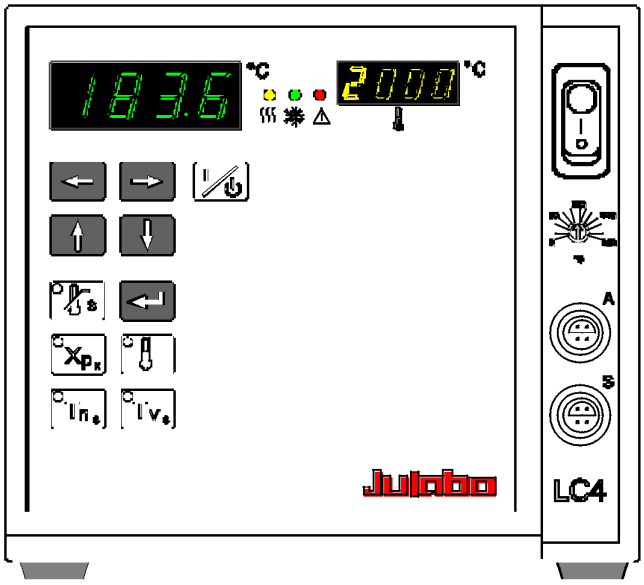
English

Operating manual

Temperature controller

LC4



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Congratulations!

You have made an excellent choice.
JULABO thanks you for the trust you have placed in us.
This operating manual has been designed to help you gain an understanding of the principles of operating and possibilities of our circulators. For optimum utilization of all functions, we recommend that you thoroughly study this manual prior to beginning operation.

Safety Warnings

Take care your unit is operated only by qualified persons.
Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions concerning the operation of your unit or the information in this manual, contact JULABO.
Performance of installation, operation, or maintenance procedures other than those described in this manual may result in a hazardous situation and may void the manufacturer's warranty.
Transport the unit with care. Sudden jolts or drops may cause damages in the interior of the unit.
Observe all warning labels. Never remove warning labels.
Never operate damaged or leaking equipment.
Never operate the unit without bath fluid in the bath.
Always turn off the unit and disconnect the mains cable from the power source before performing any service or maintenance procedures, or before moving the unit.
Never operate equipment with damaged mains power cables.
Refer service and repairs to a qualified technician.

In addition to the safety warnings listed above, warnings are posted throughout the manual. These warnings are designated by an exclamation mark inside an equilateral triangle. Read and follow these important instructions. Failure to observe these instructions can result in permanent damage to the unit, significant property damage, personal injury or death.

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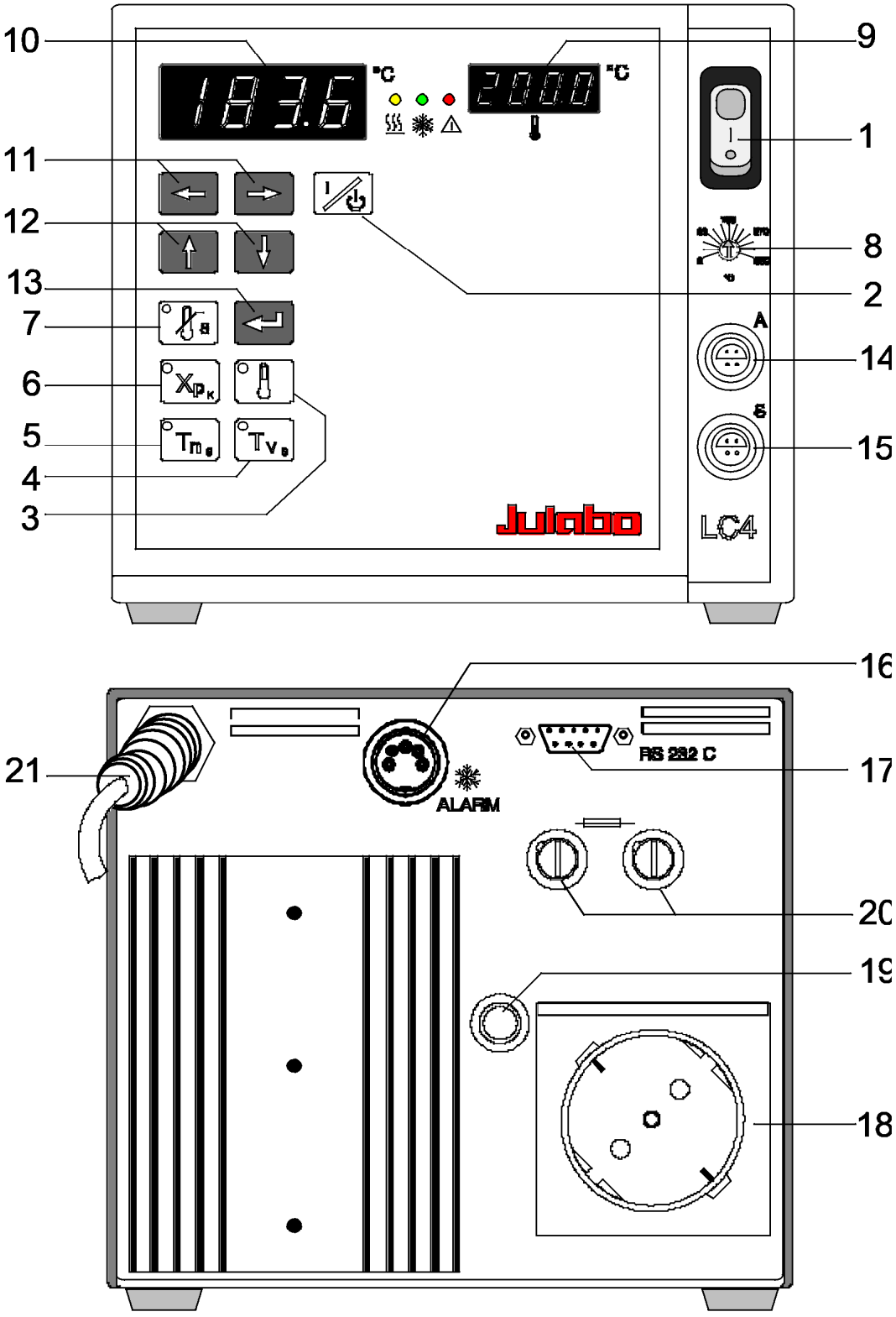
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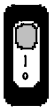
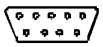
Rear view

