

Operating instructions

LAUDA Compact-thermostat
C 6 CS, C 12 CS, C 20 CS,
K 6 KS, K 12 KS, K 20 KS

LAUDA Bridge thermostat
GCS, GKS

from Serie Z 01
01/01
YACE 0049

LAUDA DR. R. WOBSE
GMBH & CO. KG
Postfach 1251
97912 Lauda-Königshofen
Tel: 09343/ 503-0
Fax: 09343/ 503-222
E-mail [info @ lauda.de](mailto:info@lauda.de)
Internet <http://www.lauda.de>

Contents	Page
1. Brief Operating Instructions	4
2. Technical data	6
3. General construction and technical description	11
3.1 Operating principle	11
3.2 Materials	11
3.3 Cooling coil	11
3.4 Pumps	11
3.5 Control	12
3.6 External controller	13
3.7 Multifunction connector	13
3.8 Mains supply output 34 H	14
3.9 Controlled cooling MVC (option)	14
3.10 Remote operation (FBC) (option)	15
3.11 SAD connection to NE 28 (option)	15
4. Safety devices and warning notes	16
4.1 Safety functions	16
4.2 Why can a thermostat be dangerous?	17
4.3 Important notes	17
4.4 Warning notes	18
5. Bath liquids and hose connections	19
5.1 Bath liquids	19
5.2 Hose connections	20
6. Unpacking, assembly and setting up	21
6.1 Unpacking	21
6.2 Setting up, operation as bath thermostat	21
7. Connection of external systems	22
7.1 Closed external circuits	22
7.2 Open systems (baths)	22
8. Cooling the thermostats	25
8.1 Mains water cooling	25
8.2 Through-flow chillers DLK 10, DLK 20 and DLK 40	25
9. Starting up	25
9.1 Filling	25
9.2 Connection to supply	25
9.3 Basic functions	26
9.4 External control	27
9.5 Operation with programmer	28
9.6 Working with controlled cooling	28
9.7 Safety circuit	31
10. Maintenance	32
10.1 Safety notes in case of repairs	32
10.2 Repair	32
10.3 Cleaning	33
10.4 Spares ordering	33

Appendix

Accessories

Circuit diagrams

1. Brief Operating Instructions

1.1 Even if you find these brief instructions initially sufficient please read the following sections, especially Section 4: "Safety devices and warning notes". For safe operation of the equipment it is essential that the information in these Operating Instructions is observed.

1.2 Check thermostat and accessories during unpacking for any transport damage and if necessary inform the carrier or the postal authority.

1.3 Assemble the unit according to Section 6 and add extra items as appropriate.

1.4 Fitting the tubing to the pump connections:

Without external system: for improved circulation within the bath remove the closing plugs from the two pump connections, fit the tubing nipples and link them together with e.g. Perbunan tubing (up to 120°C) or better a metal tubing.

With external system: make tubing connections to the external system.

Protect tubing with hose clips against slipping off.

1.5 When working near ambient temperature connect up external cooling according to Section 8.



1.6 Use only softened water or LAUDA bath liquids (Section 5). Fill the bath up to a level about 2 cm below the cover plate.



1.7 Check the supply voltage against the details on the label. Insert the mains plug.


Set the potentiometer EXT  fully anticlockwise to INT!

1.8 Switch on the unit with the mains switch (green lamp lights up).

1.9 Move the temperature setting to the required temperature.

Pressing the key  shows the operating temperature setpoint on the display. The adjustment is made on the potentiometer . Release the locking device before moving this control.

1.10 Set the overtemperature protection at the control  to some value above the setpoint. When the red signal lamp lights up, reset the system by pressing the reset key .

- 1.11 When connecting up an external system, ensure that filling this system does not cause the level inside the thermostat to fall more than is permitted.
- 1.12 If the setpoint of the bath liquid is reached, the yellow pilot lamp "Heating"  starts to flash. Having settled the digital thermometer displays the setpoint.
- 1.13 **Operating safety**
The thermostat must be operated only with non-flammable bath liquids, or with flammable bath liquids up to no more than 25 K below their flashpoint, otherwise there is a possibility that a flammable atmosphere may form (see Item 4.2).
- 1.14 **WARNING**
Parts of the bath cover may reach temperatures above 70°C when working at higher temperatures. The outflow and return pipes of the pumps reach the operating temperature. Touching them is dangerous because of high or low temperatures.

LAUDA Compact Thermostats
 C 6 CS, C 12 CS, C 20 CS, K 6 KS, K 12 KS, K 20 KS
 GCS, GKS

2. Technical data to DIN 58966

	C 6 CS	C 12 CS	C 20 CS	K 6 KS	K 12 KS	K 20 KS	GCS	GKS	
Operating temperature range (°C)				-30...300					
Working temperature range (°C)	45...300	40...300	35...300	50...300	40...300	45...300	25...300	30...300	
- with water cooling (water 15°C)				20...300 (see Item 4.4.5)					
Ambient temperature range (°C)				5...40					
Temperature setting/ Resolution	digital with 10-turn potentiometer and numerical display, resolution 0,1°C								
Bath temperature measurement	built-in digital thermometer with LED display; 0,1°C resolution, absolute accuracy better than 0,2 % of reading ± 0,2 K*); temperature probe Pt 100 to DIN IEC 751								
External temperature measurement	built-in separate measuring system using external Pt 100 to DIN IEC 751, 4-wire circuit, can be switched to LED display, accuracy 0.05 % of reading ± 0,1 K (without temperature probe)								
Temperature control	PID controller with adjustable external proportion and adjustable Xp								
Temperature variation at 70°C in the bath (±°C)				0,01*)					
Heater power (kW)	2	2	2	3	3	3	2	3	
Effective surface area of cooling coil (cm ²)				350					
Safety system	Adjustable overtemperature protection and low-level protection to EN 61010 (DIN 12879, class 2)								
Pump output against zero head									
Pressure/suction	(l/min)	20/16	20/16	20/16	24/18	24/-	24/18	20/16	24/18
Pump pressure (max.)	(bar)	0,32/0,25	0,32/0,25	0,32/0,25	0,5/0,34	0,5/-	0,5/0,34	0,32/0,25	0,5/0,34
Pump connections				M 16 x 1, nipples 13 Ø					
Filling volume (l)	4...6	9...14	14...21	4,5...7,5	6...12	11...18	---	---	
Bath opening (W x D) (mm)	150x130	300x175	300x350	150x130	150x130	300x175	---	---	
Bath depth (mm)	160	160	160	200	320	200	min 160	min 200	
Usable liquid depth (mm)	140	140	140	180	300	180	---	---	
Height to top of bath (mm)	220	220	220	260	380	260	---	---	
Overall size (W x D x H) (mm)	200x350x420	375x415x420	375x590x420	200x350x460	225x375x580	375x415x460	310x185x360	310x185x395	
Weight (kg)	12	19	23	14	19	22	8,5	9,5	
Supply (V; Hz)			230; 50 / 230; 60 Protection Class 1 to VDE 0106						
Loading (max.) without accessories (kW)	2,2	2,2	2,2	3,2	3,2	3,2	2,2	3,2	
Current take-up (max.) with accessories (A)	15	15	15	16	16	16	15	16	
Nominal current of fuses (max.) on customer's side (A)				T 16 A					

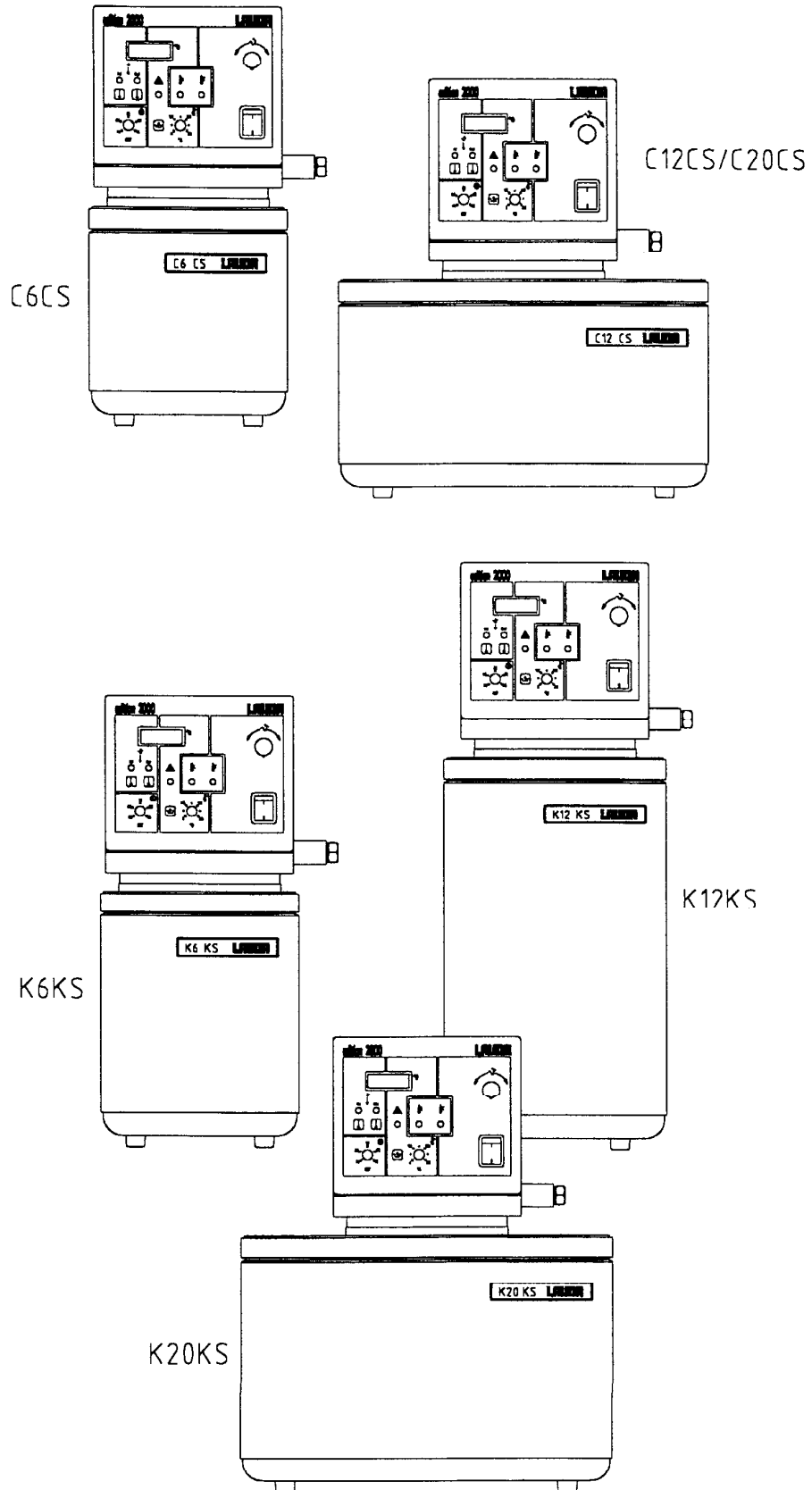
Units are conform to EU Guideline 89/336/EWG (EMC) and 73/23/EWG (low-voltage) and carry the CE mark (230 V; 50 Hz).

