

VALEGRO™ 350 / 500



Recirculating cooler

Original operating instructions

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Foreword

Congratulations

You have made a good choice.

JULABO thanks you for the trust you have placed in us.

These operating instructions are intended to familiarize you with the operation and possible applications of our appliances. Please read the operating instructions carefully. Keep the operating instructions to hand at all times.

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1 General information

1.1 About these operating instructions

These operating instructions contain important information on the safe commissioning, operation and maintenance of the appliances listed on the cover page. It is intended for all persons who install, operate or maintain these appliances.



NOTE

Observe the safety instructions!

Read the operating instructions in full before commissioning the appliance and keep them for future reference.

1.2 Accessories

JULABO offers a wide range of accessories for the devices. The accessories are not described in these operating instructions.

The complete range of accessories for the devices described in these operating instructions can be found on our website www.julabo.com. Use the search function on the website.

1.3 Symbols used

Various symbols are used in these operating instructions to make them easier to understand. The list describes the symbols used.

- ▶ Prerequisite for the following procedure
- 1. Numbered action steps
- ⇒ Intermediate result for individual steps
- ✓ Final result of a procedure
- < > Terms in angle brackets indicate operating menus
- [] Terms in square brackets refer to keys, softkeys and buttons

1.4 Operator obligations

The operator must comply with the following obligations in order to ensure safe operation:

- The operator is responsible for the qualification of the operating personnel.
- The operator is responsible for instructing the operating personnel on how to use the appliance.
- Instruct the operating personnel at regular intervals about the dangers arising during their activities and the measures to prevent them.
- The operator must ensure that the persons entrusted with operation, installation and maintenance have read and understood the operating instructions.
- The device may only be configured, installed, maintained and repaired by appropriately qualified personnel.
- If hazardous substances or substances that could become hazardous are used, the device may only be operated by persons who are qualified to handle these substances and the device.
- The operator must ensure that the appliance is checked for safe and proper condition at regular intervals depending on its use.
- The operator must ensure that the mains supply has a low impedance in order to avoid interference with devices that are operated on the same mains supply.
- The appliance is not suitable for children or persons with mental or severe physical disabilities.

1.5 Qualification of the operating personnel

Technical personnel are defined as persons who have successfully completed vocational training. They must be able to assess the work assigned to them and independently recognize and avoid potential hazards based on their technical training and professional experience.

2 Safety instructions

2.1 Meaning of the warnings

The operating instructions contain warnings intended to increase safety when using the appliance. Always follow the warnings.

A warning sign in signal color precedes the signal word. The colored signal word classifies the severity of the danger.



DANGER

The signal word indicates a hazard with a high degree of risk which, if not avoided, will result in death or serious injury.



WARNING

The signal word indicates a hazard with a medium degree of risk which, if not avoided, could result in death or serious injury.



CAUTION

The signal word indicates a hazard with a low level of risk which, if not avoided, may result in minor or moderate injury.



NOTE

The signal word indicates a potentially harmful situation. If it is not avoided, the system or objects in its vicinity may be damaged.

2.2 General safety instructions

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

Read and observe the following safety instructions before use.



CAUTION

Improper use!

If the appliance is used in a manner not intended by the manufacturer, the protection provided by the appliance may be impaired.



DANGER

Electric shock from electrical equipment!

Touching damaged live parts can lead to serious electric shocks and can injure or kill people.

- Have damaged insulation and components of the electrical system repaired immediately by a JULABO service technician or a qualified specialist workshop.
- Replace damaged mains cables immediately.
- Do not operate the appliance if the mains cable is damaged.
- When making a connection with a mains plug, this must always be freely accessible.



DANGER

Danger to life due to electric shock!

An electric shock can cause serious injury or even death.

- Only operate the appliance on a mains connection protected by an RCD (type B, $I_a = 30 \text{ mA}$).
- Only operate the appliance on mains sockets with a protective earth contact (PE).



DANGER

Danger to life due to electric shock!

An electric shock can cause serious injury or even death.

- Live parts are enclosed in the appliance housing. If the appliance housing is damaged, live parts can be touched.
- If the appliance housing is damaged, do not connect the appliance to the power supply!



DANGER

Danger to life due to electric shock!

An electric shock can cause serious injury or even death.


- The appliance may only be opened by a qualified electrician.
- Work on the electrical system may only be carried out by qualified electricians.



WARNING

Risk of burns from flammable temperature control medium!

If a flammable temperature control medium is used, it can ignite and cause severe burns on contact with the skin.

- Ensure that no ventilation openings are blocked.
- Do not smoke! No naked flames!
- When working in the vicinity of the device and the application system, do not use any electrical parts that can generate sparks.
- Drain and refill the temperature control medium if the device is idle, the temperature control medium is used with an open bath tank and the temperature control medium is highly volatile at ambient temperature.
- The surface temperature of a flammable temperature control medium must not reach the flash point of the temperature control medium under normal conditions and under conditions of a single fault.
- When using a flammable temperature control medium, attach a sign with the symbol  to the appliance.



WARNING

Hot surfaces!

The following parts and components can become hot during operation or remain hot for some time after operation:

- Temperature control medium
- Connections for external application
- Condenser

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

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



WARNING

Suspended loads!

Falling loads can cause serious injury and damage the appliance.

- Do not stand under suspended loads.
- Transport the appliance with suitable and safe lifting gear.
- Wear personal protective clothing.



WARNING

Maintenance and repair work!

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

- Only carry out work that is described in these operating instructions.
- Switch off the appliance and disconnect the mains plug before starting work.
- Repairs may only be carried out by JULABO service technicians or an authorized specialist workshop.



NOTE

No liability if unsuitable temperature control media are used!

Unsuitable temperature control media that have not been approved by JULABO can damage the device.

- Use temperature control media recommended by JULABO.
- Check parts in contact with the medium for compatibility with the temperature control medium before filling.
- Do not exceed the maximum permissible viscosity during operation.
- Before using a temperature control medium other than the recommended one, consult JULABO.



NOTE

Only use original JULABO spare parts!

The JULABO warranty is void if non-original spare parts are used.



NOTE

Wear personal protective equipment!

Missing or unsuitable personal protective equipment increases the risk of damage to health and injury to persons.

Examples of personal protective equipment are

- Work gloves
- safety shoes
- protective clothing
- respiratory protection
- hearing protection
- Face and eye protection
- Determine and provide personal protective equipment for the respective application.
- Only use personal protective equipment that is in proper condition and provides effective protection.
- Adapt personal protective equipment to the person, e.g. size.

**NOTE****Keep safety signs in legible condition!**

Safety signs on the appliance warn of hazards at danger points and are an important part of the appliance's safety equipment. Missing safety markings increase the risk of injury to persons.

- Clean dirty safety signs.
- Replace damaged and illegible safety signs immediately.

2.3 Intended use

JULABO recirculating coolers are used for temperature control of external, closed applications with a temperature control medium.

2.4 Foreseeable misuse

The appliance is not suitable for direct temperature control of foodstuffs and luxury foods or pharmaceutical and medical products.





The appliance is not suitable for use in a potentially explosive environment.

The appliance is not suitable for use in a corrosive or aggressive environment.

The device is not intended for use in residential areas. Interference to radio reception may occur.

2.5 Safety markings

The following safety labels are affixed to the appliance.

Symbol	Symbol Description	Location
	Warning of a danger zone. Observe the operating instructions.	Rear of appliance
	Read the operating instructions before switching on.	Rear of appliance
	Warning of hot surface	Condenser, supply / return connections
	Warning of flammable refrigerant	Type plate

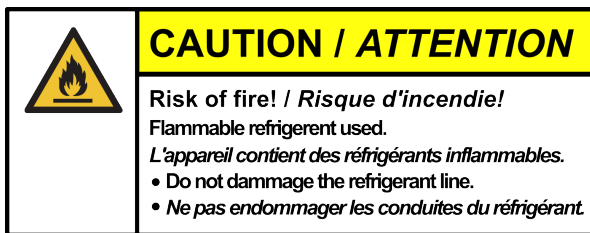
2.6 Attaching the safety label

The following section only applies to appliances with natural refrigerants that are operated in the USA or Canada.

After unpacking the appliance, affix the enclosed safety stickers in the places shown.

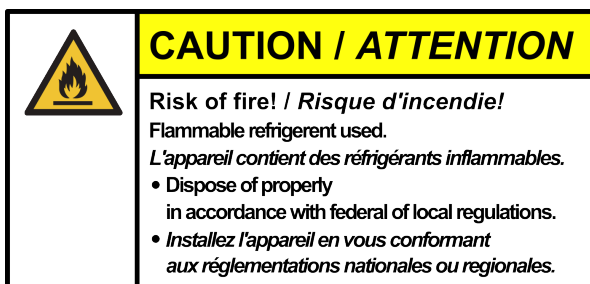
Housing front, under front cover





Safety label (order no. 3.383.2630)

Right side of housing



Safety label (order no.: 3.383.2600)

	NOTICE / AVIS
<p>This unit is intended for commercial, industrial or institutional use, as defined in the safety standards for refrigeration systems according to ANSI/ASHRAE 15.</p> <p><i>Cet appareil est destiné à un usage commercial, industriel ou institutionnel tel que défini par les normes de sécurité des systèmes de réfrigération, selon ANSI/ASHRAE 15.</i></p>	

Note (order no. 3.383.2640)

2.7 Refrigerant

In the event of a leak in the refrigerant cycle, a certain volume per kg of refrigerant is prescribed at the installation site for safety reasons to prevent the formation of an ignitable mixture of refrigerant and air. The refrigerant charge is specified on the rating plate.



