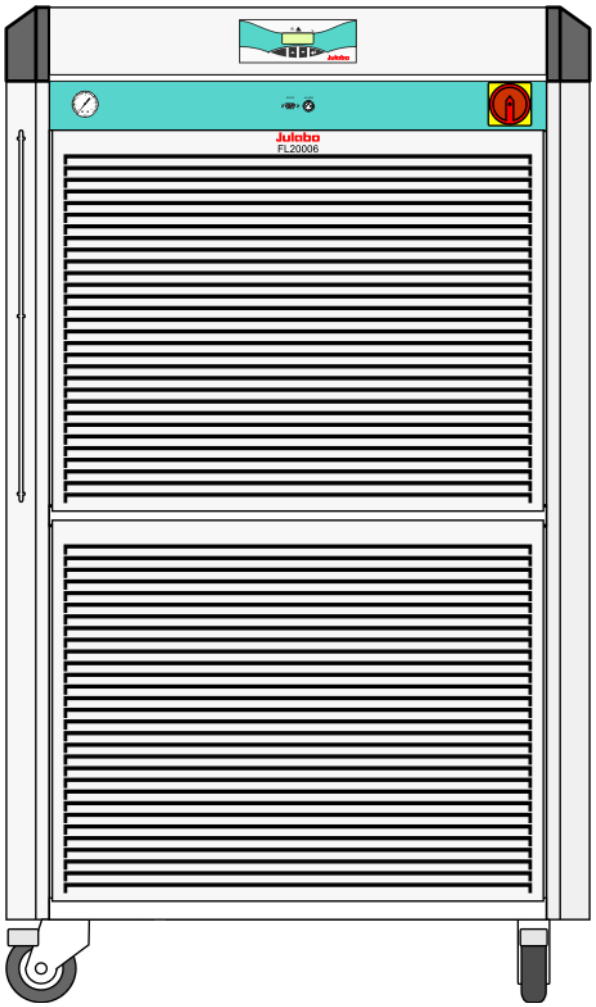
English

OPERATING MANUAL

Recirculating Coolers

FL20006

FLW20006



Julabo
THE TEMPERATURE CONTROL COMPANY

JULABO GmbH
77960 Seelbach / Germany
Tel. +49 (0) 7823 / 51-0
Fax +49 (0) 7823 / 24 91
info.de@julabo.com
www.julabo.com

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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 operation and possible applications of our circulators. For optimal utilization of all functions, we recommend that you thoroughly study this manual prior to beginning operation.

The JULABO Quality Management System

Temperature control devices for research and industry are developed, produced, and distributed according to the requirements of ISO 9001 and ISO 14001. Certificate Registration No. 01 100044846

Unpacking and inspecting

Unpack the recirculating cooler 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.

Printed in Germany

Important: keep operating manual for future use

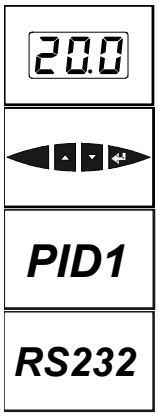
TABLE OF CONTENTS

1. Intended use

JULABO recirculating coolers have been designed for temperature application to specific fluids. The pump connections can be used for cooling applications in an external circuit at a constant temperature.

JULABO water baths are not suitable for direct temperature control of foods, semi-luxury foods and tobacco, or pharmaceutical and medical products. Direct temperature control means unprotected contact of the object with the bath medium (bath fluid).

1.1. Description



- ☑ The recirculating coolers 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 regulation is used to withdraw heat from the bath fluid by means of the cooling machine and to automatically regulate the required need.
- ☑ Electrical connections:
  1. The serial interface RS232 allows modern process technology without additional interface.
  2. Alarm output for external alarm message.
- ☑ Manually adjustable by-pass (handwheel) to reduce the pump capacity (e. g. for glass equipment).

2. Operator responsibility – Safety instructions

The products of JULABO ensure safe operation when installed, operated, and maintained according to common safety regulations. This section explains the potential dangers that may arise when operating the circulator and also specifies the most important safety precautions to preclude these dangers as far as possible.

The operator is responsible for the qualification of the personnel operating the units.

- ➢ The personnel operating the units should be regularly instructed about the dangers involved with their job activities as well as measures to avert these dangers.
- ➢ Make sure all persons tasked with operating, installing, and maintaining the unit have read and understand the safety information and operating instructions.
- ➢ When using hazardous materials or materials that could become hazardous, the unit may be operated only by persons who are absolutely familiar with these materials and the unit. 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!

Contact JULABO GmbH
Gerhard-Juchheim-Strasse 1
77960 Seelbach / Germany

Tel. +49 7823 51-0 info.de@julabo.com
Fax +49 7823 2491 www.julabo.com

Safety recommendations for the operator

- You received a product developed 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 water bath.
Routine operation can also be carried out by untrained personnel who should however be instructed by trained personnel.

Use

For the use according to the intended purpose, special material requirements have to be respected (bath fluids). Only use non-acid and non corroding materials.
Observe all warnings for the used materials (bath fluids) and the respective instructions (safety data sheets).
Only use the unit in well ventilated areas. (see page 15).
The recirculating coolers are not for use in explosive atmosphere

When using hazardous materials or materials that could become hazardous, **the operator must** affix the enclosed safety labels **(1 + 2)** to the front of the unit so they are highly visible:

1		Danger area. Attention! Observe instructions. (operating manual, safety data sheet)
2 **or**		Carefully read the user information prior to beginning operation. **Scope: EU**
2		Carefully read the user information prior to beginning operation. **Scope: USA, NAFTA**

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

2.1. Installation Log for FL20006

EN 378-2
EN 378-4
Documentation

The operator is obliged to keep an installation log for the refrigeration unit if the filling volume of the refrigerant exceeds 3 kg!

The installation log must be kept with the unit.
If the information and data is recorded on a computer, the current status must be printed out (hard copy) and kept with the unit.
It must be assured that the log is available to an expert in case of repairs and repeated inspections.

The installation log must include the following information:
See example on page 33

2.2. Disposal

This unit contains the refrigerant R404A or R452A, which at this time is not considered harmful to the ozone layer. However, over the long operating period of the unit, disposal rules may change. Therefore, only qualified personnel should handle the disposal.

Valid in EU countries
See the current official journal of the European Union – WEEE directive.
Directive of the European Parliament and of the Council 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!

