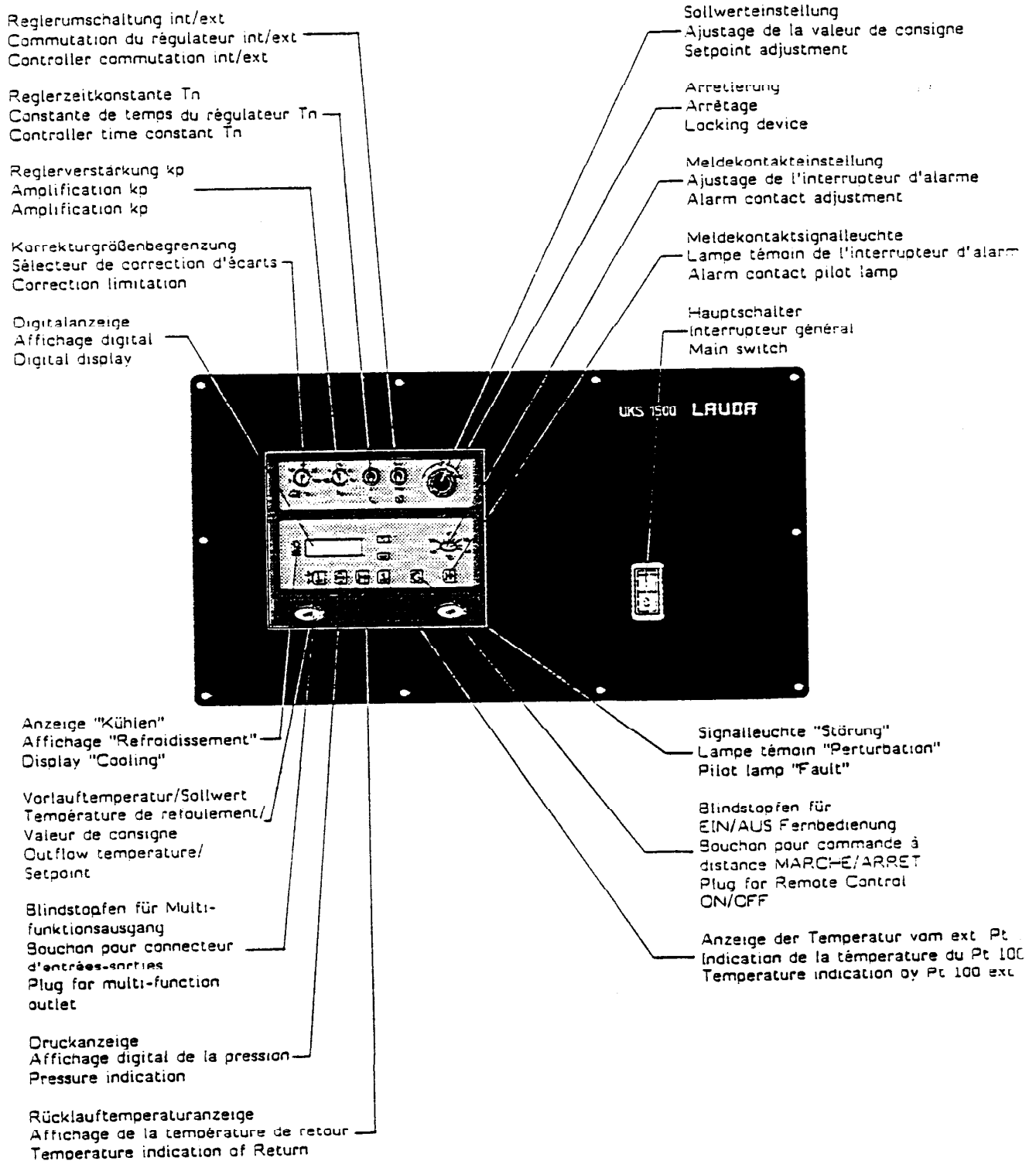
Vorderansicht  
 Vue avant  
 Front view

UKS 1000 P



Rückansicht  
 Vue arrière  
 Rear view

Entleerungshahn  
 Robinet de vidange  
 Drain cock



### 3. General construction and technical description

#### 3.1 Type selection

The circulating cooler UKS 1000 P is a compact bench or floor-standing unit with air-cooled condenser.

The circulating cooling units Class UKS 1500 are compact floor-standing cooling units. They are available as air-cooled or water-cooled units (W after the type designation).

#### 3.2 Construction

##### UKS 1000:

In the lower part of the unit the refrigeration system with pump in the back is mounted. The liquid tank is located on top. All components are mounted in an enamelled sheet steel case whose side walls can easily be removed in case of servicing. There are castors in the back of the unit so that the unit can easily be moved by lifting the front part.