WARNING

Leakage of flammable refrigerant!

The appliance contains flammable refrigerant in a technically permanently sealed circuit. In the event of a leak in the refrigerant circuit, a flammable concentration may form in the air, which may ignite or explode due to potential ignition sources in the vicinity. This can lead to serious injury or death.

- Observe the prescribed minimum room size for operating the appliance.
- Only use the appliance in well-ventilated rooms.
- Avoid ignition sources in the immediate vicinity of the appliance (e.g. electrical switches, hot surfaces, naked flames).
- Do not damage refrigerant lines.
- Do not damage the fins of the condenser.
- In the event of a refrigerant leak, switch off the appliance immediately, keep open flames and ignition sources away, ventilate the room well and contact JULABO Service.



CAUTION

Refrigerants are harmful to health!

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

- Avoid contact and inhalation.
- Damage to the refrigerant cycle may only be repaired by JULABO service technicians or qualified specialist personnel.
- If refrigerant leaks, switch off the appliance immediately and ventilate the room well.

For 0.008 kg of R-290 refrigerant, 1 m³ of space must be provided or a room volume of 125 m³ is required for 1 kg of R-290 refrigerant.

The calculation/assessment, whether **one or more** refrigeration systems per room, **always** remains **the same**, as it can be assumed that several leaks are **not** causally connected or that consequential faults occur.

2.8 Protective devices

Technical safety devices ensure safe operation. If a safety device is triggered, the operator is warned by a message on the display and an acoustic signal.

Overtemperature protection

The overtemperature protection prevents the appliance from overheating. The protection temperature is fixed at 90 °C.

The protective mechanism responds if the temperature of the temperature control fluid exceeds the set limit value. The temperature control is switched off. An acoustic signal sounds and an alarm message appears on the display.

Low level protection

A level switch detects if the level of the temperature control fluid is too low.

In the event of a low level alarm, the entire temperature control is switched off to prevent the pump from running dry. A continuous signal tone sounds. An alarm message appears on the display. A restart is required.

3 Technical data

Performance data measured according to DIN12876. Performance specifications apply at an ambient temperature of 20 °C.

The following applies to the sound pressure level values:

- from: Appliance in base load operation (40% pump stage)
- to: Appliance at nominal conditions (100% pump stage, 20°C bath, 20°C ambient temperature).
- Sound pressure levels may increase at higher ambient temperatures.

Group classification of the device according to CISPR 11:

- The device is a Group 1, Class A ISM device using radio frequency for internal purposes
- Class A: Use in an industrial electromagnetic environment

According to IEC 61010-1, the device is designed for safe operation under the following environmental conditions

- Indoor use
- Altitude up to 2000 m NHN
- Ambient temperature +5 ... +40 °C (unless otherwise specified in the technical data)
- Maximum relative humidity 80 % at air temperatures up to 31 °C, decreasing linearly up to 50 % relative humidity at 40 °C
- Pollution degree 2
- Overvoltage category II



NOTE

The maximum transportation temperature is +70°C.

3.1 VALEGRO 350

General information		
Cooling		Air cooling
Display		OLED
Protection class according to IEC 60529		IP21
Class according to DIN 12876		NFL
Sound pressure level	dB(A)	50 ... 52

Temperature data		
Working temperature range	°C	-20 ... +40
Temperature constancy	K	±0.3
Temperature resolution	K	0.1
Temperature control		digital
Working temperature sensor		Pt100
Max. permissible return temperature	°C	+85

Dimensions and weight		
Body dimensions (W x D x H)	cm	23 x 40 x 44
Overall dimensions (W x D x H)	cm	23 x 46 x 45
total weight	kg	26

Cooling capacity	°C	20	0	-10	-20
115 ... 230 V	kW	0.35	0.25	0.18	0.07
100 V	kW	0.35	0.20	0.15	0.03

Pump		
Volume flow	l/min	16
discharge pressure	bar	0.6

Pump

Viscosity max.	cSt	50
Internal filling volume	l	1.5 ... 3
Pump connection		M16 x 1 external thread

Electrical connection data

Mains connection	V Hz	100 ... 115 50/60		200 ... 230 50/60	
Power consumption max.	V	100	115	200	230
	A	5	4	3	3
Permissible voltage tolerance	%	±10	±10	±5	±5

3.2 VALEGRO 500

General information		
Cooling		Air
Display		OLED
Protection class according to IEC 60529		IP21
Class according to DIN 12876		NFL
Sound pressure level	dB(A)	51 ... 55

Temperature data		
Working temperature range	°C	-20 ... +40
Temperature constancy	K	±0.3
Temperature resolution	K	0.1
Temperature control		digital
Working temperature sensor		Pt100
Max. permissible return temperature	°C	+85

Dimensions and weight		
Body dimensions (W x D x H)	cm	23 x 40 x 44
Overall dimensions (W x D x H)	cm	23 x 46 x 45
total weight	kg	26

Cooling capacity	°C	20	0	-10	-20
115 ... 230 V	kW	0.50	0.37	0.25	0.10
100 V	kW	0.45	0.32	0.20	0.03

Pump		
Volume flow	l/min	19
Delivery pressure	bar	0.85

Pump

Viscosity max.	cSt	50
Internal filling volume	l	1.5 ... 3
Pump connection		M16 x 1 external thread

Electrical connection data

Mains connection	V Hz	100 ... 115 50/60		200 ... 230 50/60	
Power consumption max.	V	100	115	200	230
	A	5	4	3	3
Permissible voltage tolerance	%	±10	±10	±5	±5

3.3 Materials and media compatibility

3.3.1 Materials of the parts in contact with the medium

The following table lists the materials that can come into contact with the temperature control medium.

The information can be used to check compatibility with the temperature control medium used.

- 1.4301 / 304 / S30400
- 1.4404 / 316L / S31603
- 1.4571 / 316Ti / S31635
- CR
- EPDM
- FPM
- ceramic
- NBR
- Polypropylene
- PPS
- PVC-U
- Nylon ferrite composite

3.3.2 Temperature control media

Only water or a water-glycol mixture in a ratio of 1:1 is permitted as a temperature control medium.



NOTE

No liability if unsuitable temperature control media are used!

Unsuitable temperature control media that have not been approved by JULABO can damage the device.

- Use temperature control media recommended by JULABO.
- Check parts in contact with the medium for compatibility with the temperature control medium before filling.
- Do not exceed the maximum permissible viscosity during operation.
- Before using a temperature control medium other than the recommended one, consult JULABO.



NOTE

Material damage due to freezing water!

Freezing water can damage the appliance and the temperature control product.

- When using water as a temperature control medium, do not use temperatures below 5 °C.



NOTE

The addition of ammonia to the temperature control medium is not permitted!

Water quality requirements

When using water as the temperature control medium, the following water quality requirements apply:

- Calcium carbonate concentration: 0.7 - 1.4 mmol/l
- pH value: 6 - 8.5
- Ultrapure water / distilled water is suitable as a temperature control medium after adding 0.1 g Na_2CO_3 per liter of water.



NOTE

The following types of water are unsuitable as a temperature control medium:

- Distilled, deionized, demineralized water
- seawater
- chlorinated water
- contaminated water
- water containing iron
- river water

3.4 Temperature control hoses

Temperature control hoses for connection to an external system must be matched to the working temperature range and the respective temperature control application.

You can find temperature control hoses for every area of application on our homepage.

Temperature control hoses must meet the following requirements:

- Temperature resistance
- Pressure resistance
- Suitable material properties for the temperature control medium used



CAUTION

Risk of scalding due to damaged temperature control hoses!

Hot temperature control medium can escape from damaged temperature control hoses and cause severe scalding on contact with the skin.

- Check temperature control hoses regularly to ensure they are intact.
- Replace damaged temperature control hoses immediately.
- Do not kink the temperature control hoses.
- Replace temperature control hoses regularly.
- Check pump connections for leaks.



NOTE

Damage to the temperature control hoses due to kinking!

Temperature control hoses are damaged by kinking and can leak.

- Lay the temperature control hoses in large radii.
- Avoid kinking the temperature control hoses.



NOTE

Damage to the mains cable due to excessive temperature!

The temperature control hoses must not touch the mains cable during operation.

- Keep the temperature control hoses and mains cable separate.