2.3. 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(0)7823 / 51 - 0

CE

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

Produkt / *Product*: Umlaufkühler / *Recirculating Cooler*

Typ / *Type*: FL20006, FLW20006 **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 den 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:
The above-named product is in compliance with the following harmonized standards and technical specifications:

EN 50581 : 2012
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
Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte, Teil 1: Allgemeine Anforderungen
Safety requirements for electrical equiment for measurement, control, and laboratory use, Part 1: General requirements

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

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

EN 378-1 : 2016
Kälteanlagen und Wärmepumpen – Sicherheitstechnische und umweltrelevante Anforderungen – Teil 1: Grundlegende Anforderungen, Begriffe, Klassifikationen und Auswahlkriterien
Refrigerating systems and heat pumps - Safety and environmental requirements - Part 1: Basics requirements, definitions, classification and selection criteria

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

EN 378-3 : 2016
Kälteanlagen und Wärmepumpen – Sicherheitstechnische und umweltrelevante Anforderungen – Teil 3: Aufstellungsort und Schutz von Personen
Refrigerating systems and heat pumps - Safety and environmental requirements - Part 3: Installation site and personal protection

EN 378-4 : 2016
Kälteanlagen und Wärmepumpen – Sicherheitstechnische und umweltrelevante Anforderungen – Teil 4: Betrieb, Instandhaltung, Instandsetzung und Rückgewinnung
Refrigerating systems and heat pumps - Safety and environmental requirements - Part 4: Operation, maintenance, repair and recovery

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

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

Seelbach, 20.10.2017

M. Juchheim, Geschäftsführer / *Managing Director*

2017_051_FL(W)20006-Umlaufkühler_d_e.docx

2.4. Technical specifications

Recirculating Cooler			**FL20006**	**FLW20006**
Cooling			air cooled	water coolrd
Working temperature range		°C	-25 ... +40	-25 … +40
Temperature stability		°C	±0.5	
Temperature selection:			digital	
via key pad			indication on LED-DISPLAY	
remote control via personal computer			indication on monitor	
Temperature indication:			LED-DISPLAY	
Resolution		°C	0.1	
Temperature control			PID 1	
Temperature sensor			Pt 100	
Excess temperature protection			85 °C - fixed value	
Low liquid level protection			float switch	
Cooling capacity		°C	+20 0 -10 -20	+20 0 -10 -20
Medium: Mixture water-glycol		kW	20.0 10.0 6.0 2.5	20.0 12.0 7.0 3.0
Cooling compressor			1--stage	
Refrigerant			R404A, R452A*	
Electrical connections:				
Computer interface			RS232	
Alarm output			for external alarm signal	
Control connections		V / A	230 / max. 0.1	
Circulating pump:				
discharge, max.	at 0 bar	l/min	80	80
pressure, adjustable	at 0 Liter	bar	0.8 ... 6.0	0.8 ... 6.0
Feed pressure indication		bar	Manometer	
Filling level indicator			sight glass	
Filling volume	from ... to	liters	15 ... 37	
Dimensions (WxLxH)		cm	95x115x161	
Weight		kg	360	330
Ambient temperature range		°C	5 ... 40	
Return flow temperature		°C	80 max.	
Cooling water				
Flow rate at 15 °C inlet temperature		l/min	-----	24
Noise level, 1 m distance		dBA	73	
IP class according to IEC 60 529			IP 21	
Mains power connection		V/ Hz	400/3PNPE /50	400/3PNPE /50
Current input	at 400 V	A	18	18
Mains power connection		V/ Hz	230/3PPE /60	230/3PPE /60
Current input	at 230 V	A	36	36

* at 400 V / 3PNPE / 50 Hz

All measurements have been carried out at: rated voltage and frequency,
ambient temperature: 20 °C

Warning functions and safety installations

Excess temperature protection	85 °C - fixed value
Low liquid level protection	float switch
Alarm message	optical + audible (permanent)
Excess temperature - Warning function	75 °C
Overload protection	for compressor and pump motor
Classification according to DIN 12876-1	class I

Environmental conditions according to IEC 61 010-1:

Use only indoor.
Altitude up to 2000 m - normal zero.
Ambient temperature: +5 ... +40 °C
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
Max. mains fluctuations of ±10 % are permissible.

The unit corresponds to Class I

Overvoltage category	II
Pollution degree	2

Caution:
The unit is not for use in explosive environment.

Standards for interference resistance according to EN 61326-1
This unit is an ISM device classified in Group 1 (using high frequency for internal purposes) Class A (industrial and commercial range).

EMC requirements

The device is an ISM device of group 1 per CISPR 11 (uses HF for internal purposes) and is classified in class A (industrial and commercial sector).

Notice:

- Devices of class A are intended for the use in an industrial electromagnetic environment.
- When operating in other electromagnetic environments, their electromagnetic compatibility may be impacted.

Information about the used refrigerants

The **Regulation (EU) No. 517/2014 on fluorinated greenhouse gases** applies to all systems which contain fluorinated refrigerants and replaces (EC) 842/2006.
The aim of the Regulation is to protect the environment by reducing emissions of fluorinated greenhouse gases. Among other things it regulates the emission limits, use and recovery of these substances. It also contains requirements for operators of systems which require / contain these substances to function.

Under Regulation 517/2014, the operator of a system of this nature has the following duties:

- The operator must ensure that the equipment is checked at regular intervals for leaks.
- These intervals depend on the CO_2 equivalent of the system. This is calculated from the refrigerant fill volume and type of refrigerant. The CO_2 equivalent of your system is shown on the model plate.
- The operator undertakes to have maintenance, repair, service, recovery and recycling work carried out by certified personnel who have been authorized by JULABO.
- All such work must be documented. The operator must keep records and archive them for at least five years. The records must be submitted to the relevant authority on request.

Refer to the text of the Regulation for further information.

2.5. Cooling water connection

Only for water cooled models - FLW:

Cooling water pressure (IN / OUT)	max.	6 bar
Difference pressure (IN - OUT)		2 bar to 6 bar
Flow rate on FLW 20006	typical	24.0 l/min
Cooling water temperature		15 °C

Notice: **Cooling water circuit**
Risk of oil leaking from the refrigeration system (compressor) of the recirculating cooler into the cooling water in case of a fault in the cooling water circuit!
Observe the laws and regulations of the water distribution company valid in the location where the unit is operated.