Cat. No.:	230 V; 50 Hz	LCB 155	LCB 157	LCB 159	LCB 163	LCB 165	LCB 167	LCG 108	LCG 109
	230 V; 60 Hz	LCB 255	LCB 257	LCB 259	LCB 263	LCB 265	LCB 267	LCG 208	LCG 209

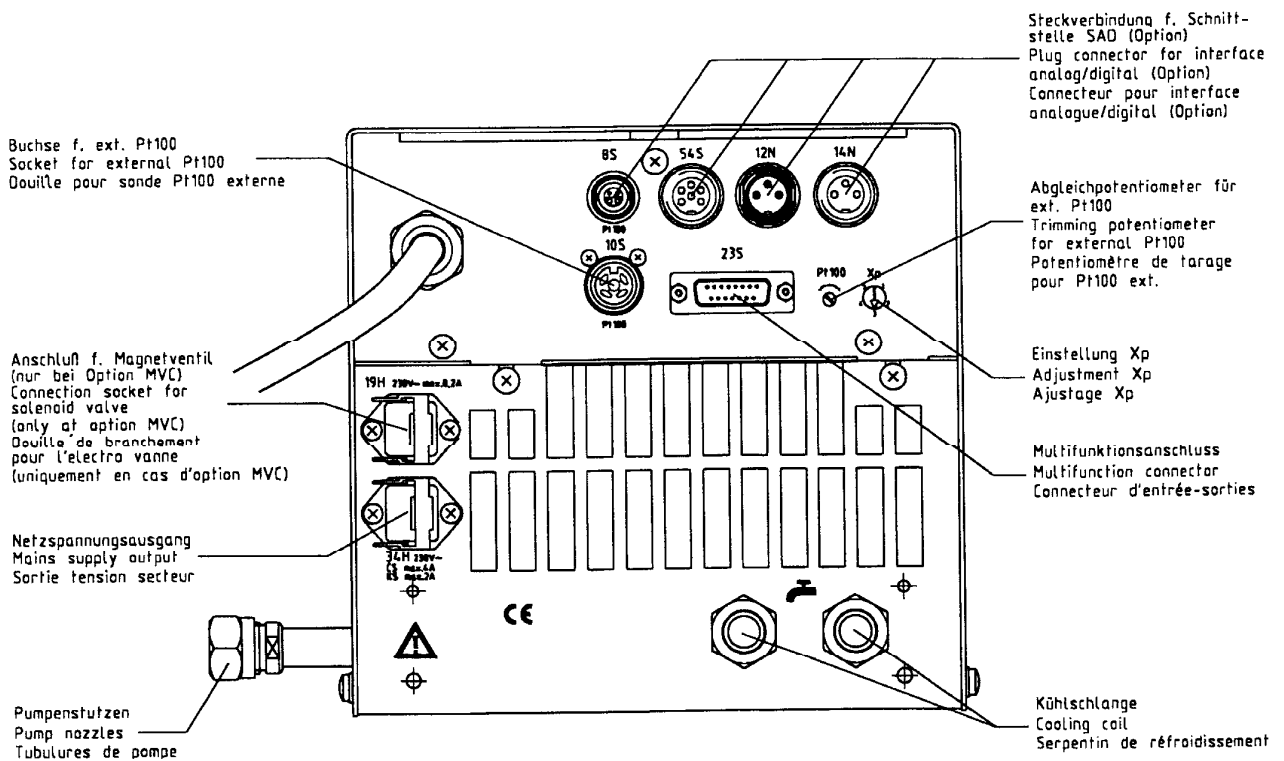
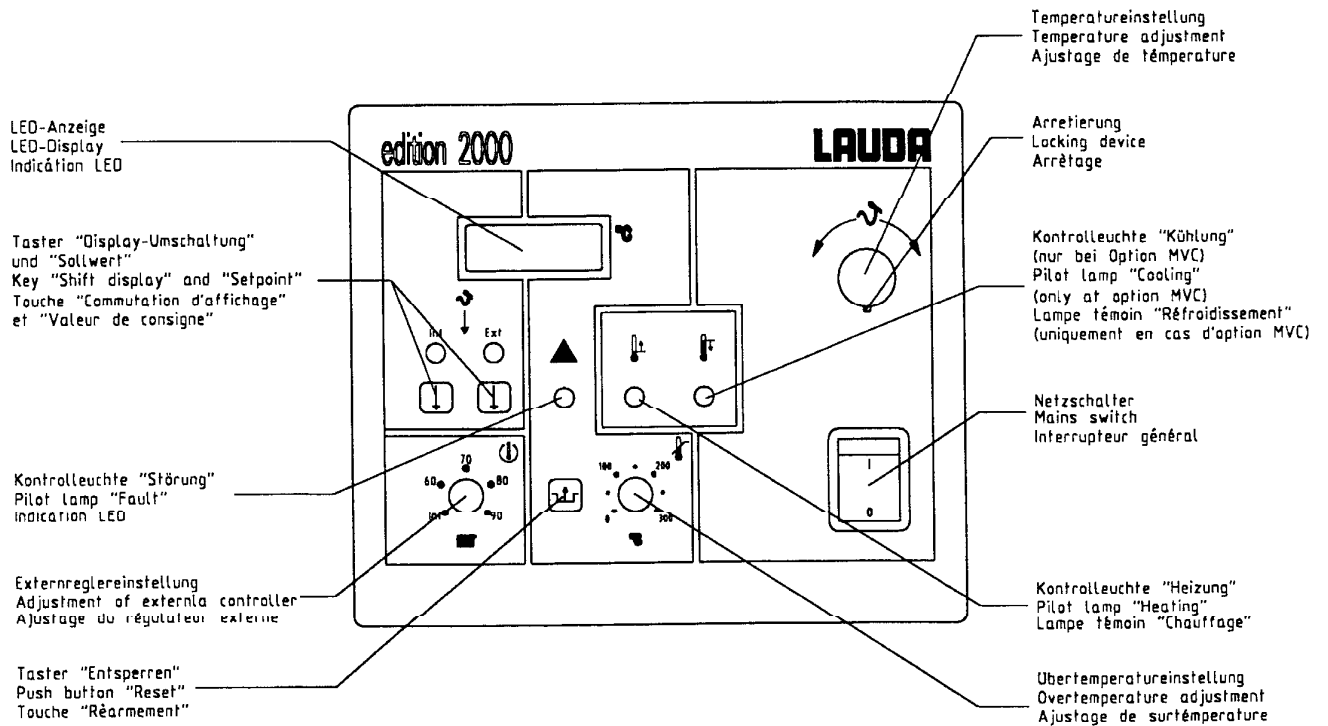
Units of different power supplies may have different heating capacities as well as different values for power consumption (see type label).
 Technical changes reserved.

*) see Item 4.3

LAUDA Compact Thermostats
C 6 CS, C 12 CS, C 20 CS, K 6 KS, K 12 KS, K 20 KS
GCS, GKS



LAUDA Compact Thermostats
 C 6 CS, C 12 CS, C 20 CS, K 6 KS, K 12 KS, K 20 KS
 GCS, GKS



3. General construction and technical description

3.1 Operating principle

The LAUDA bath/circulation thermostats Series C and K with Electronics S differ in bath volume, bath depth, pump type and output as well as in heating capacity.

Bridge thermostats GCS and GKS with telescopic rods for universal bath applications on baths of a width of 310 to 550 mm.

All types offer the operating temperature range of -30°C...300°C.

Laboratory thermostats operate with liquids (operating medium, heat transfer fluid) which serve for energy transfer to the product to be thermostated.

The thermostated products can be immersed in the thermostatic bath (bath thermostat), or placed in an external open bath whose liquid is circulated by the pump of the thermostat.

When operating as circulator the thermostatic liquid is pumped through an external heat exchanger arranged by the user in which the product is being thermostated (jacketed vessels, reactors, heat exchangers).

3.2 Materials

All materials in contact with the bath liquid are made from high-grade stainless steel or materials of similar anti-corrosion properties.

