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TECHNOLOGY GROUP

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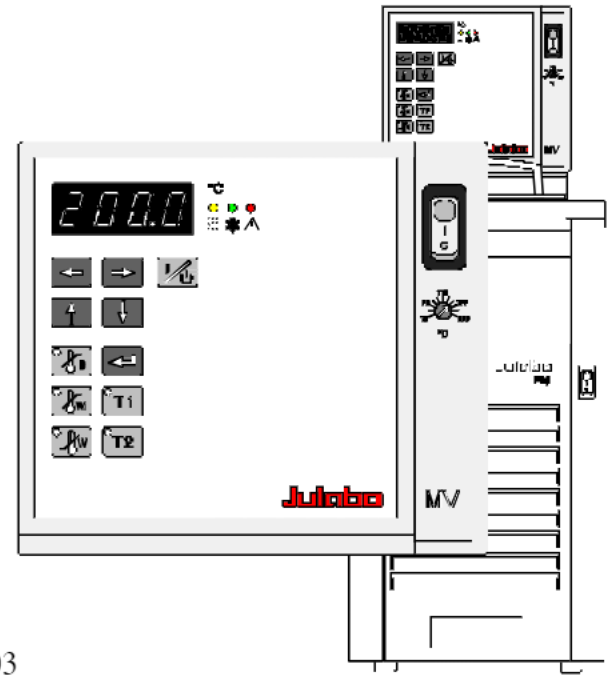
Refrigerated Circulators

F12
F25
F26
F32
F33
F34

FP40
FP45
FP50

FPW50

-MV
-MW



We are ISO 9001 certified

1.951.1422BE2 01/03

19511422.doc

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 circulators. For optimum utilization of all functions, we recommend that you thoroughly study this manual prior to beginning operation.

Safety Warnings

Take care your unit is operated only by qualified persons.
Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions concerning the operation of your unit or the information in this manual, contact JULABO.
Performance of installation, operation, or maintenance procedures other than those described in this manual may result in a hazardous situation and may void the manufacturer's warranty.
Transport the unit with care. Sudden jolts or drops may cause damages in the interior of the unit.
Observe all warning labels.
Never remove warning labels.
Never operate damaged or leaking equipment.
Never operate the unit without bath fluid in the bath.
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.
Refer service and repairs to a qualified technician.