Recommended quality of cooling water:

pH – value	*7,5 to 9,0*
Sulfate [SO4 2-]	*< 100 ppm*
Hydrocarbonate [HCO3-] / Sulphate [SO4 2-]	*> 1 ppm*
Hardness [Ca2+, Mg2+] / [HCO3-]	*> 0,5 dH*
Alkalinity	*60 ppm < [HCO3-] < 300 ppm*
Conductivity	*< 500 µs / cm*
Chloride (CL-)	*< 50 ppm*
Phosphate (PO43-)	*< 2 ppm*
Ammonia (NH3)	*< 0,5 ppm*
Free Chlorine	*< 0,5 ppm*
Ferri Ions (Fe3+)	*< 0,5 ppm*
Mangano Ions (Mn2+)	*< 0,05 ppm*
Carbon dioxide (CO2)	*< 10 ppm*
Hydrosulfide (H2S)	*< 50 ppm*
Content of oxygen	*< 0,1 ppm*
Algae growth	*impermissible*
Suspended solids	*impermissible*

Notice:

Danger of corrosion of heat exchanger due to unsuitable quality of cooling water.

- Due to its high content of lime hart water is not suitable for cooling and causes calcination of the heat exchanger.
- Ferrous water or water containing ferrous particles will cause formation of rust even in heat exchangers made of stainless steel.
- Chlorous water will cause pitting corrosion in heat exchangers made of stainless steel.
- Due to its corrosive characteristics distilled and deionized water is unsuitable and will cause corrosion of the bath. .
- Due to its corrosive characteristics sea water is not suitable.
- Due to its microbiological (bacteria) components which settle in the heat exchanger untreated and unpurified river water and water from cooling towers is unsuitable.
- Avoid particulate matter in cooling water.
- Avoid putrid water.

3. Safety notes for the user

3.1. Explanation of safety notes

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 classified using a signal word.
Read and follow these important instructions.

Warning:
Describes a possibly highly dangerous situation. If these instructions are not followed, 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 property damage may 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.

3.2. Explanation of other notes

Note!
Draws attention to something special.

Important!
Indicates usage tips and other useful information.

3.3. Safety instructions

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)!
- The power supply plug serves as a safe disconnecting device from the line and must always be easily accessible.
- 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.
- Never operate the unit without bath fluid in the bath.
- Do not drain the bath fluid while it is hot or cold!
  Check the temperature of the bath fluid prior to draining (by switching the unit on for a short moment for example).
- Use suitable connecting tubing.
- Avoid sharp bends in the tubing, and maintain a sufficient distance from surrounding walls.
- Make sure that the tubing is securely attached.

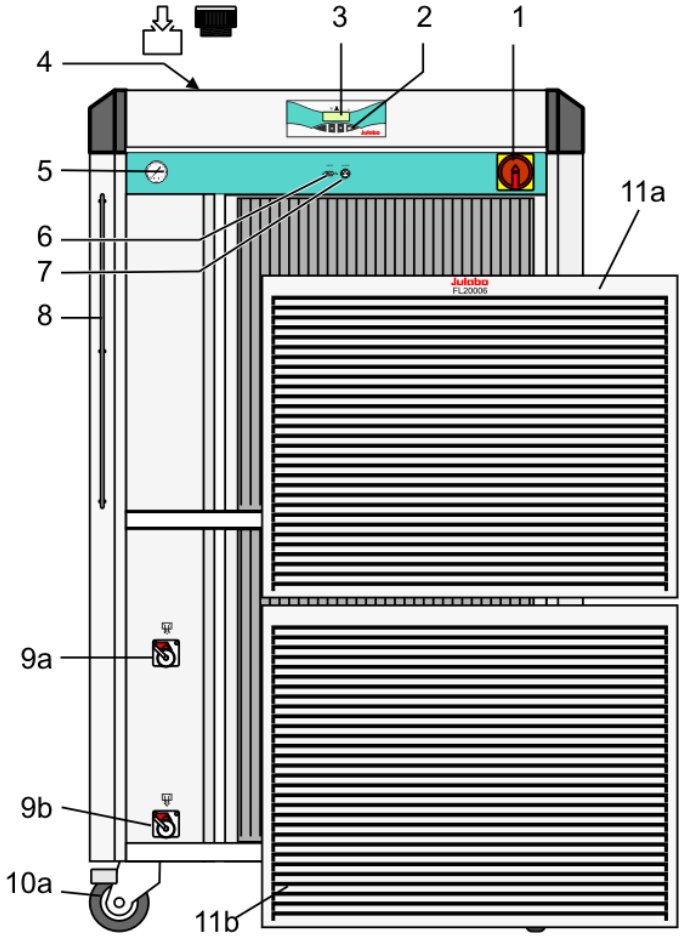
- Regularly check the tubing for material defects (e.g., for cracks).
- Never operate damaged or leaking equipment.
- Always turn off the unit and disconnect the mains cable from the power source before performing any service or maintenance procedures, or before moving the unit.
- Always turn off the unit and disconnect the mains cable from the power source before cleaning the unit.
- Always empty the bath before moving the unit.
- Transport the unit with care.
- Sudden jolts or drops may cause damage in the interior of the unit.
- Observe all warning labels.
- Never remove warning labels.
- Never operate equipment with damaged mains power cables.
- Repairs are to be carried out only by qualified service personnel.

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

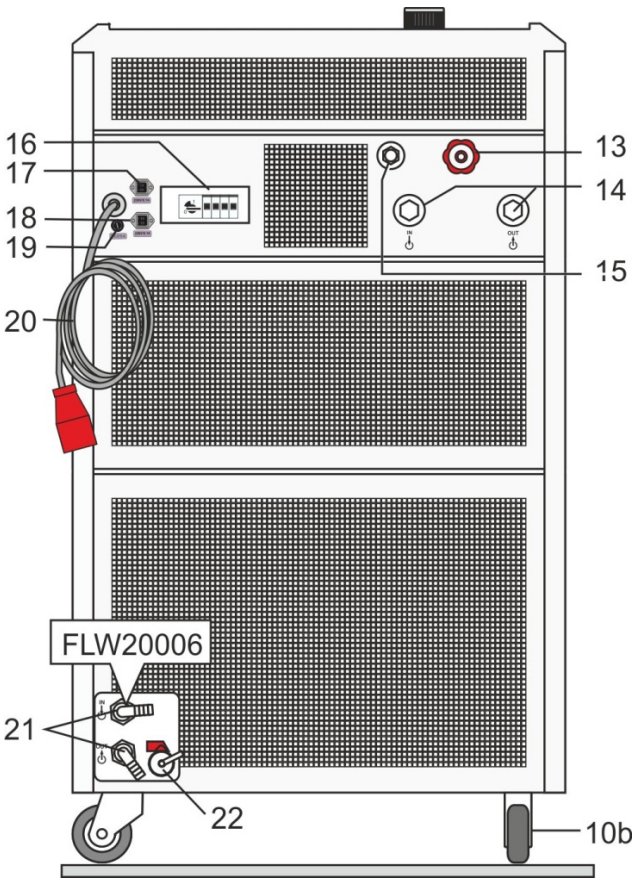
- Some parts of the bath tank and the pump connections may become extremely cold during continuous operation. Therefore, exercise particular caution when touching these parts.