##### UKS 1500:

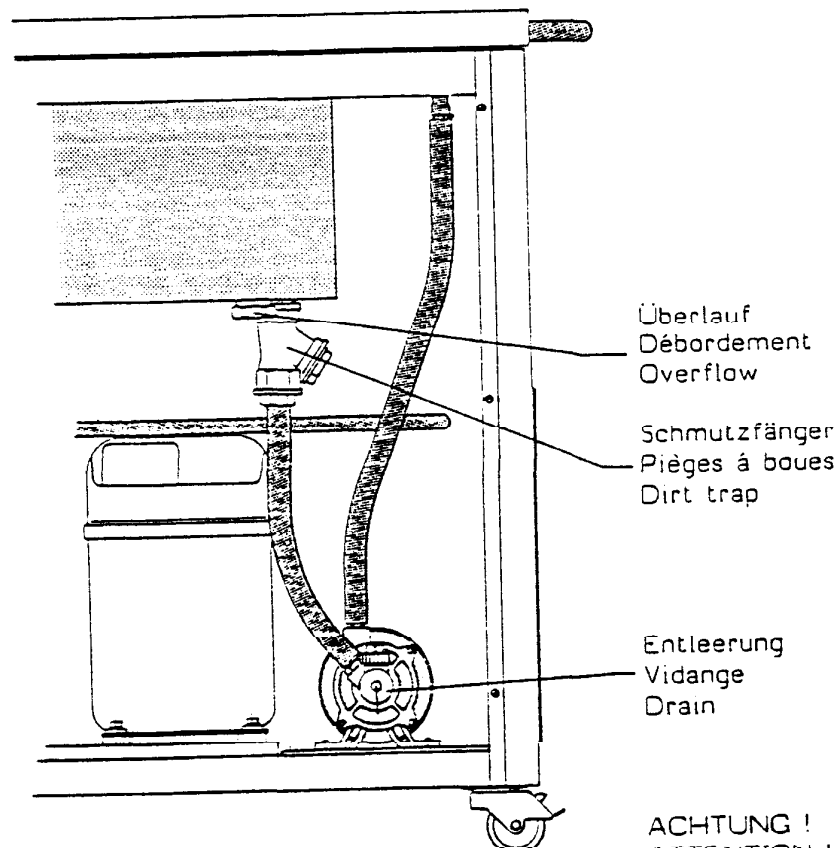
The refrigeration system and the pump are mounted inside the lower part of the unit. The liquid tank is mounted on top.

A frame of steel sections forms the support which is covered by 4 panels. The unit is mounted on 4 castors, with the two front ones lockable. The front and back panels are fitted with large ventilation grills which provide heat dissipation, especially on the air-cooled units. The sides have recesses which allow the units to be placed side-by-side. 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, or fibre-reinforced rubber. The bath drain cock and an overflow (which is normally closed) are accessible behind the right side panel. If required, a hose leading to a collecting vessel can be connected to the overflow using a 1" hose connector (UKS 1500 only).

A dirt trap is fitted at the tank outlet (towards the pump suction) whose screen can be removed for cleaning (UKS 1500).



ACHTUNG !  
ATTENTION !  
ATTENTION !  
Teile sind isoliert !  
Parties sont isolée !  
Parts are insulated !

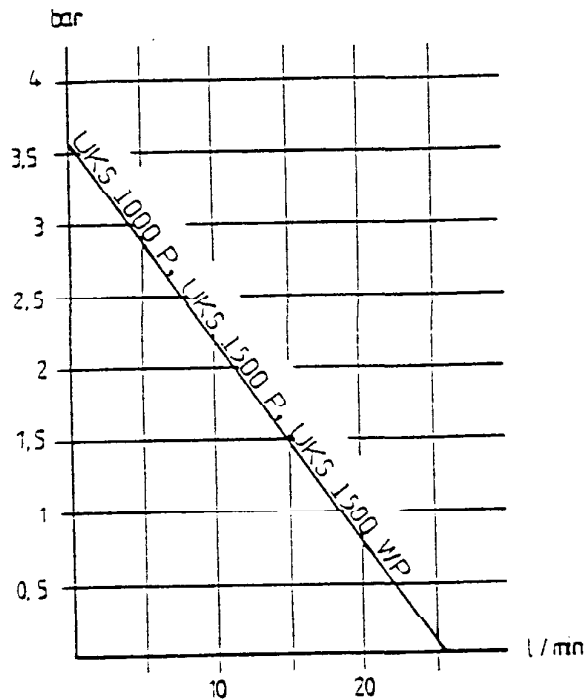
### 3.4 Circulating pump

The units are fitted with a free-standing 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 (glass!).

