Julabo
THE TEMPERATURE CONTROL COMPANY

CORIO™ CP



Heating immersion circulator, open bath heating circulator, refrigerated circulator

Original operating manual

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Legal

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1 Foreword

Congratulations!

You have made an excellent choice.

JULABO would like to thank you for the trust you have placed in our company and products.

This operating manual will help you become acquainted with the use of our units. Read the operating manual carefully. Keep the operating manual handy at all times.

2 About this manual

This manual is intended for the equipment specified on the cover page.



NOTE

Observe the safety instructions!
Read the Safety section of this manual before using the equipment for the first time.

2.1 Original JULABO spare parts

Hassle-free continuous operation and safety also depend on the quality of the spare parts used.

Only original JULABO spare parts guarantee the highest possible quality and safety. Original JULABO spare parts are available directly from JULABO or your specialist dealer.
Please note that JULABO cannot provide a warranty service if non-original JULABO spare parts are used.

2.2 Accessories

JULABO offers a wide range of accessories for the devices. Accessories are not described in this manual.

The complete range of accessories for the devices described in this manual can be found on our website **www.julabo.com**. Use the Search function on the website.

2.3 Warnings

The manual contains warnings to increase safety when using the device. Warnings must always be observed.

A warning sign displayed in signal color precedes the signal word. The signal word, highlighted in color, specifies the severity of the hazard.



DANGER

This signal word designates a danger with a high level of risk which, if it not prevented, will result in death or serious injuries.



WARNING

This signal word designates a danger with a medium level of risk which, if it not prevented, may result in death or serious injuries.



CAUTION

This signal word designates a danger with a low level of risk which, if it not prevented, may result in minor to moderate injuries.



NOTE

This signal word designates a possibly harmful situation. If it is not avoided, the system or objects in its vicinity may be damaged.

2.4 Symbols used

Various symbols are used throughout this manual to aid reading comprehension. This list describes the symbols used.

- 🛠 Tools needed for the following approach
- ▶ Prerequisite to be met for the following procedure
- 1. Numbered action steps
- ➥ Interim result for individual action steps
- ☝ Additional note for individual action steps
- ✓ Final result of a procedure
- <> Terms in angle brackets denote control menu
- [] Terms in square brackets denote keys, softkeys and buttons

3 Intended use

This section defines the purpose of the unit so that the operator can operate the unit safely and avoid misuse.

JULABO circulators are laboratory devices that are designed for temperature control applications with liquid media in a bath tank or with a cooling machine. An external loop circuit can be connected to the pump connectors so that the temperature of the bath media can be kept constant.

Only use the device if it is in technically perfect condition and only use it in accordance with its intended use. Be aware of safety issues or hazards and comply with the operating manual! In particular, always immediately rectify faults that could impair safety!

The circulators are not suitable for direct temperature control application of food, other consumables or pharmaceutical or other medical products.

The devices are not suitable for use in an explosive environment.

The devices are not intended for use in living areas. They may cause interference with radio reception.

4 Safety

4.1 Safety instructions

The unit is built in accordance with state of the art technology and recognized safety regulations. Despite this, its use may pose a risk to life and limb for the user or third parties.

Therefore, always read and observe the following safety instructions before using the product.

Hot surfaces!

The following parts and elements may become hot during operation:

– Bath fluid
– Heating element
– Bath lid
– Bath surface
– Connections for external application

Contact may cause severe burns or scalds to hands and arms, face and limbs.

- Keep sufficient distance from hot surfaces and fluids.
- Wear suitable protective gloves.

Electric shock from electrical system!

Touching damaged live parts can cause severe electric shocks and lead to injury or even death.

- Have damaged insulation and parts of the electrical system immediately repaired by JULABO service technicians or a qualified specialist workshop
- Immediately replace damaged power cords
- When connected with a mains plug, this mains plug must always be readily accessible

Refrigerants are harmful to health!

Refrigerants and their vapors are harmful to health. There is a suffocation risk in enclosed spaces.

- Do not touch or inhale refrigerants.
- Have damage to the refrigerant cycle repaired only by JULABO service technicians or qualified specialists.
- If refrigerant leaks, stop the device immediately and ventilate the room thoroughly.

Natural refrigerants are flammable!

The device contains flammable refrigerants. If there is a leak in the refrigerant cycle, a flammable concentration may form in the air and ignite or explode. This can result in serious injury or death.

- Use the required minimum room size for operating the device.
- Do not store any potential sources of ignition near the device.
- If refrigerant leaks, stop the device immediately and ventilate the room thoroughly.
- Have damage to the refrigerant cycle repaired only by JULABO service technicians or qualified specialists.
- Have maintenance work performed only by JULABO service technicians or qualified specialists.

Wear personal protective equipment!

Lacking or unsuitable personal protective equipment increases the risk of health damage and injury.

Personal protective equipment includes, for example:

– Work gloves
– Safety shoes
- Protective clothing
– Breathing protection
- Hearing protection
– Face and eye protection

- Specify and provide personal protective equipment for the respective application.
- Use only personal protective equipment that is in good condition and provides effective protection.
- Adapt personal protective equipment to the person, e.g., by size.

Keep safety symbols legible!

Safety symbols on the unit warn of dangers in hazardous areas and are an important part of the unit's safety equipment. Missing safety symbols increase the risk of injury to persons.

- Clean dirty safety symbols.
- Replace damaged and unrecognizable safety symbols immediately.

Maintenance and repair work!

Improper maintenance and repair work jeopardizes operational safety. This can result in serious injury or death.

- Only carry out work described in this operating manual. Switch off the unit and disconnect it from the power supply before carrying out any work.
- All other maintenance and repair work may only be carried out by a JULABO service technician or a qualified specialist workshop.

4.2 Safety symbols

There are safety symbols included with the device, which should be attached to the device before initial operation.

Safety symbols	Description
	Warning of a danger zone. Note operating manual
	Warning about hot surface
	Warning of cold surface
	Warning of a flammable liquid heat transfer medium
	Read operating manual before switching on

4.3 Safety function

Technical protective devices provide for safe operation. If a safety function is triggered, the operator is alerted with a message on the display and an acoustic signal.

Adjustable high temperature cut-off

The high temperature cut-off prevents overheating of the heater.

- If the measured temperature rises above the set protective temperature, an error message is shown on the display. The pump and heater are switched off. A restart is required.

Overheating protection

The overheating protection prevents overheating of the heater.

- The protective mechanism is triggered when the device recognizes a temperature difference of more than 20 K between the working temperature sensor and the safety temperature sensor. Am error message appears on the display. A restart is required.

Low liquid level protection

A level switch recognizes when the bath fluid fill level in the bath tank is too low. The device has a two-stage warming system to prevent overheating of the heater or dry running of the pump.

- The low liquid level warning is triggered when the liquid level in the bath tank is about half the full level. A warning message appears on the display. The bath fluid should be topped up.
- The low liquid level alarm is triggered when the float reaches its lower limit stop. The device switches off the pump and heater. A continuous signal tone sounds. A warning message appears on the display. A restart is required.

5 Product description

5.1 Product overview

Circulators can be combined with various baths and cooling machines.

Heating immersion circulator



CORIO CP circulator

Heating circulator



Circulator with closed stainless steel bath tank.
Example: CORIO CP-BC4 for temperature control application in the bath or an external application

Refrigerated circulator



Circulator with cooling machine.
Example: CORIO CP-300F for standard temperature applications

5.2 Function description

This section describes the function of the device.

The circulator can be mounted on any bath tank with a volume up to 50 liters. The circulators are used for internal and external temperature control, and depending on the device combination and accessories used can work in a temperature range between -50°C and +200°C.

When mounted on a bath tank the circulator is a heating circulator, when combined with a cooling machine it is a refrigerated circulator.

5.3 Operating and functional elements

The following figure shows the operating and functional elements and their position on the unit.

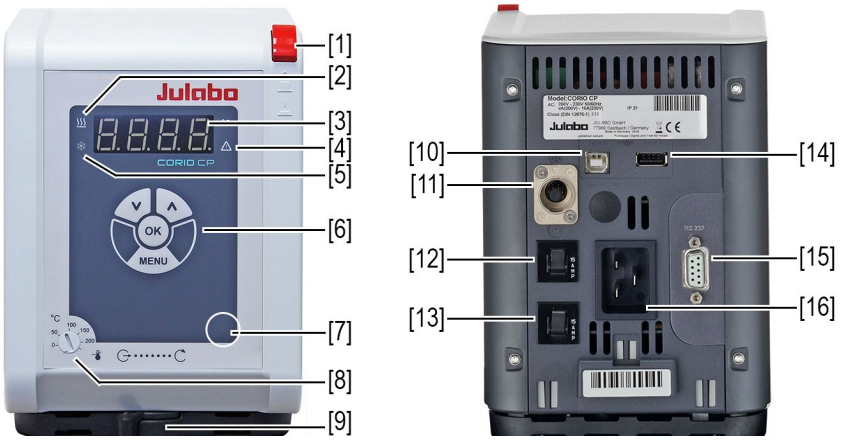


Fig. 1: Control and function elements

1	Mains switch
2	Heating control LED
3	LED display
4	Alarm control LED
5	Cooling control LED
6	Keypad with display
7	Service key (covered)
8	High temperature cut-off setting
9	Internal/external flow direction setting
10	USB interface, Type B
11	CAN plug for connection with a refrigeration unit
12	Mains fuse, resettable
13	Mains fuse, resettable
14	USB interface, Type A
15	RS232 interface
16	Mains connection

5.3.1 Key description

The device is operated using the key panel. This is used to control all menu functions and make entries.