1. Operating controls and functional elements

1		Mains power switch, illuminated
2		Start / stop key
3		Working temperature setpoint
4		Control parameter Tv (lead time)
5		Control parameter Tn (resetting time)
6		Control parameter Xp (proportional range)
7		Safety temperature
8		Adjustable excess temperature protection (safety temperature)
9		Indication of working temperature
10		MULTI-DISPLAY (LED) temperature indication
11		Cursors left/right
12		Edit keys (increase/decrease setting)
13		Enter key (store)
		Indicator light - Alarm
		Indicator light - Cooling
		Indicator light - Heating
14		Connector: Working sensor A
15		Connector: Safety sensor S
16		Connector:  / alarm output
17		RS232C interface
18		Grounded mains socket for heating device
19		Threaded fitting (10 mm) for stand rod attachment
20		Mains fuses, fuse holders
21		Mains power cable with plug

2. Unpacking and checking

Unpack the controller and accessories and check for damages incurred during transit. These should be reported to the responsible carrier, railway or postal authority, and a request for a damage report should be made. These instructions must be followed fully for us to guarantee our full support of your claim for protecting against loss from concealed damage. The form required for filing such a claim will be provided by the carrier.

3. Description

Fulfilling its principle task, reliable temperature control and measurement, the LC4 temperature controller also implements safety and monitoring functions, particularly in the areas of chemical research and quality control. The sophisticated capabilities of the unit allow wide application with electrical heating devices such as

heating hoods, heating baths,
heating pads and bandages,
water and oil baths.

Setting is rapid and simple using the keypad with its easy to learn symbols. Keypad is splash-proof, easily cleaned and ergonomically designed. The microprocessor technology allows the working temperature setpoint and five parameter sets to be stored and indicated on the MULTI-DISPLAY (LED).
The safety value for excess temperature protection, a safety installation independent from the control circuit, is adjustable on the front and visible on the MULTI-DISPLAY (LED).
The RS232C port permits modern process engineering without additional interface, directly on-line from the controller to your application equipment.

The LC4 temperature controller conforms to the safety requirements specified by DIN 12 876, as well as DIN 58 966, and to the guideline for first voltage range EN 61010.

4. Quality Management System

The JULABO **Q**uality **M**anagement **S**ystem:
Development, production and distribution of temperature application instruments for research and industries conform to the requirements according to DIN EN ISO 9001:1994-08.
Certificate Registration No. QA 051004008.

5. Operating procedures

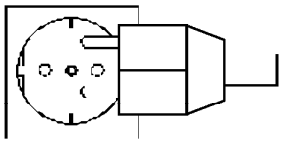
5.1. Setup

- The unit should be set up at a dry location.
- Place the unit in an upright position and do not obstruct the ventilation.
- A wall distance of at least 10 cm must be maintained for ventilation, allowing internal heat to be conducted away from the unit.

- If one or more temperature controllers are set up in a cabinet for example, take care of good ventilation (waste heat per unit = approx. 60 Watts).
- The ambient temperature must not exceed 35 °C. Ambient temperatures above 35 °C result in a failure of the unit.
- Do not set up the unit in the immediate vicinity of heat sources and do not expose to sun light.

5.2. Power connection

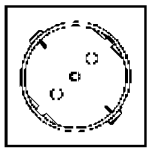
Connect the unit only to a grounded mains power socket! We disclaim all liability for damage caused by incorrect line voltages!



Check to make sure that the line voltage matches the supply voltage specified on the identification plate. Deviations of ±10 % are permissible.

5.3. Connecting a heating device

Set up the heating device according to the instructions or securely fix the unit in the bath tank using appropriate means. Danger of burning and fire!



Connect the power plug to the grounded mains socket (18) on the rear of the controller.

Max. resistive load 1000 W at 115 V / 2000 W at 230 V.
Max. current 5 A at 115 V / 10 A at 230 V.

5.4. Connecting the temperature sensors

Connect both sensors prior to turning the unit on since an alarm shutoff will be effected if the sensors are not connected (see page 21).

Connect the working sensor to the socket “A” (14) and
the safety sensor to socket “S” (15) .

Sensor calibration:

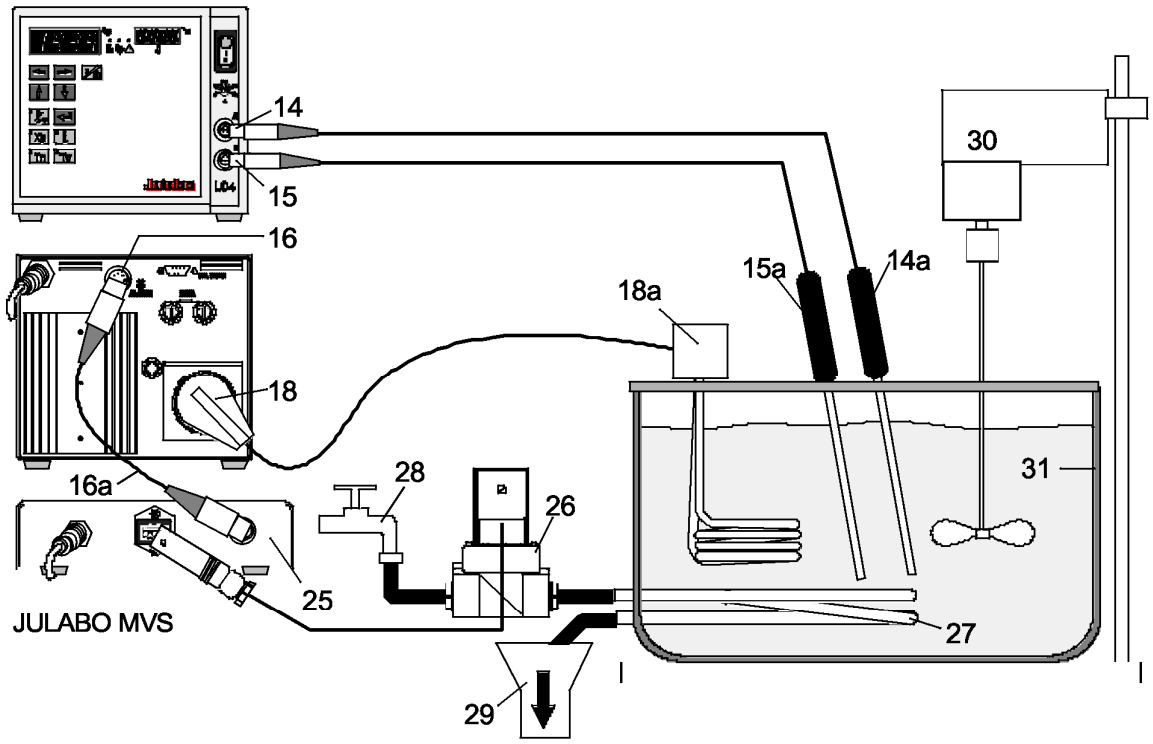
When the controller is first placed into operation or whenever a sensor is replaced, a working sensor calibration must be carried out (ATC - see page 16).

Place both sensors into the bath medium and securely fix the sensors.

5.5. Applications

Directly heated bath liquid:

- The bath liquid is directly heated via the heating device.
- Working and safety sensors must both be immersed in the bath liquid.
- Whenever countercooling is necessary (in case of temperature application near the ambient temperature), cooling in the bath is performed through a cooling coil connected to a solenoid valve and the MVS controller.

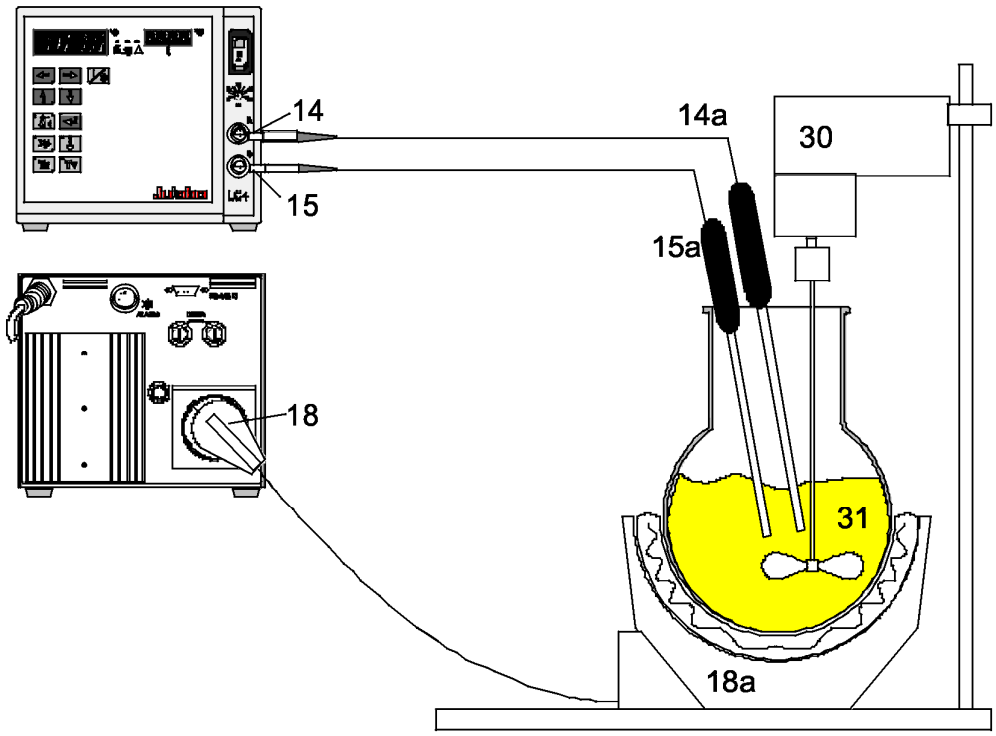


14	Connector: Working sensor	14a	Working sensor
15	Connector: Safety sensor	15a	Safety sensor
16	Connector for control cable	16a	Control cable for MVS
18	Mains socket for heating device	18a	Heating device / heating hood

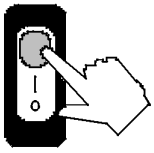
25 MVS solenoid valve controller (order no. 9 790 000)
26 Solenoid valve 220 Volts (order no. 8 980 700)
27 Cooling coil
28 Tap water connection
29 Cooling water drain
30 Stirrer motor for bath circulation
31 Bath tank / round bottom flask with bath liquid

Indirectly heated bath liquid:

- The bath liquid is indirectly heated.
- Working and safety sensors must both be immersed in the bath liquid.