4 Structure and function

4.1 Functional description

The device is a recirculating cooler that works with a refrigerant cycle. Intelligent control technology regulates the temperature control. The evaporator extracts heat from the temperature control medium and the condenser releases it into the ambient air.

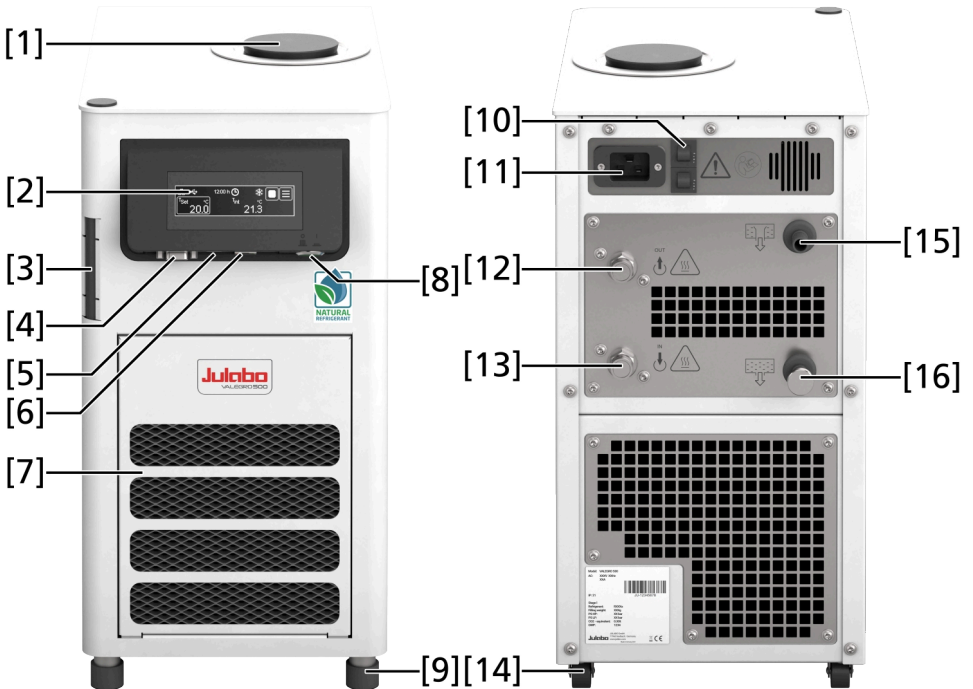
An external application is connected to the device via the pump connections. To control the temperature of the application, the temperature control medium is pumped through the heat exchanger in a circuit by the circulation pump.

The electronics evaluate the device sensors and control the actuators.

The cooling unit brings the temperature control medium to the desired temperature.

4.2 Operating and functional elements

This chapter describes the operating and functional elements and shows their position on the device.



Operating and functional elements

1. Filler neck cover
2. Touch screen
3. Illuminated level indicator
4. RS232 connection
5. USB-C connection
6. Ethernet interface (option)
7. Removable ventilation grille
8. Power switch
9. Feet
10. Mains fuse, resettable
11. Mains connection
12. Supply connection
13. Return connection

- 14. Roller
- 15. Overflow
- 16. Drain

4.3 Interfaces

This section describes the electronic interfaces available on the device with the associated pin assignments and connection values.

4.3.1 USB-C interface

The device has a USB-C interface.

The following functions can be carried out via the USB-C interface:

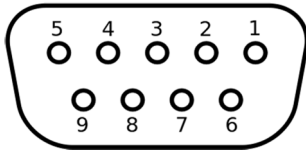
- Remote control of the device via a PC
- Data recording on an external storage medium
- Saving black box data to an external storage medium
- Uploading firmware from an external storage medium

Technical data USB-C interface

Parameters	Value	Unit of measurement
Output / input voltage	5	VDC
Maximum current / current consumption	500	mA

4.3.2 RS232 interface

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



RS232 socket

Pin assignment RS232 interface

Pin	Assignment	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.

Factory setting RS232 interface

Parameters	Parameter Value
Parity	even
Baud rate	4800 baud
Handshake	hardware
Data bit	7
Stop bit	1

4.3.3 Ethernet interface (option)

The device can be connected to a network or directly to a PC via the Ethernet interface.

Technical data Ethernet interface

Parameters	Value	Unit
Voltage level	3.3	VDC

5 Transportation



CAUTION

Risk of crushing due to falling appliance!

An unsecured appliance can fall down and cause crushing injuries if transported incorrectly.

- Secure the appliance against tipping and falling during transportation.
- Secure loose parts against falling during transportation.
- Transport the appliance in an upright position using a suitable means of transportation.
- Wear safety shoes.



CAUTION

Risk of injury due to appliance tipping over!

When pulling or pushing, the appliance can tip over and cause injuries.

- Always keep the appliance upright on its castors during transportation.
- Secure loose parts against falling during transportation.
- Wear safety shoes.



CAUTION

Risk of injury due to appliance tipping over!

The filled appliance can tip over during transportation.

- Drain the temperature control medium before transport.



NOTE

Material damage due to holding on to the control panel!

The control panel must not be used as a handle during transportation.

Transportation on castors

The appliance can be transported on level ground and over short distances using its castors.

Prerequisites

- ▶ The appliance is switched off and disconnected from the mains.
- ▶ The temperature control medium has been drained.
- ▶ All external connections have been removed.

Procedure

1. Lift the front of the appliance slightly at the bottom and pull it into its place of operation.
 2. Position the appliance in its place of operation.
- ✓ The appliance has been transported safely on its castors.

Transport with a forklift truck

The appliance can be transported with a forklift truck.

Prerequisites

- ▶ The appliance is switched off and disconnected from the mains.
- ▶ The temperature control medium has been drained.
- ▶ All external connections have been removed.

Procedure

1. Place the appliance in the center of a pallet.
 2. Place loose parts, e.g. cables, next to the appliance on the pallet.
 3. Secure the appliance to the pallet from below using four M12 screws.
 4. Transport the appliance to its place of operation using a suitable forklift truck.
- ✓ The appliance has been transported safely to its place of operation.

6 Set up

6.1 Set up the device at the place of operation

Prerequisites

- ▶ The device has been transported to the place of operation.
- ▶ The size and infrastructure of the place of operation are suitable for operating the device.
 - ❗ **NOTE** Recommended minimum distance of 1 m from neighboring devices to avoid electromagnetic interference.

Procedure

1. Set up the appliance on a flat, smooth, non-flammable surface.
 - ❗ **NOTE**
 - Ensure that the appliance stands securely.
 - Leave at least 20 cm of free space in front of and behind the appliance.
 - All ventilation openings in the casing must not be covered.
 - The refrigerant cycle must not be damaged.
- ✓ The appliance is installed at the place of operation.

7 Commissioning

7.1 Connecting the device to the power supply

This section describes the electrical connection of the device with mains plug.



DANGER

Electric shock from electrical equipment!

Touching damaged live parts can lead to serious electric shocks and can injure or kill people.

- Have damaged insulation and components of the electrical system repaired immediately by a JULABO service technician or a qualified specialist workshop.
- Replace damaged mains cables immediately.
- Do not operate the appliance if the mains cable is damaged.
- When making a connection with a mains plug, this must always be freely accessible.



DANGER

Danger to life due to electric shock!

An electric shock can cause serious injury or even death.

- Only operate the appliance on a mains connection protected by an RCD (type B, $I_a = 30 \text{ mA}$).
- Only operate the appliance on mains sockets with a protective earth contact (PE).



DANGER

Danger to life due to electric shock!

An electric shock can cause serious injury or even death.

- Live parts are enclosed in the appliance housing. If the appliance housing is damaged, live parts can be touched.
- If the appliance housing is damaged, do not connect the appliance to the power supply!



NOTE

Damage to the mains cable due to excessive temperature!

The mains cable must not touch any parts that become hot during operation.

- Keep the mains cable away from surfaces that can become hot.

Prerequisites

- ▶ The device is at its operating location.

Procedure

1. Insert the appliance plug of the mains cable supplied into the mains connection socket on the back of the appliance.
 2. Insert the plug of the mains cable into the socket.
- ✓ The appliance is electrically connected.

7.2 Connecting an external system

The appliance is used to control the temperature of external closed systems in a temperature control circuit. An external system is connected to the pump connections of the device.



CAUTION

Risk of scalding due to damaged temperature control hoses!

Hot temperature control medium can escape from damaged temperature control hoses and cause severe scalding on contact with the skin.

- Check temperature control hoses regularly to ensure they are intact.
- Replace damaged temperature control hoses immediately.
- Do not kink the temperature control hoses.
- Replace temperature control hoses regularly.
- Check pump connections for leaks.



CAUTION

Injuries and material damage due to incompatible externally connected system!

If the temperature range and/or pressure parameters of an externally connected system do not match the appliance, this can lead to damage to individual components or even failure of the entire system. Hot temperature control medium can escape under high pressure or cause components to burst.