Key	Function
	The **[OK]** key is used to start a temperature control application or to stop a running temperature control application. The **[OK]** key enables a selected function, opens a menu option, or confirms a set value.
	Use the arrow keys to navigate in the main menu, select a function, or set a value. Short press for single steps, press and hold for fast counting.
	The **[MENU]** key is used to bring up main menu, to undo an entry, or to jump back one step in the menu.

5.4 Interfaces

This section describes the electronic interfaces on the device.

For safe operation, the interfaces must be operated according to their corresponding permissible specifications.

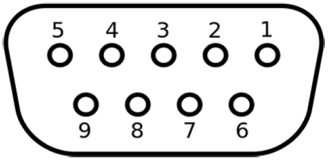
5.4.1 Insulation requirements for the connection of external equipment

External equipment connected to the thermostat must be reinforced or double insulated from the mains and the maximum voltages must be below the values of 30 VAC / 60 VDC.

Also note the maximum voltage information in the technical specifications for the individual interfaces.

5.4.2 RS232 interface

The RS232 interface is a 9-pin D-Sub socket for connecting the device to a PC.



RS232 plug

RS232 interface pin assignment			
Pin 2	RxD receive data	Pin 7	RTS request to send
Pin 3	TxD transmit data	Pin 8	CTS clear to send
Pin 5	0 V signal GND		

Pins 1, 4, 6 and 9 are reserved. Do not use.

RS232 interface factory setting	
Parity	straight
Baud rate	4800 baud
Handshake	Hardware
Data bit	7
Stop bit	1

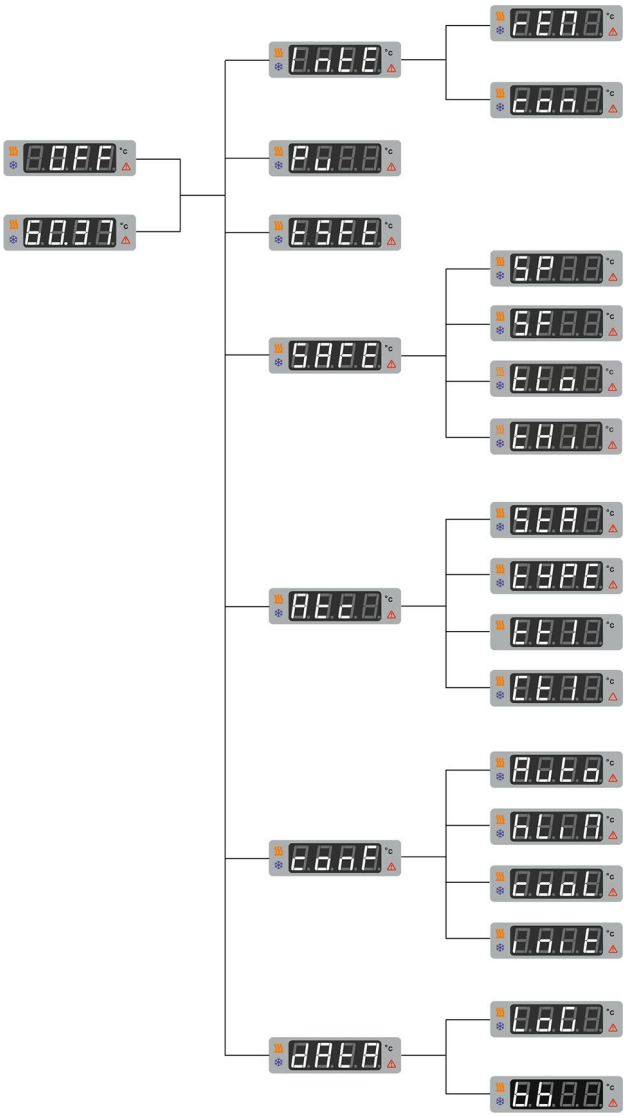
5.4.3 USB-A interface

USB sticks can be connected to the USB-A interface. This unit is capable of reading data from the USB stick as well as saving data to the USB stick.

Technical data for USB-A interface	
Output voltage	5 VDC
Maximum current	500 mA

5.5 Operating interface

The device is operated using the four navigation keys. The figure shows the menu structure of the user interface.



Menu structure

5.6 Alarm messages

Alarms and warnings are indicated on the display using error codes. Important error code descriptions can be found in the appendix. If you are unable to rectify a fault, contact Technical Service.

Alarm:

In the event of an alarm, the control LED lights up. The temperature control is stopped. At the same time, a continuous acoustic signal sounds and an error code is shown on the display. The acoustic signal can be deactivated by pressing the **[OK]** key. The fault causing the alarm must be remedied. A restart is required.

Warning:

In the event of a warning, the temperature control application is not interrupted. A signal tone is emitted at intervals. The display alternates between the actual temperature and the error code. The acoustic signal can be deactivated by pressing the **[OK]** key. If the underlying cause of the warning is remedied, the signal tone ceases. Depending on the cause, warnings may cease automatically after a period of time, e.g. when the device cools down.

5.7 Main menu

The **[MENU]** key is used to access the main menu. The Main menu is divided into menu options, which respectively contain more submenus or in which settings can be specified. The main menu can be exited by pressing the **[OK]** key or by pressing the **[MENU]** key again.

The **<Main menu>** is divided into the following menu options:

- **<IntE>** Interface:
  - **<rEM>** Set up remote control mode
  - **<con>** Set interface parameters
- **<Pu>** Set pump capacity
- **<tSEt>** Set timer
- **<SAFE>** Safety:
  - **<SP>** Display for high temperature cut-off settings
  - **<SF>** Display for safety temperature sensor settings
  - **<tHi>** Set overtemperature warning
  - **<tLo>** Set subtemperature warning
- **<Atc>** Adjust temperature sensors (ATC):
  - **<StA>** Enable/disable adjustment
  - **<tYPE>** Set type of adjustment
  - **<tt1> ... <tt3>** Actual values of circulator
  - **<Ct1> ... <Ct3>** Correction value
- **<con>** Configure:
  - **<AUto>** Select/deselect autostart function
  - **<hLiM>** Set power supply
  - **<cooL>** Set chiller mode
  - **<init>** Factory reset
- **<dAtA>** Data logging:
  - **<LoG>** Enable/disable data logging
  - **<bb>** Read out blackbox data

5.8 Technical data

Performance specifications measured in accordance with DIN12876. Cooling capacities up to 20°C measured with ethanol; over 20°C with thermal oil unless specified otherwise. Performance specifications apply at an ambient temperature of 20°C. Performance values may differ with other bath fluids.

Grouping of the device acc. to CISPR 11:

- The device is an ISM device of group 1, which uses high frequency for internal purposes
- Class A: Use in an industrial electromagnetic environment

In accordance with IEC 61010-1, the device is designed for safe operation under the following ambient conditions:

- Indoor use
- Altitude up to 2000 m above sea level
- Ambient temperature +5 … +40°C
- Maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly down to 50% relative humidity at 40°C
- Mains voltage fluctuations up to ±10% of the nominal voltage permissible if not otherwise specified
- Pollution degree level 2

Protection class according to EN 60 529:

- Protection class IP21

CORIO CP					
Temperature control application					
Working temperature range	°C	+20… +200			
Temperature stability	°C	± 0.03			
Temperature resolution	°C	0.01			
Temperature control		PID1			
Temperature setting		Digital			
ATC sensor adjustment		3-point adjustment			
Pump					
Volume flow rate at 0 bar	l/min	8… 27			
Supply pressure at 0 l	bar	0.1… 0.7			
Maximum viscosity	cSt	50			
Dimensions					
Dimensions (W x D x H)	cm	13.2 x 16.0 x 36.2			
Immersion depth	cm	16.0			
Weight	kg	2.5			
Display					
Display		LED			
Performance data					
Mains connection		100-115 V, 50/60 Hz		200-230 V, 50/60 Hz	
		100 V 50/60 Hz	115 V 50/60 Hz	200 V 50/60 Hz	230 V 50/60 Hz
Current consumption	A	9	10	9	10
Heating capacity	kW	0.8	1.0	1.5	2.0
Mains fuse, resettable	A	15			

5.8.1 Material of parts that come into contact with the medium

The table lists parts that could come into contact with the bath fluid as well as the material that the parts are made of. This data can be used to check the compatibility of the parts with the bath fluid used.

Parts that come into contact with the medium	Material
Motor	1.4301
Pump	PPS
Heating element	1.4404/316L
Inbuilt temperature sensor Pt100	1.4571
Connection of temperature sensor	1.4301
Float	1.4401
Float pipe	1.4571
Hose olive	1.4301
Single-ear clamp	1.4301
Hose	FPM/FKM

5.8.2 Technical data for refrigerated circulators

This section lists the technical data of the refrigerated circulator.