3.3 Cooling coil

All units are fitted with a cooling coil which permits cooling, e. g. with water, for working temperatures in the range of ambient temperature (see Item 4.4.5 and Section 8).

3.4 Pumps

All units except Type K 12 KS are equipped with a centrifugal pressure/suction pump. This can be used to operate both external open baths and closed external systems (reactors).

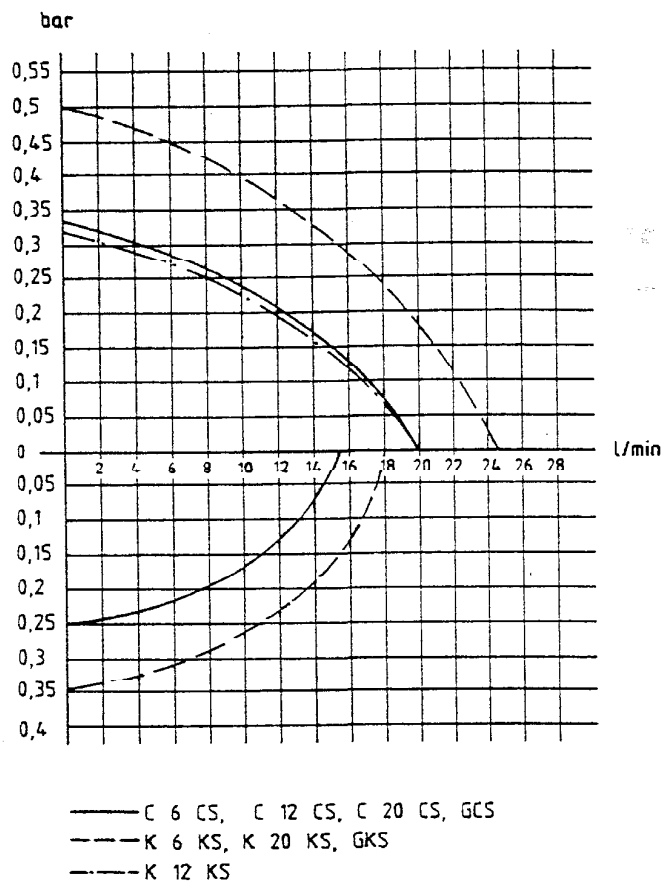
The immersion pumps are supplied in the two performance classes C and K.

The thermostat K 12 KS is fitted with a pure pressure pump since this unit operates specially in the high temperature range.

The pumps are driven by external-runner motors with a continuous shaft.

The pumps operate perfectly up to a viscosity of approx. 70 mm²/s (K 12 KS approx. 120 mm²/s), with the pump output decreasing rapidly with increasing viscosity.

Pump characteristic
230 V/50 Hz



3.5 Control

The units employ a Pt 100 resistance thermometer for measuring the bath temperature. The temperature is indicated on a green LED display. The setpoint is selected on a 10-turn precision potentiometer with locking device and is indicated on the LED display. A PID controller produces fully electronic control of the tubular heater (in the bath) using a triac with burst firing action. Tubular heaters with a surface loading of approx. 6 W/cm² are employed.

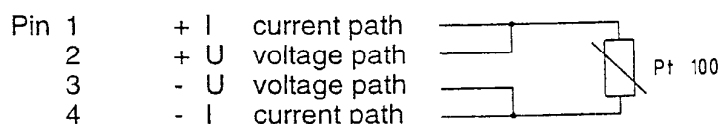
3.6 External controller

An additional signal circuit permits connection of an external Pt 100 resistance thermometer to DIN IEC 751 whose indication can be switched to the display; a proportion of this signal can be coupled into the control system. This arrangement greatly reduces the influence of disturbances on the temperature in the external consuming device.
 The external measurement is also available on the multifunction connector 23 S (see Item 3.7).

Connection for external Pt 100 at rear plug connection 10 S in 4-wire circuit.

Use screened connecting cables. Connect screen to plug case. Cover connectors not in use with protective caps!

Pin connections socket 10 S Pt 100



4-pin plug for Pt 100 connection


Cat. No. EQS 014

3.7 Multifunction connector

15-pin connector 23 S on the back, with multiple function.

Use screened connecting cables. Connect screen to plug case. Cover connectors not in use with protective caps!

- Pin 1: bath temperature recorder connection, correct sign; 10 mV/K;
 $R_i = 100 \text{ Ohm}$; internal recorder resistance $\geq 1 \text{ MOhm}$ min. (0V pin 3)
- Pin 2: Pt 100 EXT; 4-wire; - current path
- Pin 3: 0V reference potential for measurement signals
- Pin 4: programme or external setpoint input 10 mV/K, added to the selected setpoint. The sum of both setpoints is displayed on pressing key
 $R_i = 20 \text{ kOhm}$ (0V pin 3)
- Pin 5: output signal, only for accessory units (0V pin 12)
- Pin 6: setpoint output 10 mV/K, $R_i \approx 100 \text{ Ohm}$. Load resistance $\geq 10 \text{ kOhm}$ min. (0V pin 3)
- Pin 7: + 12 V supply voltage, max. additional loading 20 mA
- Pin 8: reference voltage approx. 5 V, load resistance $\geq 10 \text{ kOhm}$ (0V pin 3)

- Pin 9: Pt 100 EXT; 4-wire; - voltage path
- Pin 10: -12 V supply voltage, max. additional loading 20 mA (0V pin 12)
- Pin 11: Pt 100 EX I; 4-wire; + current path
- Pin 12: 0V load reference potential 
- Pin 13: 18 V if red fault lamp is alight, i.e. safety circuit to DIN 12879 has operated.
Ri 1 kOhm, I max. = 10 mA (0V pin 12)
- Pin 14: recorder connection for external temperature, correct sign, 10 mV/K;
Ri 100 Ohm; internal recorder resistance \geq 1 MOhm (0V pin 3)
- Pin 15: Pt 100 FXT; 4-wire; + current path

Pins 2, 9, 11 and 15 Pt 100 EXT are parallel to socket 10 S. They must not be connected up if socket 10 S is in use.

In case of a fault the signals appearing at this connector can usefully be employed for the initial investigation of the fault.

15-pin connector Cat. No. EQM 030
Housing for above Cat. No. EQG 017

3.8 Mains supply output 34 H

The 230 V supply voltage is available at the socket 34 H at the back in normal operation and with the unit switched on. The maximum current which can be drawn there is 2 A. In case of a fault this voltage is switched off. This output can be used e.g. to connect a non-return fitting (Cat. No. UD 125).

Suitable mating plug Cat. No. FOS 045

3.9 Controlled cooling MVC (option)

As an option the units can be equipped in our company for controlled cooling to operate a solenoid valve which controls the cooling water flow.

It ensures faster heating up, greatly reduced water consumption, and improved temperature control during heat dissipation since the heater does not operate against the cooling action.

Controlled cooling (factory fitted)
for C-S and K-S Cat. No. LCZ 852

Solenoid valve for cooling water control Cat. No. UD 085

3.10 Remote operation (FBC) (option)

As another option the units can be converted for remote control; the entire electronics with control panel is removed from the unit and used for remote operation. An adapter for the cable connections is required on the basic unit and the control panel is placed in an extra housing. The conversion must be carried out by a qualified electrician. All necessary components except for the connection cables are supplied as part of the kit.

Please specify the length of the connection cables.

Conversion kit for remote operation FBC Cat. No. LCZ 960

Set of cables for remote operation FBC
 5 m long Cat. No. UK 235

Set of cables for remote operation FBC
 length as specified Cat. No. UK 238

19" adapter to take the control panel
 of the remote operation system FBC 5 HE
 for one or two panels Cat. No. LRZ 009

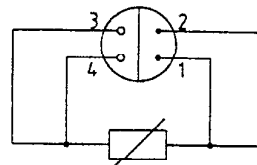
3.11 SAD connection to NE 28 (option)

The connector according to NAMUR recommendation NE 28 is located at the back of the control unit if option SAD is fitted.

Use screened connecting cables. Connect screen to plug case. Cover connectors not in use with protective caps!

8S: _____ Pt 100 connection (EXT) (Lemosa plug)

- | | | |
|---|----------------|-----|
| 1 | = Pt 100 (EXT) | I + |
| 2 | = Pt 100 (EXT) | U + |
| 3 | = Pt 100 (EXT) | U - |
| 4 | = Pt 100 (EXT) | I - |



Note: only one of the Pt 100 inputs, socket 10 S or 8 S, may be used at a time!

54 S: _____ signal connection

- | | |
|---|--|
| 1 | = external temperature 0 - 10 V (0 V = -100°C / 10 V = 400°C) |
| 2 | = internal temperature 0 - 10 V (0 V = -100°C / 10 V = 400°C) |
| 3 | = earth of measurement signals (pin 1, 2, 5) |
| 4 | = control signal 4 - 20 mA (4 mA = -100°C / 20 mA = 400°C)
at 0°C setpoint setting! |
| 5 | = control signal 10 mV/K (parallel to MF 23 S pin 4) |
| 6 | = earth of the control signal (linked int. to pin 3) |

Note: of the three control signal (programmer) inputs (23 S pin 4, 54 S pin 4 and 5) only one pin may be used at a time!

12 N floating contact general fault

- 1 = n.o. (closing)
- 2 = common
- 3 = n.c. (opening)
- 1, 2 = are closed under normal conditions

3-pin mating socket

Cat. No. FQD 047

14 N contact input, fault

- 1 = n.o. (closing)
 - 2 = common
 - 3 = not used
- mating plug with link 1, 2 is included in the unit

Interface SAD to NE 28
factory fitted or retrofit kit


Cat. No. LCZ 959

4. Safety devices and warning notes

4.1 Safety functions

The built-in overtemperature limiter is adjustable with a tool (screwdriver) between 0°C and 300°C.