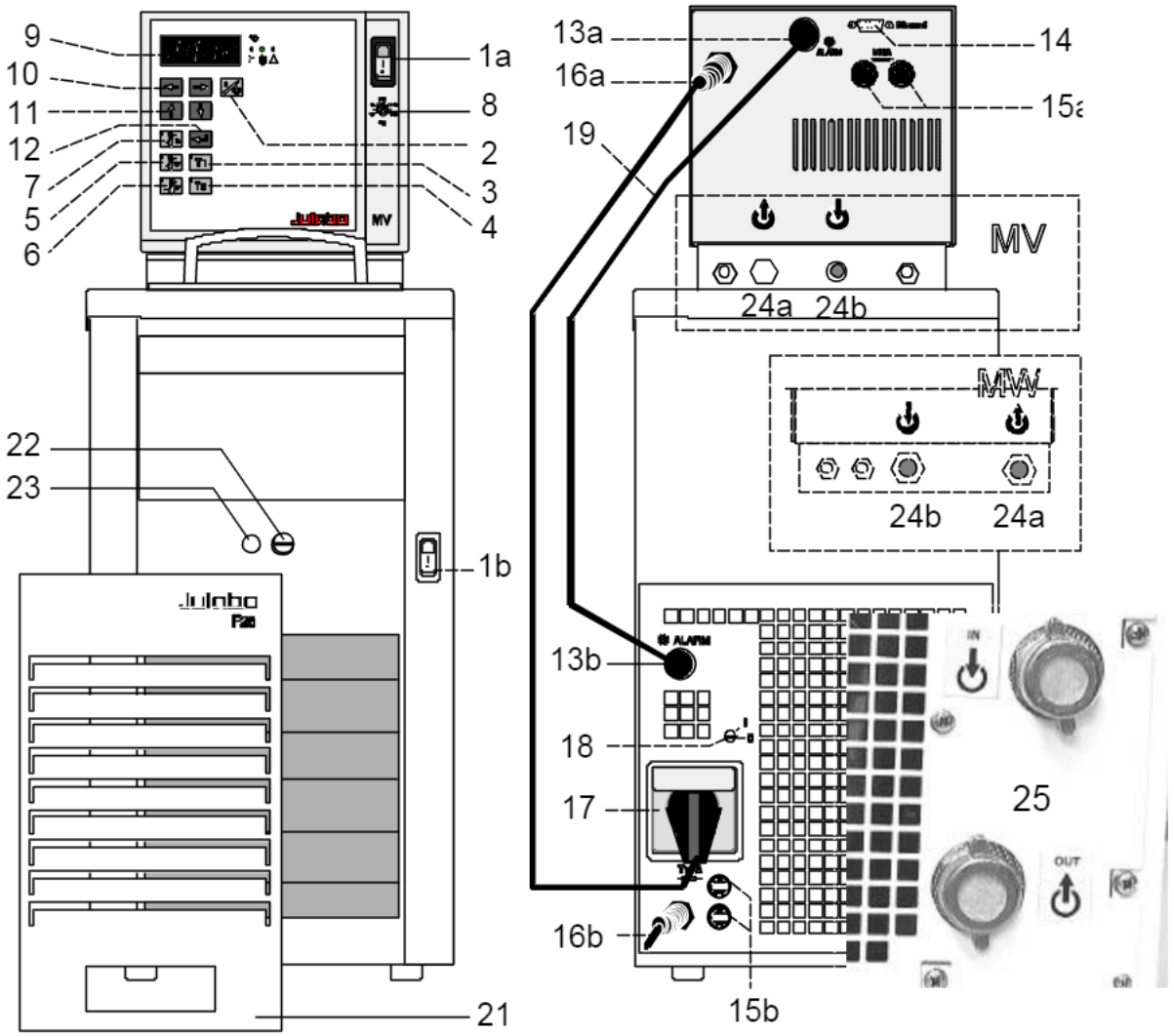


In addition to the safety warnings listed above, warnings are posted throughout the manual. These warnings are designated by an exclamation mark inside an equilateral triangle. Read and follow these important instructions. Failure to observe these instructions can result in permanent damage to the unit, significant property damage, personal injury or death.

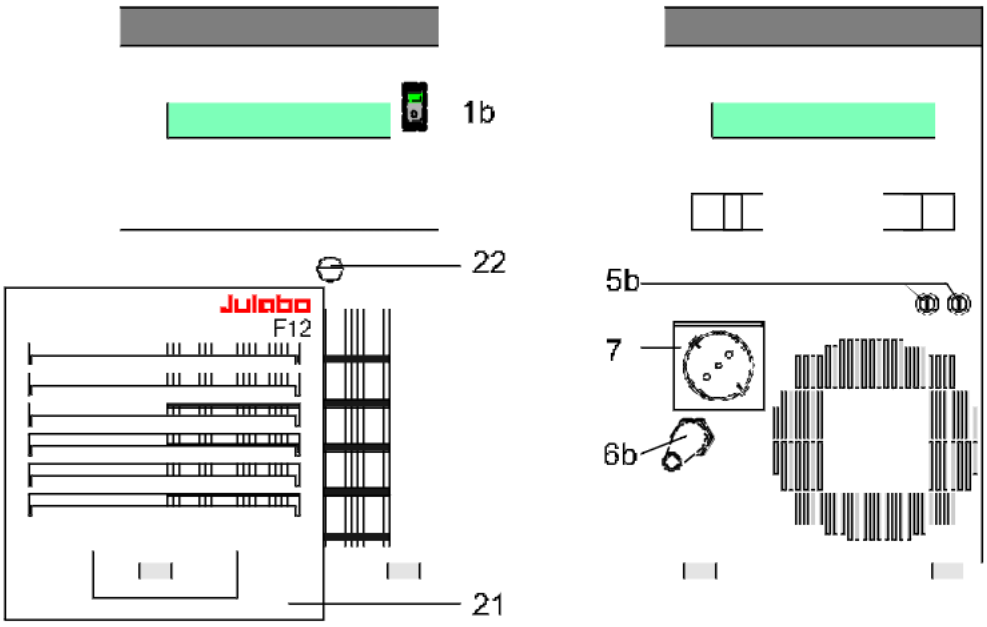
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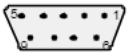
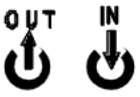
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1. Operating controls and functional elements