- Before making the connection, check whether the external system is compatible with the specifications of the temperature control unit.
- If an external system is connected that is not designed for the maximum pressure of the appliance (e.g. glass apparatus), limit the delivery rate of the pump in the settings and take suitable measures to limit the pressure (e.g. pressure relief devices).
- Allow for sufficient safety reserves. System-related pressure peaks can briefly exceed the specified maximum delivery pressure.
- Do not install shut-off valves in the return flow.
- Check the pump settings before and during commissioning and adjust if necessary.
- 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 pipes can be damaged if touched.

- Pump connections must be free during operation.
- No loose parts or lines must come into contact with the pump connections during operation.

**NOTE****Overflow of temperature control medium through externally connected systems!**

If the externally connected system is higher than the temperature control system, temperature control medium may flow back and overflow when the system is switched off.

- Arrange the connected external system at the same or lower level than the temperature control system.
- Install a shut-off valve or solenoid valve as a backflow preventer between the external system and the temperature control system.

**NOTE****Damage to the temperature control hoses due to kinking!**

Temperature control hoses are damaged by kinking and can leak.

- Lay the temperature control hoses in large radii.
- Avoid kinking the temperature control hoses.

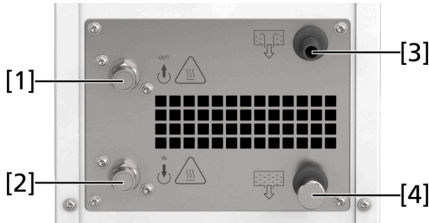
**NOTE****Material damage due to overflow of the temperature control medium!**

The maximum filling volume of the system can be exceeded if the temperature control medium expands during operation. Uncontrolled leaks of temperature control medium can cause damage to the appliance.

- Do not fill the appliance unattended.
- Connect the hose to the overflow and guide it into a suitable collecting vessel.
- Never close the overflow at the back of the appliance!
- Allow for approx. 12 % volume change per 100 °C temperature change.

7.2.1 Connecting an external system with screw connections

This section describes how to connect an external closed system with screw connections to the appliance.



1. Flow connection
2. Return connection
3. Overflow connection
4. Drain connection

Requirements

- ▶ Two open-end wrenches, size 19 mm and 22 mm
- ▶ Two open-end wrenches, size 27 mm
- ▶ Torque wrench
- ▶ Suitable temperature control hoses with threaded connections are available
- ▶ The temperature control hoses are connected to the external system
- ▶ Overflow hose with an internal diameter of 10 mm is available

Procedure

1. Remove the screw plugs from the supply and return lines.
2. Fit the temperature control hoses. Counterhold with a second open-end wrench.
 - ⇒ Tightening torque of the M16 screws: 20 Nm
 - ⇒ The temperature control hose from the lower inlet of the external system is connected to the pump connection flow. This ensures proper venting of the external system.
3. Attach the overflow hose to the overflow connection piece and secure with a hose clamp.
4. Guide the overflow hose into a suitable container to collect the temperature control medium.
 - ❗ **NOTE** The overflow hose must hang open in the collection vessel and must not be submerged. Pressure equalization must be possible.
5. Check all lines for tight fit and leaks.
 - ✓ The external system is connected to the appliance.

7.3 Filling the device

This section describes how to fill the appliance with temperature control medium during commissioning.

The filling quantity can be found in the technical data.



NOTE

Material damage due to overflow of the temperature control medium!

The maximum filling volume of the system can be exceeded if the temperature control medium expands during operation. Uncontrolled leaks of temperature control medium can cause damage to the appliance.

- Do not fill the appliance unattended.
- Connect the hose to the overflow and guide it into a suitable collecting vessel.
- Never close the overflow at the back of the appliance!
- Allow for approx. 12 % volume change per 100 °C temperature change.

Prerequisites

- ▶ The drain is closed.
- ▶ The appliance is switched off.
- ▶ The external system is connected.

Procedure

1. Open the filler neck of the internal reservoir.
 2. Fill the temperature control medium up to the upper mark on the level indicator.
 3. Switch on the appliance at the power switch.
 4. Set the target temperature.
 5. Start temperature control.
 - ⇒ The temperature control medium is pumped into the connected external system.
 6. Top up the temperature control medium to half the level indicator.
 7. When the setpoint temperature is reached, adjust the fill level by topping up or draining.
 - ! **NOTE**
 - As the temperature rises, the temperature control medium expands and can overflow.
 - If the temperature falls, the low level protection may be triggered and interrupt the temperature control process.
 8. Close the filler neck.
- ✓ The device and the external application are filled with temperature control medium.

8 Operation




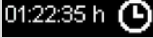






8.1 User interface




8.1.1 Softkeys and status icons

The outlined softkeys on the touchscreen can be selected with a finger to access submenus. Numerical values can be selected and changed by swiping up, down, left or right.

The user interface contains the following softkeys and status icons.



Icon	Icon Description
	Display Ethernet connection active
	Display External storage medium inserted
	Recording to external storage medium active
	<p>Timer display:</p> <ul style="list-style-type: none"> • Start date / time of the timer or • the remaining time when the timer is running
	Heating display active
	Cooling display active
	Display current internal temperature
	Display error messages: Only the first error is displayed. If there are several warnings, each cause must be eliminated separately and the appliance restarted.
	Display warning message: Only the first warning is displayed. If there are several warnings, each cause must be eliminated separately.
	Display operating status
	Setting setpoint temperature / display current setpoint temperature
	<p>Pump level setting</p> <p>Display current pump stage</p>

Icon	Icon Description
	Call up main menu / Pump pressure
	Temperature control start
	Temperature control stop

8.1.2 Alarm and warning messages

Alarms and warnings are indicated by error codes on the display. Important error codes are described in the chapter entitled **Faults and troubleshooting**.

If an error cannot be rectified by the operator, contact Technical Service.

Warning:

In the event of a warning, temperature control is not interrupted. A warning message appears on the display. An intermittent signal tone sounds. The signal tone can be switched off by touching the touchscreen. Once the cause of the warning has been rectified, the warning disappears. Depending on the cause, warnings may disappear by themselves after some time.

Alarm:

In the event of an alarm, temperature control is stopped. The actuators are switched off. At the same time, a continuous acoustic signal sounds and an alarm message appears on the display. The signal tone can be switched off by touching the touchscreen. The cause of the alarm must be eliminated. A restart is required.



NOTE

The list of alarm and warning messages can be found in **chapter 10 Faults and troubleshooting**.

8.2 Main menu



Press the [≡] softkey on the start screen to open the main menu. The main menu is divided into menu items, each of which contains further submenus or in which settings can be made directly.

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

- Set safety
- Determine thermodynamics
- Connect device
- Timer
- Evaluate data
- Install device
- Device settings
- Service settings
- About the device

8.2.1 Set security menu



- Autostart yes / no
- Pump mode Automatic / Pump always on / Pump run-on
- Temperature limits:
 - Setpoint min. / max.: Setting the upper and lower limit value for the temperature setpoint
 - Over / under temperature alarm, over / under temperature warning: Setting of alarm and warning limits
 - Overtemperature protection

8.2.2 Determine thermodynamics menu



- Set controller:
 - Xp
 - Tn
 - Tv
- Set pump:
 - Pump output

8.2.3 Connect device menu



- Remote control: off, serial, USB, Ethernet (option)
- Interfaces:
 - Serial:
 - Mode
 - Baud rate
 - Parity
 - Handshake
 - Ethernet (option):
 - Obtain IP via DHCP
 - MAC address
 - IP address
 - Subnet mask
 - Default gateway
 - Remote control port
 - Host name

8.2.4 Timer menu



- Activate yes / no
- Schedule start
 - immediately
 - Date / time
- Start date
- Start time
- Setpoint
- End state
 - Standby
 - Last setpoint
 - Start setpoint
- Duration

8.2.5 Evaluate data menu



- Record data
 - Activate yes / no
 - Sampling time

- Save black box data
- Alarm memory

8.2.6 Install device menu



- Adjust temperature sensor
- Reset device
- Enable options: Display all options and indicate whether they are enabled or not
- MAC address



NOTE

Material damage due to freezing water!

Freezing water can damage the appliance and the temperature control product.

- When using water as a temperature control medium, do not use temperatures below 5 °C.

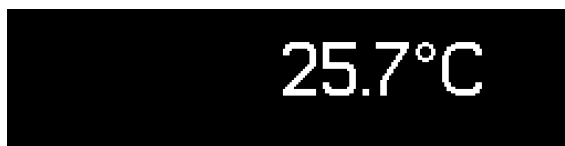
8.2.7 Settings menu



- Set language
- Set date and time
- Set physical units
 - Temperature °C / °F

- Screen brightness
- Screen saver yes / no

⇒ The current temperature is displayed while the screen saver is active. Touching the touchscreen interrupts the screen saver.



NOTE

Damage to the OLED display due to deactivated screen saver!

Deactivating the screen saver has a negative impact on the service life of the display.