Performance diagram



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. 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 when overloaded. 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 Water-cooled version

The heat of condensation and the heat losses of the motor are removed through a water-cooled countercurrent heat exchanger. The connections for inlet (from water tap) and outlet (drain) are located on the back of the unit below the back panel. Inlet on the left and outlet to the drain on the right, viewed from the rear of the unit. The cooling water rate is matched to the requirement through the condensation pressure. It ranges between 20 and 250 l/h. The water temperature should not exceed 25°C.

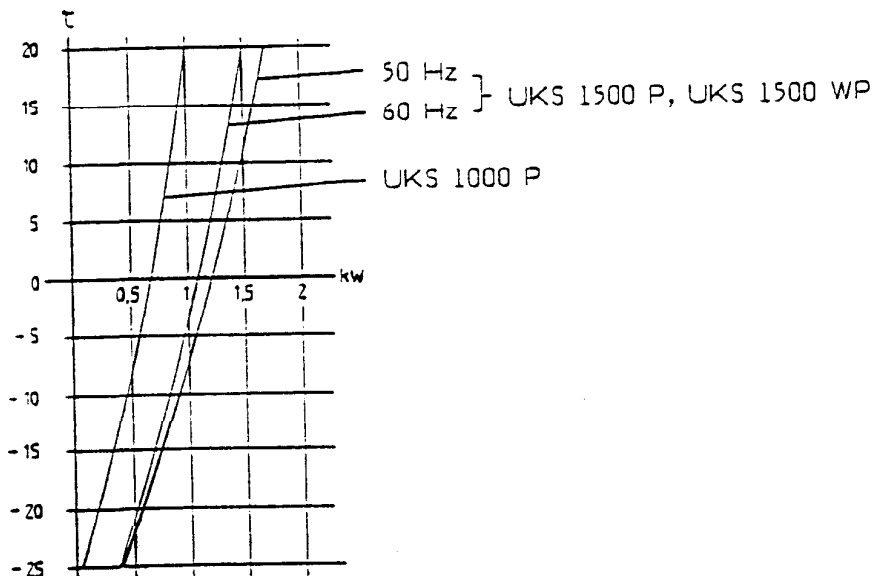
### 3.5.4 Safety devices of the refrigeration system

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

3.5.4.2 The cooling circuit is protected against excessive condensation pressures by a pressure switch. When activated a red fault LED on the control panel lights up. In most cases this fault condition arises through insufficient condenser cooling, i.e. insufficient or missing cooling water supply or dirty finned condenser on air-cooled units.

The green lamp  in the control panel lights up when the solenoid valves are on position "cooling".