5.6. Switching on / Start - Stop



Switching on:

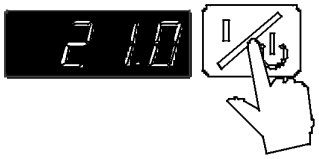
Turn on the mains power switch.

The unit performs a self-test. A signal sounds, and all segments of the two 4-digit displays as well as all indicator lights will illuminate.

Then the software version (example: n 1.0) and the model description "LC 4" appear.

The display "**OFF**" or "**r OFF**" indicates the controller is ready to operate. Also the effective working temperature setpoint is indicated (example: 20.0 °C).

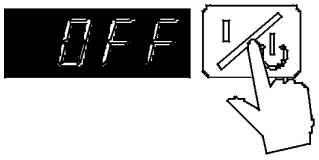
The controller enters the operating mode activated before switching the controller off,
keypad control mode (manual operation) or
remote control mode (operation via personal computer).



Start:

- Press the start/stop key.
  - The MULTI-DISPLAY (LED) indicates the actual bath temperature. (example: 21.0 °C)
  - The indicator light in the setpoint key illuminates.

Temperature control is carried out according to the parameter set last effective (see page 17).

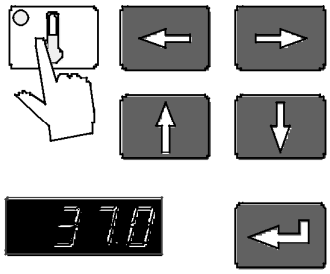


Stop:

- Press the start/stop key.
  The MULTI-DISPLAY (LED) indicates the message "OFF".

The unit also enters the safe operating state "OFF" or "r OFF" after a mains power interruptance. The temperature values entered via the keypad remain in memory. With the controller in keypad control mode, press the start/stop key to restart operation.
With the controller in remote control mode, the personal computer must first resend the parameters set via the interface before operation of the controller may be restarted.

5.7. Setting the temperatures



Setting the working temperature:

① Press the setpoint key .
The indicator light **blinks** and the effective value appears on the MULTI-DISPLAY (LED).

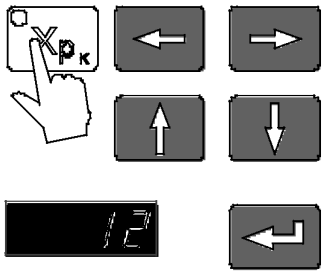
② Use the cursor keys to move left or right on the display until the numeral you wish to change is blinking.

③ Use the increase/decrease arrows to change the selected numeral (-, 0, 1, 2, 3, ... 9).

④ Press enter to store the selected value (example: 37.0 °C).

The working temperature is maintained constant after a short heat-up time (example: 37.0 °C).

5.8. Setting the PID control parameters Xp, Tn and Tv



Setting the Xp (proportional range)

① Press the key .
The indicator light **blinks** and the effective Xp value appears on the MULTI-DISPLAY (LED).

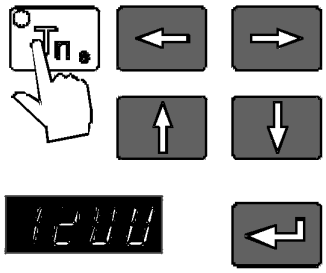
② Use the cursor keys to move left or right on the display until the numeral you wish to change is blinking.

③ Use the increase/decrease arrows to change the selected numeral (-, 0, 1, 2, 3, ... 9).

④ Press enter to store the selected value (example: 12 °C).

Setting range for the Xp parameter: 0.1 to 50 °C

Setting the Tn (resetting time)



① Press the key [Tn].
The indicator light **blinks** and the effective value for Tn appears on the MULTI-DISPLAY (LED).

② Follow the instructions

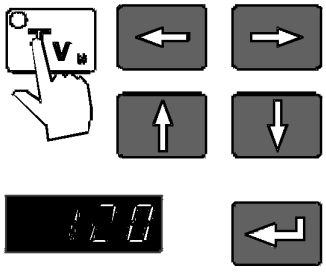
③ for [Xp]

④ (example: 1200 s).

Setting range for Tn: 1 to 9998 s.

With Tn set to 9999, the integral part of the controller is deactivated (use of a P or PD type controller).

Setting the Tv (lead time)



① Press the key [Tv].
The indicator light **blinks** and the effective value for Tv appears on the MULTI-DISPLAY (LED).

② Follow the instructions

③ for [Xp]

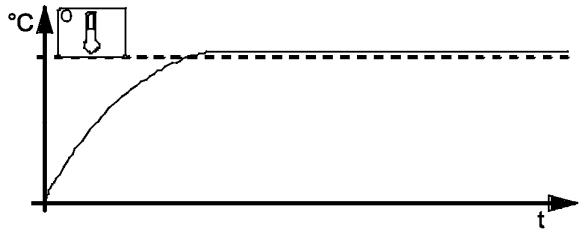
④ (example: 120 s).

Setting range for Tv: 0 to 1000 s.

With Tv set to 0 eingestellt, the differential part of the controller is deactivated (use of a P or PI type controller).

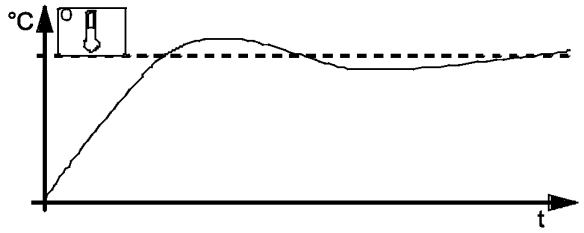
5.8.1. Optimization instructions for the PID control parameters

The heat-up curve reveals inappropriate control settings.