- The screen saver is activated by default.
- To prevent images from burning in, do not deactivate the screen saver.

8.2.8 Service menu



The **<Service>** menu is password protected. Only JULABO service technicians have access.

8.2.9 About the device menu



- Display of the device identity with voltage variant and firmware version.

8.3 Switching on the device

This section describes how to switch on the device.

Prerequisites

- ▶ The device is connected and ready for operation.

Procedure

1. Switch on the device at the power switch.
 - ⇒ The software boots and starts the device. The display shows the device name, the voltage variant and the loaded configuration.
- ✓ The device is switched on. It switches to the last active operating mode. If the autostart function is activated, the appliance starts the temperature control directly with the last setting.
 - ! **NOTE** In “always on” pump mode, the pump starts directly.



NOTE

When the remote control is activated, it is not possible to operate the device.

8.4 Switching off the device

This section describes how to switch off the device.

Prerequisites

- ▶ The device is switched on.

Procedure

1. Stop the current temperature control.
 - ❗ **NOTE** Only switch off the appliance when it is in standby mode.
 2. Switch off the appliance at the power switch.
- ✓ The appliance is switched off.

8.5 Setting the setpoint temperature

The appliance regulates the temperature to the set setpoint temperature. The setpoint temperature can be changed during temperature control. The set value is saved.

Prerequisites

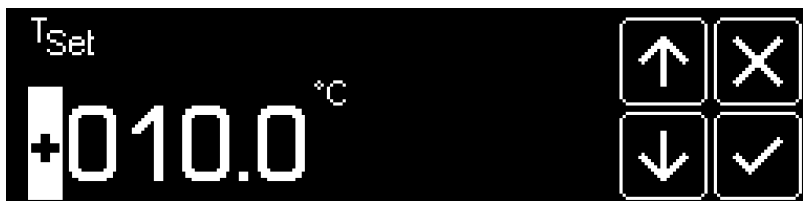
- ▶ The appliance is switched on.



Procedure

1. Press the [TSet] softkey.

⇒ The setting screen for the setpoint temperature opens.



2. Set the setpoint temperature using the arrow keys or by swiping across the display (left, right, up, down) and confirm with [✓].
- ✓ The setpoint temperature is set and active. The setting of the setpoint temperature can be interrupted by pressing the [x] button. The previous value is retained.

8.6 Setting the pump

The pump output can be set in one percent increments.



NOTE

Material damage due to excessive pump pressure!

If the permissible operating pressure of the external system is below the maximum delivery pressure of the pump, an incorrect pump setting can cause damage to the application.

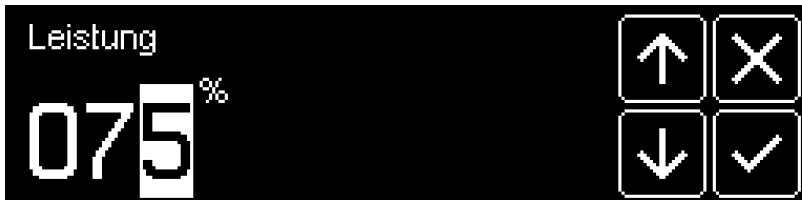
- Monitor the pressure at the application when changing the pump settings.
- When commissioning for the first time or after making changes to the system, start the pump at minimum pump output and carefully increase the output during operation as required.

Prerequisites

- ▶ The appliance is switched on.

Procedure

1. Call up the **<Main menu>**.
2. In the **<Determine thermodynamics>** submenu, select the **<Set pump>** menu item.



3. Set the desired value using the arrow buttons or by swiping across the display and confirm with [✓].
 - ⇒ The minimum value is set internally in the device. The maximum value is limited by the adjustable maximum pump output in the **<Set safety>** menu.
4. Confirm entry.
 - ✓ The set value takes effect immediately. The pump is set. The pump output setting can be canceled with the [x] button. The previous value is retained.

8.7 Starting temperature control

A temperature control task can be started directly on the appliance. Other options include controlling the temperature control via the timer and remote control via a connected PC.

Prerequisites

- ▶ The appliance is switched on.
- ▶ The setpoint temperature is set.

Procedure

1. Press the [▶] softkey.
 - ✓ The appliance starts temperature control immediately. The temperature control can be stopped with the [✓] softkey.

8.8 Setting the timer

The timer can be used to program the duration of temperature control for up to 100 hours as well as the start date and time. The target temperature is set as the setpoint temperature.

After the set duration has elapsed, the appliance switches to the previously defined state:

- Standby mode
- Maintain target temperature
- Temperature control to original setpoint temperature

Prerequisites

- ▶ The appliance is switched on.

Procedure

1. Call up the <Main menu>.
2. Call up the <Timer> submenu.
 - ⇒ The dialog box for setting the timer appears on the display.
3. Set the start time and start date and confirm with [✓].
4. Set the temperature setpoint and the desired duration and confirm with [✓].
5. In the <Final state> field, select how the appliance should behave after the temperature control time has elapsed.
6. Select <Activate>/<Yes> in the submenu to activate the timer.
 - ✓ The timer is programmed and active.

8.9 Activating the autostart function

The autostart function enables temperature control to be started directly with the mains switch or via an intermediate timer.

The appliance is configured at the factory so that it switches to a safe operating state in the event of a power failure. The autostart function is deactivated. "OFF" appears on the display. The cooling unit, the heater and the pump motor are disconnected from the mains voltage.



WARNING

Unattended auto-start of the appliance!

When commissioning the appliance, ensure that an unattended auto-start of the appliance, e.g. after a power failure, cannot pose a risk to persons or systems.

- Ensure that the protective and warning devices on the appliance are functioning correctly.

Prerequisites

- ▶ The appliance is switched on.

Procedure

1. Call up the **<Main menu>**.
2. In the **<Set security>** submenu, select the **<Autostart>/<Yes>** menu item.
✓ The autostart function is activated. The next time it is switched on, temperature control starts immediately with the preset values. A timer can be interposed and programmed. In this case, the mains switch of the appliance must remain switched on.

8.10 Recording data

The device can record data on an external storage medium. The conditions for this are defined in the <Evaluate data> menu and recording is started.

The recorded data can be evaluated at a later time.

Prerequisites

- ▶ The device is switched on.
- ▶ An external data carrier is available.

Procedure

1. Connect the external data carrier to the USB-C socket.
 2. Call up the <Main menu>.
 3. Call up the <Evaluate data> submenu.
 4. Call up the <Record data> submenu.
 5. Set the sampling time and confirm with [✓].
 6. Select <Activate>/<Yes> in the submenu to activate the recording.
 7. Confirm the settings with the [✓] softkey.
- ✓ Data recording starts. The data is recorded at the set interval until recording is stopped.

8.11 Thermodynamics

8.11.1 Control parameters

The appliance works with a PID controller whose behavior is determined by the proportional range X_p , the reset time T_n and the derivative time T_v . The optimum values for these control parameters depend on the application. The control parameters are set at the factory so that good control behavior is achieved with most applications. In individual cases or if there are special control requirements, the control parameters can be adapted to the application.

The internal control parameters can be adjusted in the **<Determine thermodynamics>/<Adjust controller>** submenu.

Proportional range X_p

The proportional range X_p is the range around the setpoint in which the P component of the controller is active. Within this range, the P component of the controller behaves proportionally to the control deviation. The smaller X_p , the faster the controller becomes. A value for X_p that is too small can cause the system to oscillate.

Reset time T_n

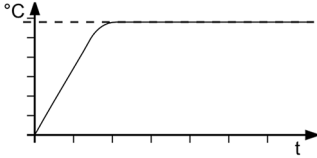
The reset time T_n is a measure of the “strength” of the I component of the controller. The I component builds up by adding up the control deviation over time and thus ensures that no permanent control deviation occurs. A small T_n leads to a faster elimination of the control deviations, but increases the risk of overshoot and oscillations. If T_n is set to 0 s, the I component of the controller is deactivated.

Derivative time T_v

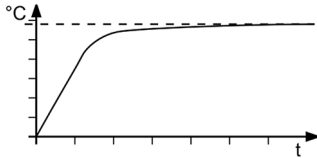
The derivative action time T_v influences the D component of the controller, which reacts to the rate of change of the control deviation and counteracts it. This allows overshoots to be damped. The greater T_v , the greater the damping effect. However, if T_v is set too high, this can lead to unsteady control behavior. If T_v is set to 0 s, the D component of the controller is deactivated. This is how it is configured on delivery, as satisfactory control behavior can usually also be achieved with a pure PI controller.

8.11.2 Optimizing temperature curves

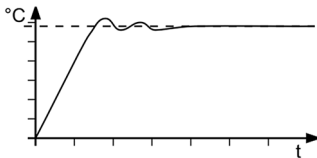
A recorded temperature curve provides information on how individual control parameters can be optimized to achieve a better result.



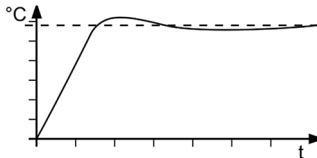
Optimum temperature control curve, temperature quickly reaches the setpoint without overshooting and maintains the setpoint.