Technical data		**CORIO CP-200F**					
Working temperature range	°C	-20 … +200					
Cooling capacity	°C	+20	+10	0	-10	-20	
	kW	0.20	0.17	0.15	0.10	0.02	
Refrigerant		R134A					
Dimensions							
Dimensions (W x D x H)	cm	23 x 39 x 65					
Usable bath opening	cm	13 x 15					
Bath depth	cm	15					
Volumes min. … max.	l	3.0 … 4.0					
Weight	kg	26.0					

Technical data		**CORIO CP-201F**					
Working temperature range	°C	-20 … +200					
Cooling capacity	°C	+20	+10	0	-10	-20	
	kW	0.20	0.17	0.15	0.10	0.02	
Refrigerant		R134A					
Dimensions							
Dimensions (W x D x H)	cm	44 x 41 x 44					
Usable bath opening	cm	13 x 15					
Bath depth	cm	15					
Volumes min. … max.	l	3.0 … 4.0					
Weight	kg	24.7					

Technical data		**CORIO CP-300F**					
Working temperature range	°C	-25 … +200					
Cooling capacity	°C	+20	+10	0	-10	-20	
	kW	0.30	0.30	0.27	0.19	0.08	
Refrigerant		R134A					
Dimensions							
Dimensions (W x D x H)	cm	24 x 42 x 66					
Usable bath opening	cm	13 x 15					
Bath depth	cm	15					
Volumes min. … max.	l	3.0 … 4.0					
Weight	kg	28.0					

Technical data		**CORIO CP-310F**					
Working temperature range	°C	-30… +200					
Cooling capacity	°C	+20	0	-10	-20	-30	
	kW	0.30	0.27	0.21	0.12	0.02	
Refrigerants		R449A, R290					
Dimensions							
Dimensions (W x D x H)	cm	23 x 40 x 65					
Usable bath opening	cm	13 x 15					
Bath depth	cm	15					
Volumes min. … max.	l	3.0 … 4.0					
Weight	kg	25.6					

at 200-230 V, 50/60 Hz, permissible voltage deviation: ±5%

Technical data		**CORIO CP-449F**					
Working temperature range	°C	-30… +200					
Cooling capacity	°C	+20	0	-10	-20	-30	
	kW	0.44	0.35	0.27	0.20	0.06	
Refrigerants		R290					
Dimensions							
Dimensions (W x D x H)	cm	37 x 59 x 69					
Usable bath opening	cm	28 x 35					
Bath depth	cm	20					
Volumes min. … max.	l	21.0 … 30.0					
Weight	kg	39.5					

Technical data		**CORIO CP-450F**					
Working temperature range	°C	-30… +200					
Cooling capacity	°C	+20	0	-10	-20	-30	
	kW	0.44	0.37	0.27	0.16	0.06	
Refrigerants		R449A, R290					
Dimensions							
Dimensions (W x D x H)	cm	23 x 40 x 65					
Usable bath opening	cm	13 x 15					
Bath depth	cm	15					
Volumes min. … max.	l	3.0 … 4.0					
Weight	kg	25.6					

at 200-230 V, 50/60 Hz, permissible voltage deviation: ±5%

Technical data		**CORIO CP-600F**					
Working temperature range	°C	-35… +200					
Cooling capacity	°C	+20	+10	0	-10	-20	-30
R452A	kW	0.60	0.54	0.50	0.33	0.19	0.07
R449A	kW	0.60	0.54	0.44	0.27	0.16	0.04
Refrigerant		R449A, R452A*					
Dimensions							
Dimensions (W x D x H)	cm	33 x 47 x 69					
Usable bath opening	cm	22 x 15					
Bath depth	cm	15					
Volumes min. … max.	l	5.0 … 7.5					
Weight	kg	35.7					

at 200-230 V, 50/60 Hz, permissible voltage deviation: ±5%,
** at 100 V, 50/60 Hz*

Technical data		**CORIO CP-601F**					
Working temperature range	°C	-35… +200					
Cooling capacity	°C	+20	+10	0	-10	-20	-30
R452A	kW	0.60	0.54	0.50	0.33	0.19	0.07
R449A	kW	0.60	0.54	0.44	0.27	0.16	0.04
Refrigerant		R449A, R452A*					
Dimensions							
Dimensions (W x D x H)	cm	33 x 47 x 74					
Usable bath opening	cm	22 x 15					
Bath depth	cm	20					
Volumes min. … max.	l	8.0 … 10.0					
Weight	kg	38.5					

at 200-230 V, 50/60 Hz, permissible voltage deviation: ±5%,
** at 100 V, 50/60 Hz*

Technical data		**CORIO CP-900F**					
Working temperature range	°C	-38 … +200					
Cooling capacity	°C	+20	+10	0	-10	-20	-30
	kW	0.90	0.85	0.80	0.52	0.31	0.11
Refrigerant		R449A					
Dimensions							
Dimensions (W x D x H)	cm	39 x 62 x 75					
Usable bath opening	cm	26 x 35					
Bath depth	cm	20					
Volumes min. … max.	l	21.0 … 30.0					
Weight	kg	52.0					

Technical data		**CORIO CP-1000F**					
Working temperature range	°C	-50… +200					
Cooling capacity	°C	+20	0	-10	-20	-30	-40
	kW	1.00	0.96	0.73	0.51	0.25	0.11
Refrigerant		R449A					
Dimensions							
Dimensions (W x D x H)	cm	42 x 49 x 74					
Usable bath opening	cm	18 x 13					
Bath depth	cm	15					
Volumes min. … max.	l	5.0 … 7.5					
Weight	kg	51.5					

at 200-230 V, 50/60 Hz, permissible voltage deviation: ±5%

Technical data		**CORIO CP-1001F**					
Working temperature range	°C	-38… +100					
Cooling capacity	°C	+20	+10	0	-10	-20	-30
	kW	1.00	0.95	0.85	0.60	0.32	0.12
Refrigerant		R449A					
Dimensions							
Dimensions (W x D x H)	cm	45 x 64 x 95					
Usable bath opening	cm	35 x 41					
Bath depth	cm	30					
Volumes min. … max.	l	42.0 … 56.0					
Weight	kg	73.7					

Technical data		**CORIO CP-1000FW**					
Working temperature range	°C	-50… +200					
Cooling capacity	°C	+20	0	-10	-20	-30	-40
	kW	1.00	0.96	0.73	0.51	0.25	0.11
Refrigerant		R449A					
Dimensions							
Dimensions (W x D x H)	cm	42 x 49 x 70					
Usable bath opening	cm	18 x 13					
Bath depth	cm	15					
Volumes min. … max.	l	5.0 … 7.5					
Weight	kg	51.5					

at 200-230 V, 50/60 Hz, permissible voltage deviation: ±5%

5.8.3 Bath fluids

The most important criterion when selecting the bath fluid is the working temperature range in which the application is operated.

- Selection of the bath fluid must ensure that the flash point is never exceeded when it comes into contact with the ambient air.
- Recommended bath fluids and further information can be found on our website



WARNING

Risk of burns due to Flammable heat transfer medium

If a flammable heat transfer medium is used, it may ignite and cause serious burns when it comes into contact with skin.

- Ensure all ventilation openings are not obstructed
- No smoking! No flame!
- Do not use electrical parts which can produce spark when operating around the equipment and the application system
- Drain and recover the liquid when the equipment idles, if the liquid heat transfer medium is used with an open bath tank and if it is highly volatile at ambient temperature
- Affix a label on the equipment with symbol  if a flammable liquid heat transfer medium is to be used



NOTE

No liability accepted for usage of bath fluids that are not suitable!

Unsuitable bath fluids that are not approved by JULABO can damage the water bath.

- Use bath fluids that are recommended by JULABO
- Before filling, check the parts that are in contact with the medium for compatibility with the bath fluid
- Do not exceed the maximum permissible viscosity during operation
- Consult JULABO before using a bath fluid other than the recommended one



NOTE

Material damage caused by freezing water!
Freezing water can damage the device and the sample.
- When using water as the tempering fluid, do not temper below 5°C

Water as bath fluid
- Water can be used for working temperatures from +5 °C to +90 °C
- Recommended: Use only ultrapure or distilled water.
- When using ultrapure or distilled water, add 0.1 g Na_2CO_3 per liter of water.

Recommended bath fluid
- JULABO Thermal G

5.8.4 Hoses

Hoses for connection of an external system must suit the working temperature range and the respective temperature control application.
Hoses for every area of application can be found on our website.

Hoses must meet the following requirements:
- Temperature resistance
- Pressure resistance
- Suitable material properties for the bath fluid used

6 Transport and installation

This section describes how to transport the unit safely.

6.1 Transporting the device

A circulator can be transported with the cooling machine when mounted.



CAUTION

Risk of crushing by falling device!
A device that is not secured appropriately can fall down during improper transport and cause crushing injuries.
- Secure the device against tipping and falling during transport
- Secure loose parts against falling during transport
- Transport the device upright and with a suitable means of transport
- Wear personal protective equipment



CAUTION

Burn hazard on the heating element!
The heating element may still be hot even after the device has been switched off, and may cause burns if touched.
- Allow the device to cool down to room temperature after switching off
- Wear protective gloves

► The device is switched off and emptied.
► A suitable transport trolley is available.
1. Unplug the power plug from the device.
2. If necessary, disassemble the temperature control hoses of the external system.
3. Use the recessed grips on the cooling machine to lift the device onto the center of the transport trolley, if necessary in a pair.

