Julabo
THE TEMPERATURE CONTROL COMPANY

VALEGRO™
350 / 500

# Recirculating cooler

**Original operating instructions**

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# Imprint

**Headquarters**

**JULABO GmbH**
Gerhard-Juchheim-Strasse 1
77960 Seelbach
Seelbach, Germany
Phone: +49 7823 51-0
info.de@julabo.com
www.julabo.com

**Branch 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
www.julabo.com/en-gb

# 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.

### Copyright



Illustrations in these operating instructions are for illustrative purposes only and are not necessarily true to scale.

# Table of contents

# 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 Notes on CE marking

The conformity of this product with the relevant EU directives is confirmed by the EU Declaration of Conformity contained in the appendix to these instructions.

The conformity of this product with the relevant UK regulations is confirmed by the UKCA Declaration of Conformity included in the appendix to this manual.

## 1.3 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.

## 1.4 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

## 1.5 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.

## 1.6 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, Ia = 30 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 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 closed rooms.

- 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.

## 2.7 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 |

| **Pump** | | | | | |
|---|---|---|---|---|---|
| discharge pressure | bar | 0.6 | | | |
| 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 |

| **Pump** | | | | | |
|---|---|---|---|---|---|
| Delivery pressure | bar | 0.85 | | | |
| 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 $_{Na2CO3}$ 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.

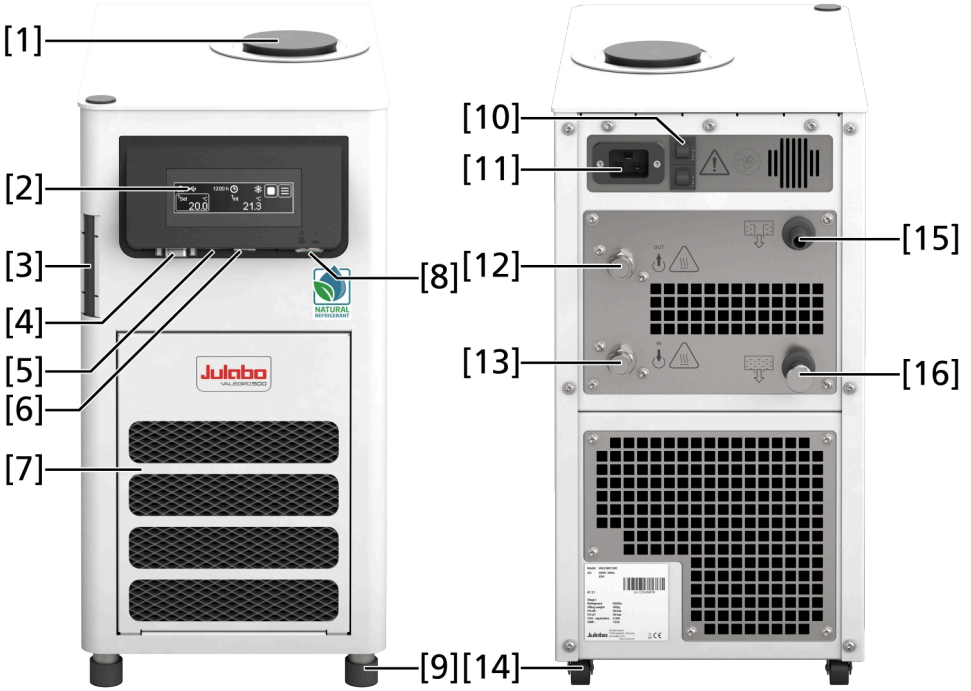
An external application is connected to the device via the pump connections. To control the temperature of the application, the temperature control medium is pumped through the heat exchanger in a circuit by the circulation pump.

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:

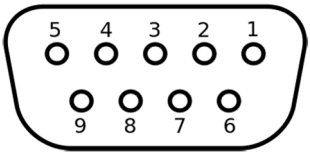
- Remote control of the device via a PC
- Data recording on an external storage medium
- Saving black box data to an external storage medium
- Uploading firmware from an external storage medium

**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, Ia = 30 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 appliance.