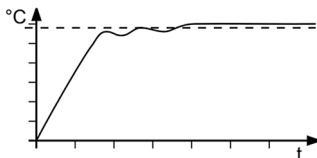
Symptom: Temperature curve approaches the setpoint slowly and does not quite reach it.
Remedy: Reduce T_v and/or T_n , increase X_p .



Symptom: Temperature curve approaches the setpoint quickly, overshooting with oscillations occurs. Remedy: Increase T_v and/or T_n .



Symptom: Temperature curve quickly approaches the setpoint, overshooting occurs.
Remedy: Increase X_p .



Symptom: Temperature curve is rapidly approaching the setpoint value, temperature builds up, setpoint value is exceeded. Remedy: Reduce X_p and/or T_v .

8.12 Remote control of the device

8.12.1 Controlling the device remotely via the RS232 interface

The device can be controlled remotely via the RS232 interface. A null modem cable is required for connection to a PC.

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

Setting parameters

Prerequisites

- ▶ Remote control is deactivated.

Procedure

1. Call up the **<Main menu>**.
 2. Call up the **<RS232>** menu item in the **<Connect device>/<Digital interfaces>** submenu.
 3. Set the interface parameters **[Baud rate]**, **[Handshake]** and **[Parity]** if they differ from the factory settings.
 - ⇒ With parity “None”, the number of data bits is set to 8.
- ✓ The interface parameters are set and immediately active.

Remote control device

Prerequisites

- ▶ The device is switched off.
- ▶ A terminal program is installed on the PC.

Procedure

1. Connect the device and PC with a null modem cable.
2. Switch on the device.
3. Call up the **<Main menu>** on the device.
4. In the **<Connect device>/<Interfaces>** submenu, activate the RS232 serial interface.
5. In the **<Connect device>/<Remote control>** submenu, activate the “Serial” connection type.
 - ⇒ RS232 mode is displayed on the start screen.
6. Start the terminal program on the PC.
7. Enter the interface parameters in the terminal program.

8. Select the COM port of the device in the terminal program and establish a connection.
- ✓ Remote control via the RS232 serial interface is active. The device can be remote-controlled via the terminal program using the interface commands. For interface commands, see appendix.

8.12.2 Remote control of the device via Ethernet interface

The device can be controlled remotely via the Ethernet interface (optional).

Prerequisites

- ▶ A terminal program is installed on the PC.

Procedure

1. Connect the device and PC with a standard network cable.
2. Call up the **<Main menu>** on the device.
3. In the **<Connect device>/<Interfaces>** submenu, call up the **<Ethernet>** menu item.
4. Activate the **[Obtain IP via DHCP]** function to set up the connection automatically if a DHCP server is available in the network.
5. Alternatively, set the IP address, subnet mask and default gateway manually.
6. Enter the **<remote control port>**.
7. Go back one menu level and activate Ethernet in the **<Connect device>/<Remote control>** submenu.
8. Start the terminal program on the PC.
9. Select the IP address and the Ethernet port of the device in the terminal program and establish a connection.
- ✓ Remote control via the Ethernet interface is set up and active. The device can be controlled remotely using the interface commands via the terminal program. For interface commands, see appendix.

8.12.3 Remote control of device via USB interface

Prerequisites

- ▶ The device is switched off.
- ▶ A terminal program is installed on the PC.

Procedure

1. Connect the device and PC with a standard USB cable.
 2. Download the appropriate USB driver from the website www.julabo.com in the download area (up to and including Microsoft Windows 8).
 - ⇒ Depending on the operating system of the connected PC, it may be necessary to install the USB driver.
 3. Install the USB driver on the PC.
 4. Switch on the device.
 5. Call up the **<Main menu>** on the device.
 6. Activate the USB interface in the **<Connect device>/<Remote control>** submenu.
 - ⇒ USB mode is displayed on the start screen.
 7. Start the terminal program on the PC.
 8. Select the COM port of the device in the terminal program and establish a connection.
- ✓ Remote control via the USB interface is active. The device can be controlled remotely using the interface commands via the terminal program. For interface commands, see appendix.

8.12.4 Query device status

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

Prerequisites

- ▶ The device is connected to a PC via an interface.

Procedure

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 in response to the status query.



NOTE

- Explanations of the status messages can be found in the **appendix**.
- Explanations of the alarm and warning messages can be found in **the Faults and troubleshooting chapter**.

8.13 Adjusting the temperature sensor (ATC)

For physical reasons, there may be a temperature difference between the internal temperature sensor and a more distant measuring point in the temperature control circuit. As a result, the temperature measured by the device deviates slightly from the temperature in the external application. Adjusting the temperature sensor can increase the accuracy of the temperature control.

A 1-point adjustment is possible if the application is tempered to a specific setpoint. The adjustment curve is shifted parallel to the measurement curve by the offset.

8.13.1 Adjusting the internal temperature sensor

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

Prerequisites

- ▶ A suitable reference thermometer is attached to the desired measuring point of the external application.
- ▶ The device is filled.
- ▶ The device is switched on.

Procedure

1. Set the desired setpoint temperature and start the temperature control.
 - ⇒ When the setpoint is reached, allow the temperature to stabilize for a few minutes.
 - ❗ **NOTE** The more stable the temperature in the bath tank, the more precise the calibration result.
 2. Compare the temperature of the reference thermometer with the internal temperature of the appliance shown on the display and determine the difference.
 3. Call up the **<Main menu>**.
 4. In the **<Install device>** submenu, select the **<Adjust temperature sensor>** menu item.
 5. Enter the determined temperature difference as an offset and confirm with [✓].
 - ⇒ The offset is accepted directly.
- ✓ The temperature sensor is adjusted.
- ❗ **NOTE** The setting limits for the temperature setpoint and for warning and alarm limits are also shifted by the offset.
 - ❗ **NOTE** The overtemperature protection works independently of the adjustment with the internally measured temperature without offset.

9 Cleaning and maintenance

9.1 Maintenance intervals

The table lists the regular maintenance work according to their maintenance intervals. The specified maintenance intervals refer to single-shift operation. The times given are approximate values.

Interval	Activity	Qualification	Duration [min]
	Calibrate gas detector (only for appliances with flammable refrigerant)	JULABO Technical Service	-
Every 2 years	Check safety markings	Operator	1
As required	Clean condenser	Operator	5
As required	Clean level indicator	Operator	5



NOTE

For the JULABO maintenance and service offer, contact JULABO sales or service.

9.2 Emptying the appliance

If the appliance is to be sent in for technical service or disposed of properly, it must be completely drained.

The appliance should always be completely emptied before it is taken out of service for any length of time and when the external application is changed.



CAUTION

Risk of scalding from hot temperature control medium!

The temperature control medium can become very hot during the temperature control process. Contact with hot temperature control medium can lead to scalding.

- Allow the appliance to cool down to room temperature before emptying.
- Avoid direct contact with hot temperature control medium
- Wear protective gloves.

Prerequisites

- ▶ The device is switched off.
- ▶ The appliance is at room temperature.
- ▶ The external application is disconnected from the appliance.
- ▶ A sufficiently large collection container is available under the drain of the appliance.

Procedure

1. Open the drain.
 - ⇒ The temperature control fluid flows into the collection container provided.
2. When the appliance is completely empty, close the drain.
 - ✓ The appliance is drained.

9.3 Cleaning the appliance

The outside of the device should be cleaned at regular intervals. Before using a cleaning or decontamination method other than that recommended by JULABO, consult JULABO to ensure that the intended method will not damage the device.



NOTE

Damage to the electronics due to water ingress!

Water ingress can damage the electronics of the appliance and cause it to fail.

- Only clean the outside of the appliance with a damp cloth.
- Prevent water from entering the appliance .

Requirements

- ▶ Lint-free cloth
- ▶ Mild cleaning agent
- ▶ The appliance is switched off.
- ▶ The appliance is disconnected from the power supply.

Procedure

1. Allow the appliance to cool down to room temperature.
 2. Clean the surface of the appliance with a damp cloth.
 - ❗ **NOTE** You can use a little washing-up liquid for cleaning. If in doubt, ask Technical Service for alternative cleaning agents.
- ✓ The appliance is cleaned.

9.4 Cleaning the condenser

The condenser at the front of the appliance should be cleaned from time to time in order to maintain full cooling capacity.



WARNING

Leakage of flammable refrigerant!

The appliance contains flammable refrigerant in a technically permanently sealed circuit. In the event of a leak in the refrigerant circuit, a flammable concentration may form in the air, which may ignite or explode due to potential ignition sources in the vicinity. This can lead to serious injury or death.

- Observe the prescribed minimum room size for operating the appliance.
- Only use the appliance in well-ventilated rooms.
- Avoid ignition sources in the immediate vicinity of the appliance (e.g. electrical switches, hot surfaces, naked flames).
- Do not damage refrigerant lines.
- Do not damage the fins of the condenser.
- In the event of a refrigerant leak, switch off the appliance immediately, keep open flames and ignition sources away, ventilate the room well and contact JULABO Service.