☝ See the technical data for weight information.

4. Use straps to secure the device against tipping in the center of the transport trolley.
5. Place loose parts for the device, such as cables, on the transport trolley.

✓ The device is then ready for transport and can be safely transported to its installation location.

6.2 Install the device at the operating location

This section describes how the device is set up at the installation location.

- ▶ The device has been transported to the operation location.
- ▶ The size and infrastructure of the operation location are suitable for device operation.

1. If possible, position the device under an extraction system.

☝ Depending on the bath fluid, gases may be created at high temperatures.

☝ Recommended minimum distance of 1 m to other devices, to prevent electromagnetic interference.

2. Place the device on a level, smooth, non-flammable surface.
3. Ensure that the device is securely positioned.
4. For refrigerated circulators: Ensure an open space in front of and behind the device of at least 20 cm.

✓ The device is set up at the operation location.

7 Initial operation

7.1 Mounting the circulator

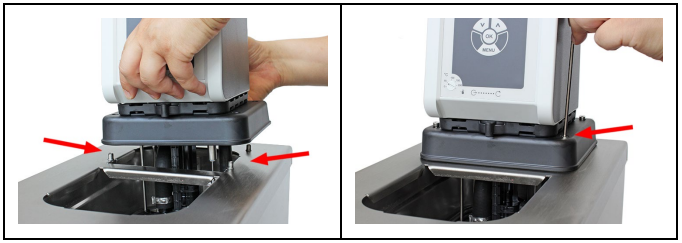
7.1.1 Mount heating or refrigerated circulator

In the case of a heating circulator or a refrigerated circulator, the circulator is mounted on the closed bath or on cooling machine.

If the circulator is disassembled, e.g. due to a change of device or for service purposes, it can then be easily reassembled with the connecting box.

🛠 Allen key, size 3 mm

- ▶ The circulator is ready to be mounted on a closed bath or cooling machine.
- ▶ The bath is empty.



1. Carefully insert the circulator into the bath.
- ➥ Align the bath's four threaded sleeves with the four holes on the connection box.
2. Place the four mounting screws into the holes on the connection box.
3. Tighten the mounting screws [right image].
4. Check that the circulator is seated correctly, and that the connection box gasket is seated on the unit surface without any gaps.
- ✓ The heating circulator or refrigerated circulator is mounted.

7.2 Connect the device to the power supply

7.2.1 Connect bridge mounted or heating circulator

This section describes how the circulator is connected as a bridge mounted circulator or heating circulator.

- ► The circulator is mounted as a bridge mounted or heating circulator.
- ► The power cable is ready for use. If using the 200-230 V, 50/60 Hz variant in the United States or Canada, you must use the JULABO power cable USA 3x12AWG (order number 7.901.2694). This power cord is not included.



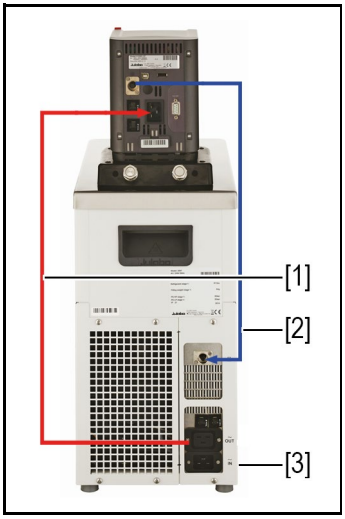
1. Insert the power cable on the back of the circulator into the mains connection [1].
2. Connect the circulator to the power supply using the power cable.

✓ The circulator is connected.

7.2.2 Connect refrigerated circulator

This section describes how the circulator is connected as a refrigerated circulator.

- ► The circulator is mounted on a refrigeration unit.
- ► The connection cable, mains cable and CAN bus cable are ready for use.



1. Connect the connection cable [1] of the circulator with the refrigeration unit.
2. Connect the CAN plugs of both units with the CAN bus cable [2].
3. Connect the refrigeration unit to mains power [3] using the power cable.

✓ The refrigerated circulator is connected. Alternatively, the units can be connected to separate circuits. If necessary, the power supply must be set up in the unit setting.

7.3 Connecting an external system

The device is designed for tempering external, closed loop systems. An external system is connected to the unit's pump connections.



CAUTION

Risk of burns due to damaged temperature control hoses!
Hot bath fluid can escape from damaged temperature control hoses and cause serious burns when it comes into contact with skin.

- Check the temperature control hoses regularly for integrity
- Immediately replace damaged temperature control hoses
- Do not kink temperature control hoses
- Regularly exchange temperature control hoses
- Check the pump connections for leak tightness



NOTE

Material damage due to incompatible externally connected system!
If the temperature range and/or pressure parameters of an externally connected system do not match those of the device this can result in damage to individual components or even failure of the entire system.

- Before connection check the external system for compatibility with the device combination
- If an external system is connected that is not set up for the maximum pressure of the device, the pump's flow rate must be limited in the settings
- If an external system is connected, the safety of the entire system is the responsibility of the operator



NOTE

Hot pump connections!
The pump connections can become very hot during operation. Heat-sensitive parts or cables can be damaged if they have contact.

- Pump connections must be uncovered during operation
- No loose parts or cables should come into contact with pump connections during operation

NOTE

Overflowing bath fluid due to externally connected systems!
If the externally connected system is higher than the temperature control system, bath fluid can flow back and overflow when switched off.

- Position the connected external system on the same level or lower than the temperature control system
- Position a shut-off valve or Solenoid valve between the external system and the temperature control system as backflow protection.

NOTE

Damaged hoses due to kinking!
Hoses are damaged by kinking and can may leak.

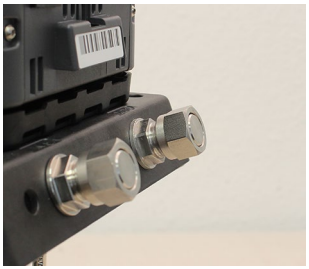
- Lay hoses with large radii
- Avoid kinking of the hoses

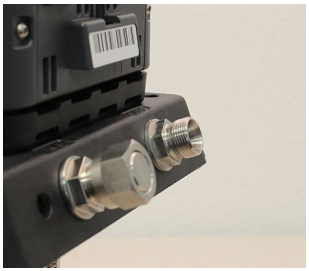
7.3.1 Connect an external system with screw connections

This section describes how to connect an external, closed system to the device using screw connectors.

- Open-end wrench, 17 mm
- Open-end wrench, 19 mm
- Torque wrench

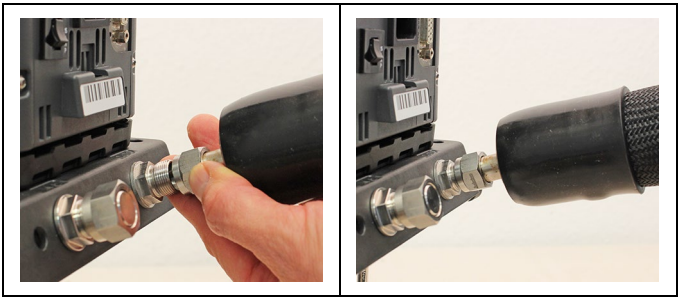
- ▶ The circulator is equipped with the optional assembly frame or pump set.
- ▶ The temperature control hoses of the external system are equipped with M16x1 female and barrel gaskets.





1. Remove the union nuts on the pump connections.

2. Remove the sealing plugs.

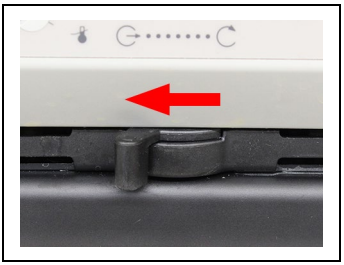


3. Screw the hoses onto the pump connections by hand.

☝ Pay attention to the supply and runback position.

4. Carefully tighten the pump connections with a maximum torque of 3 Nm. Brace the nut (width across flats: 17 mm) using an open-end wrench.

☝ **Warning!** Over-tightening the pump connections may cause the assembly frame to break.



5. Set the flow direction lever to external circulation.

✓ The external system is connected.

☝ If the external system is disassembled, the pump connections must be resealed with the sealing plugs so that no bath fluid can splash out during operation.

7.3.2 Connect an external system with barbed fittings

This section describes how to connect an external, closed system to the device using barbed fittings.

- Open-end wrench, 17 mm
- Open-end wrench, 19 mm
- Torque wrench

- ▶ The circulator is equipped with the optional assembly frame or pump set.
- ▶ Barbed fittings are provided to install the external system.



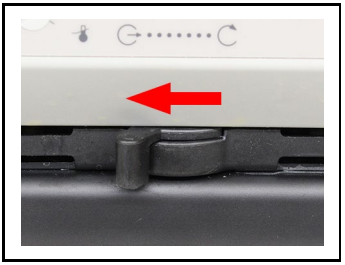
1. Remove the union nuts on the pump connections.
2. Remove the sealing plugs.
3. Push one barbed fitting through each of the union nuts.
4. Mount the barbed fittings with the union nuts on the pump connections.
5. Carefully tighten the union nut with a maximum torque of 3 Nm. Brace the nut (width across flats: 17 mm) using an open-end wrench.