Rear view



1a/1b		Mains power switch, illuminated, for circulator / cooling machine
2		Start / stop key
3		Working temperature T1
4		Working temperature T2
5		High temperature warning limit
6		Low temperature warning limit
7		Safety temperature
8		Adjustable excess temperature protection (safety temperature)
9		MULTI-DISPLAY (LED) temperature indication
10		Cursors left/right
11		Edit keys (increase/decrease setting)
12		Enter key (store)
		Indicator light - Alarm
		Indicator light - Cooling
		Indicator light - Heating
13a		Connector: Control cable for cooling machine
13b		Connector: Cooling machine control (not on F12)
14		RS232C interface
15a		Mains fuses for circulator
15b		Mains fuses for cooling machine
16a		Mains power cable for circulator
16b		Mains power cable with plug
17		Built-in mains outlet for connection of circulator
18		Selector dial for cooling machine (only on F25, F26, F34) Position "1"
19		Control cable for cooling machine
21		Removable venting grid
22		Drain tap
23		Drain port (not on F12)
24a		Pump connector: MV - feed MW - pressure pump
24b		Pump connector: MV - return MW - suction pump
25		Only for water cooled models: Cooling water OUTLET / INLET

2. Quality Management System



The JULABO **Q**uality **M**anagement **S**ystem:
Development, production and distribution of temperature application instruments for research and industries conform to the requirements according to DIN EN ISO 9001:1994-08.

Certificate Registration No. QA 051004008.

3. Unpacking and checking

Unpack the 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.

4. Description

The JULABO refrigerated circulators employ a circulator head and a cooling machine with bath tank, and have been designed for heating and cooling of liquids in the bath tank.
Besides the cooling aggregate, the main functional elements are the heater, circulation pump and control electronics. An electronic proportional temperature control (PID characteristic) adapts the heat supplied to the thermal requirements of the bath.

Setting is rapid and simple using the keypad with its easy to learn symbols. Keypad is splash-proof, easily cleaned and ergonomically designed.
The microprocessor technology allows four temperature values to be stored and indicated on the MULTI-DISPLAY (LED): working temperatures T1 and T2, high and low temperature warning limits.

The safety value for excess temperature protection, a safety installation independent from the control circuit, is adjustable on the front and visible on the MULTI-DISPLAY (LED).

The RS232C port permits modern process engineering without additional interface, directly on-line, from the circulator to your application equipment.

The circulators conform to the safety requirements specified by DIN 12 876 (safety class III), as well as DIN 58 966, the guideline for first voltage range EN 61010.

4.1. Installation

- Place the unit in an upright position.
- Keep at least 20 cm of open space on the front and rear venting grids.
- 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.



Only for water cooled models:
Ensure circulation of cooling water by connecting the tubing to cooling water inlet (IN) and outlet (OUT) on the rear of the recirculating cooler.
Water pressure: 3.5 to 6 bar.
Cooling water temperature: <20 °C

OUT IN ¾"

4.2. Bath liquids and tubing

Carefully read the safety data sheet of the bath liquid used, particulary with regard to the fire piont!
If ethanol is used, only supervised operation is possible.

Recommended bath liquids:

Bath liquids	Temperature range	Flash point / fire point	
Thermal M	+50 °C ... 170 °C	>275 °C	>320 °C
Thermal H	+50 °C ... 250 °C	>280 °C	>350 °C
Thermal HY	-60 °C ... 50 °C	>62 °C	>110 °C
Ethanol (C_2H_5OH)	-100°C bis 0 °C	12 °C	
deionisiertes Wasser	5 °C bis 80 °C		

ATTENTION: The maximum permissible viscosity is 30 $mm^2 \times s^{-1}$.

No liability for use of other bath liquids!

