

English

Operating manual

Cryo-Compact Circulators
The *Economy*-Series

CF30

CF40

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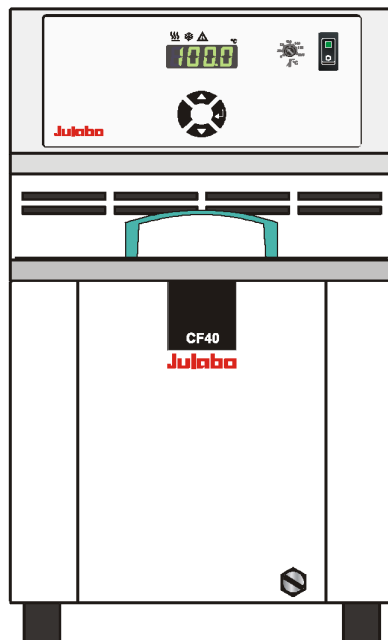
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1.951.4866 BE0 01/07

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Congratulations!

You have made an excellent choice.

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

This operating manual has been designed to help you gain an understanding of the principles of operating and possibilities of our Cryo-Compact Circulators. For optimum utilization of all functions, we recommend that you thoroughly study this manual prior to beginning operation.

Quality Management System



The JULABO Quality Management System:

Development, production and distribution of temperature application instruments for research and industries conform to the requirements according to DIN EN ISO 9001:2000.

Certificate Registration No. 01 100044846

EC Conformity



The products described in the operating instructions conform to the requirements of the following European guidelines:

Low voltage regulations with respect to legal harmonization of the member countries concerning electric devices for use within certain voltage limits.

EMC guideline with respect to legal harmonization of the member countries concerning electromagnetic compatibility.

Julabo

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1. Use according to intended purpose

JULABO Cryo-Compact Circulators have been designed for temperature application to specific fluids in a bath tank. The units provide pump nozzles for temperature application to an external system (loop circuit).



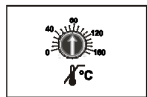
- ☑ The Cryo-Compact Circulators are operated via the splash-proof keypad. The implemented microprocessor technology allows to set and to store the setpoint that can be indicated on the LED temperature display.



- ☑ The PID temperature control adapts the heat supplied to the thermal requirements of the bath.



- ☑ Safety installations conforming to IEC 61010-2-010



The excess temperature protection is a safety installation independent from the control circuit.

The safety value is set using a tool (screwdriver).



If the low level protection device is triggered, a complete shutdown of the heater and circulating pump is effected.

- ☑ The serial interface RS232 allows modern process technology without additional interface.



JULABO Cryo-Compact circulators are not conceived for direct temperature application to food and luxury articles or pharmaceutical and medico-technical products.

Direct temperature application means: Unprotected contact of the object with the bath medium (bath fluid).

2. Operator responsibility – Safety recommendations

The products of JULABO Labortechnik GmbH warrant a safe operation if installation, operation and maintenance is carried out according to common safety regulations. This section informs you about potential dangers that may arise from operating the cryo-compact circulator and also mentions the most important safety precautions.

The operator is responsible for the qualification of the personnel operating the units. The operator should be constantly informed about the dangers involved with their job activities as well as preventive actions.

Make sure all persons expected to carry out operation, installation and maintenance of the unit read and understand the safety information and operating instructions.

When using hazardous materials, the cryo-compact circulator may only be operated by persons that are absolutely familiar with these materials and the cryo-compact circulator. These persons must be fully aware of possible risks.

If you have any questions concerning the operation of your unit or the information in this manual, please contact us!

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2.1. Handling

You received a product conceived for industrial use. Nevertheless, avoid strikes to the housing, vibrations, damages to the keypad foil (keys, display) or contamination. Make sure the product is regularly checked for proper condition. Regularly check (at least every 2 years) the proper condition of the mandatory, warning, prohibition and safety labels.

Take care that the mains supply features a low impedance to avoid any negative affects on the instrument being operated in the same mains.

This unit is designed for operation in a controlled electromagnetic environment. This means that transmitting devices (e.g. cellular phones) should not be used in the immediate vicinity.

Magnetic radiation may influence other units with components susceptible to magnetic fields

(e.g. a monitor). We recommend to keep a minimum distance of 1 m.

Permissible ambient temperature: max. 40 °C, min. 5 °C.

Permissible relative air humidity: 50 % (40 °C).

Do not store in an aggressive atmosphere. Protect from contaminations. Do not expose to sunlight.

Appropriate Operation

Only qualified personnel is authorized to perform configuration, installation, maintenance and repairs of the recirculating cooler. Untrained personnel should be instructed by trained personnel.

2.2. Use

Only use recommended materials (bath fluids). Only use non-acid and non corroding bath fluids.

The bath can be filled with flammable materials. Fire hazard!

There might be chemical dangers depending on the bath medium used.

Observe all warnings for the used materials (bath fluids) and the respective instructions (safety data sheets). Insufficient ventilation may result in the formation of explosive mixtures. Only use the unit in well ventilated areas (see page 12).



When using hazardous materials, **the user must** attach the enclosed safety labels to the front of the unit so they are well visible:

Warning label W09:
Colors: yellow, black





Danger area.
Attention! Observe instructions.
(operating manual, safety data sheet)

Operator responsibility – Safety recommendations

| | | |
|---|---|--|
| Mandatory label M018 Colors: blue, white |  | Carefully read the user information prior to beginning operation Scope: EU |
| Semi S1-0701 Table A1-2 #9 |  | Carefully read the user information prior to beginning operation Scope: NAFTA |

Particular care and attention is necessary because of the wide operating range. There are thermal dangers: Burn, scald, hot steam, hot parts or cold parts and surfaces that can be touched.

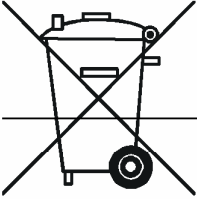
| | | |
|--|---|---|
| Warning label W26: Colors: yellow, black |  | Hot surface warning. (The label is put on by JULABO) |
| Warning label W017: Colors: yellow, black |  | Low temperature warning. (The label is put on by JULABO) |

Observe the instructions in the manuals for instruments of a different make that you connect to the cryo-compact circulator, particularly the respective safety recommendations. Also observe the pin assignment of plugs and technical specifications of the products.

2.3. Disposal

The product may be used with oil as bath fluid. These oils fully or partially consist of mineral oil or synthetic oil. For disposal, observe the instructions in the safety data sheets.