☝ **Warning!** Over-tightening the pump connections may cause the assembly frame to break.

6. Attach the external system's hoses to the barbed fittings.

☝ Pay attention to the supply and runback position.

7. Using tube clamps, secure the hose to prevent it from slipping.



8. Set the flow direction lever to external circulation.

✓ The external system is connected.
☝ If the external system is disassembled, the pump connections must be resealed with the sealing plugs so that no bath fluid can splash out during operation.

7.4 Set high temperature safety function

Before each new temperature application, the temperature must be set for the tank and internal reservoir high temperature cut-off. Set a value that is at least 25 K below the flash point of the bath fluid being used. The surface temperature of the bath fluid must not exceed the flash point at any time. An alarm is triggered when the set value is exceeded.

🛠 Slotted screwdriver, size 3

► The device is connected.
1. Switch the device on.
➥ If no temperature liquid has been filled yet, the low liquid level alarm is displayed.
➥ Depending on the default setting, the high temperature cut-off alarm is displayed.
2. Press the **[MENU]** key.
3. Use the arrow keys to select the menu option **<SAFE>** and confirm with **[OK]**.
4. Use the arrow keys to select the menu option **<SP>** and confirm with **[OK]**.
➥ The display shows the current value.



5. Use the screwdriver to set the high temperature cut-off.
➥ The display shows the set value.
6. Set a value that is at least 25°K under the flash point of the bath fluid used, and leave the menu with **[OK]**.
➥ The set value is immediately active.
7. Turn the device off so that the alarm messages are reset.
✓ The high temperature cut-off is set.

7.5 Fill device

This section describes how the device should be filled with bath fluid during initial operation.

Specifications for filling volume can be found in the technical data.

- ► The drain valve is closed.
- ► The device is switched off.

1. Remove the bath lid.
2. Half fill the bath with bath fluid.

- ☝ The bath fluid expands with increasing temperature and can overflow.
- ☝ With decreasing temperature, the low liquid level protection can be triggered and interrupt the temperature control process.

3. Switch the device on and start the temperature control application.

- ☝ If an external system is connected, the pump supply must be set to "external" so that it fills the external system.

4. Watch the fill level and, if necessary, adjust it by refilling or draining.

- ☝ Once the working temperature has been reached and the sample inserted, the level of bath fluid in the bath tank should cover the heating coil of the heating circulator or the cooling coil of the refrigeration unit.

5. Close the bath opening with the bath lid.

- ✓ The device is filled with bath fluid.

7.6 Set up power supply for the refrigerated circulator

For a refrigerated circulator, the power supply is configured at the factory. The circulator is supplied with power from the refrigeration unit. Alternatively, both units can be connected to separate circuits with one power cable each. The type of power supply is set in the operating menu.

- ► The cooling machine is connected.

1. Switch the device on at the mains switch.
2. Press the **[MENU]** key.
3. Use the arrow keys to select the menu option **<conF>** and confirm with **[OK]**.
4. Use the arrow keys to select the menu option **<hLiM>** and confirm with **[OK]**.
5. Select **<On>** or **<OFF>** and confirm with **[OK]**.

- ☝ **<On>** when device combination is connected to same power supply. The heating power limit is activated. Depending on the total current consumption, it limits the heating power of the circulator and prevents overloading of the power supply.
- ☝ **<OFF>** when connected to disconnected power supply. Full heating capacity is available.
- ✓ The power supply for the refrigerated circulator is set up.

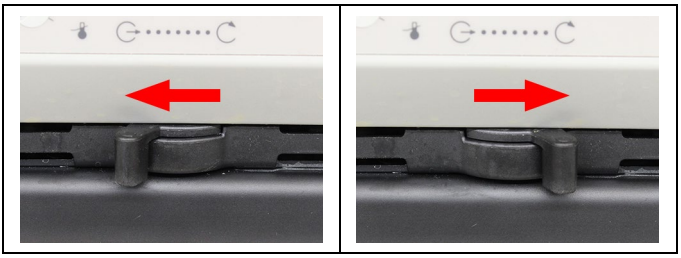
7.7 Adjusting the flow of the bath fluid

The flow direction of the bath fluid is set using the lever on the front control:

- Lever position left (external): The bath fluid is mainly fed into the external application.
- Lever position right (internal): The bath fluid is mainly circulated in the internal bath.

	NOTE
	Bath fluid squirts out! If the pump connections are not sealed, bath fluid can squirt out even with the flow direction set to internal. • For internal temperature control, close the external pump connections

▶ The device is switched off.
▶ Bath fluid is filled.



1. Set the lever to a low level for internal circulation (e.g. position 2 from the right stop).
2. Switch on the device and check whether the flow of the bath fluid suits your application.
3. If necessary, adjust the flow until it suits your application.

✓ The flow of the bath fluid is set.

7.8 Set chiller mode

For a refrigerated circulator, the chiller mode is preset ex works to automatic operation. Three different chiller modes can be selected in the operating menu:

- Auto: The controller calculates the duration of the heating process in the event of a setpoint change of more than +5 K. Based on the calculated heating duration, the control decides whether the refrigeration unit is to be switched off or not, depending on demand.
- On: The refrigeration unit is permanently switched on during operation.
- OFF: The refrigeration unit remains switched off during operation.

► The device is switched on.
► The cooling machine is connected.
1. Press the **[MENU]** key.
2. Use the arrow keys to select the menu option **<conF>** and confirm with **[OK]**.
3. Use the arrow keys to select the menu option **<cooL>** and confirm with **[OK]**.

☝ The menu option can only be accessed if the circulator detects a connected refrigeration unit.

4. Select the desired chiller mode and confirm with **[OK]**.

➥ The display flashes briefly.
✓ The chiller mode is set.

7.9 Set temperature warning limits

The low temperature **<tLo>** and high temperature **<tHi>** are adjustable temperature limits that serve as warning limits for the device. If one of the warning limits is exceeded during the course of a temperature control application, then the device issues a warning with an acoustic signal and displays an error code.

► The device is switched on.
1. Press the **[MENU]** key.
2. Use the arrow keys to select the menu option **<SAFE>** and confirm with **[OK]**.
3. Use the arrow keys to select the menu option **<tHi>** and confirm with **[OK]**.

➥ The set value for the high temperature limit starts to flash.

4. Use the arrow keys to set the parameter and confirm with **[OK]**.

➥ The decimal point starts to flash.

5. Use the arrow keys to set the decimal point and confirm with **[OK]**.

➥ The set value is confirmed by flashing briefly. The display switches to **<tHi>**.

6. Use the arrow keys to switch to the low temperature limit **<tLo>** then repeat steps 3 and 4 for the lower temperature limit.

✓ The temperature warning limits are set. After a short time, the display changes to standby mode or temperature control mode depending on the status.

8 Operation

8.1 Switch on the unit

This section describes how to switch on the device.

► The unit is connected and ready for operation.
1. Switch the unit on at the mains switch.
➥ All display elements light up briefly, the software boots and starts the device.
✓ The unit is switched on and ready for operation. It switches to the most recently activated operating mode, manual mode of operation or remote control mode. If the auto start function is activated, then the unit starts directly into the last setting.
☝ If remote control mode is enabled, the device cannot be operated directly. First disable remote control mode.

8.2 Switch off the unit

This section describes how to switch off the device.

► The device is switched on.
1. Stop a running temperature control application.
➥ If a cooling machine is connected, the cooling symbol flashes and the cooling machine is shut down.
☝ Do not switch off the device until the cooling symbol stops flashing and the device is in standby mode.
2. Switch the device off at the mains switch.
✓ The device is switched off.

8.3 Configuring setpoint temperature

Device is running the temperature control application to the configured setpoint temperature. The factory setting is 10°C. The setpoint temperature can be changed while the temperature control application is running. The set value is saved.

► The unit is switched on.
1. Press one of the arrow keys briefly.
➥ The display switches from the actual value display to the setpoint display. The digits before the decimal point flash.
2. Use the arrow keys to set the value before the decimal point and confirm with **[OK]**.

➥ The set value is applied. The decimal point flashes.
3. Use the arrow keys to set the value after the decimal point and confirm with **[OK]**.
➥ The set value is applied. The new setpoint temperature flashes briefly.
✓ The setpoint temperature is set and active. Setpoint temperature configuration can be interrupted using the **[MENU]** key. The previous value is then retained.

8.4 Start temperature control application

A temperature application can be started directly on the unit. Other options include timer-controlled temperature control application with the integrated programmer and remote control via a connected PC.

► The unit is ready for use.
1. Switch the unit on at the mains switch.
2. Use the arrow keys to set the desired setpoint temperature.
3. Press and hold the **[OK]** key until the temperature control application starts.
✓ The setpoint temperature is saved. The display flashes briefly. The unit starts the temperature control application at once. The temperature control application can be stopped with the **[OK]** key.
☝ Observe the following for heating circulators:
For temperature control applications near or below the ambient temperature: Use a cooling coil or JULABO immersion cooler.

8.5 Activate autostart function

The autostart function makes it possible to start a temperature control application directly using the mains switch or via an intermediate timer.