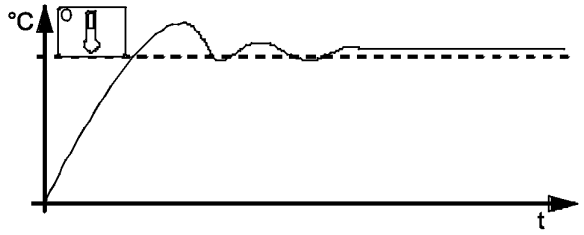


optimum setting

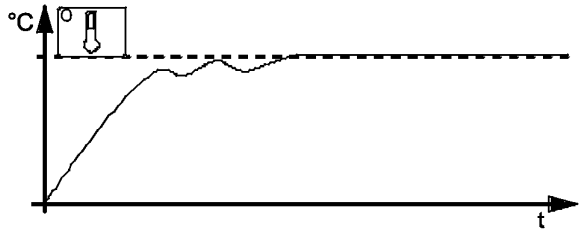
Inappropriate settings may produce the following heat-up curves:



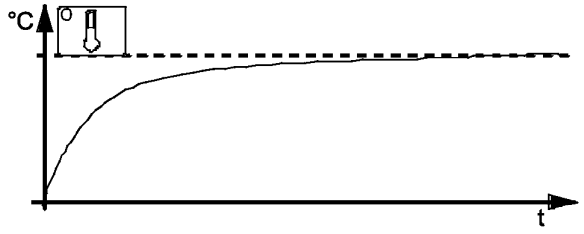
Xp too low



Tv/Tn too low

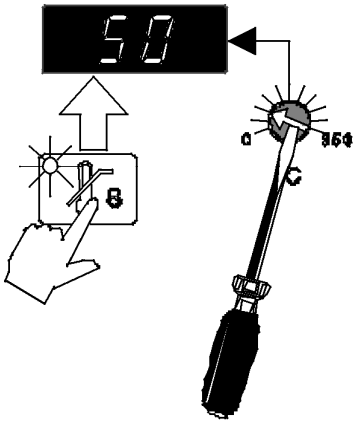


Xp or Tv too high



Tv/Tn or Xp too high

5.9. Setting the safety temperature (with shutdown function)

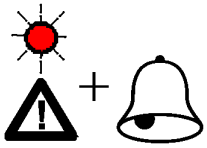


(excess temperature protection)

- Press the key to indicate the safety temperature value on the MULTI-DISPLAY and using a screwdriver simultaneously turn the setting screw to the desired value (example: 50 °C).

Setting range: 0 °C to 360 °C
in 2 °C steps

This safety installation is independent of the control circuit. As soon as this safety installation is triggered, a complete shutdown of the connected heating device is effected.



The alarm is indicated by optical and audible signals (continuous tone)
and
on the MULTI-DISPLAY (LED) appears the error message "**E**rror **01**".

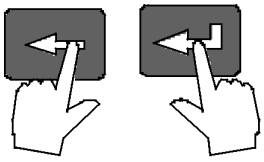
Recommendation:
Set the safety temperature at 5 to 10 °C above the working temperature setpoint.

The excess temperature protection should be set at least 25 °C below the fire point of the bath liquid used!

In the event of wrong setting there is a fire hazard!

We disclaim all liability for damage caused by wrong settings!

6. Menu functions



Parameters and values are set via the menu level that may be selected at any time.

- Enter or exit the menu level by pressing the left arrow and enter at the same time.
- Using the cursor keys select the menu functions one by one.

6.1. Sensor calibration - ATC function

Controller (TT)

Calibration bath (TM)

The ATC (Absolute Temperature Calibration) function serves to calibrate the working sensor.

- Place the working sensor "A" and the temperature sensor of a thermometer in the calibration bath.
- Determine the difference temperature ($\Delta T = T_M - T_T$) and store as correcting factor (example ΔT = -0.26 °C) as follows:
- With the edit keys change the menu function from "Atc 0" to "Atc 1" and then press enter.
- Using the cursor keys and the edit keys set the correcting factor (example -0.26 °C) and then press enter.

After exiting the menu level, the corrected value (example: 36.7 °C) is indicated on the MULTI-DISPLAY (LED).

Recommendation:
In case a calibrated temperature measuring instrument is used, the ATC function allows the controller to be used as testing instrument according to ISO 9000.

6.2. Temperature range: HL / LL

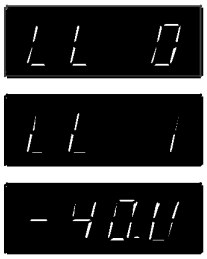
The laboratory controller LC4 features the possibility to limit the working temperature range to protect thermally sensitive substances.

Setting the upper limit

- With the edit keys ↑ ↓ change the menu function from "HL 0" to "HL 1" and then press enter ↵.
- Using the cursor keys ← → and the edit keys ↑ ↓ set the upper limit (example: 250.0 °C) and then press enter ↵.

HL (High Limit) factory-setting: 350.0 °C

Setting the lower limit



- With the edit keys ↑ ↓ change the menu function from "LL 0" to "LL 1" and then press enter ↵.
- Using the cursor keys ← → and the edit keys ↑ ↓ set the lower limit (example: -40.0 °C) and then press enter ↵.

LL (Low Limit) factory-setting: -50.0 °C

6.3. Parameter sets for control: PA

The LC4 provides 5 different parameter sets for controlled processes.

Selecting a parameter set for control:

- Press the edit keys ↑ ↓ to select the desired parameter set (1 to 5) and then press enter ↵. (example: parameter set 3).

For each parameter set, the control parameters Xp, Tn and Tv may be individually modified and stored (see page 12).

Preference: Quick access to parameters determined during previous applications.