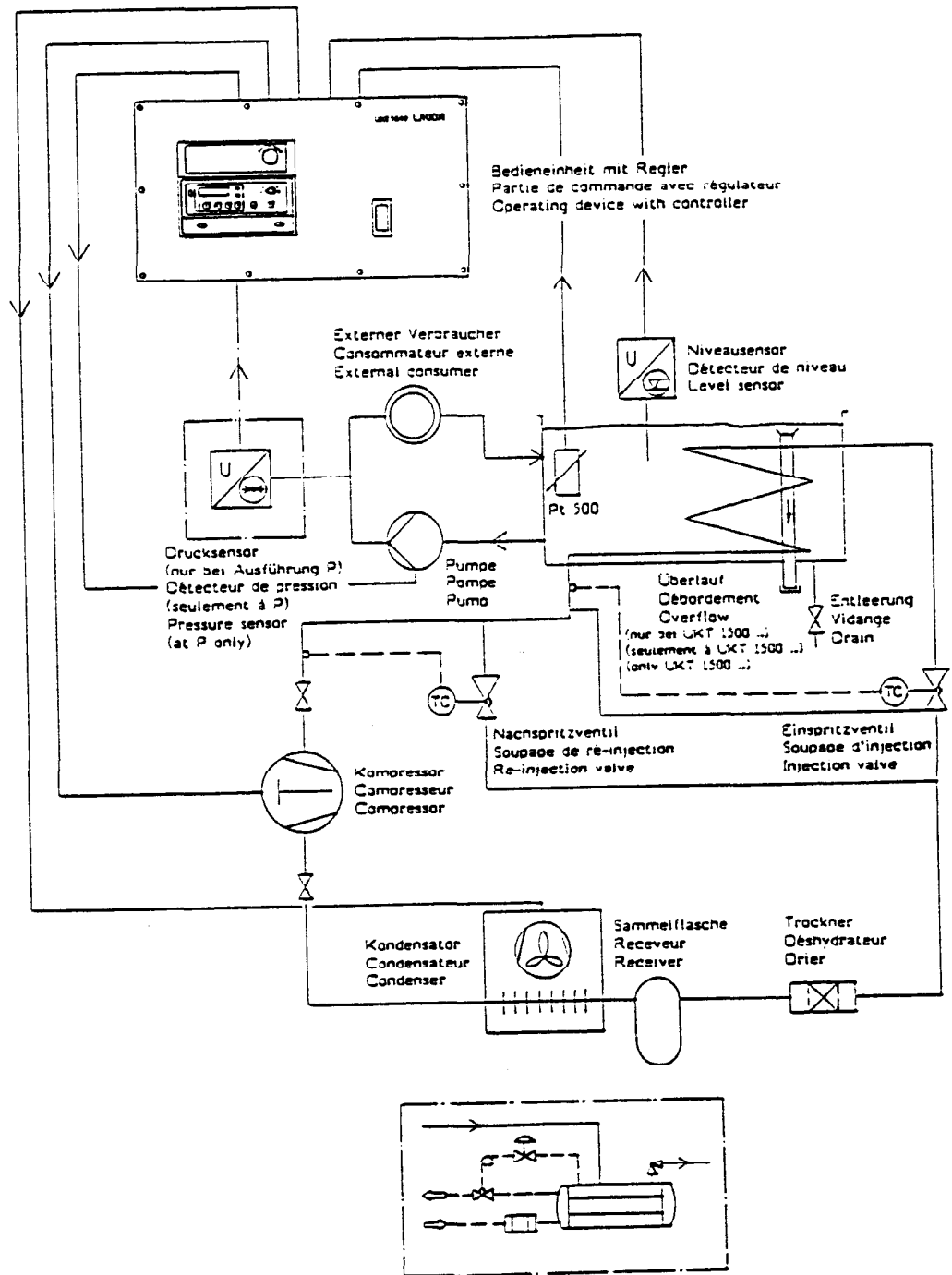
### Cooling performance diagrams



**Important:** Empty the condenser on water-cooled units if there is danger of frost (e.g. transport in winter)! Heat the bath liquid to approx. 20°C. Remove water hose from the mains supply. Set the setpoint for example to -20°C and blow compressed air into the water inlet hose (on the left seen from the back) as soon as the compressor starts up.

Arrange the outflow hose as flat as possible so that the unit can be emptied completely. Switch off the unit again immediately.



Cooling and temperature control circuit diagram



Bündelrohrkondensator ( nur bei Ausführung W )  
 Tubulaire condensateur ( seulement à W )  
 Tube bundle condenser ( at W only )

### 3.6 Control

3.6.1 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 multifunction output) 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 a continuous PID controller. This ensures under all operating conditions that the amount of energy removed or introduced is only sufficient to maintain the selected temperature. This form of operation is referred to as proportional cooling.

Cooling is controlled through pulse duration modulation with a cycle time of approx. 5 sec, using special low-noise solenoid valves. Additionally the refrigeration unit is automatically switched off immediately if the setpoint is more than 5°C above the actual temperature or if no cooling pulses have been demanded by the controller for more than 10 min.

A standstill monitor ensures that the minimum standstill time of the unit is 40 sec.

### 3.6.2 External control operation

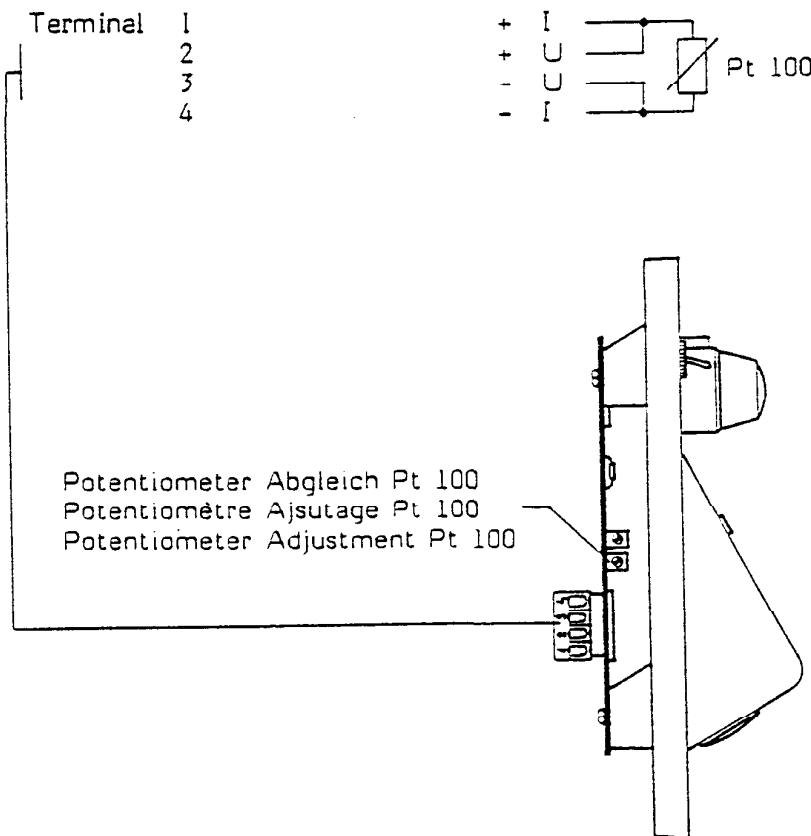
Additionally operation with the installed external controller is possible. This offers the possibility to record and indicate the temperature at external measuring points, e.g. in a reactor. A Pt 100 resistance thermometer to DIN 43760 in four-wire circuit serves as measuring probe, which can be connected inside the control housing. A cascade control is given when the external control is switched on. The cascade control compares the real value at the external measuring point. This makes operating easier and provides better control results.