Prerequisites

- ▶ The appliance is switched off.
- ▶ The appliance is disconnected from the power supply.
- ▶ The appliance has cooled down to room temperature.

Procedure

1. Remove the ventilation grille from the front of the appliance.



2. Carefully vacuum the dirt from the condenser with a vacuum cleaner.
⚠ **CAUTION** Take care not to damage the fins of the condenser.



3. Replace the ventilation grille.
✓ The condenser has been cleaned.

9.5 Cleaning the level indicator

If necessary, the illuminated level indicator can be cleaned using the brush supplied.

Requirements

- ▶ Cleaning brush
- ▶ The appliance is switched off
- ▶ The appliance is disconnected from the power supply

Procedure

1. Remove the level indicator cover.
2. Push the cleaning brush into the level indicator from above and clean with up and down movements.



- ✓ The level indicator is cleaned.

9.6 Replacing the detachable power cable

The appliance is equipped with a detachable mains cable.



NOTE

The appliance may only be operated with the mains cable supplied. If the mains cable needs to be replaced due to a defect, it can be reordered.

Order number	Designation
5.350.3300	EU mains cable, 200-230 V
5.350.3300 + 5.320.8620	Mains cable CH, 200-230 V + adapter plug from Schuko to Switzerland
5.350.3311	Mains cable CN, 230 V
5.350.3311	Mains cable GB, 200-230 V
5.350.3310	Mains cable US, 100-115 V

9.7 Checking the function of the underlevel protection

This section describes how to check the function of the low level protection device.



CAUTION

Risk of scalding from hot temperature control medium!

The temperature control medium can become very hot during the temperature control process. Contact with hot temperature control medium can lead to scalding.

- Allow the appliance to cool down to room temperature before emptying.
- Avoid direct contact with hot temperature control medium
- Wear protective gloves.

Prerequisites

- ▶ The appliance is switched on.
- ▶ The appliance is at room temperature.
- ▶ The external application is disconnected from the appliance.
- ▶ A sufficiently large collection container is available under the drain of the appliance.

Procedure

1. Open the drain valve.
 - ⇒ The temperature control medium flows into the collection container provided.
 - ⇒ The low level alarm is triggered during the draining process. Acknowledge the message on the display.
2. If the low level alarm has been triggered, close the drain.
 - ✓ The function of the low level protection device has been checked. Refill the appliance with temperature control medium before using it again.

9.8 Checking the safety markings

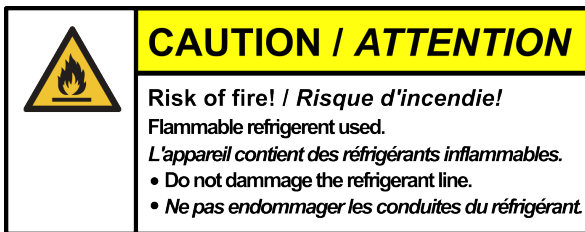
The following section only applies to appliances with natural refrigerants that are operated in the USA or Canada.

The safety markings on the appliance must be clearly legible at all times. Their condition must be checked every two years.

Procedure

1. Check the safety markings on the appliance for legibility and completeness.
 2. Replace defective or missing safety labels.
 - ❗ **NOTE** Safety labels can be reordered from JULABO.
- ✓ The safety labels on the appliance have been checked.


Housing front, under front cover




Safety label (order no. 3.383.2630)

Right side of housing



	CAUTION / ATTENTION
	<p>Risk of fire! / <i>Risque d'incendie!</i> Flammable refrigerant used. <i>L'appareil contient des réfrigérants inflammables.</i></p> <ul style="list-style-type: none">• Dispose of properly in accordance with federal or local regulations.• <i>Installez l'appareil en vous conformant aux réglementations nationales ou régionales.</i>

Safety label (order no.: 3.383.2600)

	NOTICE / AVIS
	<p>This unit is intended for commercial, industrial or institutional use, as defined in the safety standards for refrigeration systems according to ANSI/ASHRAE 15.</p> <p><i>Cet appareil est destiné à un usage commercial, industriel ou institutionnel tel que défini par les normes de sécurité des systèmes de réfrigération, selon ANSI/ASHRAE 15.</i></p>

Note (order no. 3.383.2640)

9.9 Taking the device out of operation and storing it

If an appliance is not to be used for a longer period of time or is to be sent to the Technical Service for repairs, for example, it is taken out of operation. The procedure described must be followed to ensure that it continues to function reliably after a longer period of storage.

Prerequisites

- ▶ The appliance is switched off.

Procedure

1. Empty the appliance completely (see **Emptying the appliance**).
 2. Disconnect the appliance from the power supply.
 3. Dismantle the external application.
 4. Drain the temperature control medium completely.
 5. Clean the inside and outside of the appliance.
 6. Remove all residues of the cleaning fluid from the pipe system (e.g. with compressed air).
 7. Close all connections and drain valves.
 8. Store the appliance in a sufficiently ventilated, dust-free, dry and frost-free location. Avoid corrosive and aggressive environments.
- ✓ The appliance is protected and stored safely. It can be put back into operation if required.

9.10 Sending in the device

In the event of faults on the appliance that the operator cannot rectify himself, contact Technical Service.



NOTE

Observe the following before shipping:

- Drain the appliance completely (temperature control medium, refrigerant).
- Clean and decontaminate the appliance properly to prevent any risk to service personnel.
- Close all connections tightly with nuts and sealing caps.
- Carefully pack the appliance to protect it from damage.
- Mark the packaging so that the device can be transported upright.
- Complete the online return form at www.julabo.com/service.



NOTE

For safe return transportation to JULABO, use the original packaging if possible.

Shipping address

JULABO GmbH

Gerhard-Juchheim-Strasse 1

77960 Seelbach

Seelbach, Germany

Phone: +49 7823 51-66

service.de@julabo.com

9.11 Warranty

The following warranty terms apply to products sold in North America by JU-LABO (“Seller”) to the entity identified as the buyer (“Buyer”) on the Seller’s invoice.

Initial Warranty

Upon Seller’s receipt of full payment for the Products, and subject to Buyer’s compliance with the Terms of Sale and all other agreements with Seller with respect to the Products, Seller warrants to Buyer that the Products manufactured by Seller will be free from defects in materials and workmanship for a period not to exceed two (2) years of operation from the date the Product was shipped by Seller to Buyer (the “Initial Warranty”).

EXCLUSION OF ALL OTHER EXPRESS WARRANTIES; EXCLUSION OF ALL IMPLIED WARRANTIES

OTHER THAN THE INITIAL WARRANTY, NO OTHER EXPRESS WARRANTIES ARE GIVEN. ALL IMPLIED WARRANTIES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE EXCLUDED IN ALL RESPECTS AND FOR ALL PURPOSES. SELLER DISCLAIMS AND MAKES NO IMPLIED WARRANTIES OF ANY KIND.

Exclusions

The initial warranty does not cover damage to the product resulting from accident, abuse, improper installation or operation, unauthorized or improper repair, replacement or alteration (including, but not limited to, repair, replacement or alteration performed by anyone other than Seller’s employees or authorized representatives), failure to perform (or improper performance of) maintenance, unreasonable or unintended use or misuse of the product, or failure to follow written installation or operating instructions.

Buyer must return proof of purchase of the Product to Seller or one of its authorized representatives within thirty (30) days of the date the Product was shipped to Buyer by Seller in order to make a claim under the Initial Warranty. Notwithstanding anything to the contrary herein, all glassware, including but not limited to reference thermometers, is expressly excluded from the Initial Warranty.

Buyer’s Exclusive Remedies; Seller’s Limitations of Liability

Buyer’s sole and exclusive remedy under the Initial Warranty shall be limited, at Seller’s sole discretion, to either: (i) repair of defective parts; or (ii) replacement of defective parts. In either case, the warranty period for the product receiving a repaired or replaced part under the terms of the original warranty will not be extended. Any repairs or replacements made by Seller under this warranty

shall be made at one of Seller's facilities in Allentown, Pennsylvania, U.S.A., or at the facility of an authorized representative of Seller, which location shall be determined by Seller in its sole discretion; provided, however, that Seller may, in its sole discretion, make such repairs or replacements at Buyer's facility, in which case Buyer shall be responsible for travel, living and other expenses incurred by Seller in making such repairs or replacements at Buyer's facility. As a condition precedent to Seller's obligation to repair or replace any Product part under the Initial Warranty, Buyer shall (i) promptly notify Seller in writing of any such defect; (ii) return the proof of purchase of the Product to Seller or Seller's authorized representatives within thirty (30) days from the date the Product was shipped by Seller; and (iii) assist Seller in all respects in its attempts to determine the legitimacy and basis of any claim made by or on behalf of Buyer, including, but not limited to, granting Seller access to the Product to verify the operating conditions. If Buyer fails to notify Seller in writing within the Initial Warranty Period or fails to return the proof of purchase of the Product as described above, Seller shall have no further liability or obligation to Buyer therefor. In no event shall Seller's liability under the Initial Warranty exceed the original purchase price of the Product that is the subject of the alleged defect.