This unit contains the refrigerants R404A or R134a – at this time considered not to have any negative effects on the ozone layer. However, during the long operating period of the unit, disposal prescriptions may change. So only qualified personnel should take care of disposal.

| | |
|---|---|
|  | <p><u>Valid in EU countries</u> Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE). This directive requires electrical and electronic equipment marked with a crossed-out trash can to be disposed of separately in an environmentally friendly manner. Contact an authorized waste management company in your country. Disposal with household waste (unsorted waste) or similar collections of municipal waste is not permitted!</p> |
|---|---|

3. Technische Daten

| | | CF30 | |
|--|-------------|--------|---------------------------|
| Working temperature range | | °C | -30 ... +150 |
| Temperature stability | | °C | ±0.03 |
| Temperature selection | | | digital |
| via keypad | | | indication on LED-DISPLAY |
| remote control via personal computer | | | indication on monitor |
| Temperature indication: | | | LED-DISPLAY |
| Resolution | | °C | 0.1 |
| Temperature control | | | PID 1 |
| Working temperature sensor | | | Pt 100 |
| Safety temperature sensor | | | Pt 100 |
| Heater wattage | (at 230 V) | kW | 2,0 |
| Heater wattage | (at 115 V) | kW | 1,0 |
| Cooling capacity | | °C | <u>20 0 -20</u> |
| Medium ethanol | | kW | 0.32 0.25 0.15 |
| Cooling compressor | | | 1-stage |
| Refrigerant | | | R134a |
| Cooling machine | | | Air-cooled |
| Electrical connections: | | | |
| Computer interface | | | RS232 |
| Pump capacity: | | | |
| Flow rate max. | at 0 bar | l/min | 15 |
| Pressure max. | at 0 liter | bar | 0,35 |
| Bath opening (WxL) | | cm | 16x3 |
| Bath depth | | cm | 14 |
| Filling volume | | liters | 2.0 ... 3.0 |
| Overall dimensions (WxDxH) | | cm | 24x46x40 |
| Weight | | kg | 32 |
| Ambient temperature | | °C | 5 ... 40 |
| Protection class according to IEC 60 529 | | | IP 21 |
| Mains power connection | 230 V/50 Hz | V/ Hz | 207-253 / 50 |
| Current input (at 230 V) | | A | 10 |
| Mains power connection | 230 V/60 Hz | V/ Hz | 197-242/60 |
| Current input (at 230 V) | | A | 11 |
| Mains power connection | 115 V/60 Hz | V/ Hz | 103-127 / 60 |
| Current input (at 115 V) | | A | 13 |

All measurements have been carried out at: rated voltage and frequency
 ambient temperature: 20 °C Technical changes without prior notification reserved.

Technische Daten

| | | CF40 | |
|--|-------------|--------|------------------------------|
| Working temperature range | | °C | -40 ... +150 |
| Temperature stability | | °C | ±0.03 |
| Temperature selection | | | digital |
| via keypad | | | indication on LED-DISPLAY |
| remote control via personal computer | | | indication on monitor |
| Temperature indication: | | | LED-DISPLAY |
| Resolution | | °C | 0.1 |
| Temperature control | | | PID 1 |
| Working temperature sensor | | | Pt 100 |
| Safety temperature sensor | | | Pt 100 |
| Heater wattage | (at 230 V) | kW | 2,0 |
| Heater wattage | (at 115 V) | kW | 1,0 |
| Cooling capacity | | °C | <u>20 0 -20 -30</u> |
| Medium ethanol | | kW | 0.47 0.4 0.28 0.12 |
| Cooling compressor | | | 1-stage |
| Refrigerant | | | R404A |
| Cooling machine | | | Air-cooled |
| Electrical connections: | | | |
| Computer interface | | | RS232 |
| Pump capacity: | | | |
| Flow rate max. | at 0 bar | l/min | 15 |
| Pressure max. | at 0 liter | bar | 0,35 |
| Bath opening (WxL) | | cm | 19x3 |
| Bath depth | | cm | 19 |
| Filling volume | | liters | 4.0 ... 5.5 |
| Overall dimensions (WxDxH) | | cm | 28x46x46 |
| Weight | | kg | 41 |
| Ambient temperature | | °C | 5 ... 40 |
| Protection class according to IEC 60 529 | | | IP 21 |
| Mains power connection | 230 V/50 Hz | V/ Hz | 207-253 / 50 |
| Current input (at 230 V) | | A | 12 |
| Mains power connection | 230 V/60 Hz | V/ Hz | 197-242/60 |
| Current input (at 230 V) | | A | 12 |
| Mains power connection | 115 V/60 Hz | V/ Hz | 103-127 / 60 |
| Current input (at 115 V) | | A | 16 |

All measurements have been carried out at: rated voltage and frequency
 ambient temperature: 20 °C Technical changes without prior notification reserved.

3.1. Warning functions and safety installations

| | |
|---|----------------------------------|
| Excess temperature protection | adjustable from 0 °C ... 220 °C |
| Low liquid level protection | float switch |
| Classification according to DIN 12876-1 | class III |
| Alarm message | optical + audible (permanent) |
| Warning message | optical + audible (in intervals) |
| Overload protection | for compressor and pump motor |
| Supervision of working sensor | plausibility control |
| Reciprocal sensor monitoring between working and safety sensors | difference >25 °C |

Environmental conditions according to IEC 61 010-1:

Use only indoor.

Altitude up to 2000 m - normal zero.

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

Air humidity:

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

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

Stromversorgung: entspricht der Schutzklasse I, VDE 0106 T1

Over voltage category II

Pollution degree 2



Not for use in explosive atmosphere

4. Safety notes for the user



In addition to the safety warnings listed above, warnings are posted throughout the manual. These warnings are designated by an exclamation mark inside an equilateral triangle. „Warning of a dangerous situation (Attention ! Please follow the documentation).“

The danger is described according to an alarm keyword.
Read and follow these important instructions.



Warning:

Describes a possibly highly dangerous situation. If this is not avoided, serious injury and danger to life could result.



Caution:

Describes a possibly dangerous situation. If this is not avoided, slight or minor injuries could result. A warning of possible damage can also be contained in the text.



Notice:

Describes a possibly harmful situation. If this is not avoided, the product or anything in its surroundings can be damaged.

4.1. Safety recommendations

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



- Only connect the unit to a power socket with earthing contact (PE – protective earth)!
- Place the instrument on an even surface on a pad made of **non-inflammable** material.
- Do not stay in the area below the unit.
- Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit.
- Observe the fire point of the bath medium used.
The excess temperature protection should be set at least 25 °C below the fire point.
- Never operate the unit without bath fluid in the bath.
- Pay attention to the thermal expansion of bath oil during heating to avoid overflowing of the fluid.
- Prevent water from penetrating into the hot bath oil.