*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*

**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 device, this can lead to damage to individual components or even failure of the entire system.

- 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).
- Do not install shut-off valves in the return line.
- 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*

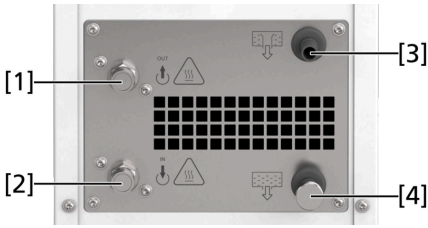
**Damage to the temperature control hoses due to kinking!**
Temperature control hoses are damaged by kinking and can leak.
- Lay the temperature control hoses in large radii.
- Avoid kinking the temperature control hoses.

*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.

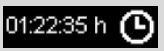
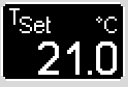
# 8 Operation

## 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 |
|   | Timer display:<br>• Start date / time of the timer or<br>• 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 |
|   | Pump level setting<br>Display current pump stage |

| 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.

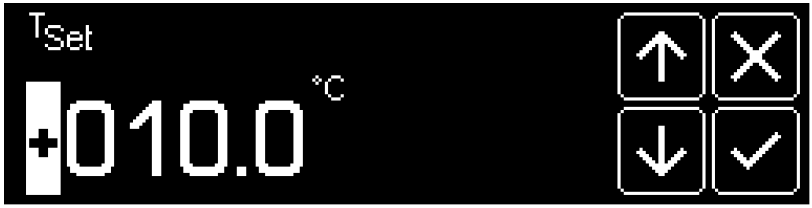
**Prerequisites**

▶ 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 Xp, the reset time Tn and the derivative time Tv. 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 Xp**

The proportional range Xp 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 Xp, the faster the controller becomes. A value for Xp that is too small can cause the system to oscillate.

**Reset time Tn**

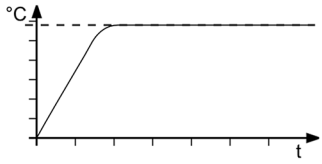
The reset time Tn is a measure of the “strength” of the I component of the controller. The I component builds up by adding up the control deviation over time and thus ensures that no permanent control deviation occurs. A small Tn leads to a faster elimination of the control deviations, but increases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

**Derivative time Tv**

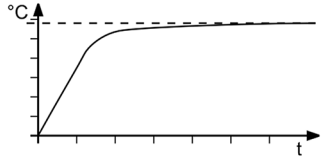
The derivative action time Tv influences the D component of the controller, which reacts to the rate of change of the control deviation and counteracts it. This allows overshoots to be damped. The greater Tv, the greater the damping effect. However, if Tv is set too high, this can lead to unsteady control behavior. If Tv 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

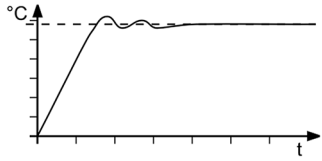
A recorded temperature curve provides information on how individual control parameters can be optimized to achieve a better result.



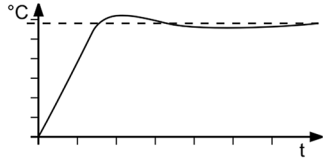

Optimum temperature control curve, temperature quickly reaches the setpoint without overshooting and maintains the setpoint.



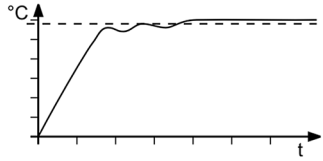

Symptom: Temperature curve approaches the setpoint slowly and does not quite reach it. Remedy: Reduce Tv and/or Tn, increase Xp.