The device is configured ex works in such a ways that it switches to a safe operating status in the event of power failure. The autostart function is deactivated. The display shows "OFF." The refrigeration aggregate, heater, and pump motor are disconnected from the mains voltage.

► The device is switched on.
1. Press the **[MENU]** key.
2. Use the arrow keys to select the menu option **<conF>** and confirm with **[OK]**.
3. Use the arrow keys to select the menu option **<Auto>** and confirm with **[OK]**.

4. Use the arrow keys to select **<On>** and confirm with **[OK]**.

➥ The display flashes briefly.

✓ The autostart function is activated. The next time the device is switched on, the temperature control application will immediately start with the preset values. You can also insert and program a timer. In this case the mains switch of the device must remain on.

8.6 Record data

8.6.1 Record measurement data

Measurement data for an ongoing temperature control application can also be recorded onto a USB stick at the same time. The target value temperature, actual value temperature, and the percentage output are documented every second in the record. The data is saved as a .txt file and can be subsequently analyzed.

► The unit is switched on.

► A USB stick is available.

1. Insert the USB stick into the USB port.
2. Press the **[MENU]** key.
3. Use the arrow keys to select the menu option **<dATA>** and confirm with **[OK]**.
4. Use the arrow keys to select the menu option **<LoG>** and confirm with **[OK]**.
5. Use the arrow keys to select **<On>** and confirm with **[OK]**.

➥ The display flashes briefly.

✓ The recording of measurement data is started and indicated on the display by a flashing dot. Use the arrow keys to select **<OFF>** and stop data recording and confirm with **[OK]**.

8.6.2 Reading out blackbox data

The blackbox stores all relevant data from the last 20 minutes. In addition, the black box logs alarms and warnings.

The blackbox can be read out and the data sent to technical service for analysis.

► The device is switched on.

► A USB stick is available.

1. Insert the USB stick into the USB port.
2. Press the **[MENU]** key.
3. Use the arrow keys to select the menu option <dATA> and confirm with **[OK]**.

4. Use the arrow keys to select the menu option <bb> and confirm with **[OK]**.
5. Use the arrow keys to select **<YES>** and confirm with **[OK]**.

➥ The display flashes briefly. -bb- is shown on the display when saving.

✓ The blackbox data is saved onto the USB stick as a .txt file.

8.7 Adjust pump

The performance of the pump can be set in one-percent increments.

► The device is switched on.

1. Press the **[MENU]** key.
2. Use the arrow keys to select the menu option **<Pu>** and confirm with **[OK]**.
3. Use the arrow keys to set the motor speed between 30% and 100% and confirm with **[OK]**.

➥ The setting is applied immediately.

✓ The pump is set.

To achieve low setpoint temperatures, it may be helpful to reduce the pump output in certain situations. This decreases the pump's heat input into the bath fluid.

8.8 Remote control device

The device can be connected to a PC via its interfaces and controlled remotely using a program such as ° EasyTemp. It is also possible to send interface commands to the device using a terminal.

The respective interface is set up when the remote control is deactivated.

If remote control mode is enabled, the device cannot be operated directly.

8.8.1 Remote control device using USB interface

The device can be remote-controlled via the standard USB B interface.

► The device is switched off.

► The computer has a terminal program installed.

1. Connect the circulator (USB port type B) to the computer with a standard USB cable.
2. Download the suitable USB driver from the download area of the website www.julabo.com.

☝ Depending on the operating system used by the connected computer, it may be necessary to install the USB driver.

3. Install the USB driver on the computer.

4. Switch the circulator on.
5. Press the **[MENU]** key.
6. Use the arrow keys to select the menu option **<IntE>** and confirm with **[OK]**.
7. Use the arrow keys to select the menu option **<rEM>** and confirm with **[OK]**.
8. Use the arrow keys to select **<USb>** and confirm with **[OK]**.

☝ The circulator reports to the PC with the ID "STMicroelectronics Virtual COM Port" as a COM port in the device manager.

9. Start the terminal program on the computer.
10. Use the terminal program to select the COM port of the circulator and establish a connection.

✓ Remote control via the USB interface is activated. You can now remote control the circulators using interface commands from the computer.

8.8.2 Set RS232 interface parameters

The interface parameters cannot be changed during remote control mode. If they differ from the factory settings, they must be set before remote control mode is activated.

1. Press the **[MENU]** key.
2. Use the arrow keys to select the menu option **<IntE>** and confirm with **[OK]**.
3. Use the arrow keys to select the menu option **<con>** and confirm with **[OK]**.
4. Use the arrow keys to select **<bAud>** and confirm with **[OK]**.
5. Use the arrow keys to select the desired baud rate and confirm with **[OK]**.

➥ The display flashes briefly.

6. Use the arrow keys to select **<HAnd>** (handshake) and confirm with **[OK]**.
7. Use the arrow keys to select **<SOFt>** (software), **<HArd>** (hardware), or **<none>** (none), and confirm with **[OK]**.

➥ The display flashes briefly.

8. Use the arrow keys to select **<PAr>** (parity) and confirm with **[OK]**.
9. Use the arrow keys to select **<nonE>** (no parity), **<odd>** (odd), or <**EvEn>** (even) and confirm with **[OK]**.

☝ If parity is **<nonE>**, the number of data bits is set to 8.

➥ The display flashes briefly.

✓ The interface parameters are set.

8.8.3 Remote control device using RS232 interface

The device can be remote-controlled via the RS232 interface. A null modem cable is required to connect to a PC.

► The device is switched off.
► The computer has a terminal program installed.
► The interface parameters are set on the device.
1. Connect the circulator with the computer using a serial interface cable.
2. Switch the circulator on.
3. Press the **[MENU]** key.
4. Use the arrow keys to select the menu option **<IntE>** and confirm with **[OK]**.
5. Use the arrow keys to select the menu option <rEM> and confirm with **[OK]**.
6. Use the arrow keys to select **<232>** and confirm with **[OK]**.
7. Start the terminal program on the computer.
8. Enter the interface parameters into the terminal program.

☝ See the RS232 interface section.

9. Use the terminal program to select the COM port of the circulator and establish a connection.

✓ Remote control via the serial interface is activated. rOFF appears in standby mode. You can now remote control the circulator with interface commands via the terminal program.

8.8.4 Request device status

The current device status can be queried via an interface command.

► The device is connected to a PC via an interface.
1. Enter the command "status" in the terminal program and press **[Enter]**.

✓ The device responds with a status message. If an alarm or warning is pending, the device sends the respective alarm or warning message to the status query. Explanations of the status messages as well as alarm and warning messages can be found in the Appendix.

8.9 Setting the timer

The timer can be used to program the duration of a temperature control application from 0 to 999 minutes. The setpoint temperature is maintained for the programmed time. After the set duration has elapsed, the device switches to standby mode.

► The device is switched on.
1. Press the **[MENU]** key.
2. Use the arrow keys to select the menu option **<tSEt>** and confirm with **[OK]**.

➥ The minute display flashes.
3. Use the arrow keys to set the minutes.

➥ Press and hold the arrow key for fast counting.
4. Confirm with **[OK]**.

➥ The display flashes briefly.
✓ The timer is programmed and active.

The decimal point flashes on the display until the setpoint temperature is reached. The timer starts once the setpoint temperature has been reached. The actual temperature and remaining operating time are now displayed in turns.

After the set time has elapsed, a double acoustic signal sounds and the device switches to standby mode.

The setpoint temperature can still be changed until it is reached. The timer remains active and starts when the new setpoint temperature is reached. If the setpoint temperature is changed while the timer is running, the timer is deactivated.

The running timer is stopped with the **[OK]** key.

8.10 Adjusting the temperature sensor (ATC)

For physical reasons, there can be a temperature difference in the bath tank between the temperature sensor and a defined, more remote point within the bath fluid volume. As a result, the measured temperature deviates slightly from the actual bath temperature. Adjustment of the temperature sensor can increase accuracy of the temperature control application.

The adjustment of a temperature sensor requires the determination of the temperature difference between the temperature sensor and the reference thermometer. Three adjustment options are available:

- 1-point adjustment: When a sample is tempered to a certain setpoint. The adjustment curve is displaced parallel to the original curve by the reference amount.
- 2-point adjustment: When the temperature is controlled between two setpoints. The slope of the temperature curve is adjusted between two points.
- 3-point adjustment: When temperature is controlled within a temperature range. This results in an arched temperature curve.

8.10.1 Adjust internal temperature sensor

This section describes how to adjust the internal temperature sensor of the device.

► The bath tank is filled.
► The device is switched on.
► The ATC function is disabled.

1. Hang the calibrated thermometer in the bath tank and place the bath lid on top.
2. Press the **[MENU]** key.
3. Use the arrow keys to select the menu option **<Atc>** and confirm with **[OK]**.
4. Use the arrow keys to select the menu option **<tYPE>** and confirm with **[OK]**.
5. Use the arrow keys to select the number of correction points and confirm with **[OK]**.
6. Exit the menu and start the temperature control application with the desired setpoint temperature.

➥ When the setpoint is reached, allow the temperature to stabilize for several minutes.

☝ The more stable the temperature in the bath tank, the more precise the adjustment result.

7. In menu option **<Atc>,** use the arrow keys to select the correction point **<Ct1>** and confirm with **[OK]**.
8. Enter the read reference temperature and confirm with **[OK]**.