The bath temperature is sensed by a separate Pt 100 resistance thermometer and processed by a separate electronics. When exceeding the set switching point the unit is switched off permanently on all poles (limiter function).

The red signal lamp  lights up and at the multifunction connector 23 S a signal of approx. 18 V appears at contact 13.

A float switch with magnetic coupling acts as low-level cut-out and also switches off the unit (pump and heater) permanently on all poles.
The switch-off function of the safety circuit remains stored during a break in the supply or after switching off the supply.

Reset is possible only after rectifying the fault, using the reset key .

The safety devices are conform to EN 61010-2-010.

The pump motor is fitted with a temperature monitor which switches off if the motor winding overheats. The heater is also switched off simultaneously. After the motor winding has cooled down the pump starts up automatically.

4.2 Why can a thermostat be dangerous?

1. Thermostats are equipped with heaters which supply the necessary heat to the thermostating liquid. If the temperature control fails or if the liquid level is too low, the heater may reach temperatures which can lead to a fire in the laboratory, especially in combination with flammable liquids.
2. When using the thermostat as a circulation thermostat a hose may break, causing hot liquid to spill and endangering people and goods.

The safety requirements on thermostats therefore depend on whether

- o non-flammable or flammable liquids are used
- o operation is with or without supervision.

The thermostats described in these Operating Instructions are protected against overtemperature and low liquid level if used according to the descriptions indicated in these Operating Instructions.

The units can be operated with non-flammable bath liquids, and with flammable bath liquids up to 25 K below their flashpoint (EN 61010), while DIN 12879 requires a safety spacing of only 5 K to the flashpoint. In each case it is assumed that there is correct adjustment and regular testing (see Item 9.7) of overtemperature and low-level protection.

4.3 Important Notes

The user is only protected against those hazards which are caused by exceeding the temperature and by low liquid level.

Further hazards may arise from the type of product being thermostated, e.g. a shift above or below certain temperature levels or fracture of the container and a reaction with the thermostatic liquid etc.

It is impossible to cover all possible causes and they remain largely within the decision and responsibility of the user.

Values for temperature variation and indication accuracy apply under normal conditions according to DIN 58966. In special cases high-frequency electromagnetic fields may lead to less favourable values. There is no loss of safety.

Warning: The units must only be used according to the descriptions indicated in the Operating Instructions.

This includes operation by properly qualified and instructed personnel.

The units are not designed for operation under medical conditions according to EN 60601-1 or IEC 601-1!

4.4 Warning notes

4.4.1 Temperatures

Parts of the bath cover may reach temperatures above 70°C when working at higher temperatures. The outflow and return pipes of the pumps reach the operating temperature. Touching them is dangerous because of high or low temperatures!

4.4.2 Mains connection

Connect the unit only to mains sockets with protective earth contact (PE) which must not have a fuse higher than T 16 A.

4.4.3 Mains cable

We have ensured that the mains cable and other plug connections do not touch any hot parts. Please check that there is no contact between the connecting tubings filled with hot liquid, other hot parts and the mains cable.

4.4.4 Fume extraction

Depending on the bath liquid used and the operating method there is a possibility that toxic vapours may be produced. In that case it is necessary to provide appropriate fume extraction. Pull out the mains plug before cleaning the bath with solvents. Provide appropriate fume extraction. Before starting up the unit it is absolutely essential to ensure that the bath contains no explosive mixture. If necessary purge it with nitrogen!

4.4.5 Cooling water, steam production

Use cooling coils with cooling water only at operating temperatures below 100°C; at higher temperatures there is a danger that steam may be produced. When changing the bath liquid from water to heat transfer fluids for temperatures above 100°C any remaining water - including the one in the hoses and external system - has to be removed completely. Otherwise there is a danger of burns because of delayed boiling.

5. Bath liquids and hose connections

The operating temperature ranges specified for the bath liquids and the tubings are for general information only and may be restricted through the operating temperature range or safety requirements specified in the appropriate standards (see Item 4.2).

5.1 Bath liquids

Operating temperature range 5...90°C

Use softened water. Make up evaporation losses at elevated temperatures. Losses can be reduced by providing suitable bath covers (see Accessories).

Distilled or deionised high-purity water is corrosive and should only be used with the addition of about 0.1 g sodium carbonate per litre water. Otherwise its use may lead to corrosion.

Temperatures near zero and below:

Water - monoethylene glycol mixture, preferably Glycoshell P 300, in the ratio 1:1

working temperature range	-30...100°C	<u>Ultra-Therm G 100</u>
boiling point	110°C	Cat. No. LZB 009
viscosity at 20°C	4 mm ² /sec	
non-flammable		

When operating for longer periods at higher temperatures the proportion of water decreases. The mixture approaches the properties of pure glycol and becomes flammable (flashpoint 128°C). The mixture ratio should therefore be checked from time to time against the original mixture, e.g. using a hydrometer.

Recommended operating temperature range 30°C...165°C

Ultra-Therm 330 SCB
(synthetic heat transfer oil)
extended temperature range 185°C
according to DIN 12879

Cat. No. LZB 007

viscosity at 20°C	34 mm ² /sec
flashpoint	190°C
boiling point	390°C

Recommended operating temperature range 80°C...280°C

Ultra-Therm SW 300 N
(Silicone oil)
extended temperature range 300°C
according to DIN 12879

Cat. No. LZB 008

viscosity at 20°C	260 mm ² /sec
viscosity at 100°C	20 mm ² /sec
flashpoint	305°C

Safety data sheets according to EU Guidelines are available on request.

5.2 Hose connections

5.2.1 Perbunan tubing, uninsulated Cat. No. RKJ 011
 9 mm int. diameter.
 Temperature range 0...120°C.
 Suitable for all bath liquids listed above

Perbunan tubing, insulated Cat. No. LZS 004
 9 mm int. diameter, approx. 30 mm ext. diameter.
 Temperature range -60...120°C.
 Particularly suitable
 for low-temperature operation

Perbunan tubing, uninsulated Cat. No. RKJ 012
 11 mm int. diameter.
 Temperature range 0...120°C.

Perbunan tubing, insulated Cat. No. LZS 008
 11 mm int. diameter, 9 mm insulation
 Temperature range -60...120°C.
 Particularly suitable
 for low-temperature operation.

5.2.2 Silicone tubing, uninsulated Cat. No. RKJ 059
 11 mm int. diameter.
 Temperature range -30...100°C.
 For water and water-glycol mixture.

Silicone tubing, insulated Cat. No. LZS 007
 11 mm int. diameter, 9 mm insulation.
 Application as for uninsulated Silicone tubing.
 Temperature range -60...100°C.

Note: do not use Silicone tubing in conjunction with Silicone oils !

5.2.3 Metal hoses (single-layer insulation)

Temperature range 0...400°C
 Metal hose MC 50 (50 cm long) Cat. No. LZM 040
 Metal hose MC 100 (100 cm long) Cat. No. LZM 041
 Metal hose MC 150 (150 cm long) Cat. No. LZM 042
 Metal hose MC 200 (200 cm long) Cat. No. LZM 043

Metal hoses with special insulation (3-layer insulation)

Temperature range 0...350°C
 Metal hose MC 50 S (50 cm long) Cat. No. LZM 046
 Metal hose MC 100 S (100 cm long) Cat. No. LZM 047
 Metal hose MC 150 S (150 cm long) Cat. No. LZM 048
 Metal hose MC 200 S (200 cm long) Cat. No. LZM 049

Metal hose connections to link pump outlets (insulated) Cat. No. LZM 044
 Temperature range 0...400°C

Highly-flexible, thermally insulated stainless steel (V2A) metal hoses with M 16 x 1 mm connecting thread. Int. diameter 10 mm. These hoses offer optimum security.

Further details on thermostatic liquids and hoses can be found in our special publication.

6. Unpacking, assembly and setting up

6.1 Unpacking

Goods are packed carefully, largely preventing transport damage. If unexpectedly some damage is visible on the equipment, the carrier or the postal authority has to be informed so that it can be inspected.

Standard accessories

1 Bath cover	Cat. No. HDQ 069	for C 6 CS, K 6 KS, K 12 KS
1 Bath cover	Cat. No. HDQ 067	for C 12 CS, K 20 KS
2 Bath covers	Cat. No. HDQ 067 and HDQ 068	for C 20 CS
4 Nipples 13 mm dia.	Cat. No. HKO 026	
4 Screw caps	Cat. No. HKM 032	
2 Closing plugs	Cat. No. HKN 065	

Operating Instructions

6.2 Setting up, operation as bath thermostat

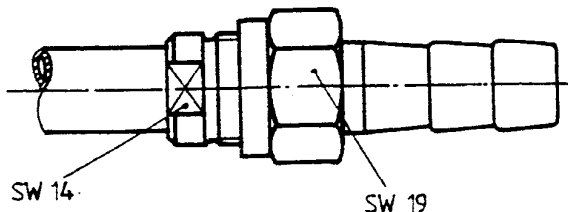
Set up the unit conveniently so that the control panel is towards the front and ensure that the air circulation for the units through the ventilating openings at the back of the unit is not restricted. A minimum spacing of 20 cm is recommended.

Close the drain cock at the back of the bath!

When operating as bath thermostat - no external system connected up - it is advisable to ensure internal circulation by removing the closing plugs from the pump flow and return connections. Remove the screw caps and link the pump connections together using a piece of tubing.