		Factory-preset parameter sets for the following controlled processes:
Set 1:	Xp = 4 °C Tn = 150 s Tv = 10 s	Directly heated liquid bath Filling volume: 4.5 litres of water Setpoint temperature: 70 °C Heater capacity: 2000 W
Set 2	Xp = 10 °C Tn = 300 s Tv = 25 s	Directly heated liquid bath Filling volume: 4 litres of Thermal H Setpoint temperature: 150 °C Heater capacity: 2000 W
Set 3	Xp = 20 °C Tn = 1800 s Tv = 165 s	Heating hood model JH2000 with 2000 ml round bottom flask Filling volume: 2 litres of water Setpoint temperature: 70 °C Heater capacity: 480 W (stage III)
Set 4	Xp = 35 °C Tn = 1800 s Tv = 130 s	Heating hood JM500 with 500 ml round bottom flask Filling volume: 0.5 litres of water Setpoint temperature: 70 °C Heater capacity: 150 W (stage II)
Set 5	Xp = 15 °C Tn = 1550 s Tv = 120 s	Heating hood JM500 with 500 ml round bottom flask Filling volume: 0.5 litres of Thermal H Setpoint temperature: 100 °C Heater capacity: 150 W (stage II)

6.4. Active countercooling: Pc

For applications near the ambient temperature, countercooling might become necessary.
For this purpose, connect the JULABO MVS solenoid valve controller to the ❄ / alarm socket (application example see page 9). The supply of a cooling pulse "Pc" must be activated on the controller.

Activating the supply of a cooling pulse:

- With the edit keys ↑ ↓ change the menu function from “Pc 0” to "Pc 1" and then press enter ↵.

Factory setting: "Pc 0" (no countercooling).

- Whenever countercooling is not necessary, reset the “Pc” parameter to 0.

6.5. Controlling the heater capacity: h

This control allows the maximum effective heater capacity of the connected heating device to be adjusted in 10 % steps between 10 % and 100 %. The gradient of the temperature rise function may thus be controlled to permit gentle warming of thermally sensitive substances and to prevent over-shooting.

Controlling the heater capacity:

- Using the edit keys ↑ ↓ set the desired maximum heater capacity and then press enter ↵.
(example: 70 %).

Factory setting: 100 %

6.6. Interface parameters: r - br - P - H

Whenever the parameter setting of the controller is not conform to those of the connected personal computer, a modification is necessary.

Factory setting of the RS232 interface:

Baudrate:	4800 Bauds
Parity:	2 (even)
Handshake:	1 (Hardware handshake)
Data bits:	7
Stop bits:	1

- Press the cursor key **Fehler! Es ist nicht möglich, durch die Bearbeitung von Feldfunktionen Objekte zu erstellen.** until the desired parameter appears on the MULTI-DISPLAY (LED).
- Use the edit keys to set the desired parameter and then press enter.

Adjustable interface parameters

REMOTE
0 = keypad control mode
1 = remote control mode via RS232C

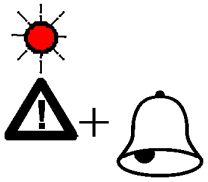
BAUDRATE
12 = 1200 bauds
24 = 2400 bauds
48 = 4800 bauds
96 = 9600 bauds

PARITY
0 = no parity
1 = odd
2 = even

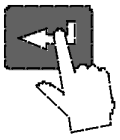
HANDSHAKE
0 = Protocol Xon/Xoff (software handshake)
1 = Protocol RTS/CTS (hardware handshake)

Like all parametes which can be entered through the keypad, interface parameters are stored in memory even after the controller is turned off.

7. Troubleshooting guide / Error messages

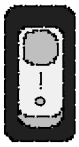


Whenever the microprocessor electronics registers a failure, a complete shutdown of the heating device connected to the controller is performed. The alarm light "⚠" illuminates and a continuous signal tone sounds.



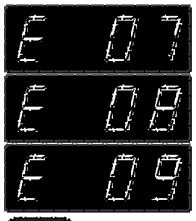
Press enter  to turn off the signal tone.

Cause	Remedy
• The safety temperature value lies below the working temperature setpoint.	Set the safety temperature to a higher value.
• A sudden temperature increase, e.g. caused by the immersion of preheated samples.	Set the safety temperature to a higher value.

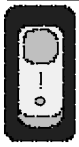


After eliminating the malfunction, press the mains power switch off and on again to cancel the alarm state.

• The wires of the working temperature sensor are interrupted or short-circuited.

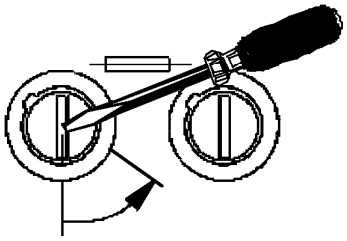


} other errors



After eliminating the malfunction, press the mains power switch off and on again to cancel the alarm state.
If the error reappears, contact an authorized JULABO service station.

If necessary have the unit checked by a JULABO service technician.



Mains fuses

- The mains fuses on the rear of the unit may easily be exchanged as shown on the left.
  (Fine fuse T 10.0 A, dia. 5 x 20 mm)

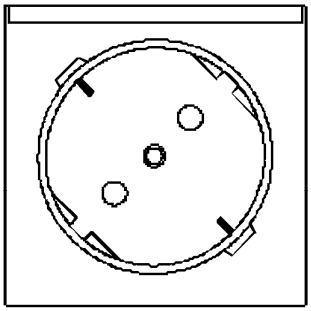
Only use fine fuses with a nominal value as specified.

8. Safety recommendations

Follow the safety recommendations to prevent damage to persons or property. Further, the valid safety instructions for working places must be followed.