➥ The display flashes briefly. The correction value **<Ct1>** is stored at the current internal temperature value **<tt1>**.

9. If necessary, repeat steps 6 to 8 for a 2-point or 3-point adjustment.

✓ The temperature sensor is adjusted. The correction values are saved and can be displayed in menu option **<Atc>.**

8.10.2 Enabling ATC function

For regular operation, the correction values saved for an adjustment can be enabled in the menu.

► The device is switched on.
► Correction values are saved.

1. Press the **[MENU]** key.
2. Use the arrow keys to select the menu option **<**Atc> and confirm with **[OK]**.
3. Use the arrow keys to select the menu option **<StA>** and confirm with **[OK]**.
4. Use the arrow keys to select **<On>** and confirm with **[OK]**.

➥ The display flashes briefly.

✓ The ATC function is activated. The stored correction values are offset against the temperature measured internally.

8.11 Device Reset

The function resets the device to the factory settings.

► The device is switched on.

1. Press the **[MENU]** key.
2. Use the arrow keys to select **<conF>** and confirm with **[OK]**.
3. Use the arrow keys to select the menu option **<init>** and confirm with **[OK]**.
4. Use the arrow keys to select **<YES>** and confirm with **[OK]**.

➥ The display flashes briefly.

✓ The device is reset to factory settings.

9 Maintenance

9.1 Check safety symbols

The safety labels affixed to the device must be clearly legible at all times. Their condition must be checked every two years.

1. Check the safety signs on the device for legibility and completeness.
2. Replace defective or missing safety markings.

☝ Safety signs can be reordered from JULABO.

✓ The safety signs on the device have been checked.

9.2 Check the functionality of high temperature cut-off

This section describes how you can test that the high temperature safety function is operational.

🛠 Slotted screwdriver, size 3

► The device is switched on.
► The temperature control application starts.
1. Use the screwdriver to adjust the high temperature cut-off to a temperature that is below the displayed actual value.

➥ An acoustic signal sounds and the error code "E 14" is displayed. The high temperature cut-off works.

2. Then set a value that is above the actual value.
3. Switch the device off, wait a few seconds, then switch the device on again.

➥ The alarm message is deactivated.

4. Set the high temperature cut-off.

✓ The high temperature cut-off is set and its functionality tested.

9.3 Test the low liquid level safety function

This section describes how you can test that the low liquid level safety function is operational.

► The device is switched on.
1. Remove the bath lid.
2. Using a long object, e.g. a straightedge, carefully push the circulator float downwards until it reaches its mechanical stop.

➥ An acoustic signal sounds and the error code "E 01" is displayed. The low liquid level safety function works.

3. Switch the device off, wait a few seconds, then switch the device on again.
➥ The alarm message is deactivated.
4. Close the bath opening.
✓ The low liquid level safety function has been tested for functionality.

9.4 Replace detachable power cord

The device is equipped with a detachable power cord.

If the power cord needs to be replaced, ensure that the new one is at least dimensioned for the device power requirements. Insufficiently dimensioned power cords must not be used. See type plate for mains voltage and current value.

We recommend only using original JULABO spare parts.

9.5 Emptying

The device must be completely drained if it is to be sent in for technical service or is to be properly disposed of.

In general, the device should be completely emptied before longer shutdowns or when there is a change to the external application.



CAUTION

Risk of burns from hot bath fluid!

Bath fluid can become very hot during a temperature control process.
Contact with hot bath fluid can cause scalding.

- Before draining the device, let it cool to room temperature
- Avoid direct contact with hot bath fluid
- Wear protective gloves

► The device is tempered to room temperature and switched off.
1. Place an adequately large collection vessel under the drainage valve.
2. Take off the bath lid.
3. Open the drain valve.
➥ The bath fluid drains out of the bath tank into the collection vessel provided.
4. Once the bath tank is completely drained, close the bath opening.
5. Close the drain valve.
✓ The device is emptied. If an external system is connected, it can now be disconnected from the device and also drained.

9.6 Clean device

The circulator and bath tank, and also a cooling machine if connected, should be cleaned from time to time.

In addition to this, the device must be appropriately decontaminated if hazardous substances have been spilled on or into the device.

- 🛠 Lint-free cloth
- 🛠 Mild cleaning agent



NOTE

Damage to the electronics due to water penetration!
Ingress of water can damage electronic components of the device and thus lead to failure of the device.

- Clean the outside of the device with a damp cloth only
- Prevent water from entering the device

► The device is switched off and disconnected from the mains voltage.

1. Allow the device to cool down to room temperature.
2. Completely drain the bath fluid.
3. Clean the surface of the circulator and the bath tank with a damp cloth.

☝ Some dish detergent may also be used for cleaning. If in doubt, ask technical service for alternative cleaning mediums.

✓ The device has now been cleaned.

9.7 Device storage

This section describes how to store the device.

► The device is switched off and disconnected from the mains voltage.

1. Empty all system components completely.
2. Clean the device.
3. Carefully dry the device and all its system components, e.g. with compressed air.
4. Close all connections.
5. Store the device in a dust-free, dry and frost-free location.

✓ The device is protected and can be safely stored there. It can be put into operation again as needed.

9.8 Technical Service

If the unit shows faults you cannot resolve, please contact our Technical Service.

JULABO GmbH
Technical Service
Gerhard-Juchheim-Strasse 1
77960 Seelbach / Germany
Tel.: +49 7823 51-66
Fax: +49 7823 51-99
Service.de@julabo.com

Before sending a device to Technical Service, the following points must be observed:

- Clean and decontaminate the device properly to avoid endangering service personnel.
- Include a brief description of the fault.
- Package the device safely for shipment.

9.9 Warranty

JULABO provides a warranty that the device will function perfectly as long as it is connected and used correctly and as described in the operating manual.

The warranty period is one year from the invoice date.



With the 1PLUS warranty, the warranty can be extended to two years free of charge.

The 1PLUS warranty gives the user a free extended warranty to 24 months, limit to a maximum of 10,000 hours of service.

A prerequisite for this is that the user registers the device at **www.julabo.com**, quoting its serial number, within four weeks of initial operation. The warranty applies from the date of JULABO GmbH's original invoice.

10 Disposal

10.1 Device disposal

When disposing of the device, the applicable country-specific guidelines must be observed.

- ► The circulator combination is switched off and disconnected from the mains voltage.
1. Empty the bath tank or cooling machine completely.
2. Disconnect all power cables and, if necessary, data cables from the circulator and from other connected devices.
3. If present, disconnect the circulator combination from a connected external application.
4. Remove the circulator from the bath tank or cooling machine.
5. Give the devices to an authorized disposal company.

- ☝ Disposed of the device in household waste, or similar facilities for the collection of domestic waste, is not permissible.
- ✓ The circulator combination is disposed of properly.

11 EC Declaration of Conformity

EG-Konformitätserklärung nach EG Maschinenrichtlinie 2006/42/EG, Anhang II A
EC-Declaration of Conformity to EC Machinery Directive 2006/42/EC, Annex II A

Hersteller / *Manufacturer*:

JULABO GmbH
Gerhard-Juchheim-Strasse 1
77960 Seelbach / Germany
Tel: +49 7823 51-0

CE

Hiermit erklären wir, dass das nachfolgend bezeichnete Produkt
We hereby declare, that the following product

Produkt / *Product*: Thermostat / *Circulator*

Typ / *Type*: CORIO CP **Serien-Nr. / *Serial-No.*:** siehe Typenschild / *see type label*

aufgrund seiner Konzipierung und Bauart in der von uns in Verkehr gebrachten Ausführung den grundlegenden Sicherheits- und Gesundheitsanforderungen der nachfolgend aufgeführten EG-Richtlinien entspricht.
due to the design and construction, as assembled and marketed by our Company – complies with fundamental safety and health requirements according to the following EC-Directives.

Maschinenrichtlinie 2006/42/EG; Machinery Directive 2006/42/EC
EMV-Richtlinie 2014/30/EU; EMC-Directive 2014/30/EU
RoHS-Richtlinie 2011/65/EU; RoHS-Directive 2011/65/EU

Angewandte harmonisierte Normen und techn. Spezifikationen:
Applied following harmonized standards and technical specifications:

EN IEC 63000:2018
Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

EN ISO 12100 : 2010
Sicherheit von Maschinen - Allgemeine Gestaltungsleitsätze - Risikobeurteilung und Risikominderung (ISO 12100:2010)
Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)

EN 61010-1 : 2010 / A1 : 2019 / AC : 2019-04, EN 61010-1 : 2010 / A1:2019
Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte, Teil 1: Allgemeine Anforderungen
Safety requirements for electrical equiment for measurement, control, and laboratory use, Part 1: General requirements

EN 61010-2-010 : 2014
Sicherheitsbestimmungen für elektrische Mess- Steuer-, Regel- und Laborgeräte Teil 2-010: Besondere Anforderungen an Laborgeräte für das Erhitzen von Stoffen
Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 2-010: Particular requirements for laboratory equipment for the heating of materials

EN 61326-1 : 2013
Elektrische Mess-, Steuer-, Regel- und Laborgeräte- EMV-Anforderungen- Teil 1: Allgemeine Anforderungen
Electrical equipment for measurement, control, and laboratory use - EMC requirements - Part 1: General requirements