As a permanent arrangement the hose link of flexible insulated metal tubing (Cat. No. LZM 044) is the best and safest solution.

NOTE: When loosening or tightening the screw caps (19 mm a/f), hold the threaded nipple on the tubing connections with a spanner (14 mm a/f)!



7. Connection of external systems

7.1 Closed external circuits

Remove the closing plugs by releasing the threaded rings (19 mm a/f) from the outflow and return connections and replace them by the tubing nipples (13 mm dia.) supplied.

If the thermostat is connected to closed external circuits, additional liquid must be poured in after the thermostat is switched on until the level in the bath remains at the correct height (approx. 2 cm below top plate).

At higher operating temperatures it is necessary to allow during filling for the expected expansion in volume of approx. 8% per 100°C.

For suitable tubing materials see Section 5.
We recommend metal tubings for temperatures above 100°C.

With external systems at a high level it may happen even in closed circuits that the external volume drains down and the thermostat tank overflows if the pump is stopped and air enters the thermostated system!

Always ensure the maximum possible flow area in the external circuit (nipples, tubing, system). This results in a larger flow and therefore improved thermostatic control.

NOTE: Always protect tubing with hose clips against slipping off, or use stainless steel hoses with screwed connections.

NOTE: When loosening or tightening the screw caps (19 mm a/f) at the tubing connections hold the threaded nipple with a spanner (14 mm a/f)!

7.2 Open systems (baths)

The units (except for K 12 KS) are equipped with a pressure/suction pump. This can be used for circulation to closed external circuits at higher pump outputs and in particular also to open external baths. There are two possibilities for maintaining the level in external baths:

1. The suction tubing is mounted in the external bath so that its end is at the required liquid level. The flow of the pressure stage is restricted with a tubing clamp on the hose from the pressure connection to the external bath so that the flow of the pressure stage is restricted slightly below that of the suction stage. This becomes noticeable by the entry of air into the suction tubing.

This operating method is not recommended, in particular at temperatures below 0°C and when using oil at elevated temperatures.

2. The preferred solution is the use of the LAUDA level controller (Cat. No. LPZ 901) which provides the functions of adjustable level control with float, screw-on connection for external bath, and clamp fitting for 4 mm dia. Pt 100 probe.

7.2.1 Fitting the level controller

Cat. No. LPZ 901

The level controller is mounted on the external bath using the screw clamp ①. The mounting is suitable for both round and rectangular baths.

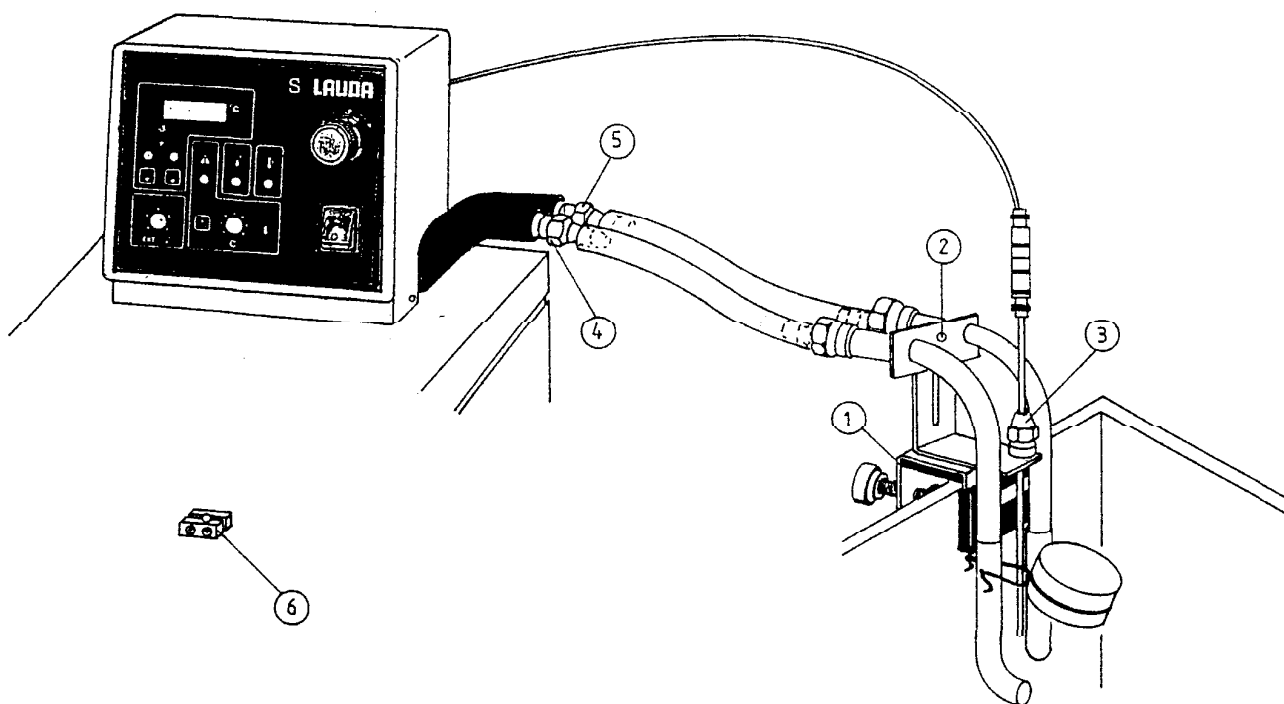
Height adjustment after loosening the screw ②.

Make sure that there is good circulation and that the float can move freely!

Make the hose connections to the thermostat, connect the pressure nipple ④ to the pressure side and the suction nipple ⑤ to the suction side (see diagram).

Clamp fitting for Pt 100 probe (4 mm dia.) ③.

The clamp ⑥ is not required on these units!



It is advisable to set up the external bath at the same level.

If the difference in level between the open external bath and the thermostat bath is greater than 0.5 m there is the possibility in certain applications that the control range of the level controller is not sufficient. With higher external bath level the suction hose should then be clamped off to such an extent that a constant level in the bath is obtained at which the float is within its control range. If the external level is low the pressure hose has to be similarly restricted by partly clamping it off.

WARNING: If thermostat and external bath are not at the same level it is essential to provide venting of the connecting hoses when the pump is switched off in order to prevent overflowing.

It is preferable to use the Non-Return Fitting (see Accessories) which is mounted at the highest point of hose connection (bath or thermostat connection) and which is linked electrically to the mains output 34 H.

Non-Return Fitting

Cat. No. UD 125

NOTE: Always protect tubing with hose clips against slipping off, or use stainless steel hoses with screwed connections.


NOTE: When tightening the screw caps (19 mm a/f) at the tubing connections, hold the threaded nipple with a spanner (14 mm a/f)!

8. Cooling the thermostats

Because of the frictional heat of the circulating pump, thermostating without cooling can only start appreciably above ambient temperature (see Technical data, working temperature range, lower limit). For lower temperatures it is essential to work with cooling.

The following possibilities are available for cooling:

8.1 Mains water cooling

Depending on water temperature down to 15°C. The thermostats are equipped with a cooling coil (at the rear ) which is linked by tubing to the water tap and to the drain.

Flow should be kept as low as possible; this saves water and improves temperature control. Controlled cooling is possible when using option MVC (see Item 3.9)

8.2 Through-flow chillers DLK 10, DLK 20 and DLK 40

Can be used, depending on thermostat type, down to -10°C (DLK 10), -30°C (DLK 20) or -40°C (DLK 40). Use insulated tubing for the hoses from the flow and return connections on the pump to the chiller nipples. If the thermostat operates in a closed external circuit the chiller is connected in the return line from the external system to the thermostat.

Always use water-glycol mixture (ratio 1:1).

9. Starting up

9.1 Filling

Fill the unit with bath liquid to suit the operating temperature, see Section 5. The filling volume is given under Technical data. In general the thermostat must be filled no higher than 2 cm below the cover plate. When working with thermal oils (e.g. Ultra-Therm 330 SCB) slightly less liquid should be used to allow for expansion. The level must obviously not fall below the minimum, otherwise the low-level protection switches off the unit (see Safety circuit). The same applies to filling an external system by the pump during start-up.

9.2 Connection to supply

Connect the unit only to an earthed socket (PE). Compare the details on the label with the mains voltage (see Item 4.4.2).

Model according to EMC directive EN 61326-1 (industrial areas only).*

When working without external system, ensure that the pump connections are linked together (metal hose link Cat. No. LZM 044), or use the closing plugs.




* Notice only valid for EU countries!



9.3 Basic functions


9.3.1 Set potentiometer EXT  fully anticlockwise (INT)!


Set the potentiometer for the overtemperature switch-off point to suit the required operating temperature, with due consideration for the bath liquid.
When operating below ambient temperature the overtemperature cut-out setting must of course be above ambient temperature until the operating temperature is reached. Then the switch-off point can be set slightly above the bath temperature (at least approx. 0°C).


9.3.2 Switch on the mains switch. The green signal lamp lights up.


Briefly press the left key  Int. The bath temperature is indicated. When the red signal lamp  lights up, briefly press the reset key .

9.3.3 Using the keys  Int and  Ext the display can be switched to bath temperature (Int) or the temperature of the external Pt 100 (Ext) irrespective of the control mode selected (INT-EXT).

The indication is on the green signal lamps Int and Ext. At the same time the display indicates the setpoint when pressing one of the two keys .

9.3.4 To adjust the setpoint press one of the keys , release the locking device on the setpoint knob and select the setpoint according to the display. Lock the knob again - release the key.