- Connect the unit only to a grounded mains power socket!
- Observe the flash point of the bath medium used. The excess temperature protection should be set at least 25 °C below the fire point.
- Set up the heating device according to the instructions prior to connection to the controller and ensure secure attachment to the bath.
  Danger of burning and fire!
- Immerse both temperature sensors in the bath medium and ensure secure attachment.

9. Electrical connections



Grounded mains socket

Connector for heating device

- Maximum 1000 W resistive load at 115 V.
  Maximum current 5 A.
- Maximum 2000 W resistive load at 230 V.
  Maximum current 10 A.

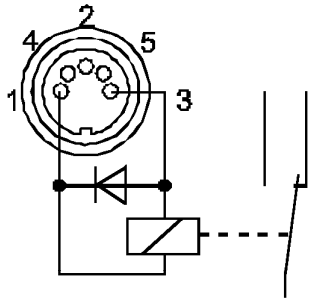
Connectors for temperature sensors

Pin assignment:

Pin 1	Current +
Pin 2	Voltage +
Pin 3	Voltage -
Pin 4	Current -

❄ / ALARM - connector

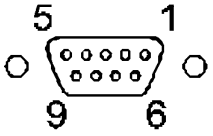
The "❄ ALARM" connector may be used as output for alarm messages.



Circuit: Operation = relay powered
Alarm = relay not powered

Pin assignment:

Pin 1:	+24 V (max. current 25 mA)
Pin 2:	0 V
Pin 3:	0 V / alarm relay
Pin 4:	Reserved - do not use!
Pin 5:	Cooling pulse



RS232C serial interface

This port can be used to connect a computer with an RS232C cable for remote control of the controller.

Pin assignments:

Pin 2	RxD	Receive Data
Pin 3	TxD	Transmit Data
Pin 5	0 VD	Signal GND
Pin 6	DTR	Data terminal ready
Pin 7	RTS	Request to send
Pin 8	CTS	Clear to send

Interface correspondence:

Controller		Computer	Controller		Computer
9-pole		25-pole	9-pole		9-pole
Pin 2 RxD	⇔	Pin 2 TxD	Pin 2 RxD	⇔	Pin 3 TxD
Pin 3 TxD	⇔	Pin 3 RxD	Pin 3 TxD	⇔	Pin 2 RxD
Pin 5 GND	⇔	Pin 7 GND	Pin 5 GND	⇔	Pin 5 GND
Pin 6 DTR	⇔	Pin 6 DSR	Pin 6 DTR	⇔	Pin 6 DSR
Pin 7 RTS	⇔	Pin 5 CTS	Pin 7 RTS	⇔	Pin 8 CTS
Pin 8 CTS	⇔	Pin 4 RTS	Pin 8 CTS	⇔	Pin 7 RTS

Use shielded cables only.
The shield of the connecting cable is electrically connected to the plug housing.

10. Remote control

10.1. Communication with a PC or a superordinated data system

Suitable terminal programs for communicating with a PC are:
- MS-Windows - TERMINAL.EXE (included with MS-Windows).
- MS-DOS - Procomm Plus, Datastrom Technologies.
- MS-DOS - Norton Utilities.

If the controller is put into remote control mode via the configuration level, the display will read "r OFF" = REMOTE STOP. The controller is now operated via the computer.

In general, the computer (master) sends commands to the controller (slave). The controller sends data (including error messages) only when the computer asks for it.

A transfer sequence consists of:
- command
- space (⇔; Hex: 20)
- parameter (the character separating decimals in a group is the period)
- End of file (↵; Hex: 0D)

The commands are divided into **in** and **out** commands.
in commands: asking for parameters to be displayed
out commands: setting parameters

The out commands are valid only in remote control mode.

Examples:
- Command to set the working temperature to 55.5 °C:

  out_sp_00 Û 55.5¿
- Command to ask for the working temperature:

  in_sp_00¿
- Response from the controller:

  55.5¿

10.2. List of commands

Befehl	Parameter	Description
version	none	Number of software version (V X.xx)
status	none	Status message, error message (see page 28)
out_mode_05	0	Stop the controller = r OFF
out_mode_05	1	Start the controller
out_mode_02	1	Parameter set 1 effective for control
out_mode_02	2	Parameter set 2 effective for control
out_mode_02	3	Parameter set 3 effective for control
out_mode_02	4	Parameter set 4 effective for control
out_mode_02	5	Parameter set 5 effective for control
in_mode_02	none	Ask for effective parameter set
out_sp_00	xxx.x	Set working temperature
in_sp_00	none	Ask for working temperature
in_pv_00	none	Ask for effective value registered by working sensor
in_pv_01	none	Ask for effective heater capacity
out_par_00	xxx.x	Set Xp of parameter set 1
in_par_00	none	Ask for Xp of parameter set 1
out_par_01	xxx.x	Set Tn of parameter set 1
in_par_01	none	Ask for Tn of parameter set 1
out_par_02	xxxx.x	Set Tv of parameter set 1
in_par_02	none	Ask for Tv of parameter set 1
out_par_03	xxx.x	Set Xp of parameter set 2
in_par_03	none	Ask for Xp of parameter set 2

Command	Parameter	Description
out_par_04	xxx.x	Set Tn of parameter set 2
in_par_04	none	Ask for Tn of parameter set 2
out_par_05	xxxx.x	Set Tv of parameter set 2
in_par_05	none	Ask for Tv of parameter set 2
out_par_06	xxx.x	Set Xp of parameter set 3
in_par_06	none	Ask for Xp of parameter set 3
out_par_07	xxx.x	Set Tn of parameter set 3
in_par_07	none	Ask for Tn of parameter set 3
out_par_08	xxxx.x	Set Tv of parameter set 3
in_par_08	none	Ask for Tv of parameter set 3
out_par_09	xxx.x	Set Xp of parameter set 4
in_par_09	none	Ask for Xp of parameter set 4
out_par_10	xxx.x	Set Tn of parameter set 4
in_par_10	none	Ask for Tn of parameter set 4
out_par_11	xxxx.x	Set Tv of parameter set 4
in_par_11	none	Ask for Tv of parameter set 4
out_par_12	xxx.x	Set Xp of parameter set 5
in_par_12	none	Ask for Xp of parameter set 5
out_par_13	xxxx.x	Set Tn of parameter set 5
in_par_13	none	Ask for Tn of parameter set 5
out_par_14	xxxx.x	Set Tv of parameter set 5
in_par_14	none	Ask for Tv of parameter set 5