The external controller functions as PID controller with PD-PID-structure commutation and adjustable limitation of correction value.


#### Technical Data Master controller

Control behaviour		PID
T <sub>n</sub>	(s)	40/220
T <sub>v</sub>	(s)	20
Amplification		0.2 ... 4 times
Limitation of correction value		<u>±</u> 5 ... 100

Terminal accumulation for external measuring point, Pt 100 according to DIN 43760. X 14 on printed circuit board A 4 behind front panel of control unit (see 8.6).



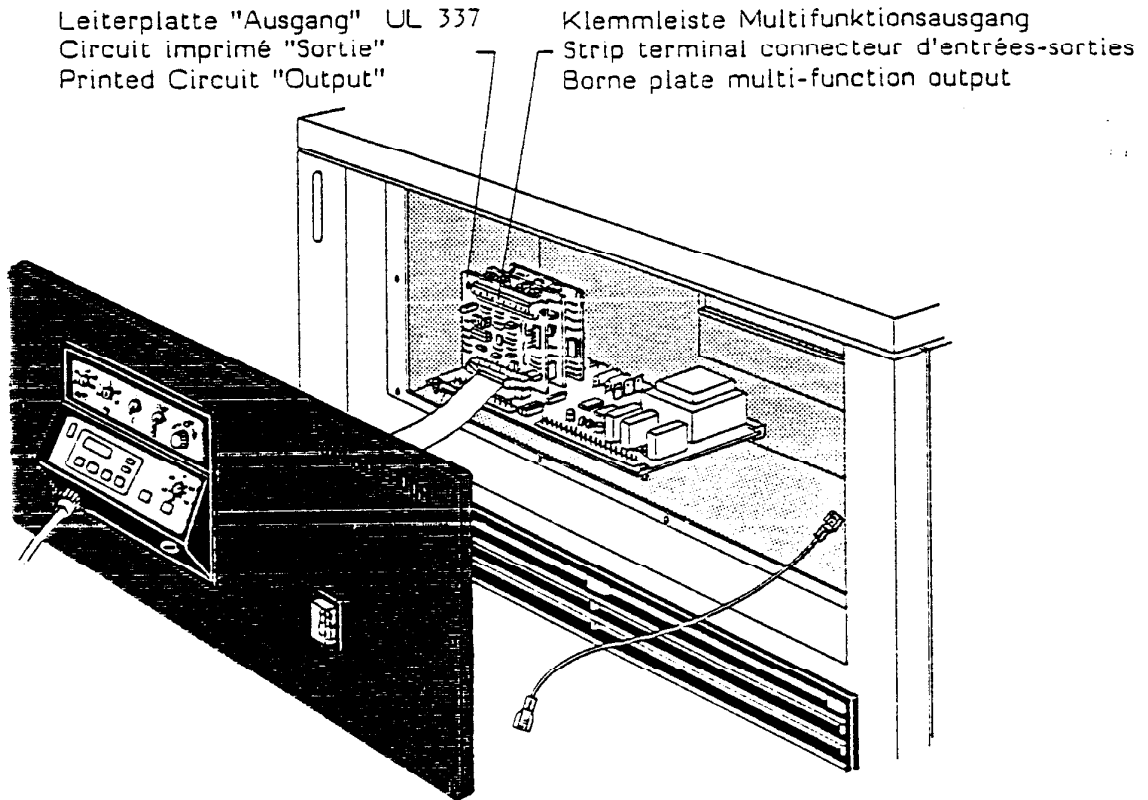
### 3.7 Pressure measurement

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 Multifunction output

As the unit described is designed to Protection IP 54 the multifunction 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.