4. Operating controls and functional elements

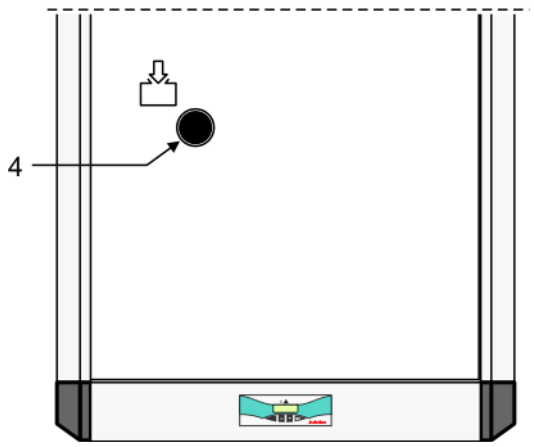
Front view

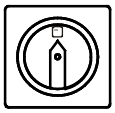
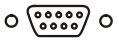
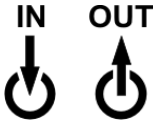


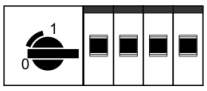
Rear view



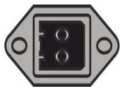
Top view



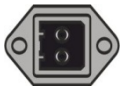
1		Mains power switch
2.0		**Keypad,** spash-water protected
2.1		Edit keys (set point increase or decrease)
2.2		Enter key Store set point value / parameter
3.0		**Indication**
3.1		LED temperature display
3.2		Control indicator – Cooling
3.3		Control indicator – Alarm
4		Fill in opening, screwed plug
5		Feed pressure indication: Manometer
6	 RS232	Interface RS232: remote control via personal computer
7		Alarm output (for external alarm signal)
8		Filling level indication
9		Drain tap with drain port
10a		Castor with brake (at the front)
10b		Castor without brake (at the back)
11		Venting grid, removable
13		Feed pressure adjusting valve
14		Pump connector OUT – pressure pump Pump connector IN– Return FL/FLW20006 G 1¼“
15		Overflow connector

16 

1 Motor protection switch for compressor motor
2 + 3 Mains circuit breakers (resettable) F1, F2 - 4 A (for Electronics)
4 + 5 Mains circuit breakers (resettable) F3, F4 - 10 A (for Pump motor)

17 

Control connection 230 V / max. 0.1 A
No control voltage in the “OFF”

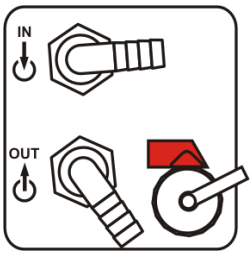
18 

Control connection 230 V / max. 0.1 A
No control voltage in the “OFF”

19 

Maiins fuse for control connections, T 0.315 A

20 Mains power cable with plug

21 

Only water cooled models
IN Cooling water inlet
OUT Cooling water outlet
G3/4" external thread
3/4" inner dia. Tubing, compression-proof

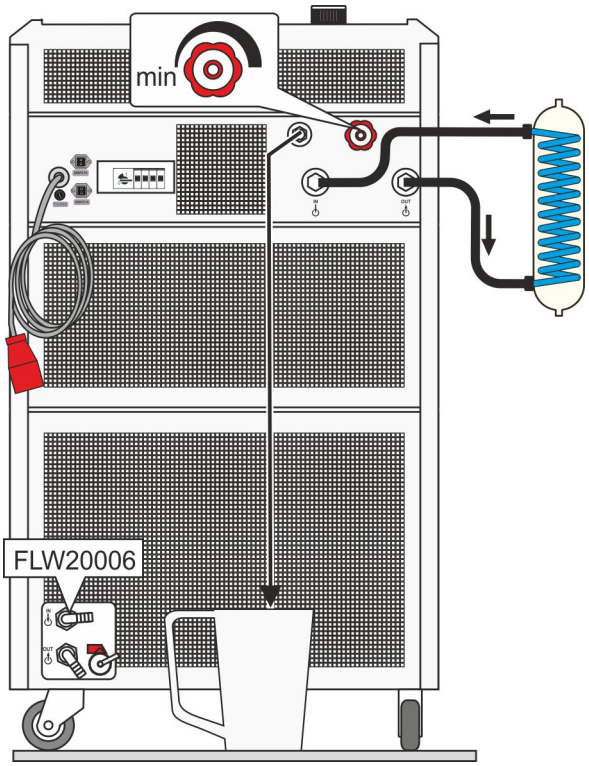
22 Cooling water drain for residual water in case of service

5. Installation

- Place the unit on an even surface on a base made of nonflammable material. Using the castors (10a, 10b) move the unit to the intended location.
  For better stability, apply the holding breaks on the front casters (10a).
- Cooling machine, pump motor and electronics produce intrinsic heat that is dissipated via the venting openings! Never cover these openings!
- Do not set up the unit in the immediate vicinity of heat sources and do not expose to sun light.
- Keep at least 20 cm of open space on the front and rear venting grid.
- 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 rejects to the environment.
  For a fault (leakage) in the refrigeration system, the standard EN 378 prescribes a certain room space to be available for each kg of refrigerant.
  > For 0.52 kg of refrigerant R404A, 1 m3 of space is required.
  > For 0.423 kg of refrigerant R452A, 1 m3 of space is required.

Caution: **Pump pressure**

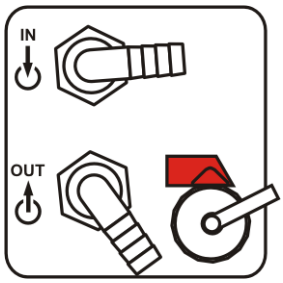
- Determine and check the max. admissible pressure for the external circuit before putting the unit into operation. The max. pressure is determined by the weakest element in the circuit (e. g. glass equipment).
- Securely attach all tubing to prevent slipping.
- Do not seal the overflow!

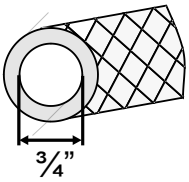


- Connect the tubings for cooling the external system to the pump connectors for feed and return (14) on the rear of the recirculating cooler.