10.3. Status messages

Message	Description
00 MANUAL STOP	Controller in "OFF" state
01 MANUAL START	Controller in keypad control mode
02 REMOTE STOP	Controller in "r OFF" state
03 REMOTE START	Controller in remote control mode

10.4. Error messages

Message	Description
-01 SAFETY-TEMP ALARM	Safety temperature alarm
-05 TEMPERATURE MEASUREMENT ALARM	Error in measuring system.
-07 I2C-BUS WRITE ERROR -07 I2C-BUS READ ERROR -07 I2C-BUS READ/WRITE ERROR	Internal errors
-08 INVALID COMMAND	Invalid command
-10 VALUE TOO SMALL	Entered value too small
-11 VALUE TOO LARGE	Entered value too large
-12 VALUE NOT VALID	Value not valid
-13 COMMAND NOT ALLOWED IN CURRENT OPERATING MODE	Invalid command in current operating mode

11. Maintenance

The controller is designed for continuous operation under normal conditions. Periodic maintenance is not required.

Repairs

Before asking for a service technician or returning a JULABO unit for repair, please contact our technical service.

When returning a unit, take care of careful and adequate packing. JULABO is not responsible for damages that might occur from insufficient packing.

JULABO reserves the right to carry out technical modifications with repairs for providing improved performance of a unit.

12. Technical specifications

Adjustable temperature range	°C	-50 350
Display accuracy	%	±0.5 ± 1 Digit
Temperature stability (depending on substances in the bath)	°C	>±0.05
Temperature selection		digital
via keypad		indication on MULTI-DISPLAY (LED)
remote control via personal computer		indication on monitor
Temperature display		MULTI-DISPLAY (LED): 4-digit Working temperature: 4-digit
Resolution	°C	0.1
ATC function	°C	±9.99
Temperature control		PID
with 5 parameter sets		freely selectable
Working temperature sensor		Pt100, 4-lead technique
Safety temperature sensor		Pt100, 4-lead technique
Electrical connections:		
External alarm		24-0 V DC / max. 25 mA
Interface		RS232C
Mains power socket		
for heating device (at 115 V)	W	max. 1000; resistive load
or (at 230 V)	W	max. 2000; resistive load
Ambient temperature	°C	5 ... 40
Mains power connection (±10 %)	V/Hz	230 / 50-60
or	V/Hz	115 / 50-60
Total power consumption	W	max. 1050 (at 115 V)
	W	max. 2050 (at 230 V)
Overall dimensions (WxDxH)	cm	17 x 17 x 16
Weight		kg 3

All measurements have been carried out at
mains voltage 230 V / 50 Hz
ambient temperature 20 °C
Technical changes without prior notification reserved.

Safety installations according to IEC 61010-2-010:	
Excess temperature protection	0 °C ... 350 °C
Supplementary safety installations:	
Supervision of the working sensor	plausibility control
Alarm indication	optical + audible (continuous tone)

Standards:

EMC regulations EN 61326

Guideline for first voltage range EN 61010-1, EN 61010-2-010

Environment:

Use only indoor.

Altitude up to 2000 m - normal zero.

Ambient temperature: +5 ... +40 °C (for storage and transportation)

Air humidity acc. DIN EN 61 010, part 1:

Max. rel. humidity 80 % for temperatures up to +31 °C,

linear decrease down to 50 % rel. humidity at a temperature of +40 °C

Protection class:IP 31 acc. EN 60 529

Power supply: acc. to class 1, VDE 0106 T1

not for use in explosive atmosphere

Max. mains fluctuation of ±10 % are permissible.

Overvoltage category II

Pollution degree 2

13. EC Declaration of Conformity

CE

The following unit complies with the essential safety requirements outlined by the EC Directives concerning the guidelines for electromagnetic compatibility (89/336/EEC) and for the low voltage regulations (73/23/EEC).

Temperature controller: **LC4**

This unit is manufactured in compliance with the following guidelines

electrical equipment for control technology and laboratory application – EMC requirements outlined by
EN 61326

safety regulation for electrical devices for measuring, control and laboratory application specified by
EN 61010

Julabo

Julabo Labortechnik GmbH
Eisenbahnstr. 45
D-77960 Seelbach / Germany

G. Juchheim, Managing Director

14. Warranty conditions

JULABO Labortechnik GmbH warrants its products against defects in material or in workmanship, when used under appropriate conditions and in accordance with appropriate operating instructions

for a period of ONE YEAR.

Extension of the warranty period – free of charge

With the '1PLUS warranty' the user receives a free of charge extension to the warranty of up to 24 months, limited to a maximum of 10 000 working hours.

To apply for this extended warranty the user must register the unit on the JULABO web site www.julabo.de, indicating the serial no. The extended warranty will apply from the date of JULABO Labortechnik GmbH's original invoice.

JULABO Labortechnik GmbH reserves the right to decide the validity of any warranty claim. In case of faults arising either due to faulty materials or workmanship, parts will be repaired or replaced free of charge, or a new replacement unit will be supplied.

Any other compensation claims are excluded from this guarantee.