- Terminal 1: Control deviation 100 mV/°C approx. for service purposes only (0 V terminal 5)
- Terminal 2: Temperature of the external measuring point (for external controller), Pt 100 recorder output, correct sign, 10 mV/°C,  $R_i = 100 \text{ Ohm}$ . Internal recorder resistance  $\geq 1 \text{ MOhm}$  (0 V terminal 5)
- Terminal 3: Setpoint output 10 mV/°C,  $R_i = 100 \text{ Ohm}$  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 (0 V terminal 7)
- Terminal 7: 0 V load reference potential

- Terminal 8: Reference output 10 V  $\pm$  0.1 V;  $R_i = 1$  kOhm;  
load resistance  $\geq 10$  kOhm min. (0 V terminal 5)
- Terminal 9: +18 V unstabilised, additional load 20 mA max.  
(0 V terminal 7)
- Terminal 10: Recorder connection for (int.) outflow temperature,  
correct sign 10 mV/°C;  $R_i = 100$  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;  $R_i = 100$  Ohm, internal recorder  
resistance  $\geq 1$  MOhm min. (0 V terminal 5).
- Terminal 12: 12 V when red LED  alight;  $R_i \approx 10$  kOhm;  
 $I$  max 1 mA (0 V terminal 7)
- Terminal 13/14: Neutral 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;  $R_i \approx 10$  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  ;  
 $R_i = 24$  kOhm (0 V terminal 5)

### 3.9 Return flow temperature measurement RT

The units are fitted with return flow temperature measurement. In that case a Pt 500 resistance thermometer is fitted into the return flow pipe at the bath inlet. After operating the key  the return flow temperature is shown on the display. 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.

### 3.11 Circulating pump UP (at UKS 1500 optional)

The units can be equipped with an additional circulating pump for internal tank circulation. It ensures good temperature control and performance by improved heat transfer at the evaporator in case of very reduced external circulation.

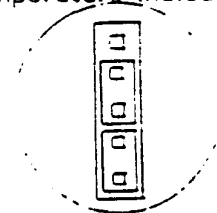
Pump for external circulation can be switched off by push-button.

4. Safety features and notes 

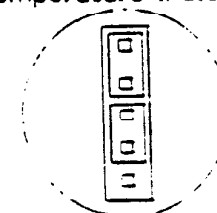
- 4.1 The red LED  (see 3.8, terminal 13/14) lights up in case of the following fault conditions.
- 4.1.1 The units are fitted with an opto-electronic level cut-out. When the liquid level drops below the minimum level the refrigeration compressor and the pump are switched off.
- 4.1.2 The circulating 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.
- 4.1.3 The overpressure cut-out of the refrigeration system only switches off the refrigeration compressor.
- 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 terminal 1/2.

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

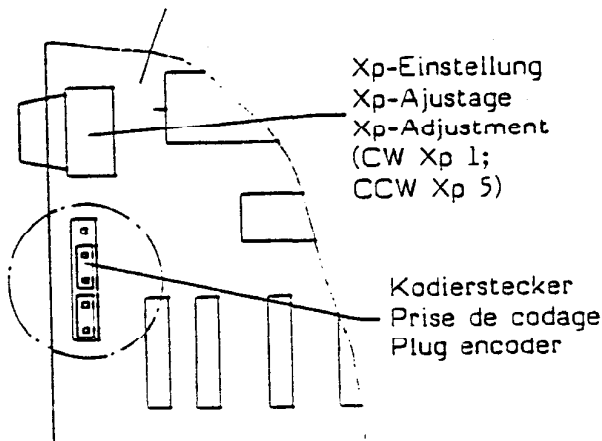
Übertemperaturmeldung  
 Indication pour surtempérature  
 Overtemperature indication



Untertemperaturmeldung  
 Indication pour température insuffisant  
 Undertemperature indication



Leiterplatte "Regelung" UL 338  
 Circuit imprimé "Réglage"  
 Printed circuit "Control"



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 main switch has been switched off!

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.

5.1 Bath liquids

Operating range 5-100°C

Use decalcified 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.

Operating range -60 to 50°C      Ultra-Therm-SK Frigor  
(Silicone oil)      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

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
1 Square spanner (not with UKS 1500 P)	EZ	127
2 off 1/2" water hoses, each 5 m long, with quick-release coupling (only with water-cooled units)		
Operating Instructions		

- 6.2 The units are 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. With air-cooled units keep a minimum spacing of 0.5 m between ventilation grills and any wall (see 3.5.2).  
With water-cooled units (with W in the type designation) make the tube connections to water tap and drain (see 3.5.3)

Secure tubing with clips to prevent it slipping off!

Check that the drain cock behind the right side panel is closed (spanner 12 a/f).

## 7. Connection of external systems

- 7.1 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 if the return flow is accidentally closed.

Apparatus made of glass normally only withstand very much lower pressures! (see accessories: "Overflow valve").

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! Overflow see Section 3.3.






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 Filling up

Fill the unit with bath liquid depending on the operating temperature according to Section 5. Filler opening underneath flap in the cover. For the initial starting fill the bath up to the upper marking of the level indicator if possible. Top up if required after charging an external system.