Order No.	Bath liquid	
8 940 100	Thermal M	10 liters container
8 940 101	Thermal M	5 liters container
8 940 102	Thermal H	10 liters container
8 940 103	Thermal H	5 liters container
8 940 104	Thermal HY	10 liters container
8 940 105	Thermal HY	5 liters container

- Recommended tubing:

	Temperature range
CR tubing	-20 °C to +120 °C
Viton tubing	-50 °C to +200 °C

The temperature controlling i.e. immersing of test tubes, Erlenmeyer flasks or similar objects directly within the circulator constitutes normal circulator practise.

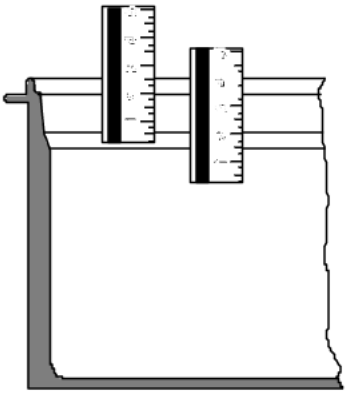
We do not know which substances are contained within these vessels. Many substances are:

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

i.e.:dangerous

You alone are responsible for the handling of these substances!

4.3. Filling / draining



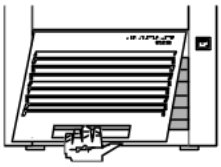
Filling

Take care that no liquid enters the interior of the circulator.

- Recommended maximum filling level with water as bath liquid: 25 mm below the tank rim
- Recommended maximum filling level with bath oils: 40 mm below the tank rim

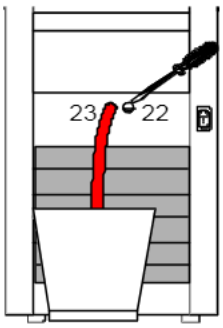
ATTENTION: the volume of bath oils will increase due to thermal expansion when the bath temperature rises.

Exercise CAUTION when emptying hot bath liquids!



Draining

- Turn off the circulator and cooling machine.
- Hold the venting grid, pull out and remove.



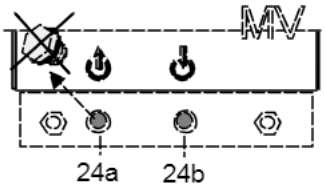
- Slide a short piece of tube onto the drain port (23) and hold it into a pail (not on F12)
- Unscrew the drain tap (22) and empty the unit completely.
- Tighten the drain tap.



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

4.4. Temperature application to external systems

Temperature application to external, closed systems.
The circulator is used for temperature application to external, closed systems (temperature loop) with simultaneous bath internal temperature application.

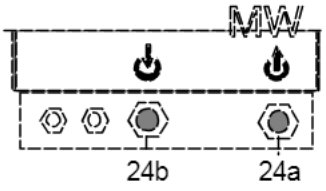


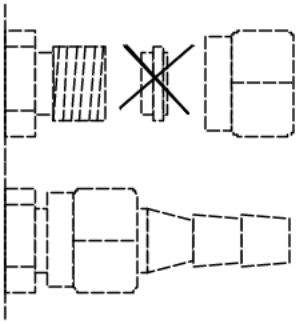
Feed Return

Connecting an external system:

- Unscrew the collar nut from the pump connector (24a).
- Slide the tubing onto the pump connectors for feed and return flow (24a, 24b).

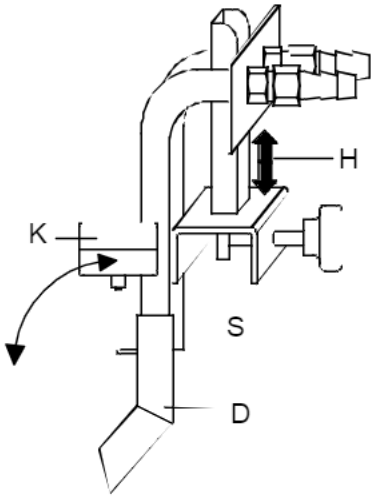
Recommendation: Use tubing insulation.





- Unscrew the M 16 x 1 collar nuts on the pump connectors (pressure pump 24a, suction pump 24b) with a 19 mm (3/4") wrench and remove the sealing disks. Using the collar nuts, screw on the tubing connection fittings delivered with the unit (8 mm or 12 mm in diameter) and tighten firmly.
- Push on the tubings, and secure with tube clamps.
- Attach the tubings 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.