- Exercise caution when emptying hot bath fluids!
Check the temperature of the bath fluid prior to draining (by switching the unit on for a short moment for example).
- Employ suitable connecting tubing.
Make sure that the tubes are securely attached.
- Never operate damaged or leaking equipment.
- Always turn off the unit and disconnect the mains cable from the power source before performing any service or maintenance procedures, or before moving the unit.
- Always empty the bath before moving the unit.
- Never operate equipment with damaged mains power cables.



- Some parts of the bath cover and the pump connections may become extremely warm during continuous operation. Therefore, exercise particular caution when touching these parts.

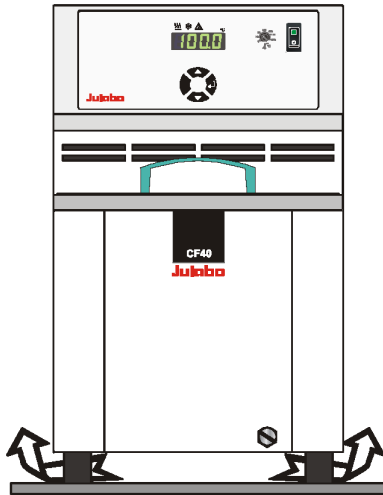


- Some parts of the bath cover and the pump connections may become extremely cold during continuous operation. Therefore, exercise particular caution when touching these parts.

5. Unpacking and checking

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

6. Installation



- Place the unit on an even surface on a pad made of **non-flammable** material.
- Cooling machine, pump motor and electronics produce intrinsic heat that is dissipated via the venting openings.! Never cover these openings!
- Be sure that the flow of ventilation can exit under the instrument.
- Keep at least 20 cm of open space on the front and rear venting grids
- The place of installation should be large enough and provide sufficient air ventilation to ensure the room does not warm up excessively because of the heat the instrument radiates to the environment.
(Max. permissible ambient temperature: 40 °C).
With regard to a disturbance in the cooling loop (leakage), the guideline EN 378 prescribes a certain room space to be available for each kg of refrigerant.
> For 0.48 kg of refrigerant R404A, a room space of 1 m³ is required.
> For 0.25 kg of refrigerant R134a, a room space of 1 m³ is required.
Model CF40 with 0.16 kg filling quantity of refrigerant R404A = 0,33 m³ volume
Model CF30 with 0.15 kg filling quantity of refrigerant R134a = 0.6 m³ volume

- Do not set up the unit in the immediate vicinity of heat sources and do not expose to sun light.
- Before operating the unit after transport, wait about one hour after setting it up. This will allow any oil that has accumulated laterally during transport to flow back down thus ensuring maximum cooling performance of the compressor.

6.1. Temperature application to external, closed systems

The Cryo-Compact Circulator is used for temperature application to external, closed systems (loop circuit)

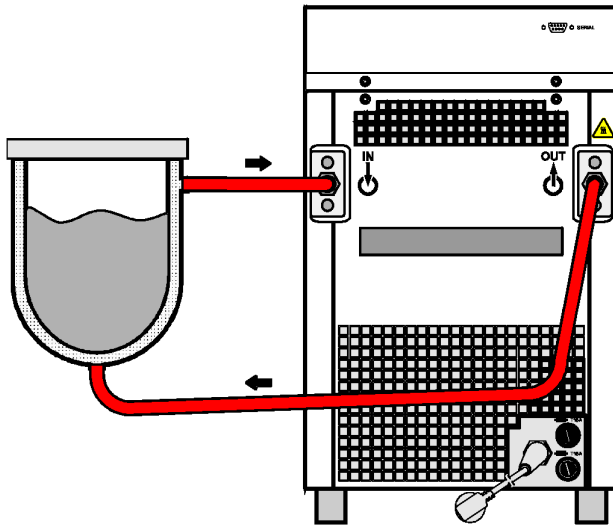


Caution: Securely attach all tubing to prevent slipping.



Notice: Flood hazard!

If the liquid levels in the Cryo-Compact Circulator bath and the external system are at different heights, overflowing must be prevented after the power has been turned off.



- Unscrew the M16x1 collar nuts on the pump connectors with a 19 mm (3/4") wrench and remove the sealing disks. Using the collar nuts, screw on the tubing connection fittings (for tubing 8 mm or 12 mm in diameter) delivered with the unit and tighten firmly. (Pressure pump: 8, Return: 9)
- Push on the tubings, and secure with tube clamps.
- Attach the tubing to the connectors of the external closed system, e.g., an instrument with a pressure-resistant temperature jacket or a temperature coil, and fasten with tube clamps to prevent slipping.

Tubing see page 14

Return flow safety device

For this reason, shut-off valves can be integrated in the loop circuit.

| Order No. | Description |
|-----------|---|
| 8 970 456 | Shut-off valve (suitable up to +90 °C) |
| 8 970 457 | Shut-off valve (suitable up to +200 °C) |

The following questions shall help to recognize possible dangers and to reduce the risks to a minimum.

- Are all tubes and electrical cables connected and installed?
Note: sharp edges, hot surfaces in operation, moving machine parts, etc.
- Do dangerous steams or gases arise when heating?
Is an exhaust needed when working?
- What to do when a dangerous substance was spilled on or in the unit?
Before starting to work, obtain information concerning the substance and determine the method of decontamination.

6.2. Tubing



Warning: Tubing:

At high working temperatures the tubing used for temperature application and cooling water supply represents a danger source.

A damaged tubing line may cause hot bath fluid to be pumped out within a short time.

This may result in:

- Burning of skin
- Difficulties in breathing due to hot atmosphere



Caution:

Safety recommendations

- Employ suitable connecting tubing.
- Make sure that the tubing is securely attached.
- Avoid sharp bends in the tubing, and maintain a sufficient distance from surrounding walls.
- Regularly check the tubing for material defects (e.g. for cracks).
- Preventive maintenance: Replace the tubing from time to time.