– Return - Feed

- Connect a piece of tubing to the overflow connector (15) and drain into a suitable vessel, which always has to be placed lower thant the exit „Overflow“.
  Do not seal the overflow connector!
- Turn the adjusting valve (13) counter-clockwise to set the lowest manometric pressure.
- 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.





- **Only water cooled models - FLW:**
  Ensure circulation of cooling water by connecting the tubing to cooling water inlet (IN)and outlet (OUT) on the rear (18) of the recirculating cooler.

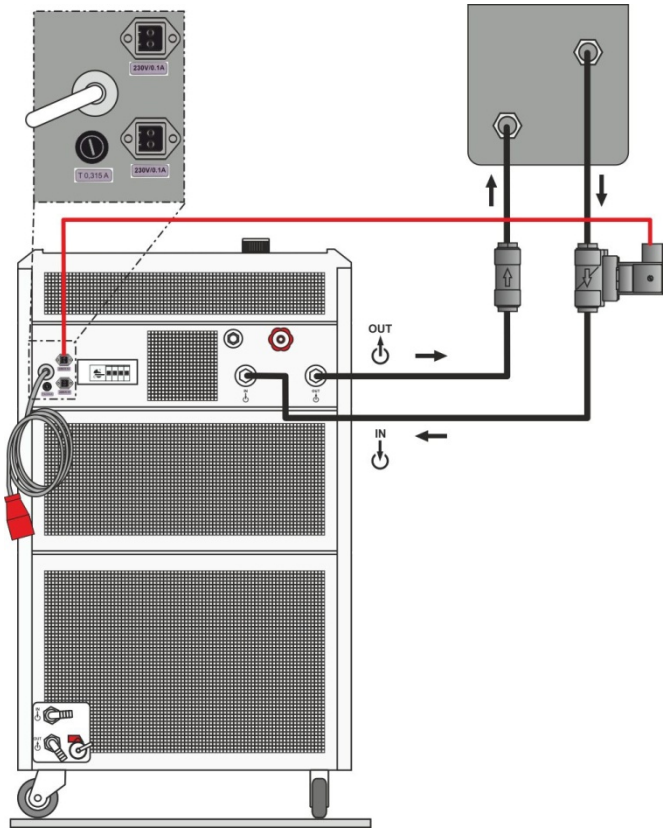
Cooling water see page 9.

Cooling water connectors		G3/4" external thread
Tubing		3/4" inner dia. Tubing, compression-proof
	IN	Cooling water inlet
	OUT	Cooling water outlet

Even high quality heat exchangers as they are installed in our equipment can be damaged by unsuitable cooling water.
The quality of the cooling water depends on the local conditions.
The heat exchanger may become leaky due to corrosion or it may become clogged due to particulate matter.

Notice:
Flood hazard!.
Return flow safety device
In case the system to be cooled is located at a higher level than the recirculating cooler, take note of bath liquid flowing back when the unit is switched off.
Should the filling volume of the bath tank not be sufficient, prevent the liquid from flowing back by using solenoid valves.

Expl. of a return flow safety device FL20006



The solenoid valve set consists of
- Solenoid valve
- nonreturn valve
- Connection cable with plug

- The nonretur valve is fitted into the feed oft he cooling system.
- The solenoid valve ist fitted into the return line and connected with the cable to the control connection (17).

Suitable for	Order text	Order No.
FL(W) 20006	Solenoid valve set G 1¼“	on request

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.

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.

5.1. Tubing

Caution:

- 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.	Description	Suitable for
8930325	1 m Reinforced tubing 1“ inner dia. (-40 ... +120°C)	FL(W) 7006/11006/20006

Tubing insulation

8930425	1 m Insulation, 35 mm inner dia.	Reinforced tubing 1“ inner dia.

Tube clamps

8970484	2 Tube clamps, size 5	Reinforced tubing 1“ inner dia.

6. Operating procedures

6.1. Bath fluids

Caution:

No liability for use of other bath liquids!
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
Do not use alcohols.

Water:

The quality of water depends on local conditions.

- Due to the high concentration of lime, hard water is not suitable for temperature control because it leads to calcification in the bath.
- Ferrous water can cause corrosion - even on stainless steel.
- Chloric water can cause pitting corrosion.
- Distilled and deionized water is unsuitable. Their special properties cause corrosion in the bath, even in stainless steel.

No liablity for use with water. Danger of freezing at working temperatures <5 °C.

Recommended bath fluids:

Bath fluids	Temperature range
soft/decalcified water	5 °C to 80 °C

See website for list of recommended bath fluids.
Contact: www.julabo.com

6.2. Power connection

Caution:

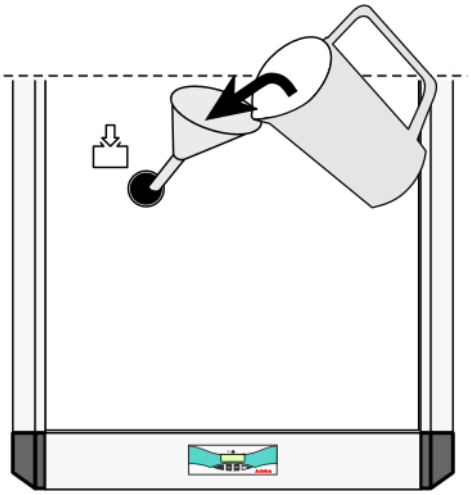
- Only connect the unit to a power socket with earthing contact (PE – protective earth)!
- The power supply plug serves as safe disconnecting device from the line and must be always easily accessible.
- Never operate equipment with damaged mains power cables.
- Regularly check the mains power cables for material defects (e.g. for cracks).

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

Make sure that the line voltage and frequency match the supply voltage specified on the type plate.

6.3. Filling

Top view



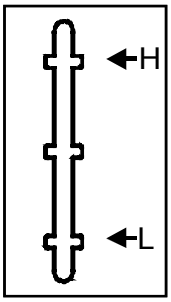
Take care that no liquid enters the interior of the circulating cooler.

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

Respect instructions from page 15 to page 17!

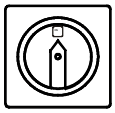
ⓘ Check to make sure that the drain taps (9a, 9b) are closed.

- Unscrew the plug from the filling port (4).
- Fill in bath fluid up to marking „H“ of the filling level indicator.



- Turn the mains switch (1) on (Switching on - see below)
- Switch on unit. To do so press button ↵ for approx. 4 seconds.
- Bath fluid is pumped into the externally connected system. Refill fluid up to marking „H“.
- The recirculating cooler is ready for operation.
- Close the the fill in opening (4) with the screw plug!