Temperature application to external, open systems



S = Suction pump connection

D = Pressure pump connection

K = Float

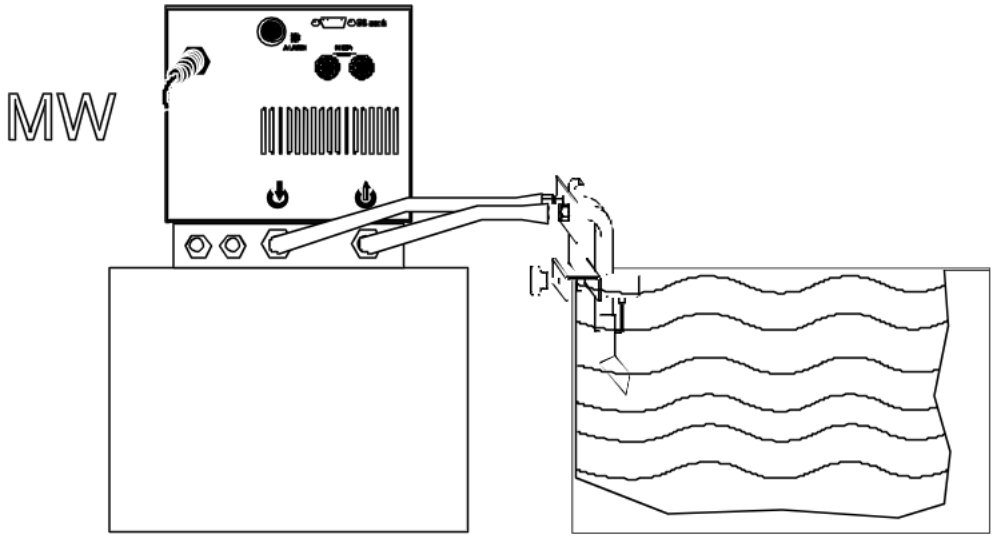
H = Height adjustment

MW circulators are equipped with both a pressure and suction pump for external temperature application in open systems.
Connections are to be made as described above .

Differing flow rates of the pressure and suction pumps should be compensated. To maintain a constant liquid level, the JULABO "D+S" Level Adapter is recommended for the external bath tank. The flow rate of the pressure pump (24a) will be then regulated by a built-in float device. The liquid level may be changed by a height adjustment on the "D+S" Level Adapter.

Order No. 8 970 410 "D+S" Level Adapter

When working at temperatures below 0 °C and using the "D+S" Level Adapter do not use oil as the bath liquid. Condensing air will result in the formation of ice and thus affects the function of the float.

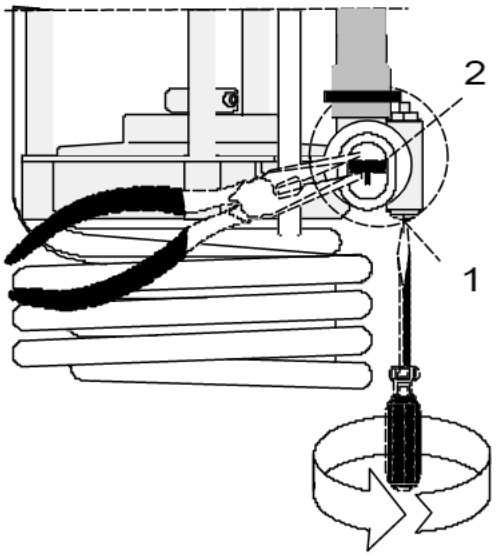


Fasten tubing to prevent slipping.

Note: If the liquid levels in the circulator bath and the external system are at different heights, overflowing must be prevented after the power has been turned off. Close off both connection tubings with standard pinchcocks or shut-off valves