Recommended tubing:

| Order No. | | Suitable for |
|-----------|---|--------------|
| 8930008 | 1 m CR [®] -tubing 8 mm inner dia. (-20 ... +120°C) | CF30, CF40 |
| 8930012 | 1 m CR [®] -tubing 12 mm inner dia. (-20 ... +120°C) | CF30, CF40 |
| 8930108 | 1 m Viton [®] tubing 8 mm inner dia (-50 °C ... 200 °C) | CF30, CF40 |
| 8930112 | 1 m Viton [®] tubing 12 mm inner dia (-50 °C ... 200 °C) | CF30, CF40 |

Tubing insulation

| | | |
|---------|-----------------------------------|--|
| 8930410 | 1 m Insulation, 14 mm inner dia.. | CR [®] -tubing 8 mm inner dia |
| 8930412 | 1 m Insulation, 18 mm inner dia. | Viton [®] tubing 12 mm inner dia. |

Tube clamps

| | | |
|---------|-----------------------|--|
| 8970480 | 2 Tube clamps, size 1 | CR [®] -tubing 8 mm inner dia |
| 8970481 | 2 Tube clamps, size 2 | Viton [®] tubing 12 mm inner dia. |

Metal tubing, flexible, triple insulated

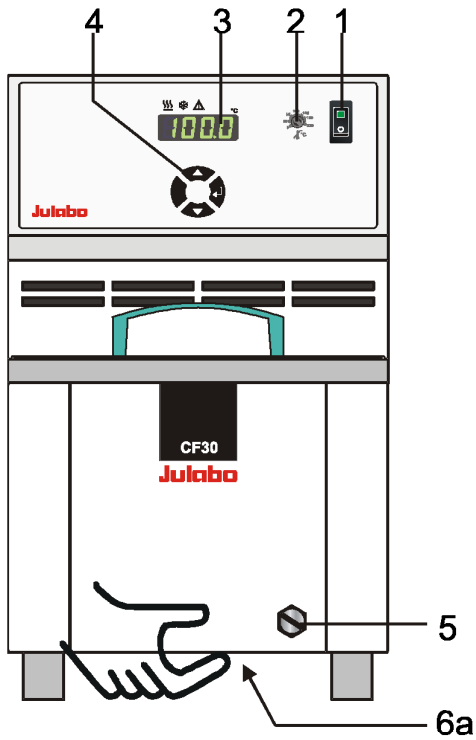
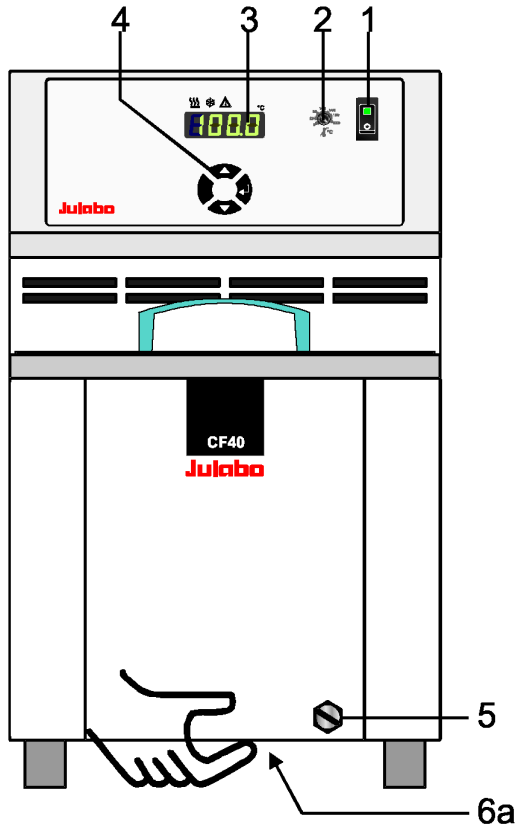
| | | | |
|-----------|-------|-------------------------|---------------------|
| 8 930 209 | 0.5 m | 2 fittings M16x1 female | -100 °C ... +350 °C |
| 8 930 210 | 1.0 m | | |
| 8 930 211 | 1.5 m | | |
| 8 930 214 | 3.0 m | | |

Metal tubing, flexible, insulated

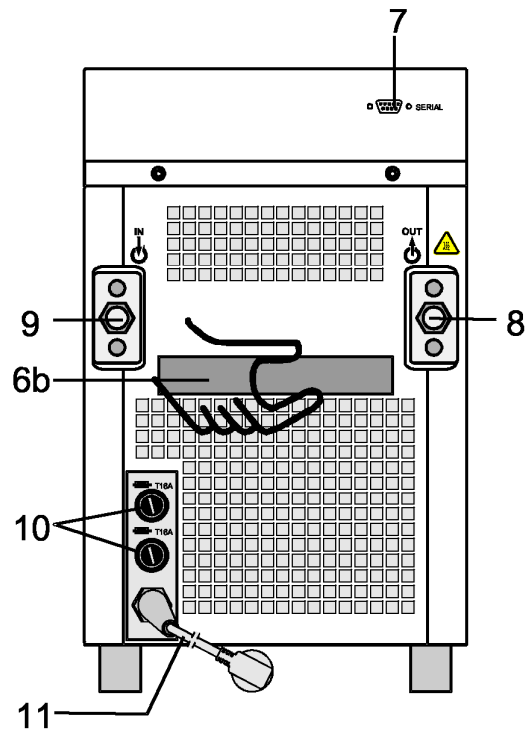
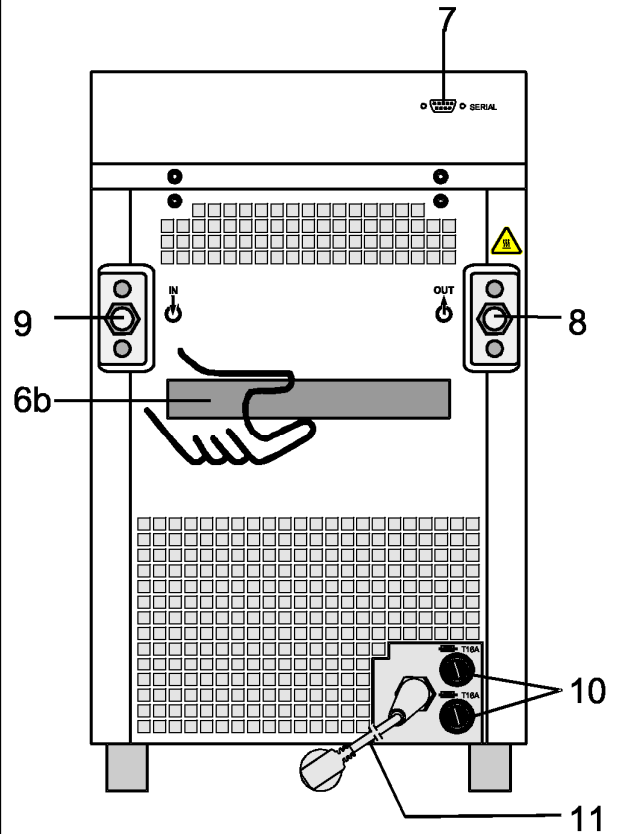
| | | | |
|-----------|-------|-------------------------|-------------------|
| 8 930 220 | 0.5 m | 2 fittings M16x1 female | -50 °C to +200 °C |
| 8 930 221 | 1.0 m | | |
| 8 930 222 | 1.5 m | | |
| 8 930 223 | 3.0 m | | |