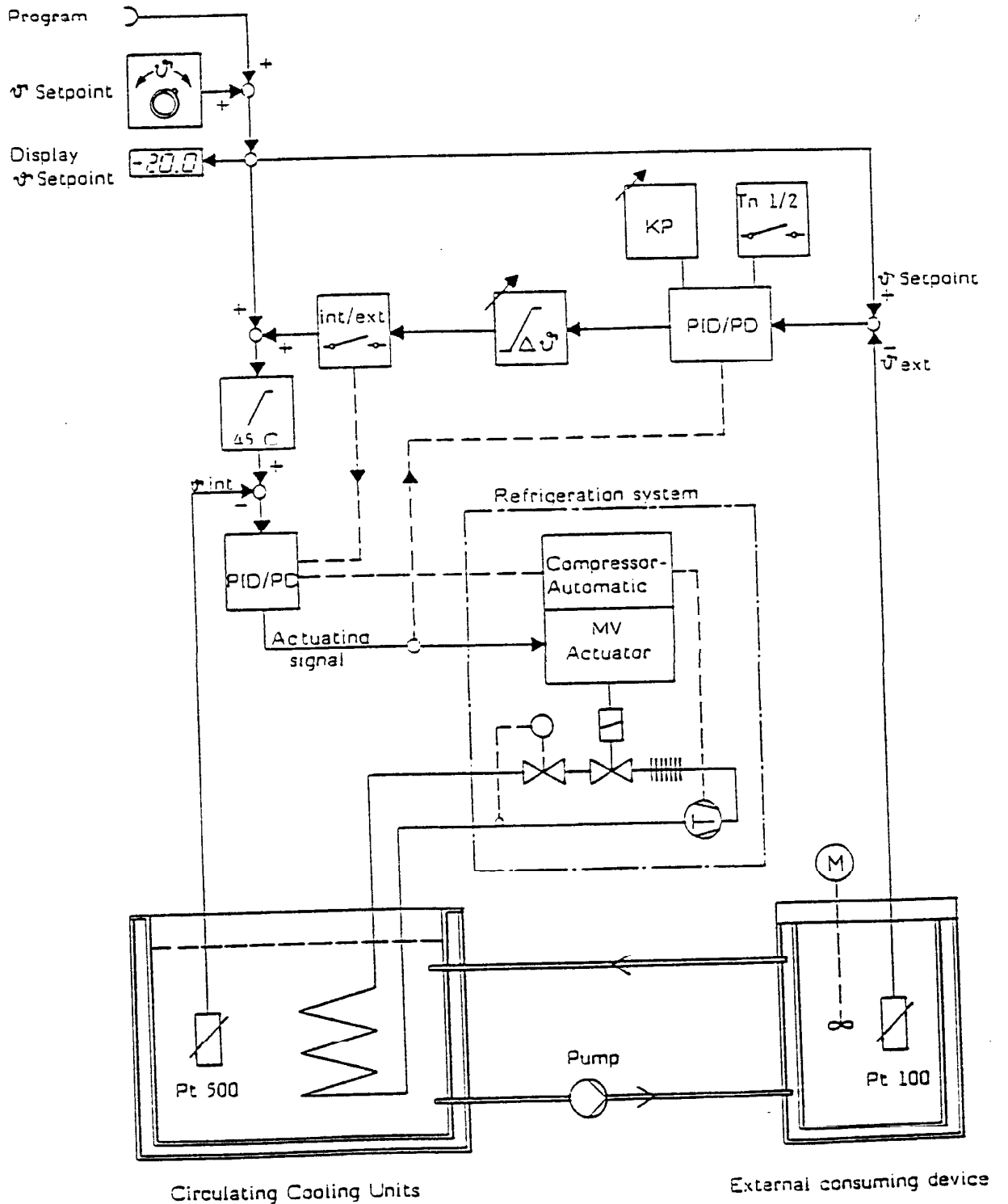
- 8.2 The unit must only be connected to a line supply with ground connection. Check the line voltage and frequency against the data on the unit! Turn on the water tap in case of water-cooled units!
- 8.3 Switch on the main switch on the right of the control panel (I). The green digital display indicates the actual outflow temperature.
- 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 operation of the solenoid valves.
- 8.5 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 External controller


When using the external controller the temperature at the remote point (product or jacket) can also be indicated on the digital display . In addition the control action of the circulating cooling unit can be influenced from this external probe (Pt 100).