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




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




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

## 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

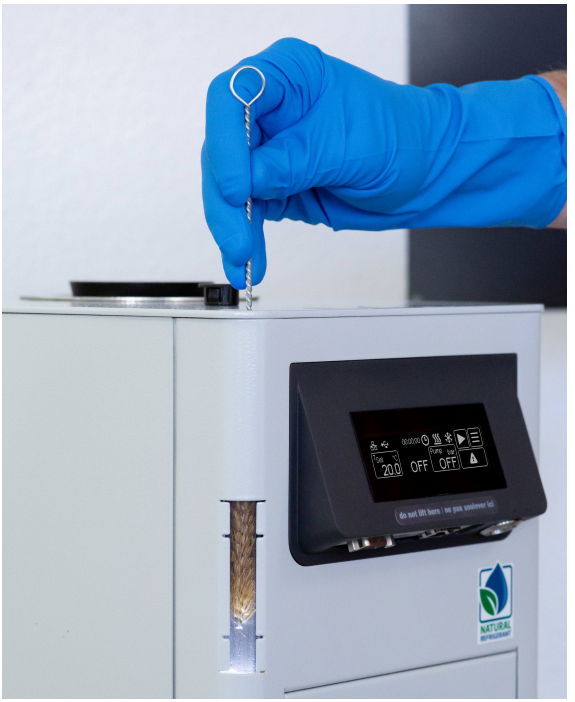
If necessary, the illuminated level indicator can be cleaned using the brush supplied.

**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<br>+ 5.320.8620 | Mains cable CH, 200-230 V<br>+ 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 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.

## 9.9 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 completelytemperature 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.
- Pack the appliance carefully 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

## 9.10 Warranty

JULABO guarantees the proper functioning of the device, provided that it is used and operated in accordance with the operating instructions.

The warranty period is one year from the date of invoice.


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

With the 1PLUS warranty, the user receives a free extension of the warranty to 24 months, limited to a maximum of 10,000 operating hours. The prerequisite is that the user registers the device at www.julabo.com within four weeks of commissioning, stating the serial number.

The date of invoice from JULABO GmbH is decisive for the warranty.

# 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 setpoint. |
| E04 | The measured temperature is below the set under-temperature limit. | Reduce the “Undertemperature” temperature limit or increase the temperature setpoint. |
| 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.<br>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.<br>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.<br>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:<br>0 = °C<br>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:<br>0 = Stop<br>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:<br>0 = °C<br>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:<br>0 = Stop temperature control<br>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.
 *
 */
```

## 12.3 EC 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*:** Umlaufkühler / *Recirculating coolers*

**Typ / *Type*:** VALEGRO 350; VALEGRO 500 **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 IEC 61010-2-011 : 2021, EN IEC 61010-2-011 :2021/A11:2021
Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte – Teil 2-011: Besondere Anforderungen für Kühlgeräte
*Safety requirements for electrical equipment for measurement, control, and laboratory use –Part 2-011: Particular requirements for refrigerating equipment*

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*

EN IEC 61326-1 : 2021
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*

EN 378-2 : 2016
Kälteanlagen und Wärmepumpen – Sicherheitstechnische und umweltrelevante Anforderungen – Teil 2: Konstruktion, Herstellung, Prüfung, Kennzeichnung und Dokumentation
*Refrigerating systems and heat pumps - Safety and environmental requirements - Part 2: Design, construction, testing, marking and documentation*

**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, 29.01.2025

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

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## 12.4 UKCA compliance

**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:** Recirculating Coolers

**Type:** VALEGRO 350, VALEGRO 500 **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 IEC 61010-2-011 : 2021 / A11:2021
*Safety requirements for electrical equipment for measurement, control, and laboratory use –Part 2-011: Particular requirements for refrigerating equipment*

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

EN IEC 61326-1 : 2021
*Electrical equipment for measurement, control, and laboratory use - EMC requirements - Part 1: General requirements*

EN 378-2 : 2016
*Refrigerating systems and heat pumps - Safety and environmental requirements - Part 2: Design, construction, testing, marking and documentation*

**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, 29.01.2025

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

2025_199_VALEGRO 350_500_Recirculating-Coolers_UKCA