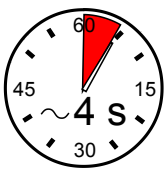
6.4. Switching on / Start - Stop



Switching on:
The recirculating cooler is turned on and off with the mains switch.

The unit performs a self-test. All segments of the 4-digit LED temperature DISPLAY and all indicator lights will illuminate.
Then the software version and the type of unit are indicated.

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.

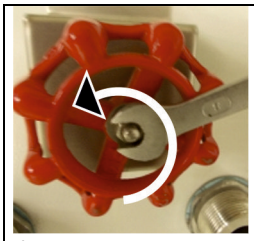
Stop:
1. Press enter ↵ **for about 4 seconds.**
2. Wait until the LED display stops blinking!
3. Turn the unit off with the mains power switch.

6.5. Setting the feed pressure

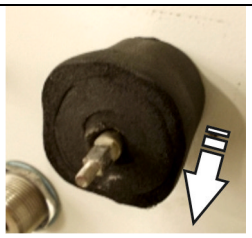
Set the max. permissible feed pressure (example: 2 bar) by slowly closing the adjusting valve (13) on the rear and looking at the manometer (5).

ⓘ The max. pressure is determined by the weakest element in the circuit (e. g. glass equipment).

Fixing a leak on the adjustment valve
The stuffing box gland on the adjustment valve must be tightened if it develops a leak.


1


2


3


4


5

1. Undo the nut (a.f. 8) and remove the hand wheel on the adjustment valve,
2. Unscrew the stuffing box gland cover,
3. Remove the insulation,
4. + 5. Tighten the nut on the seal (a.f. 27),
6. Place the seal back over the screw connection,
7. Secure the stuffing box gland cover,
8. Attach the hand wheel to the adjustment valve and secure the nut.

The adjustment valve must turn easily after the nut has been tightened.

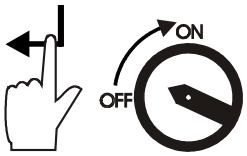
6.6. Setting the temperatures

Factory setting: 25 °C

ⓘ 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.

6.7. AUTOSTART ON / OFF



The recirculating cooler 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.
If such a safety standard is not required, the AUTOSTART function (automatic start mode) may be activated, thus allowing the start of the circulator directly by pressing the mains power switch

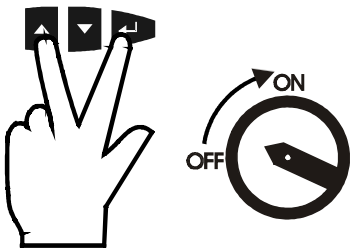
Keep depressed enter ↵ and
turn on the unit with the mains power switch.
For a short while the LED DISPLAY indicates the effective start mode:

⇨ AUTOSTART on.

⇨ AUTOSTART off.

Warning:
For supervised or unsupervised operation with the AUTOSTART function, avoid any hazardous situation to persons or property.
The recirculating cooler does no longer conform to N.A.M.U.R. recommendations.

6.8. Remote control: activate – deactivate



The recirculating cooler is to be prepared for remote control by a personal computer via the serial interface RS232.
Set the interface item from >IOFF< to >ION<.

Remote control: activate – deactivate:

- Switch off recirculating cooler 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.

(Interface OFF)

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

(Interface On)

>I On< Remote control via RS232

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

The display "**rOFF**" indicates the unit is ready to be operated via remote control.

7. Safety installations

7.1. Excess temperature protection

This safety installation is independent of the control circuit.
When the temperature of the bath fluid has reached the safety temperature (85 °C), a complete shutdown of the compressor and pump is effected.
The alarm is indicated by optical and audible signals (continuous tone) and on the LED-DISPLAY appears the error message "**E**rror **14**".

7.2. 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
"**E**rror **01**".
ⓘ 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.

Notice:
Check the low liquid level protection device at least twice a year!
To execute a functional test, drain the liquid until the alarm for low liquid level is triggered. Refill liquid afterwards.

8. 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

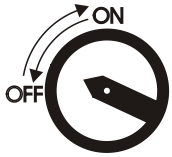
- The recirculating cooler is operated without bath fluid, or the liquid level is insufficient.
  Replenish the bath tank with the bath fluid.
- Tube breakage has occured (insufficient filling level due to excessive bath fluid pumped out). Replace the tubing and replenish the bath tank with the bath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

E 05

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

E 12

Error in A/D converter.

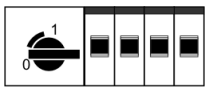
E 14	The return temperature is above the switch-off value of the high temperature protection (85°C). Check dimensioning of application. Use a stronger recirculating cooler if necessary.
E 51	• The motor protection switch for the compressor motor is off. Set motor protection switch to >1< . Check the fuses. • The pressure sensor of low pressure side (evaporation pressure) is faulty, short-circuited or has a line interruption. Have the repair done by a specialist.
E 52	• The motor protection switch for the compressor motor is off. Set motor protection switch to >1< . Check the fuses. • The pressure sensor of high pressure side is faulty, short-circuited or has a line interruption. Have the repair done by a specialist.
E 53	The suction gas temperature sensor is faulty, short-circuited or has a line interruption. Have the repair done by a specialist.
	After eliminating the malfunction, press the mains power switch off and on again to cancel the alarm state. If the unit cannot be returned to operation, contact an authorized service station.
E 03	**Warning without a complete shutdown of the unit** Excess temperature warning starting at 75 °C The return temperature soon reaches the swith-off value of the high temperature protection (85 °C).
E 20	Cooling of the condenser is affected. (see page 28) • Clean air-cooled condenser. • Check the flow rate and cooling water temperature on water-cooled condenser.

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

<u>Disturbances that are not indicated.</u>

<u>Overload protection::</u> a) for cooling machine
b) for pump motor

After a short cooling interval, the unit will automatically start running.



1 2 3 4 5

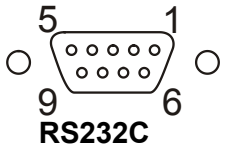
1 Motor protection switch for compressor motor

2 + 3 Mains circuit breakers (resettable) F1, F2 - 4 A (for Electronics)

4 + 5 Mains circuit breakers (resettable) F3, F4 - 10 A (for Pump motor)

9. 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.



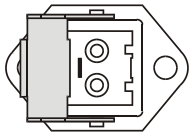
RS232C

RS232 serial interface
This port can be used to connect a computer with an RS232 cable for remote control of the recirculating cooler.