7. Operating controls and functional elements









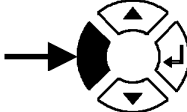








Front view CF40 / CF30



Rear view CF40/ CF30



Operating controls and functional elements

- 1  Mains power switch, illuminated
- 2  Adjustable excess temperature protection according to IEC 61010-2-010
- 3.0 **Indication**
- 3.1  LED temperature display
- 3.2  Control indicator – Heating
- 3.3  Control indicator – Cooling
- 3.4  Control indicator – Alarm
- 4.0 **Keypad** splash-water protected
-  ▼▲ Edit keys (set point increase or decrease)
-  Enter key Store set point value / parameter
-  Escape key
1. Cancel entries
2. Switch over LED temperature display
- 5  Drain port
- 6a  Handle: front
- 6b  Handle: rear
- 7  SERIAL Interface RS232: remote control via personal computer
- 8  Pump connector M16x1: ⏻ - Feed
- 9  Pump connector M16x1: ⏿ - Return
- 10  Mains fuses, T16A
- 11  Mains power cable with plug

8. Operating procedures

8.1. Bath fluids



Caution:

Carefully read the safety data sheet of the bath fluid used, particularly with regard to the fire point!

If a bath fluid with a fire point of ≤ 65 °C is used, only supervised operation is possible.

Water:

The quality of water depends on local conditions.

Ferrous water can cause corrosion - even on stainless steel.

Chloric water can cause pitting corrosion.

Mixture water -glycol:

Strictly observe the safety data and handling instructions from the manufacturer.

The proportion of water might evaporate by and by. Check the mixing ratio regularly and refill water if necessary.

Recommended bath fluids:

| Bath fluids | Temperature range | Flash point | fire point |
|----------------------|--------------------|-------------|------------|
| water | 5 °C ... 80 °C | | |
| mixture water/glycol | -30 °C ... 50 °C | | |
| JULABO Thermal G | -30 °C ... 80 °C | | |
| JULABO Thermal M | +40 °C ... +170 °C | >280 °C | >305 °C |
| JULABO Thermal H | +20 °C ... +250 °C | >270 °C | >360 °C |
| JULABO Thermal H5S | -50 °C ... +105 °C | >110 °C | >130 °C |
| JULABO Thermal H10S | -20 °C ... +180 °C | >175 °C | >210 °C |
| JULABO Thermal H20S | +0 °C ... +220 °C | >230 °C | >270 °C |

| Order No. 10 liters | Bath fluids | Order No. 5 liters |
|---------------------|---------------------|--------------------|
| 8 940 124 | JULABO Thermal G | 8 940 125 |
| 8 940 100 | JULABO Thermal M | 8 940 101 |
| 8 940 102 | JULABO Thermal H | 8 940 103 |
| 8 940 106 | JULABO Thermal H5S | 8 940 107 |
| 8 940 114 | JULABO Thermal H10S | 8 940 115 |
| 8 940 108 | JULABO Thermal H20S | 8 940 109 |



Notice:

Please contact JULABO before using other than recommended bath fluids.

JULABO takes no responsibility for damages caused by the selection of an unsuitable bath fluid.

Unsuitable bath fluids are liquids which e.g.

- are very highly viscous (much higher than 30 mm² /s at the respective working temperature)
- have corrosive characteristics or
- tend to cracking.

ATTENTION: The maximum permissible viscosity is 30 mm² /s.



Caution:

The temperature controlling i.e. of fluids in a reactor constitutes normal Cryo-compact circulator practice.

We do not know which substances are contained within these vessels. Many substances are:

- inflammable, easily ignited or explosive
- hazardous to health
- environmentally unsafe

i.e.: **dangerous**

The user alone is responsible for the handling of these substances!

8.2. Power connection



Caution:

Only connect the unit to a power socket with earthing contact (PE – protective earth)!

We disclaim all liability for damage caused by incorrect line voltages!

Check to make sure that the line voltage matches the supply voltage specified on the identification plate.

8.3. Filling

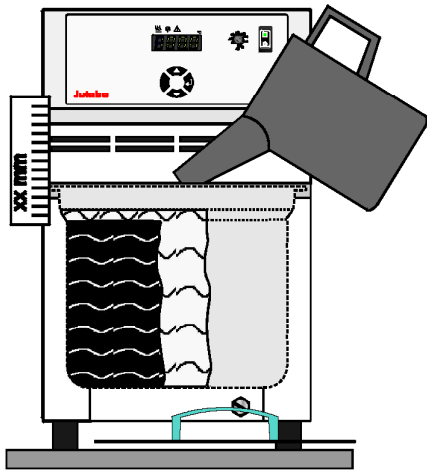


Notice:

Pay attention to the thermal expansion of bath oil during heating to avoid overflowing of the liquid.

Guideline:

A volume change of 12 % per 100 °C temperature variation is to be considered.



Take care that no liquid enters the interior of the Cryo-compact circulator .

- ① Connect the tubing from the external system to the pump connectors and check for leaks




Respect instructions from page 12 top page 14!

- ① Check to make sure that the drain tap (7) is closed.

Recommendation:

For filling, use for example an measuring jug with nuzzle.

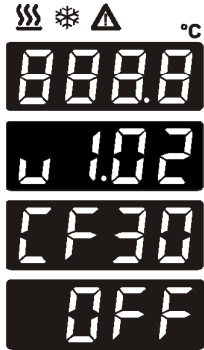
- ① Recommended maximum filling level with water as bath fluid:
30 mm below the tank rim
- ① Recommended maximum filling level with bath oils:
40 mm below the tank rim
- Turn the mains switch (1) on
(Switching on - see page 20)
- Switch on unit. To do so press button  for approx. 4 seconds.
- Tempering fluid is pumped into the externally connected system. Refill fluid.
- The Cryo-Compact Circulator is ready for operation.

Important:

- ① When using a bath fluid, the change in volume in case of change in temperature has to be respected. Fill in a little amount of bath fluid only so that the low level alarm is not triggered.
- ① Low level alarm is triggered at the following liquid level:

| | |
|------|--------------------------------|
| CF30 | 75 to 80 mm below the tank rim |
| CF40 | 80 to 85 mm below the tank rim |
- ① When reaching the working temperature, check the liquid level. If the cooling coil is not completely covered with bath fluid, refill it.

8.4. Switching on / Start - Stop



Switching on:



- The Cryo-Compact Circulator is turned on and off with the mains switch.
- ① The unit performs a self-test. All segments of the 4-digit LED temperature DISPLAY and all indicator lights will illuminate (as illustrated on the left).

Then the software version and the type of unit is indicated.