9.3.5 The lamp  shows the operation of the heater. At the control point this lamp flashes according to the heater power.

After the operating temperature has been lowered the lamp  obviously starts to flash only after the set temperature has been reached.

The lamp  has only a function in conjunction with option MVC.

The controller gain X_p can be adjusted on the back of the control unit. The adjustment range 1...5 corresponds to a proportional band of 0.4...16°C referred to the heater control signal. The standard setting at which the unit is shipped from the factory is 3. Usually it is not necessary to change the adjustment.


The scale is non-linear with the following values:


X_p	P band
1	0.4°C
2	1.5°C
3	2.5°C
4	4.5°C
5	16.0°C


If there are any control oscillations, e.g. in small baths with bath liquids of low thermal capacity and high viscosity, X_p is set to the next higher setting (e.g. from 2 to 3).


9.4 External control

9.4.1 Connect the Pt 100 resistance thermometer to socket 10 S (see Item 3.6).

Switch over the display by pressing the key  Ext. The temperature display flashes if no external Pt 100 is connected.

Using the potentiometer Pt 100  on the back of the control unit the external Pt 100 can be trimmed to a known temperature. This can be done using the bath temperature, for example, if no other temperature reference is available.

9.4.2 When used with external control, i.e. the measurement point for the control parameter is located outside the thermostat at a point selected by the user, the potentiometer EXT  can be used to select a value between approx. 50% and 90% for the proportion of the external probe. The closer the external Pt 100 probe is connected with the circulated bath liquid, the higher the external proportion (e.g. 90%) can be chosen. This increases the quality of the control results related to the external measuring points.

9.4.3 Suggested setting for a 2 litre jacketed reactor with water-glycol, external resistance thermometer in the product space, product slightly stirred. EXT  90%, Xp 2.


9.4.4 With the selected simple control method there remains a permanent deviation between external controlled temperature and setpoint, depending on the proportion of the external measurement parameter; this deviation has to be compensated by re-adjusting the setpoint.

Example: selected potentiometer EXT  80, setpoint 80°C.

After the system has settled down, the external measured temperature is 79.5°C. Increase the setpoint by 0.5 K, then the external measured temperature rises to 80°C.

9.5 Operation with programmer


A programmer Type PM 351-1 can be connected to the multifunction connector 23 S to vary the setpoint of the thermostat according to a given programme. This requires that the energy balance (heating, cooling, load) of the thermostat matches the requirements of the programme (heating rate, cooling rate, operating temperatures). The plug must not be put into 23 S when adjusting the unit setpoint to the lowest temperature of the programme. This value is entered as value A when programming the programmer. Do not change the unit setpoint any more and put in the plug of the programmer connecting cable.

Operation of the push buttons  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 351-1.

9.6 Working with controlled cooling


If the units are equipped with option MVC, operation with controlled water cooling is possible.

Insert the plug of the solenoid valve into the socket (19 H) on the back. The solenoid valve can be fitted either on the cooling coil or on a 1/2" water tap. Although fitting on the cooling coil is the usual method, mounting directly on the water tap is preferable for two reasons. When the valve is closed, the connection hose to the cooling coil is not under pressure; there is therefore no pressure surge when the valve is switched on, and the danger of the hose bursting is much reduced. Use hose clips!
With controlled cooling operation the solenoid valve switches with a cycle time of about 5 s.

The green signal lamp  indicates the status of the solenoid valve.

Restrict the water flow as much as possible at the water tap. This produces improved control and saves cooling water.

LAUDA Compact Thermostats
C 6 CS, C 12 CS, C 20 CS, K 6 KS, K 12 KS, K 20 KS
GCS, GKS

Warning: Ensure that cooling coil connectors  are being used, do not mix them up with pump connectors

It is essential to ensure free outflow from the cooling coil, especially at operating temperatures above 100°C because of steam formation! The use of controlled cooling is particularly helpful when initiating exothermal reactions or in programmer operation.

Solenoid valve for cooling water control

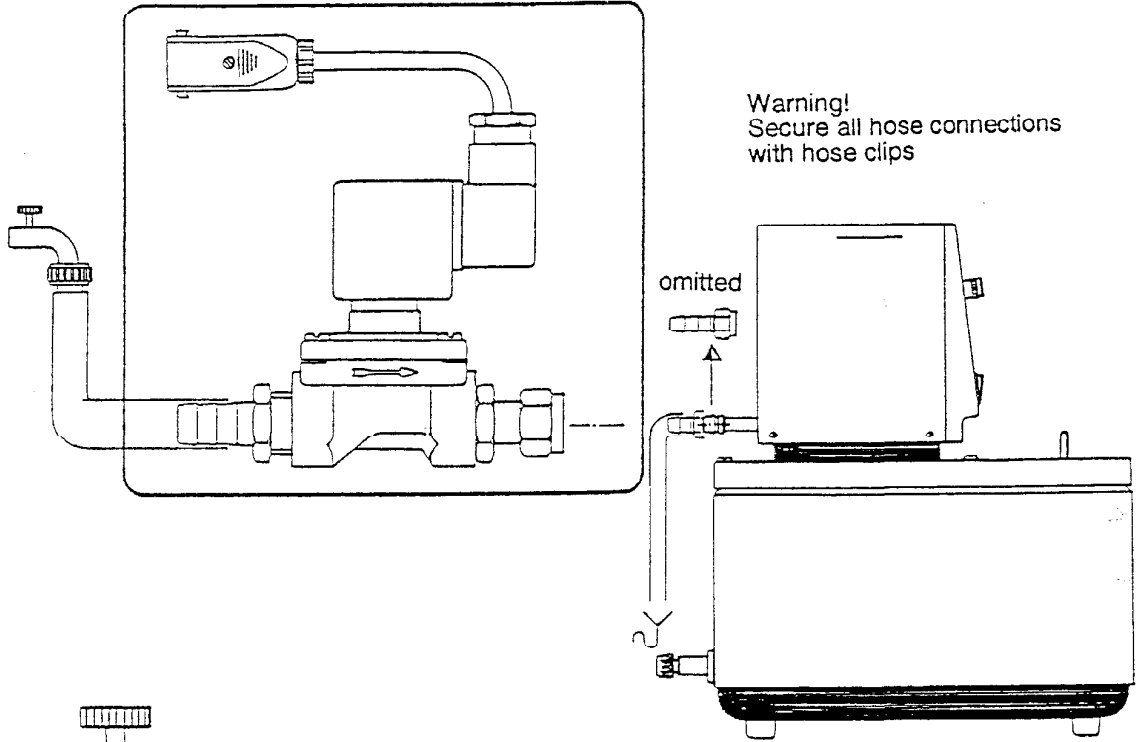
Cat. No. UD 085

Mating plug for other solenoid valve

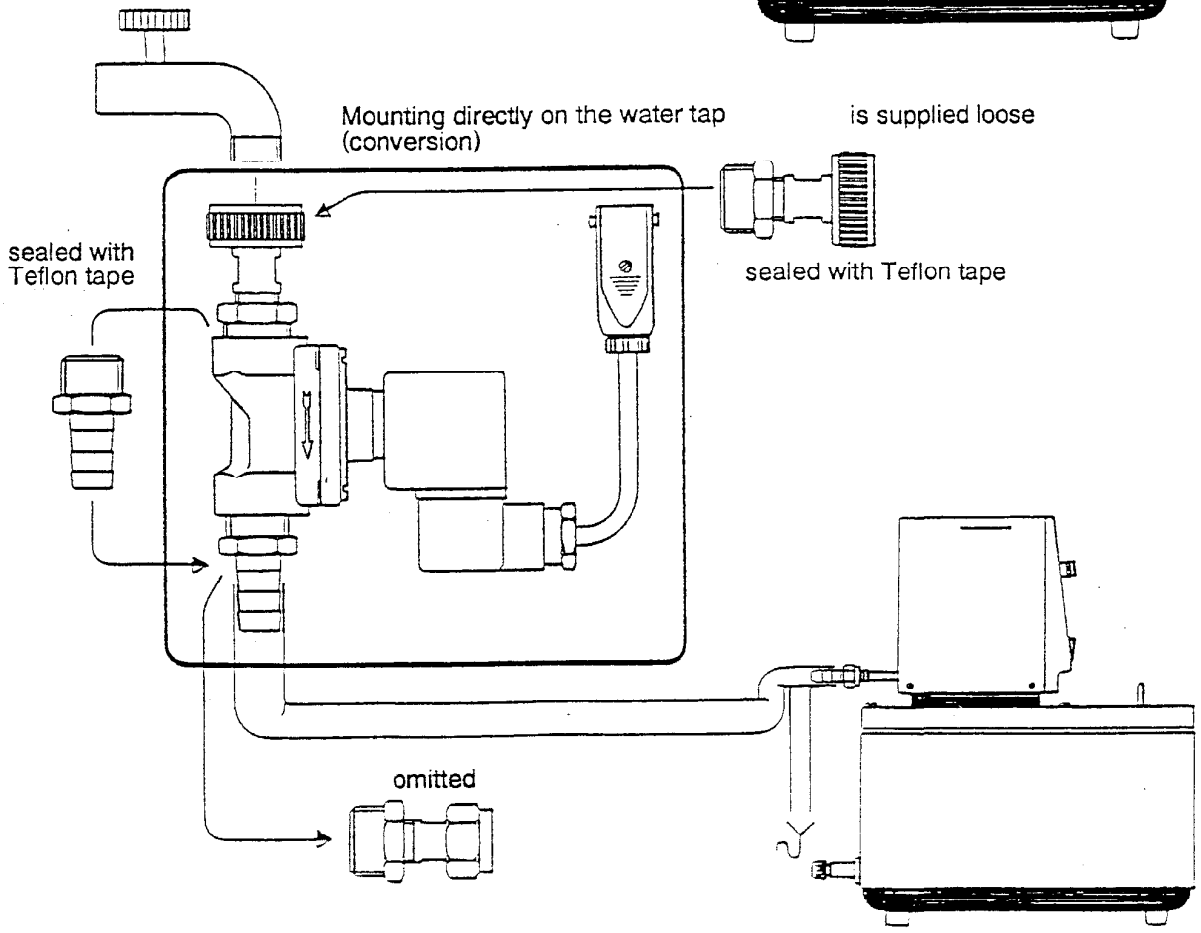
Cat. No. EQS 005

LAUDA Compact Thermostats
 C 6 CS, C 12 CS, C 20 CS, K 6 KS, K 12 KS, K 20 KS
 GCS, GKS

Mounting directly on the cooling coil (as supplied)





Mounting directly on the water tap (conversion)



9.7 Safety circuit

The operation of the safety devices of the units has already been described in Item 4.1. After starting up the user should confirm the correct operation of the safety devices. If the unit is operating unsupervised we recommend that this check should be carried out daily.