Pin assignments RS232:

Pin 2	RxD	Receive Data
Pin 3	TxD	Transmit Data
Pin 5	0 V	Signal GND
Pin 7	RTS	Request to send
Pin 8	CTS	Clear to send

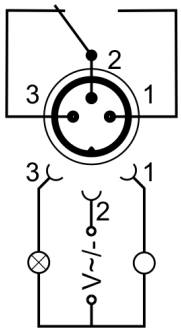
Pin 1; 4; 6, 9 Reserved - do not use!



Control connections (13, 14)
The output voltage is applied when the unit is working
for example after pressing the start/stop button. The valve is open.
Output voltage: 230 V~ / 0.1 A max

Accessories:

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



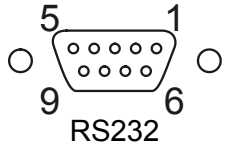
Alarm output
Potential-free change-over contact for external alarm signal.

Pin 2 and 3 are connected in case of an alarm.
Pin 2 and 1 are connected in normal condition or mains switch "Off".


Switching capacity	max.	30 W / 30 VA
Switching voltage	max.	30 V~/–
Switching current	max.	1 A

10. Remote control

10.1. Setup for remote control



Check the interface parameters for both interfaces (on recirculating cooler and PC) and make sure they match.

Interface parameters are pre-determined.

Type	RS232
Baudrate	4800 bauds
Parity	even
Handshake	hardware handshake

10.2. Communication with a PC or a superordinated data system

If the recirculating cooler is put into remote control mode the MULTI-DISPLAY (LED) will read „R -OFF-„ = REMOTE STOP. The recirculating cooler 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 recirculating cooler 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 to15.5 °C: **out_sp_00 ⇔ 15.5↵**
Command to ask for the working temperature **in_sp_00↵**
Response from the recirculating cooler: **15.5↵ LF**

10.3. 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 26)
in_pv_00	none	Actual bath temperature.
in_sp_00	none	Working temperature
in_mode_05	none	Recirculating cooler in Stop/Start condition: 0 = Stop 1 = Start

10.4. Status messages

Status messages	Description
00 MANUAL STOP	Recirculating cooler in „OFF“ state.
01 MANUAL START	Recirculating cooler in keypad control mode.
02 REMOTE STOP	Recirculating cooler in „r OFF“ state.
03 REMOTE START	Recirculating cooler in remote control mode.

10.5. Error messages

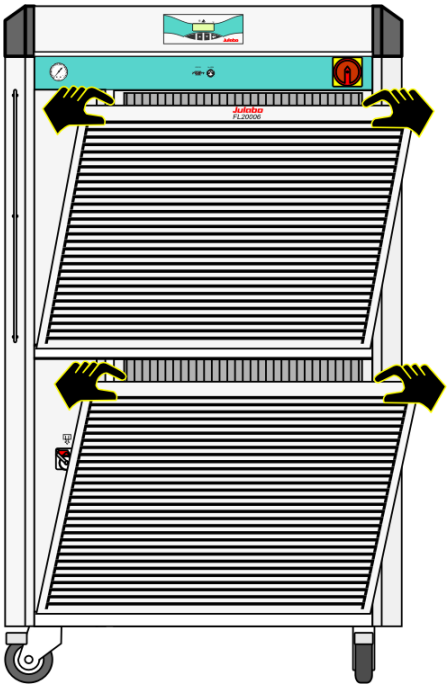
Error messages	Description
-01 LOW LEVEL ALARM	Low liquid level alarm.
-05 WORKING SENSOR ALARM	Working temperature sensor short-circuited or interrupted.
-03 EXCESS TEMPERATURE WARNING	High temperature warning. Starting at 75 °C (no deactivation) The return temperature soon reaches the switch-off value of the high temperature warning function (85 °C)
-07 I^2C-BUS ERROR	Internal error when reading or writing the I^2C bus.
-08 INVALID COMMAND	Invalid command.
-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	The return temperature is above the switch-off value of the high temperature warning function of 85 °C. Check dimensioning of application. Use a stronger recirculating cooler if necessary.
-20 WARNING: CLEAN CONDENSOR OR CHECK COOLING WATER CIRCUIT OF REFRIGERATOR	Cooling of the condenser is affected. Clean air-cooled condenser. Check the flow rate and cooling water temperature on water-cooled condenser.
-51 PRESSURE SENSOR ALARM LOW PRESSURE SIDE	• The motor protection switch for the compressor motor is off. Set motor protection switch to >1< . Check the fuses. • The pressure sensor of low pressure side (evaporation pressure) is faulty, short-circuited or has a line interruption. Have the repair done by a specialist.
-52 PRESSURE SENSOR ALARM HIGH PRESSURE SIDE	• The motor protection switch for the compressor motor is off. Set motor protection switch to >1< . Check the fuses. • The pressure sensor of high pressure side is faulty, short-circuited or has a line interruption. Have the repair done by a specialist.
-53 SUCTION GAS TEMPERATURE SENSOR ALARM	The suction gas temperature sensor is faulty, short-circuited or has a line interruption. Have the repair done by a specialist.

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

Notice:

Risk of hand injuries when mounting the venting grid.



Maintaining the cooling performance

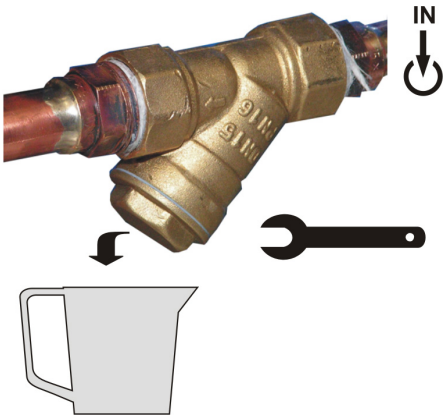
Air cooled models = FL

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

- Switch off the unit, disconnect mains power cable.
- Hold the venting grid, pull out and remove.
- Clean the ribbed condenser with a vacuum cleaner.
- Replace the venting grid.
- Switch on the unit.

The following service procedures are to be carried out only by qualified service personnel.

In order to maintain a good condition of the cooling compressor, the dirt pan in the cooling water inlet should be cleaned in regular intervals.



- Switch the unit off, disconnect the power plug.
- Interrupt the cooling water inlet.
- Loosen the screws at the back and remove right side panel.

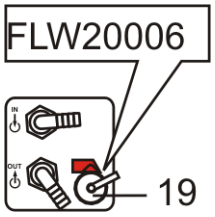
- Dirt collects behind the lock screw of the dirt trap. Remove lock screw.
- Remove the dirt by opening the water input for a short moment (rinse).
- Return and fasten lock screw to dirt trap.
- Open cooling water inlet and check screw coupling for leak tightness.
- Replace right side panel.
- The unit is ready to operate again.