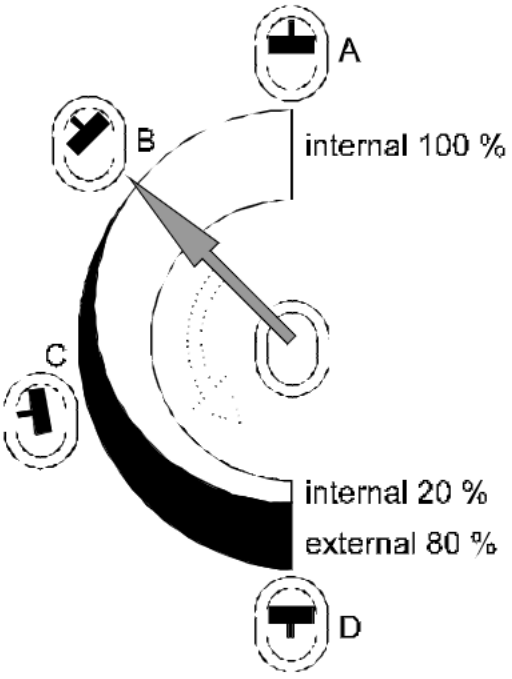
Order No.	Description
8 970 456	Shut-off valve (suitable up to +90 °C)
8 970 457	Shut-off valve (suitable up to +250 °C)

4.5. Adjusting the pump flow



The pump flow is pre-adjusted in the factory and can be modified to suit user requirements.

- Using a screwdriver turn the screw (1) anti-clockwise by 360 °.
- Using flat pliers turn the marking of the slide (2) to the desired position.
- Tighten the screw.



Examples:

Internal applications in the bath

A 100 % internal bath circulation (for large bath tanks)

B Reduced internal bath circulation (for smooth surface of bath liquid)

External/internal applications

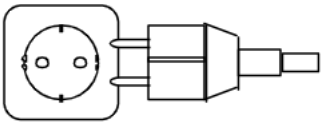
C 40 % external discharge, 60 % internal circulation (for large bath tanks)

D 80 % external discharge, 20 % internal circulation (for small bath tanks)

5. Operating procedures

5.1. Power connection

Connect the unit only to a grounded mains power socket!
We disclaim all liability for damage caused by incorrect line voltages!

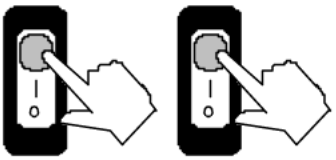


Check to make sure that the line voltage matches the supply voltage specified on the identification plate.

Deviations of ±10 % are permissible.

- Connect the circulator with mains power cable (16a) to the mains outlet (17).
- Connect the control cable (19) between the connectors ❄ (13a, 13b).
- Connect the refrigerated circulator with mains power cable (16b) to the mains socket.

5.2. Switching on / Start - Stop



Switching on:

Circulator and cooling machine may be turned on and off with separate mains switches. The integrated control light will illuminate to indicate that power has beeen applied.

The unit performs a self-test. All segments of the 4-digit MULTI-DISPLAY (LED) and all indicator lights will illuminate.



Then the software version (example: n 1.2) appears.
The display "**OFF**" or "**r OFF**" indicates the unit is ready to operate (standby mode).





The circulator enters the operating mode activated before switching the circulator off:
keypad control mode (manual operation) or
remote control mode (operation via personal computer).

Control of the cooling machine:

With the mains switch (1b) turned on, the circulator automatically switches the cooling machine off and on (not on F12).

It is switched off, if:

- the actual working temperature is increased by >30 °C (cooling is not required).
- the heater operates at full power (>800 W) for longer than 5 minutes.

It is switched on, if:

- cooling is necessary for maintaining the bath temperature. After switch-off, the cooling machine automatically switches on only after a delay of 5 minutes for protecting the cooling compressor.

On the refrigerated circulators with proportional cooling capacity control (models FP40, FP45, FP50) the cooling machines are equipped with a proportionally controlled valve. With this technique cooling occurs only to the extent required for maintaining the setpoint temperature.

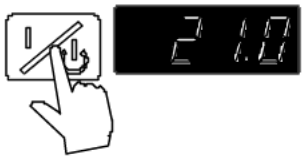


To save energy, turn off the cooling machine with the mains switch (1b) whenever cooling is not required.

Important:

At working temperatures above 150 °C, switch off or do not turn on the cooling machine since a proper function of the cooling compressor cannot be guaranteed.

Start:



- Press the start/stop key.
  - The MULTI-DISPLAY (LED) indicates the actual bath temperature. (example: 21.0 °C)
  - An illuminated indicator light in the "T1" or "T2" key indicates the activated working temperature.