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen:
Authorized representative in charge of administering technical documentation:
Hr. Torsten Kauschke, im Haus / *on the manufacturer's premises as defined above*

Die Konformitätserklärung wurde ausgestellt
The declaration of conformity was issued and valid of

Seelbach, 19.11.2021

i.V. Bernd Rother, Senior Expert Products & Innovation

12 UK Declaration of Conformity

UK Office: JULABO UK Ltd., Unit 7, Casterton Road Business Park,
Old Great North Road, Little Casterton, Stamford, PE9 4EJ, United Kingdom,
Tel.: +44 1733 265892

UKCA-Declaration of Conformity

Manufacturer:

JULABO GmbH
Gerhard-Juchheim-Strasse 1
77960 Seelbach / Germany
Tel: +49 7823 51-0

This declaration is issued under the sole responsibility of the product manufacturer

Product: Circulator
Type: CORIO CP **Serial-No.:** see type label

The object of the declaration described above is in conformity with the relevant UK Statutory Instruments and their amendments:

Supply of Machinery (Safety) Regulations 2008
Electromagnetic Compatibility Regulations 2016
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Applied following harmonized standards and technical specifications:

EN IEC 63000:2018
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

EN ISO 12100 : 2010
Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)

EN 61010-1 : 2010 / A1 : 2019 / AC : 2019-04, EN 61010-1 : 2010 / A1:2019
Safety requirements for electrical equipment for measurement, control, and laboratory use. Part 1: General requirements

EN 61010-2-010 : 2014
Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 2-010: Particular requirements for laboratory equipment for the heating of materials

EN 61326-1 : 2013
Electrical equipment for measurement, control, and laboratory use - EMC requirements - Part 1: General requirements

Authorized representative in charge of administering technical documentation:

JULABO UK Ltd., Mr. Gary Etherington, Unit 7, Casterton Road Business Park, Little Casterton, Stamford PE9 4EJ United Kingdom, Telephone: +44 1733 265892

The declaration of conformity was issued and valid of

Seelbach, 24.03.2022

i.V. Bernd Rother, Senior Expert Products & Innovation

13 Appendix

13.1 Interface commands

Interface commands allow the device to be remote controlled. Parameters can be retrieved and the current status can be queried. To do this, the device must be connected to the master computer via a digital interface. Interface commands are entered using a terminal program.

Interface commands are divided into IN commands and OUT commands.

String element	Symbol	Hex
Space	␣	20
Carriage return	↵	0D
Line feed	LF	0A

- IN commands: Retrieve parameters
  Command structure: Command + ↵

  E.g. Retrieve the setpoint temperature:
  IN_SP_00↵

  E.g. Response of the device:
  55.5 ↵LF

- OUT commands: Set parameters (only in remote control mode)
  Command structure: Command + ␣ + Parameter ↵

  E.g. Set the setpoint temperature to 55.5 °C:
  OUT_SP_00␣55.5↵

13.1.1 IN commands

IN commands retrieve device parameters.

Process values	System response
in_pv_00	Actual value
in_pv_01	Current variable (%)
in_pv_03	Current temperature of the temperature safety sensor
in_pv_04	Current setting of the high temperature safety function

Setpoints and warning limits	System response
in_sp_00	Set setpoint temperature
in_sp_03	Set high temperature warning limit
in_sp_04	Set low temperature warning limit
in_sp_07	Set pump stage (1… 5)
in_sp_27	Set pump setting

Device modes	System response
in_mode_05	Operating mode set for temperature control system: 0 = Stop 1 = Start

13.1.2 OUT commands

OUT commands set device parameters. Remote control mode must be active.

Parameter settings	Parameter	Setting
out_sp_00	xxx.xx	Setting for the setpoint temperature
out_sp_03	xxx.xx	Setting for the high temperature
out_sp_04	xxx.xx	Setting of the low temperature
out_sp_07*	x	Set pump to preset levels 1…5
out_sp_27	xxx	Pump capacity in %

* Do not use for reprogramming, use out_sp_27 instead. Pump stage 4 has an output pressure of approx. 450 mbar.

Device modes	Parameter	Setting
out_mode_05	x	Start/stop command of the device in remote control mode: 0 = Stop tempering 1 = Start tempering

13.1.3 Status commands

Status commands are used to query the current status of the device.

Status commands	System response
version	Current firmware version
status	Return of status, error, warning, alarm

13.1.4 Status messages

Possible status messages from the device for a status query.

Status message	Explanation
00 MANUAL STOP	Device in standby mode manual operation
01 MANUAL START	Device in manual mode
02 REMOTE STOP	Device in standby mode, remote control operation
03 REMOTE START	Device in remote control mode
-08 INVALID COMMAND	Device did not recognize the last received command
-09 COMMAND NOT ALLOWED IN CURRENT OPERATING MODE	Last received command is not permissible in the operating mode
-10 VALUE TOO SMALL	The last set value is too small
-11 VALUE TOO LARGE	The last set value is too large
-13 VALUE EXCEEDS TEMPERATURE LIMITS	The value is not within the set temperature limits

13.2 Alarms and Warnings

If the device is connected to a network and remotely controlled, a status query via interface command will output any pending alarms or warnings as text. Alarm and warning messages are described in the table.

If a displayed error code is not described in the table or the error is still pending after switching off and on again, please contact Technical Service.

The listed error codes can occur depending on the device type and version.

-01	The unit is being operated with a bath fluid level that is too low.	• Top up the bath fluid. • Check the temperature control hoses for damage and replace if necessary.
-03	The measured temperature is over the set high temperature limit.	• Increase "high temperature" temperature limit or decrease temperature setpoint.
-04	The measured temperature is below the set low temperature limit.	• Reduce "low temperature" temperature limit or increase temperature setpoint.
-06	The temperature difference between the working temperature sensor and the safety temperature sensor is too large.	• Increase circulation. • Check the viscosity of the tempering fluid. • If the fault has not been remedied, contact Technical Service.
-14	The set protective temperature has been exceeded.	• Check working temperature range of the application. • Increase the value of the protective temperature or decrease the setpoint temperature until it is lower than the set protective temperature.
-60	Internal read/write error.	• Switch off the unit at the mains switch, wait 4 seconds and then switch the unit on again.

-61	CAN bus error	• Check CAN bus cable for damage and replace as necessary. Switch the unit on again. If the fault has not been remedied, contact Technical Service. • Alternatively: Deactivate the refrigeration unit. The circulator operates as a heater thermostat.
-62	CAN bus error	• Switch off unit at mains switch, wait 4 seconds, then switch on unit again.
-63	Watchdog function has responded.	• Switch off the unit at the mains switch, wait 4 seconds and then switch the unit on again.
-70	Units with incompatible voltage/frequency variants connected to each other or units incorrectly configured.	• Check the permissible operating voltage of the units and their configuration.
-72	Configuration between circulator and connected refrigeration unit failed.	• Switch off the unit at the mains switch, wait 4 seconds and then switch the unit on again.
-83	Excessive power consumption via USB interface.	• Check inserted USB stick for defects and replace as necessary. The USB-A interface is not suitable for consumers with a higher required current than the maximum permissible current.
-108	The alarm latch of the protective equipment is still active.	• Switch off the unit at the mains switch, wait 4 seconds and then switch the unit on again.
-116	The alarm latch of the protective equipment is still active.	• Switch off the unit at the mains switch, wait 4 seconds and then switch the unit on again.

-427	Pressure sensor detects excessive condensation pressure.	• Check ambient temperature and reduce if necessary. • Check condenser for soiling and clean as necessary. • Switch off the unit at the mains switch, wait 4 seconds and then switch the unit on again. • For water-cooled units: Check cooling water temperature and supply. • If the fault has not been remedied, contact Technical Service.
-431	The maximum permissible current consumption at the compressor has been exceeded.	• Check mains voltage for nominal voltage. • If the fault has not been remedied, contact Technical Service.
-1427	Pressure sensor detects excessive compensation pressure.	• Check ambient temperature and reduce if necessary. • Check condenser for soiling and clean as necessary. • Switch off the unit at the mains switch, wait 4 seconds and then switch the unit on again. • For water-cooled units: Check cooling water temperature and supply. • If the fault has not been remedied, contact Technical Service.
-1431	The minimum permissible current consumption at the compressor has been fallen short of.	• Check mains voltage for nominal voltage. The specified voltage tolerance of the unit must not be exceeded. • Check the mains cable of the refrigeration unit for damage and replace if necessary. • Check ambient temperature and reduce if necessary. • Check CAN bus cable for damage and replace as necessary. • If the fault has not been remedied, contact Technical Service.

-2426	Evaporation temperature has fallen below the warning threshold.	• Check pump setting • Check hose cross-section of connection to application • Check that connection to application is clear • Check suitability of bath fluid

13.3 Error messages in configuration process

If errors occur during a configuration process or during a firmware update, these are shown on the display as error codes in ticker text.

Error code	Description	Solution
CFG error	Error during configuration.	• Repeat the process. • Replace USB stick if this occurs again. • If the fault has not been remedied, contact Technical Service.
ProG error	Error during firmware update.	• Repeat the process. • Replace USB stick if this occurs again. • If the fault has not been remedied, contact Technical Service.