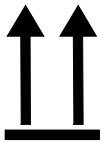
Cleaning:

Clean the outside of the unit using a wet cloth and low surface tension water.
The recirculating cooler 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
- FLW20006: drain residual water of cooling water circuit.
  (19 – Cooling water drain for residual water)
- Attach a short fault description.
- When returning a unit, take care of careful and adequate packing.
- During transport the unit has to stand upright. Mark the packing correspondingly.
- JULABO is not responsible for damages that might occur from insufficient packing.

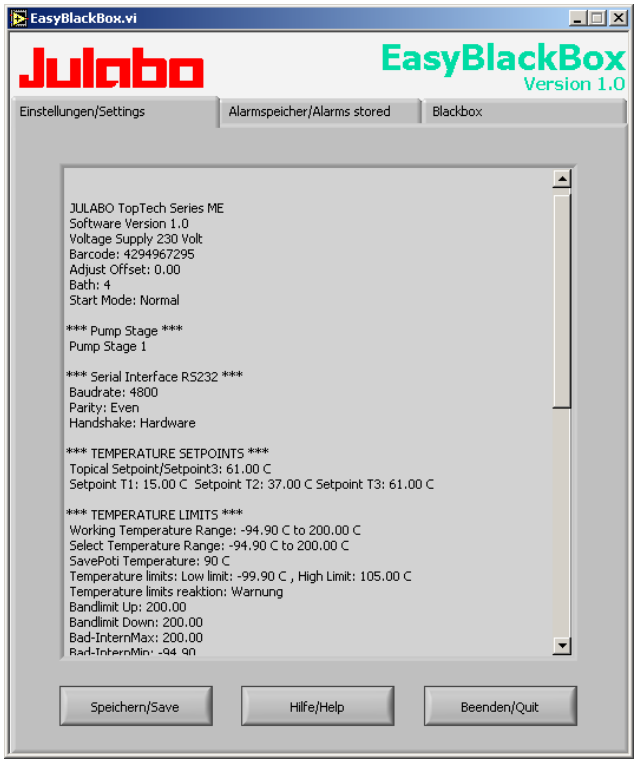
JULABO reserves the right to carry out technical modifications with repairs for providing improved performance of a unit.

11.1. JULABO Service – Online remote diagnosis

JULABO circulators of the HighTech series are equipped with a 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. This software is available as a **free** download from www.julabo.com\EasyBlackBox.

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

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



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

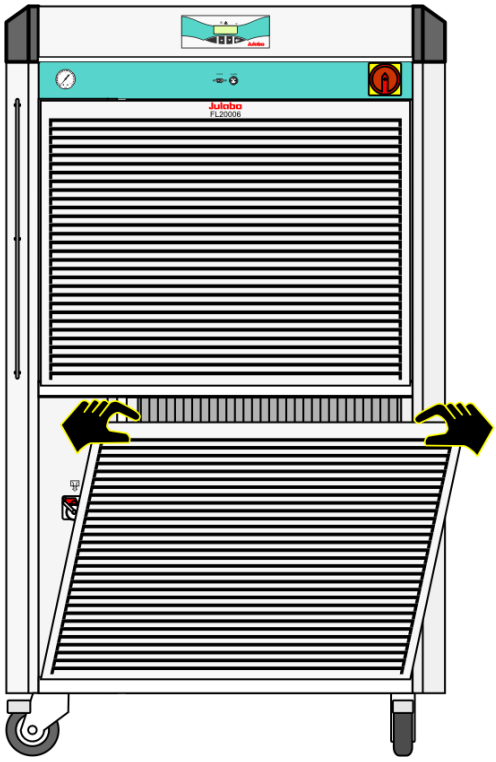
  ← see example

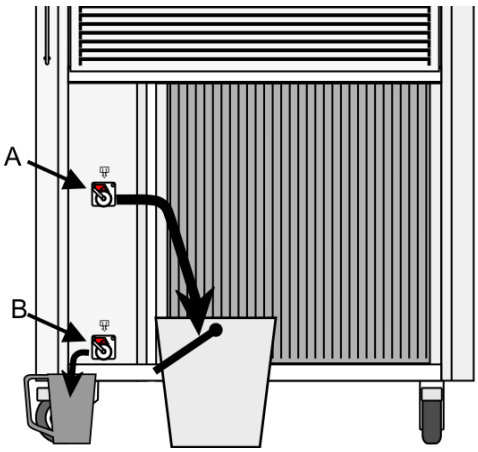
- After pressing >Speichern/Save< a text file is compiled. The program proposes a filename - >C:\model description and barcode no.<. Modifications are possible.
- E-mail this file to service.de@julabo.com, JULABO's service department. JULABO is thus able to provide rapid support.

11.2. Draining

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

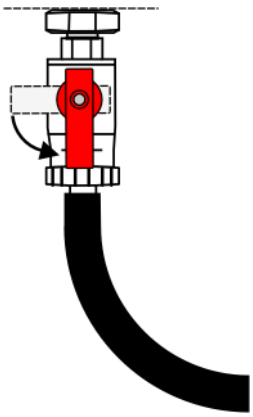
Risk of injury for hands when mounting the venting grid.





The unit has two drain taps. Both have to be used.
First drain the large tank via drain tap A, the drain the remaining liquid via drain tap B.

- Turn off the unit and disconnect the mains cable from the power source.
- Hold the venting grid, pull out and remove.
- Place a suitable vessel for accepting the used bath liquid underneath the drain.
- Assemble the barbed fitting to the drain tap.
  Slide a short piece of tube onto the barbed fitting and hold it into a pail.
- Open the drain tap and empty the unit completely.



- **Tighten** the **drain tap** after draining the unit and replace the venting grid.

12. Warranty conditions

JULABO 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.com, indicating the serial no. The extended warranty will apply from the date of JULABO GmbH’s original invoice.

JULABO 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.

13. Example Installation Log

Type of Unit: **FL** **Refrigerant:** **Filling volume refrigerant:**	**Year of manufacture:** **Permissible operating overpressure**

1 Details of all maintenance and repairs

2 Quantity and type (new, reused or recyceled) of the refrigerant used for filling
Quantity of refrigerant drained from the unit

3 If an analysis of the reused refrigerant is available, please list the results

4 Origin of the refrigerant

5 Modification and exchange of unit components

6 Results of every regular routine test

7 Extended down times