- 9.7.1 For proper operation of the low-level limiter it is essential that the float switch is operating correctly. This can be checked by draining some of the liquid. When the level drops below the minimum level (about 20 mm above the upper heater winding) the pump and the heater are switched off on all poles.

The pilot lamp "Fault"  is on. For restarting fill in bath liquid and press the Reset key  .

- 9.7.2 To check the overtemperature limiter its switch-off point is gradually reduced.

When it is below the value shown on the digital thermometer the unit must switch off as under Item 9.7.1.

To distinguish between "Overtemperature" and "Level" faults the dot on the right in the display is flashing when the overtemperature switch-off point has been exceeded. Faults in the temperature probe (break, short circuit) also lead to switch-off and flashing of the right dot in the display.

Set the switch-off point again above the bath temperature and operate the Reset key.

- 9.7.3 In case of any failure in Items 9.7.1 and 9.7.2 the unit must immediately be taken out of operation and must be tested by a qualified engineer, otherwise its safety is no longer ensured.

10 Maintenance

10.1 Safety notes in case of repairs

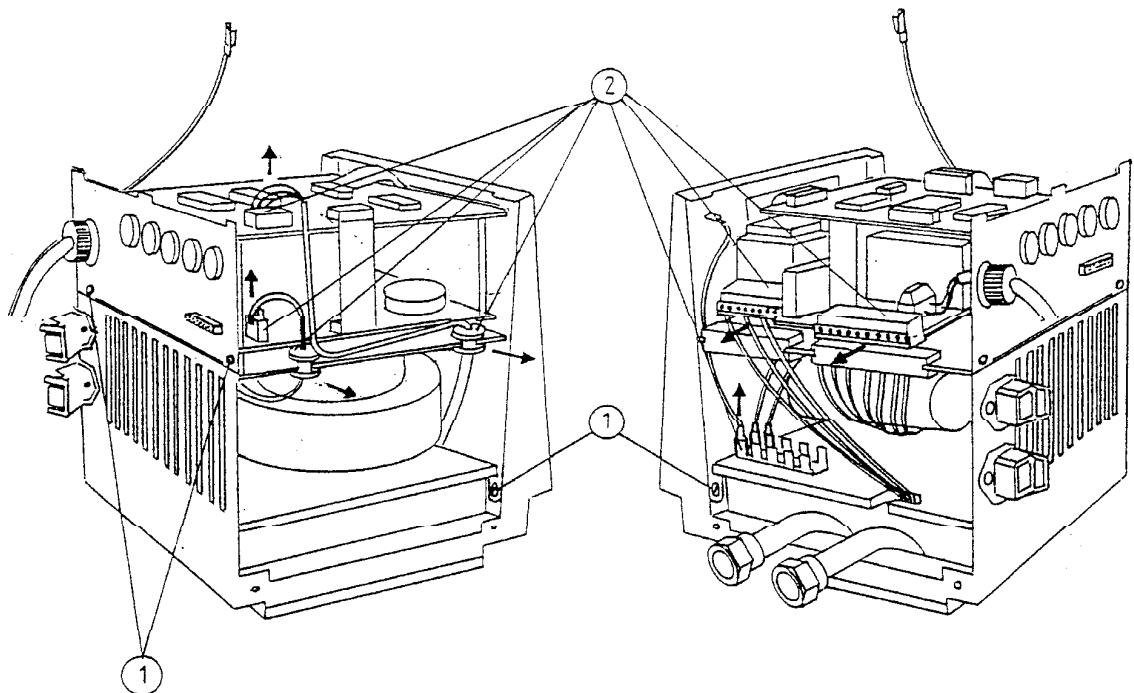
Always pull out the mains plug for all repair and cleaning operations! Repairs on the control unit with cover removed must only be carried out by a qualified electrician.

10.2 Repair

LAUDA thermostats are largely free from maintenance. Dirty thermostatic liquid should be removed through the drain cock and replaced. If the unit should become faulty it may be advisable to return only the faulty module where appropriate.

The control unit can readily be removed after removing the cover, releasing 2 screws ① (2 turns) behind the front panel and 2 screws at the rear and disconnecting the electrical connections ②.

The module with pump, heater, temperature probe etc. can also be easily separated from the bath.



There is no provision for a fuse for the complete unit since the necessary 16A fuse corresponds to the mains fuse usually provided at the location. The control circuit of the unit has a separate fuse; a fuse 5 x 20 F4A is located in the control unit. This is accessible after removing the cover. When the fuse has blown the green lamp in the mains switch does not light up.

10.3 Cleaning

The unit can be cleaned using a cloth moistened with water with the addition of a few drops of (domestic) detergent. No water must find its way into the control unit.

The user is responsible for any necessary decontamination if dangerous materials have been spilled on or inside the unit. This applies in particular if the unit is removed for a different use, for repair, storage etc.

The method of cleaning or decontamination is determined by the expertise of the user himself. If the user has any doubts on whether this may damage the unit he has to contact the manufacturer.

10.4 Spares ordering

When ordering spares please specify the equipment type and number on the label. This avoids queries and prevents supply of incorrect goods!

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

LAUDA DR. R. WOBSE
R
GMBH & CO. KG

LAUDA Compact Thermostats
C 6 CS, C 12 CS, C 20 CS, K 6 KS, K 12 KS, K 20 KS
GCS, GKS

Accessories for LAUDA Compact Thermostats C-S and K-S

RS 232 C Interface R 61/2

Cat. No. LRT 013

Using the RS 232 C (V24) Interface with A/D and D/A converter it is possible with all suitably equipped computers to read out temperatures from the thermostat and to transmit a temperature (setpoint) to the thermostat. In addition the fault signal can be called up.

Programming and automatic running of ramps and contact programming are possible.

Connecting cable R 61/2 to thermostat
length 1.2 m

Cat. No. UK 085

LAUDA Through-Flow Chillers

for cooling thermostats, in particular
at operating temperatures below
the working temperature range

DLK 10
DLK 20
DLK 40

Cat. No. LFD 105
Cat. No. LFD 106
Cat. No. LFD 107

Racks in stainless steel
for test tubes, centrifuge tubes etc.

Bath C 12 up to 2 racks

Bath C 20 up to 4 racks

RD 13 for 56 tubes 10 - 13 dia., 80 mm immersion
RD 18/1 for 33 tubes 14 - 18 dia., 80 mm immersion
RD 18/2 for 33 tubes 14 - 18 dia., 110 mm immersion
RD 30 for 14 tubes 24 - 30 dia., 110 mm immersion

Cat. No. UG 066
Cat. No. UG 067
Cat. No. UG 068
Cat. No. UG 069

Bath K 20 up to 2 racks

RE 13 for 56 tubes 10 - 13 dia., 80 mm immersion
RE 18/1 for 33 tubes 14 - 18 dia., 80 mm immersion
RE 18/2 for 33 tubes 14 - 18 dia., 110 mm immersion
RE 30 for 14 tubes 24 - 30 dia., 110 mm immersion

Cat. No. UG 070
Cat. No. UG 071
Cat. No. UG 072
Cat. No. UG 073

Bath C 6 1 rack

RF 18/1 for 20 tubes 14 - 18 dia., 80 mm immersion
RF 18/2 for 20 tubes 14 - 18 dia., 110 mm immersion

Cat. No. UG 074
Cat. No. UG 075

Bath K 6 1 rack

RG 18/1 for 20 tubes 14 - 18 dia., 80 mm immersion
RK 18/2 for 20 tubes 14 - 18 dia., 110 mm immersion

Cat. No. UG 076
Cat. No. UG 077

Details of other racks on request.