Examples: (v 1.02) (CF30)

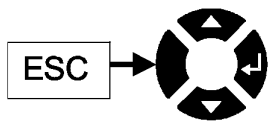
The display "OFF" indicates the unit is ready to operate (standby mode).




- Start:** Press enter  for about 4 seconds.
The LED temperature DISPLAY indicates the actual bath temperature.
- Stop:** Press enter  for about 4 seconds.
Turn the unit off with the mains power switch.

8.5. Setting the temperatures

- ① Setting can be carried out in the start/stop condition.
- 1. Press one of the keys   for a short moment.
The setpoint value instead of the actual value is indicated on the display for about 8 seconds.
The value can now be changed.
- 2. Change value:
Press  to set a higher value.
Press  to set a lower value.
Keep the keys depressed for the value to change fast.
- 3. Press enter  to store the value.

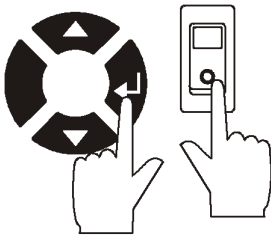



- ① Press ESC to update the display immediately, or the unit automatically returns to the effective display after about 30 seconds .

8.6. AUTOSTART ON / OFF

The Cryo-Compact Circulator has been configured and supplied by JULABO according to N.A.M.U.R. recommendations. This means for the start mode, that the unit must enter a safe operating state after a power failure (non-automatic start mode). This safe operating state is indicated by „OFF“ on the LED temperature display. A complete shutdown of the main functional elements such as compressor and circulating pump is effected simultaneously.

Should such a safety standard not be required, the AUTOSTART function (automatic start mode) may be activated, thus allowing the start of the Cryo-compact circulator directly by pressing the mains power switch or using a timer.



1. Keep depressed enter  and
2. turn on the unit with the mains power switch.

For a short while the LED DISPLAY indicates the effective start mode:

 ⇒ AUTOSTART on.

 ⇒ AUTOSTART off.

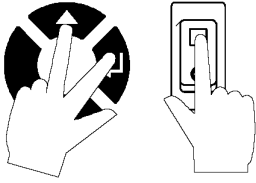


Warning:

For supervised or unsupervised operation with the AUTOSTART function, avoid any hazardous situation to persons or property.

The Cryo-compact circulator does no longer conform to N.A.M.U.R. recommendations.

8.7. Remote control: activate – deactivate



The Cryo-Compact Circulator is to be prepared for remote control by a personal computer via the serial interface RS232.

Set the interface item
 from >IOFF< (Interface OFF)
 to >ION< (Interface On).

(Interface OFF)



(Interface On)



Remote control: activate – deactivate:

- Switch off the Cryo-Compact Circulator by pressing the mains switch and wait approx. 5 seconds.
- Keep depressed the keys ▲ and enter ↵ simultaneously and turn on the unit with the mains power switch.

>I OFF< No remote control via RS232 (Factory setting)

>I On< Remote control via RS232

① The software version and the type of unit is indicated (see example on the left).

The display "r OFF" indicates the unit is ready to be operated via remote control.

9. Safety installations

9.1. Excess temperature protection



Warning:



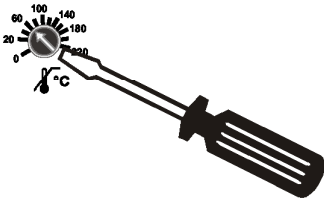
The excess temperature protection >SafeTemp< should be set at least 25 °C below the fire point of the bath fluid used.

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

We disclaim all liability for damage caused by wrong settings!



This safety installation is independent of the control circuit. When the temperature of the bath fluid has reached the safety temperature, a complete shutdown of the heater and pump is effected. The alarm is indicated by optical and audible signals (continuous tone) and on the LED-DISPLAY appears the error message "Error 14".



Setting range: 0 °C to 220 °C

- Using a screwdriver turn the setting screw to the desired value.

Recommendation:

Set the excess temperature protector at 5 to 10 °C above the working temperature setpoint.

9.2. Low level protection



This safety installation is independent of the control circuit. If the low liquid level protection device is triggered, a complete shutdown of the compressor and circulating pump is effected. The alarm is indicated by optical and audible signals (continuous tone) and on the LED-DISPLAY appears the error message

"Error 01".

- ① Turn off the unit with the mains switch, refill bath fluid and turn the unit on again!



Caution:

For refill always use the same bath fluid type that is already in the bath. Bath oils must not contain any water contaminants! Explosion hazard at higher temperatures!



Notice:

Check the safety installations at least twice a year!

- Excess temperature protection according to IEC 61010-2-010
With a screwdriver turn back the adjustable excess temperature protection until the shut-down point (actual temperature).
- Low level protection according to IEC 61010-2-010
To check the function of the float, it can be manually lowered with a screwdriver for example.

10. Troubleshooting guide / Error messages



Whenever the microprocessor electronics registers a failure, a complete shutdown of the compressor and circulating pump is performed. The alarm light "△" illuminates and a continuous signal tone sounds. The LED temperature display indicates the cause for the alarm in form of a code.



Press enter  to quit the audible signal.

E 01

- The Cryo-Compact Circulator is operated without bath fluid, or the liquid level is insufficient. Replenish the bath tank with the bath fluid.
- Tube breakage has occurred (insufficient filling level due to excessive bath fluid pumped out). Replace the tubing and replenish the bath tank with the bath fluid.

E 05

- Cable of the working temperature sensor interrupted or short-circuited.

E 06

- Defect of the working or excess temperature sensor. Working temperature and excess temperature sensors report a temperature difference of more than 25 °C.

E 12

- Error in A/D converter

E 14

- The excess temperature value lies below the working temperature setpoint. Set the excess temperature to a higher value.

E 33

- Cable of the excess temperature sensor interrupted or short-circuited.



Cancel the alarm state.

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

If the unit cannot be returned to operation, contact an authorized service station.

E 20

Warning without a complete shutdown of the unit:

- Cooling of the condenser is affected. Clean air-cooled condenser. (see page 32).

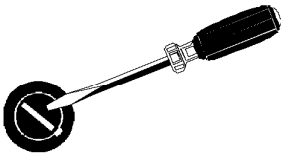


- ⓘ This message appear every 4 seconds.
An acoustic signal sounds in regular intervals.
- Compressor does not work.
After a short cooling interval, the compressor motor will be automatically reconnected and the message "E 21" no longer appears.
- Even after short switch off and switch on of the device by pressing the main power switch, the compressor might start up after a slight delay.
Error message E21 will also appear during that time.

If the unit cannot be returned to operation, contact an authorized JULABO service station.

Disturbances that are not indicated.

Overload protection:: a) for cooling machine
 b) for pump motor



Mains fuses:

The mains fuses on the rear of the unit may easily be exchanged as shown on the left.