Stop:

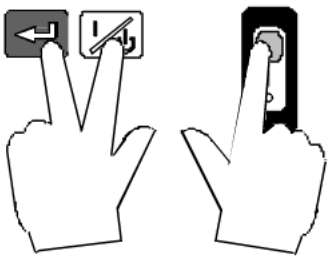


- Press the start/stop key.
  The MULTI-DISPLAY (LED) indicates the message "OFF".

The unit also enters the safe operating state "OFF" or "r OFF after a mains power interruptance. The temperature values entered via the keypad remain in memory. With the circulator in keypad control mode, press the start/stop key to restart operation .
With the circulator in remote control mode, the personal computer must first resend the parameters set via the interface before the circulator may be restarted.

NOTE:
The 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“ or „rOFF“, resp. on the MULTI-DISPLAY (LED). A complete shutdown of the main functional elements such as heater and circulation 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 circulator directly by pressing the mains power switch or using a timer.

Automatic / non-automatic start mode

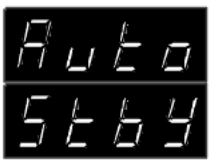


Activating/deactivating AUTOSTART

❶ Keep depressed enter and the start/stop key

❷ and turn on the circulator with the mains power switch.

For a short while the MULTI-DISPLAY indicates the effective start mode:

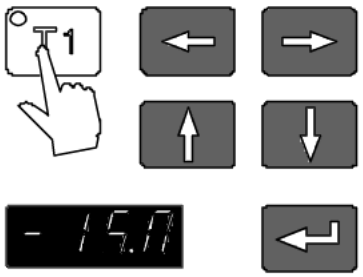


⇨ AUTOSTART on.

⇨ AUTOSTART off.

Warning:
For supervised or unsupervised operation with the AUTOSTART function, avoid any hazardous situation to persons or property.
The circulator does no longer conform to N.A.M.U.R. recommend-ations.
Take care you fully observe the safety and warning functions of the circulator.

5.3. Setting the temperatures



Setting the working temperature "T1":

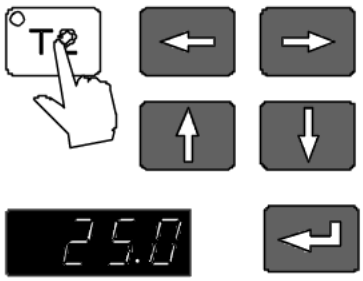
① Press the setpoint key T1.
The indicator light **blinks** and the value previously set appears on the MULTI-DISPLAY (LED).

② Use the cursor keys ← → to move left or right on the display until the numeral you wish to change is blinking.

③ Use the increase/decrease arrows ↑ ↓ to change the selected numeral (-, 0, 1, 2, 3, ... 9).

④ Press enter ↵ to store the selected value (example: -15.0 °C).

The working temperature is maintained constant after a short heat-up time (e. g. -15.0 °C).



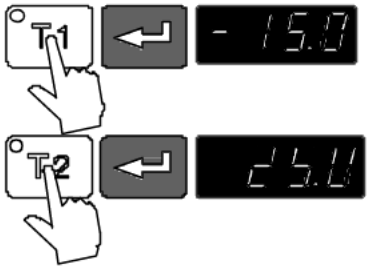
Setting the working temperature "T2":

① Press the setpoint key T2.

② Same procedure

③ as with "T1"

④ (example: 25.0 °C).

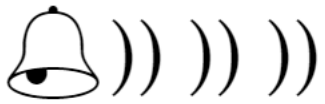


Selecting the working temperature:

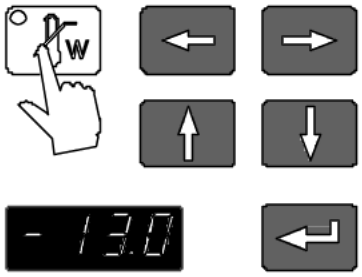
• Press the setpoint key T1 and then enter ↵.

• Press the setpoint key T2 and then enter ↵.

5.4. Warning functions



More protection for your samples in the bath!
An audible signal sounds in intervals when the actual temperature value exceeds one of the set limits (patented).