Rising platform for retrofitting

size 250x160 mm, with continuous height adjustment
suitable for:

Cat. No. LCZ 012

Bath C 12 (1 platform)

Bath C 20 (2 platforms)

Bath K 20 (1 platform)

LAUDA Compact Thermostats
C 6 CS, C 12 CS, C 20 CS, K 6 KS, K 12 KS, K 20 KS
GCS, GKS

Gable cover, stainless steel for C 20 Cat. No. LCZ 011

Level controller
for thermostating an open external bath
using pressure/suction pump Cat. No. LPZ 901

Non-return fitting
for automatic venting of the connecting hoses
when thermostating an open external bath Cat. No. UD 125

Nipples
for pump connections and cooling coil connections
13 mm dia., 10 mm int. dia. Cat. No. HKO 026
11 mm dia., 7 mm int. dia. Cat. No. HKO 025

LAUDA Compact Thermostats
C 6 CS, C 12 CS, C 20 CS, K 6 KS, K 12 KS, K 20 KS
GCS, GKS

LAUDA Pt 100 platinum resistance thermometers
to DIN IEC 751 Class A for external control
and other temperature measurement

Pt 100-42

all-glass version with NS 14/23 ground taper DIN 12242
Temp. range -100...300°C
50% response time 0.8 sec
Overall length approx. 115 mm
4-wire circuit
Fig. 1

Cat. No. ETP 049

Pt 100-44

all-glass version with NS 14/23 ground taper DIN 12242
Temp. range -100...300°C
50% response time 0.8 sec
Overall length approx. 320 mm
Fig. 2

Cat. No. ETP 007

Pt 100-66

as Pt 100-44
Overall length approx. 400 mm
Fig. 2

Cat. No. ETP 008

Pt 100-90

stainless steel protection tube 4 mm dia.
Temp. range -100...300°C
50% response time 1.5 sec
Overall length approx. 120 mm
4-wire circuit
Fig. 3

Cat. No. ETP 050

Pt 100-70

stainless steel protection tube 4 mm dia.
Temp. range -200...300°C
50% response time 1.5 sec
Overall length approx. 290 mm
4-wire circuit
Fig. 3

Cat. No. ETP 009

Pt 100-92

stainless steel protection tube 4 mm dia.
with attached Silicone cable 2 m long and plug
Temp. range -100...200°C
50% response time 3 sec
Overall length approx. 250 mm
4-wire circuit
Fig. 4

Cat. No. ETP 051

LAUDA Compact Thermostats
C 6 CS, C 12 CS, C 20 CS, K 6 KS, K 12 KS, K 20 KS
GCS, GKS

Connecting cable

with 4-pin plug for external control on
all C-and K-units and for
digital thermometer for Pt 100-44 and
Pt 100-66 1.5 m
length as specified

Cat. No. UK 048

Cat. No. UK 213

for Pt 100-42, Pt 100-70, Pt 100-90 1.5 m
length as specified

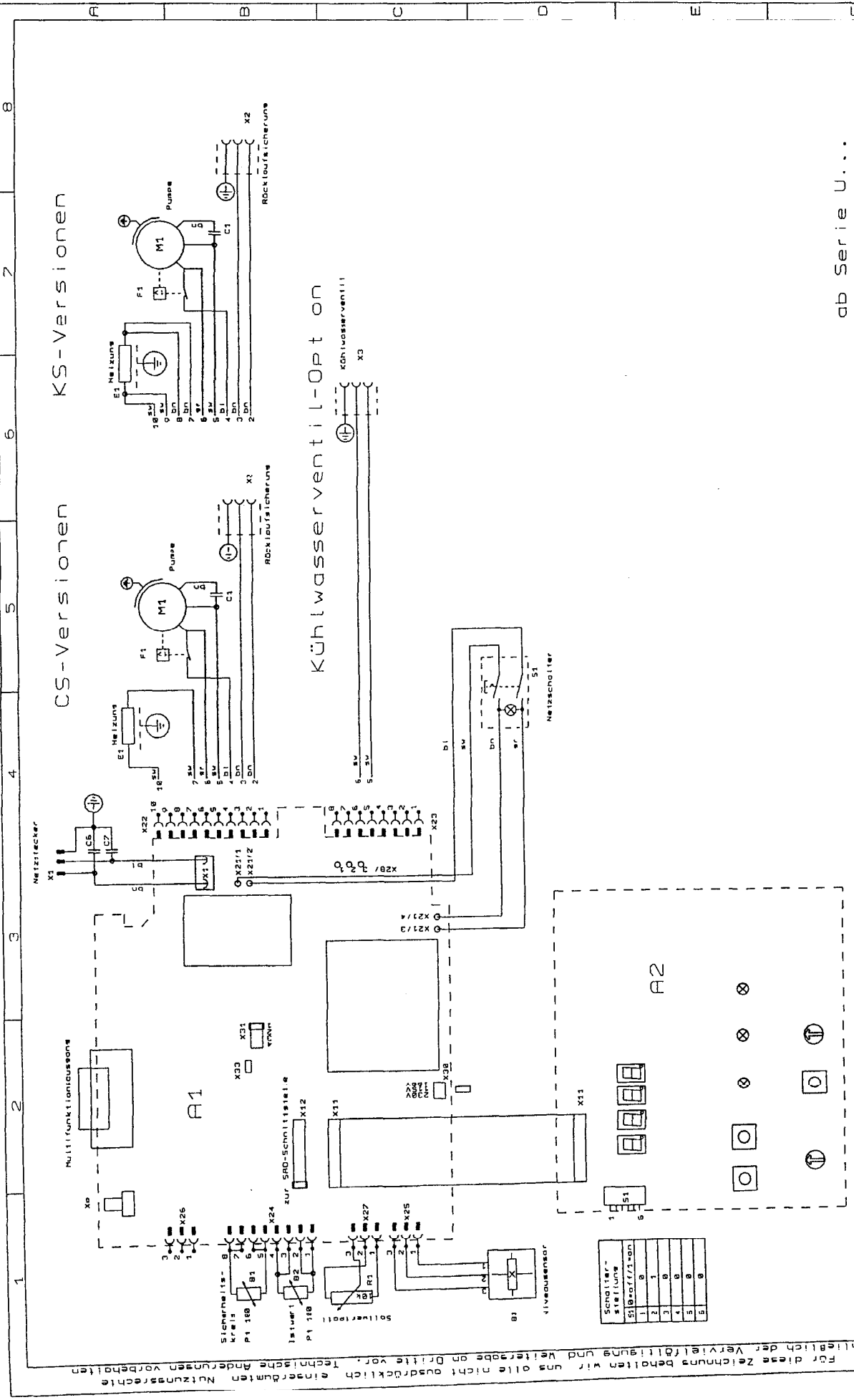
Cat. No. UK 047

Cat. No. UK 212

Screw clamp fitting

stainless steel, with helium pressure ring
for Pt 100 resistance thermometer 4 mm dia.
Fig 5

Cat. No. HX 078



KS-Versionen

CS-Versionen

Kühlwasserventil-Opton

ab Serie U...

Für diese Zeichnung behalten wir uns alle nicht ausdrücklich eingeräumten Nutzungsrechte einschließlich der Vervielfältigung und Weitergabe an Dritte vor. Technische Änderungen vorbehalten.

Schaltplan Schéma de connexions Circuit diagram		CXCS / KxKS	
LAUDA Dr. R. Uebber GmbH & Co KG Ers-G		ab Serie U...	
E.S.I		E.S.I	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
13.08.96		13.08.96	

Schalter- stellungen	1	2	3	4	5	6
S1	0	1	0	0	0	0
S2	0	0	0	0	0	0
S3	0	0	0	0	0	0
S4	0	0	0	0	0	0
S5	0	0	0	0	0	0
S6	0	0	0	0	0	0

Datum	28.12.1995
Beitrag	G. Jortheil
Datum	16.2.96
Name	G. Jortheil
Urspr.	

Geräteliste Schaltplan
List of parts Circuit diagram
Liste de pièces schéma de connexions
230V; 50Hz / 230V; 60Hz

		C 6 CS	K 6 KS	K 12 KS
		C 12 CS	K 20 KS	
		C 20 CS		
A 1	Leiterplatte „MP Netz“ Printed circuit board „MP-Mains“ Circuit imprimé „MP-Secteur“	UL 429-3	UL 429-3	UL 429-3
	Leiterplatte „Netzkühlwasserventil“ Printed circuit board „Mains cooling water valve“ Circuit imprimé „Secteur de refroidissement clapet d'eau“	UL 432-2	UL 432-2	UL 432-2
A 2	Leiterplatte „Anzeige“ Printed circuit board „Indication“ Circuit imprimé „Affichage“	UL 430-2	UL430-2	UL430-2
B 1	Pt 100 Fühler Sicherheitskreis Pt 100 Probe Safety circuit Pt 100 Sonde Circuit sécurité	US 060 (ETP 046)	US 060 (ETP 046)	US 061 (ETP 048)
B 2	Pt 100 Fühler Regelung Pt 100 Probe Controller Pt 100 Sonde Réglage			
B 3	Niveausensor Level sensor Niveau sensor	EKS 034	EKS 034	EKS 034
C 1	Motorkondensator Motor condenser Condensateur moteur	1,5 uF ECA 012	5 uF ECA 007	5 uF ECA 007
E 1	Heizkörper Heater Corps de chauffe	2kW EH 162	3kW EH 150	3kW EH 154
F 1	Klixon Pumpe Klixon Pump Klicon Pompe	-----	-----	-----
M 1	Pumpenmotor Pump Motor Moteur de pompe	EM 093	EM 094	EM 096
S 1	Netzschalter Mains switch Interrupteur secteur	EST 032	EST 032	EST 032
X 1	Netzanschluß / Netzkabel Mains connection / Mains cable Branchement secteur / Câble de secteur	EKN 008	EKN 008	EKN 008
X 2	Anschlußbuchse Rücklaufsicherung/Kühlen Connection socket Reflow security valve/Cooling Douille de jonction Protection de refoulement/Réfrigérissement	EQD 037+ EQZ 006	EQD 037+ EQZ 006	EQD 037+ EQZ 006
X 3	Anschlußbuchse Kühlwasserventil Connection socket Cooling water valve Douille de jonction vanne de refroidissement	EQK 004+ EQZ 006	EQK 004+ EQZ 006	EQK 004+ EQZ 006