Fine fuses (16a)– T 16 A, 250 V~ , D5 x 20 mm

Warning:

Before exchanging the fuses, turn off the mains power switch and disconnect the power plug from the mains socket!
Only use fine fuses with a nominal value as specified.

Example:

| Manufacturer | Supplier | Type | Order No. |
|--------------|----------|----------------------------------|------------------|
| Schurter | Schurter | G-fuse insert SPT T16A 5x20mm | No. 0001.2516 |

11. Electrical connections



Notice:

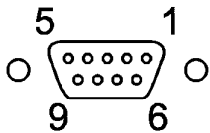
Use shielded cables only.

The shield of the connecting cable is electrically connected to the plug housing.

The unit ensures safe operation if connecting cables with a maximum length of 3 m are used. The use of longer cables does not affect proper performance of the unit, however external interferences may have a negative impact on safe operation.

RS232 serial interface

This port can be used to connect a computer with an RS232 cable for remote control of the Cryo-compact circulator .



Pin assignments RS232:

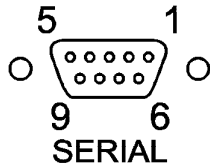
| | | |
|-------|------|---------------------|
| Pin 2 | RxD | Receive Data |
| Pin 3 | TxD | Transmit Data |
| Pin 5 | 0 VD | Signal GND |
| Pin 6 | DTR | Data terminal ready |
| Pin 7 | RTS | Request to send |
| Pin 8 | CTS | Clear to send |

Accessories:

| Order No. | Description |
|-----------|---|
| 8 980 073 | RS232 interface cable 9-pol./9-pol. , 2,5 m |
| 8 900 110 | USB interface adapter cable |

12. Remote control

12.1. Setup for remote control



1. Check the interface parameters for both interfaces (on Cryo-Compact Circulator and PC) and make sure they match.
2. Set the interface item from >IOFF< to >ION<.
3. Connect both units with an interface cable.

Interface parameters are pre-determined.

| | |
|-----------|--------------------|
| BAUDRATE | 4800 Bauds |
| PARITY | even |
| HANDSHAKE | hardware handshake |

12.2. Communication with a PC or a superordinated data system



If the Cryo-Compact Circulator is put into remote control mode the MULTI-DISPLAY (LED) will read „R -OFF-„ = REMOTE STOP. The Cryo-Compact Circulator is now operated via the computer.

In general, the computer (master) sends commands to the recirculating cooler (slave). The recirculating cooler sends data (including error messages) only when the computer sends a query.

In remote control mode:

After a power interruption the order to start and all values which have to be adjusted must be resent from the personal computer via the interface. AUTOSTART is not possible.

A transfer sequence consists of:

- command out/in command
- space (↔; Hex: 20) out/in command
- parameter (the character separating decimals in a group is the period) out command
- end of file (↵; Hex: 0D) out/in command
- The response (data string) after an **in** command is always followed by a line feed (LF, Hex: 0A).





Important times for a command transmission:

To ensure a safe data transfer, the time gap between two commands should be at least 250 ms.

The Cryo-Compact Circulator automatically responds to an **in** command with a data string followed by a LF (Line Feed). The next command should only be sent after 10 ms.

The commands are divided into **in** or **out** commands.

in commands: asking for parameters to be displayed

out commands: setting parameters



The **out** commands are valid only in remote control mode.

Examples:

Command to set the working temperature to 15,5 °C:

out_sp_00 ↔ **15.5**↵

Command to ask for the working temperature

in_sp_00↵

Response from the recirculating cooler:

15.5↵ LF

12.3. List of commands

out commands: Setting parameters or temperature values.

| Command | Parameter | Response of recirculating cooler |
|-------------|-----------|----------------------------------|
| out_mode_05 | 0 | Stop the unit = R –OFF-. |
| out_mode_05 | 1 | Start the unit. |
| out_sp_00 | xxx.xx | Set working temperature |

| |
|--|
| in commands: Asking for parameters or temperature values to be displayed. |
|--|

| Command | Parameter | Response of recirculating cooler |
|------------|-----------|---|
| version | none | Number of software version (V X.xx) |
| status | none | Status message, error message (see page 29) |
| in_pv_00 | none | Actual bath temperature. |
| in_pv_01 | none | Heating power being used (%). |
| in_pv_03 | none | Temperature value registered by the safety sensor. |
| in_pv_04 | none | Setpoint temperature of the excess temperature protection |
| in_sp_00 | none | Working temperature |
| in_mode_05 | none | Cryo-Compact Circulator in Stop/Start condition: 0 = Stop 1 = Start |


12.4. Status messages

| Status messages | Description |
|------------------------|---|
| 00 MANUAL STOP | Cryo-compact circulator in „OFF“ state. |
| 01 MANUAL START | Cryo-compact circulator in keypad control mode. |
| 02 REMOTE STOP | Cryo-compact circulator in „r OFF“ state. |
| 03 REMOTE START | Cryo-compact circulator in remote control mode. |

12.5. Error messages

| Error messages | Description |
|-------------------------------------|--|
| -01 LOW LEVEL ALARM | Low liquid level alarm. |
| -05 WORKING SENSOR ALARM | Working temperature sensor short-circuited or interrupted. |
| -06 SENSOR DIFFERENCE ALARM | Sensor difference alarm. Working temperature and safety sensors report a temperature difference of more than 25 °C. |
| -07 I²C-BUS ERROR | Internal error when reading or writing the I ² C bus. |
| -08 INVALID COMMAND | Invalid command. |

Remote control

| Error messages | Description |
|--|---|
| -09 COMMAND NOT ALLOWED IN CURRENT OPERATING MODE | Invalid command in current operating mode. |
| -10 VALUE TOO SMALL | Entered value too small. |
| -11 VALUE TOO LARGE | Entered value too large. |
| -12 TEMPERATURE MEASUREMENT ALARM | Error in A/D converter. |
| -14 EXCESS TEMPERATURE PROTECTOR ALARM | Excess temperature protection alarm  |
| -20 WARNING: CLEAN CONDENSOR OR CHECK COOLING WATER CIRCUIT OF REFRIGERATOR | Cooling of the condenser is affected. Clean air-cooled condenser. |
| -21 WARNING: COMPRESSOR STAGE 1 DOES NOT WORK | Compressor does not work. |
| -33 SAFETY SENSOR ALARM | Excess temperature sensor short-circuited or interrupted. |