THE REMEDIES PROVIDED IN THE ORIGINAL WARRANTY ARE THE SOLE AND EXCLUSIVE REMEDIES AVAILABLE TO BUYER. NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED HEREIN, AND EVEN IF THE SOLE AND EXCLUSIVE REMEDIES FAIL OF THEIR ESSENTIAL PURPOSE FOR ANY REASON, IN NO EVENT SHALL SELLER BE LIABLE FOR BUYER'S MANUFACTURING COSTS, LOST PROFITS, GOODWILL OR OTHER SPECIAL, INDIRECT, PUNITIVE, INCIDENTAL OR CONSEQUENTIAL DAMAGES TO BUYER OR ANY THIRD PARTY, AND ALL SUCH DAMAGES ARE HEREBY DISCLAIMED.

Assignment

Buyer may not assign its rights or obligations hereunder without Seller's prior written consent; provided, however, that if Buyer is a distributor of Seller, Buyer's rights and obligations under these warranty terms shall inure to the benefit of and be binding upon Buyer's customers upon presentation to Seller of proof of purchase of the Product in accordance with the terms set forth herein. The Seller shall be entitled to assign its rights and obligations hereunder in whole or in part without the prior consent of the Buyer.

Governing Law

The warranty provisions and all questions relating to their validity, interpretation, performance and enforcement shall be construed in accordance with and governed by the substantive laws of the Commonwealth of Pennsylvania, without regard to principles of conflict of laws.

Waiver

Seller's failure to insist upon strict compliance with the terms of this warranty shall not constitute a waiver of such right. No claim or right arising out of any breach of warranty by Buyer may be waived in whole or in part by a waiver of the claim or right unless the waiver is in writing and signed by an authorized representative of Seller. Seller's waiver or acceptance of any breach by Buyer of any provision of the Warranty shall not constitute a waiver or excuse for failure to comply with any other provision of the Warranty or for any prior or subsequent breach of the same provision.

Freight

Seller shall arrange and pay for the cost of returning the device to Buyer.

Out of Box Failure (OBF)

Out of Box Failure (OBF) is defined as a product failure immediately after unpacking and installation of a newly delivered product. JULABO grants a 14-day grace period after the date of shipment within which the delivered product must be checked for defects. The same exclusions apply to the OBF classification as to the regular warranty. For example, JULABO is not liable for transport damage, damage caused by the customer or third parties, or for defects caused by improper installation or use.

10 Faults and troubleshooting

10.1 Alarm and warning messages

Alarm and warning messages are described in the table.

If a displayed error code is not described in the table, or if the error continues to occur after switching off and on again, contact Technical Service.

Code	Cause	Action
E01	The level has fallen below the minimum level.	Top up the temperature control medium. Check temperature control hoses for damage and replace if necessary.
E03	The measured temperature is above the set overtemperature limit.	Increase the "Overtemperature" temperature limit or reduce the temperature set-point.
E04	The measured temperature is below the set under-temperature limit.	Reduce the "Undertemperature" temperature limit or increase the temperature set-point.
E05	The line of the working temperature sensor is interrupted or short-circuited.	Contact JULABO Service.
E14	The set protection temperature has been exceeded.	Check the working temperature range of the application. Reduce the setpoint temperature.
E40	The low level protection signals a critical fluid level.	Top up the temperature control medium.
E60	Internal read/write error.	Switch off the device at the power switch, wait 4 seconds and then switch the device back on.
E63	Error in the electronics.	Switch off the device at the mains switch, wait 4 seconds and then switch the device back on.
E72	Device does not contain a configuration.	Load valid configuration onto device.
E108	The latching function of the protective device is still active.	Switch off the appliance at the mains switch, wait 4 seconds and then switch the appliance back on.
E135	Error detected at pump output.	Contact JULABO Service.

Code	Cause	Action
E143	Set temperature limit for overtemperature alarm exceeded.	Increase temperature limit for overtemperature alarm or reduce temperature setpoint.
E144	Set temperature limit for low temperature alarm undershot.	Reduce temperature limit for low temperature alarm or increase temperature setpoint.
E183	Excessive power consumption via USB interface.	Check plugged-in external data carrier for errors and replace if necessary. The USB interface is not suitable for consumers with a higher current requirement than the maximum permissible.
E402	The line of the evaporator outlet temperature sensor is interrupted.	Contact JULABO Service.
E473	Error in the refrigeration system.	If this occurs repeatedly, contact JULABO Service.
E1305	The pump speed is too low. Pump defective or viscosity of the medium too high.	Check the pump setting and adjust if necessary. Check the viscosity of the temperature control medium and adjust if necessary.
E1437	Error in the refrigeration system.	If this occurs repeatedly, contact JULABO Service.

11 Disposal

Observe the applicable country-specific guidelines when disposing of the appliance.



This symbol on the product or its packaging indicates that it must not be disposed of with household waste. Proper disposal avoids negative effects on people and the environment and allows valuable raw materials to be reused.

Information on collection points for old appliances can be obtained from the city or municipality or an authorized disposal company.



CAUTION

Leakage of flammable refrigerant!

If flammable refrigerant escapes, there is a risk of fire and explosion.

- Do not open the refrigerant circuit.
- Have the appliance disposed of by a certified company in accordance with national or regional regulations.

12 Appendix

12.1 Interface commands

The device can be controlled remotely via interface commands. Parameters can be called up and the current status can be queried. To do this, the device must be connected to the host computer via a digital interface.

The interface commands are entered via a terminal program.

Interface commands are divided into IN commands and OUT commands.

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

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

Example: Querying the setpoint temperature:

```
IN_SP_00←
```

Example response from the device:

```
55.5 ← LF
```

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

Ex. Setting the setpoint temperature to 55.5 °C:

```
OUT_SP_00_55.5←
```

12.1.1 IN commands

IN commands are used to retrieve parameters from the device.

Process values	Comment
version	Version
Status	status
in_pv_00	Actual temperature value
in_pv_01	Current manipulated variable [%]

Setpoints and warning limits	Comment
in_sp_00	Set temperature setpoint
in_sp_03	Set overtemperature warning limit
in_sp_04	Set undertemperature warning limit
in_sp_07	Set pump stage
in_sp_11	Set temperature unit: 0 = °C 1 = °F
in_sp_27	Set pump setting
in_sp_28	Overtemperature alarm limit
in_sp_29	Undertemperature alarm limit

Device modes	Comment
in_mode_05	Set operating mode of the temperature control system: 0 = Stop 1 = Start

Auxiliary parameter	Comment
in_hil_00	Set control value limitation of the cooling capacity (%)
in_hil_01	Set control value limitation of the heating output (%)

12.1.2 OUT commands

OUT commands are used to set parameters on the device. Remote control mode must be active for this.

Setpoints and warning limits	Comment
out_sp_00	Setting the setpoint temperature
out_sp_03	Setting the excess temperature
out_sp_04	Setting the lower temperature
out_sp_06	Setting the setpoint temperature of the watchdog function
out_sp_07	Setting the pump stage
out_sp_11	Setting the temperature unit: 0 = °C 1 = °F
out_sp_27	Pump output [%]
out_sp_28	Overtemperature alarm limit setting
out_sp_29	Undertemperature alarm limit setting

Device modes	Comment
out_mode_05	Start/stop command of the device in remote control mode: 0 = Stop temperature control 1 = Start temperature control

Auxiliary parameter	Comment
out_hil_00	Setting the control value limitation of the cooling capacity (0 - 100%)
out_hil_01	Setting the control value limitation of the heating output (0 - 100%)

12.2 LwIP software license

LwIP is licensed under the BSD license. The following text is a copy of the LwIP license document contained in the source code.

```
/*
 * Copyright (c) 2001-2004 Swedish Institute of Computer Science.
 * All rights reserved.
 *
 * Redistribution and use in source and binary forms, with or without modification,
 * are permitted provided that the following conditions are met:
 *
 * 1. Redistributions of source code must retain the above copyright notice,
 *    this list of conditions and the following disclaimer.
 * 2. Redistributions in binary form must reproduce the above copyright notice,
 *    this list of conditions and the following disclaimer in the documentation
 *    and/or other materials provided with the distribution.
 * 3. The name of the author may not be used to endorse or promote products
 *    derived from this software without specific prior written permission.
 *
 * THIS SOFTWARE IS PROVIDED BY THE AUTHOR ``AS IS'' AND ANY EXPRESS OR IMPLIED
 * WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
 * MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT
 * SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL,
 * EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT
 * OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS
 * INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
 * CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
 * IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
 * OF SUCH DAMAGE.
 *
 * This file is part of the lwIP TCP/IP stack.
 *
 */
```