- 8.6.1 Connect the Pt 100 resistance thermometer. Any Pt 100 to DIN 43760 can be used. The connection is carried out in four-wire circuit (see 3.6). The time constant of the resistance thermometer should be as short as possible, because it enters the controlled member parameter.
- 8.6.2 When used as external measuring point the display can be switched to the external measuring value by pressing key . The connected resistance thermometer can be adjusted with the potentiometer in the control unit. The easiest way to do this is to dip the externally used resistance thermometer into the bath of the cooling unit and to adjust the external display according to the internal display.
- 8.6.3 The commutation to external control (cascade control) is achieved by pressing the key . Simultaneously the internal controller is switched from PID to PD, so that in the cascade only the integral part is active.
- 8.6.4 The control parameter of the master controller are adjusted to  $T_n \approx 40$  sec at button key position 2, the controller reinforcement  $K_p$  to 1. When using slow consumers, e.g. thick and bad stirred products, it is advisable to adjust the reset time  $T_n$  to 220 sec (position 1). Just as advisable can be to switch the reinforcement  $K_p$  to smaller values, e.g. to 0.5 or 0.2.
- 8.6.5 A special feature of the EXT controller is the adjustable double (+) effective limitation of correction value. The master controller works as follows: the correction value, which corresponds with the temperature difference between bath (int.) and consumer (ext.), is given to the bath controller. When using slow consumers this correction can be very high, e.g. 100°C. Without limitation of correction value a variety of thermal overstress can occur, e.g. bath liquid starts boiling, flashpoint is exceeded, temperature falls below freezing point, product is thermal overloaded etc. Additionally the behavior during the starting period is improved. This limitation of correction value can be adjusted at the potentiometer  at the operating unit. The basic adjustment is + 20°C. When judging the adjustment consider that the remaining deviation of the bath controller, which works at EXT-controller operation as PD-controller, is entered as well.

Circuit diagram Control with external controller



### 8.7 Operation with programmer

A programmer Type PM 351 or an external setpoint selector can be connected to the terminals of the multifunction output (see Section 3.8) so that the setpoint of the circulating cooling unit can be varied according to a preset program. This requires that the energy balance (heating, cooling, load) of the circulating cooling unit matches the requirements of the program (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 program; 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.

### 8.8 Operation with RS 232 C (V 24) Interface R 61 (MF required)

If a computer can be connected to the Interface RS 232 C (V24) R 61 with A/D-converter, it is possible to transfer three signals of 10 mV-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 multifunction 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 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 In case of reduced pump output the dirt trap (see 3.3) can be unscrewed and cleaned after removing the right side panel and the insulation.
- 9.4 On water-cooled units a dirt trap is located in the cooling water inlet which must be cleaned in case of faults in the system.
- 9.5 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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## Accessories for LAUDA Circulating Coolers

<u>Type</u>	<u>Ref.No.</u>
<u>LAUDA Temperature Programmer PM 351-1</u> Microprocessor-controlled programmer with up to 50 different temperature/time coordinates and a program range of 350°C for unrestricted individual programming of temperature courses. Programmable control of permissible variation. External controllable start, stop and reset function.	LRP 012
<u>Connecting cable to the strip terminal</u> multifunction output to PM 351-1	UK 178
<u>Step programmer PS 2</u> Using a timer with 7-day-program one can automatically switch between two different temperatures within the operating temperature range of the circulating cooler.	LRP 111
<u>RS 232 C Interface R 61</u> If a computer can be connected to the Interface RS 232C (V 24) with A/D and D/A converter, it is possible to transfer signals from the multifunction output of the circulating cooler to the computer and to transmit one value as setpoint from the computer to the circulating cooler. Error signal can also be determined.	LRT 011
<u>Connecting cable to strip terminal</u> of the multifunction output of the circulating cooler suitable for PS 2 and R 61.	UK 179

LAUDA Circulating Cooling Units  
 UKS 1000 P, UKS 1500 P, UKS 1500 WP

**LAUDA**

LAUDA Resistance thermometer Pt 100-70

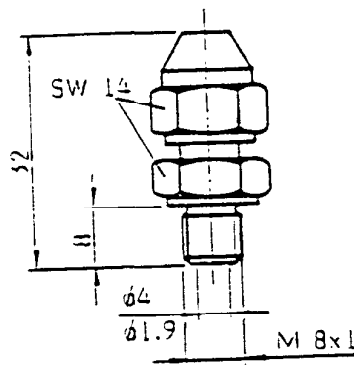
In stainless steel protecting tube, diameter 4 mm,  
 length 250 mm. Temperature range -200...300°C.  
 50% time 1.5 sec.. Four conductor connection.  
 Four pole Lemo-connector size 1.  
 Used in connection with UKS units with external controller.

ETP 009

Clamping gland, stainless steel

According to figure below. With Teflon pressure ring.  
 Thread M 8 x 1, suitable for 4 mm dia. resistance thermometers.

HX 078



Connecting cable

for connection of the Pt 100-70 to UKS units with  
 external controller. Length approximately 3 m.

UK 176

Four-way receiver and distributor for return and outlet  
 connection of pump, can be operated separately.

M 16 x 1 / 1/2" tube

LWZ 009

Overflow valve for pressure limitation and improved  
 circulation in the circulating cooler in consumers  
 with high flow resistance.  
 Break pressure for bypass adjustable.

Adjustment range 1,5 - 2,5 bar  
 Adjustment range 1,0 - 1,5 bar

LWZ 008  
 LWZ 011