13. JULABO Service – Online remote diagnosis

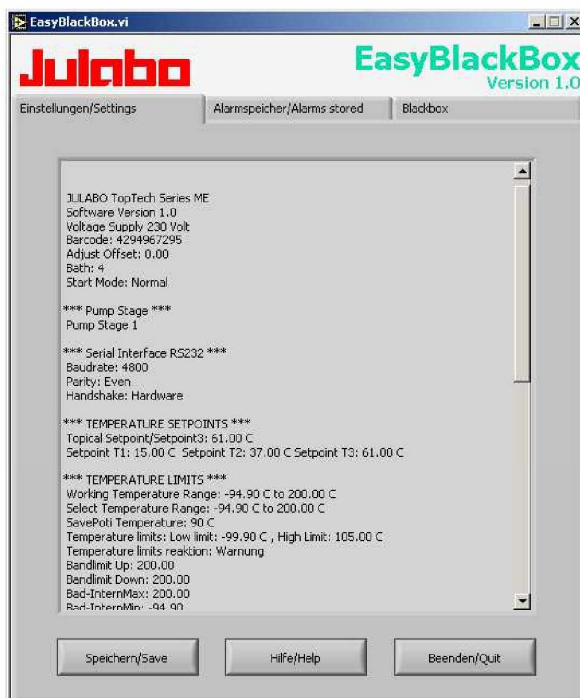
JULABO Cryo-compact circulator s of the HighTech series are equipped with a so-called black box. This box is implemented in the controller and records all significant data for the last 30 minutes.

In case of a failure, this data can be read out from the unit by using special software. The respective program is available for **free** download from www.julabo.de \ EasyBlackBox.

- Installation is easy and carried out step by step. Please observe the instructions.



- Data read-out is possible in the conditions „OFF“, „R OFF“ or „ALARM“.
- Connect the Cryo-compact circulator to the computer using an interface cable.
- Start the EasyBlackBox program. The program asks for the used port (COM1,) and the baud rate of the unit. You do not have this information on hand? Simply try it out! The program keeps on sending this request until the actually used port and correct baud rate are entered.



- Data is read out and shown on the monitor divided in the sections >Einstellungen/Settings<, >Alarmspeicher/Alarms stored<, >Blackbox<

← see example

- After pressing >Speichern/Save< a text file is compiled. The program proposes a filename - >C:\model description and barcode no.<. Modifications are possible.
- E-mail this file to service@julabo.de, JULABO's service department. JULABO is thus able to provide rapid support.

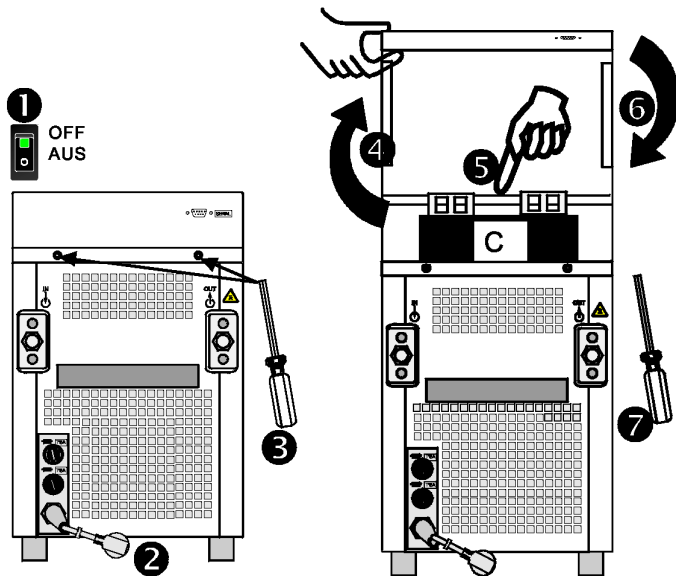
14. Maintaining the cooling performance



Caution:

Always turn off the unit and disconnect the mains cable from the power source before cleaning the unit.

The opening of the Cryo-Compact Circulator must be performed by qualified personnel only.



To maintain the full cooling performance, clean the condenser (C) from time to time.

1. Switch off device by pressing the main power switch and
2. disconnect mains cable from power source.
3. Remove 2 screws
4. Lift cover upwards.
5. Remove dirt at condenser by suction cleaning.
6. Close cover and
7. Fix by means of screws.
8. Unit is ready for operation.

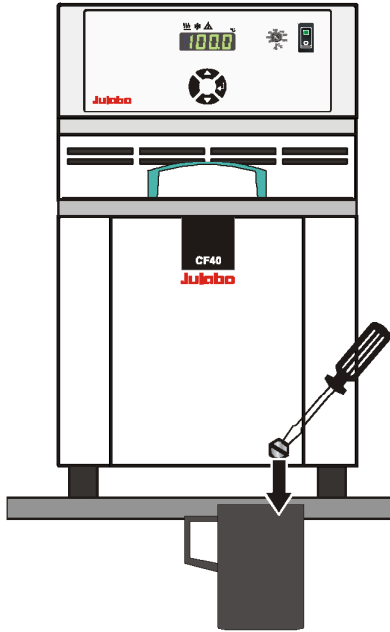
15. Draining

**Notice:**

Exercise caution when emptying hot or cold bath fluids!

Check the temperature of the bath fluid prior to draining (by switching the unit on for a short moment, for example).

Store and dispose the used bath fluid according to the laws for environmental protection.



Draining

- Turn off the unit and disconnect the mains cable from the power source.
- Place the Cryo-compact circulator near the rim of the table. Use a suitable vessel as recipient for the bath liquid
- Unscrew the drain tap and empty the unit completely.
- Tighten the drain tap.

16. Cleaning / repairing the unit

**Caution:**

Always turn off the unit and disconnect the mains cable from the power source before cleaning the unit.

Prevent humidity from entering into the Cryo-compact circulator .

Electrical connections and any other work must be performed by qualified personnel only.

Cleaning:

Clean the outside of the unit using a wet cloth and low surface tension water.

The Cryo-Compact Circulator is designed for continuous operation under normal conditions. Periodic maintenance is not required.

The tank should be filled only with a bath fluid recommended by JULABO. To avoid contamination, it is essential to change the bath fluid from time to time.

Repairs:

Before asking for a service technician or returning a JULABO instrument for repair, please contact an authorized JULABO service station.

When returning the unit:

- Clean the unit in order to avoid any harm to the service personnel
- Attach a short fault description.
If you intend to return your JULABO unit to us, you will find a Service Return Form on our website www.julabo.de . Please use this as a delivery note and include it to the unit or send it in advance either by Fax or E-Mail.
- When returning a unit, take care of careful and adequate packing.
- JULABO is not responsible for damages that might occur from insufficient packing.



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

17. Warranty conditions

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

for a period of ONE YEAR.

Extension of the warranty period – free of charge



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

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

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

Any other compensation claims are excluded from this guarantee.