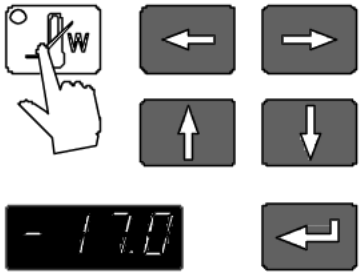
Setting the high temperature limit:

① Press the key .
The indicator light **blinks** and the value previously set appears on the MULTI-DISPLAY (LED).

② Use the cursor keys to move left or right on the MULTI-DISPLAY (LED) until the numeral you wish to change is blinking.

③ Use the edit keys to increase or decrease the numeral value (-, 0, 1, 2, 3, ... 9).

④ Press enter to store the value (example: -13.0 °C).



Setting the low temperature limit:

① Press the key .

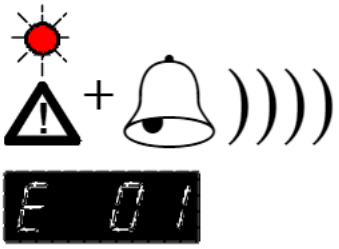
② Follow the instructions

③ for

④ (example: -17.0 °C).

☞	**Note:** The warning functions will only be triggered when the actual bath temperature, after start from the „OFF“ or „rOFF“ mode, lies within the set limits for 3 seconds.

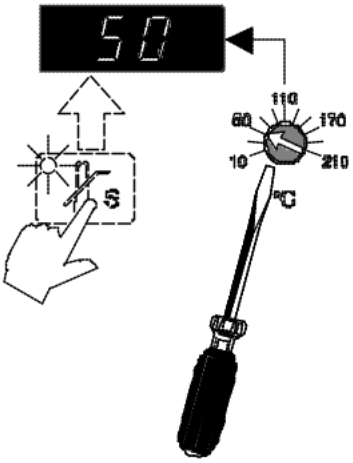
5.5. Safety installations (with shutdown function)



(excess temperature protection / low liquid level protection)

These safety installations are independent of the control circuit. When the temperature of the bath liquid has reached the safety temperature or the liquid level is insufficient, a complete shutdown of the heater and pump is effected.

The alarm is indicated by optical and audible signals (continuous tone) and on the MULTI-DISPLAY (LED) appears the error message "**E**rror **01**".



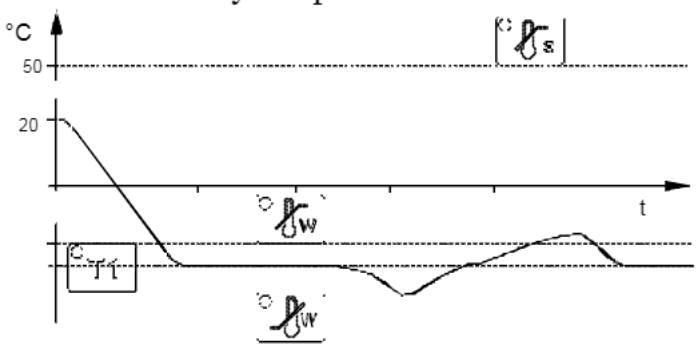
1. Excess temperature protection

- Press the key to indicate the safety temperature value on the MULTI-DISPLAY and using a screwdriver simultaneously turn the setting screw to the desired value (example: 50 °C).

Setting range: 20 °C to 210 °C
in 2 °C steps

Recommendation:
Set the safety temperature at 5 to 10 °C above the working temperature setpoint.

Example: Setting the warning functions and the safety temperature



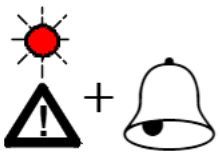
2. Low liquid level protection

- This device is triggered when the float reaches a fixed minimum liquid level.

The excess temperature protection should be set at least 20 °C below the fire point of the bath liquid used.

In the event of wrong setting there is a fire hazard!
We disclaim all liability for damage caused by wrong settings!

6. Troubleshooting guide / Error messages



Whenever the microprocessor electronics registers a failure, a complete shutdown of the heater and circulation pump (on the circulator) as well as of the cooling machine (not on F12) is performed. The alarm light "⚠" illuminates and a continuous signal tone sounds.



Cause	Remedy
• The circulator is operated without bath liquid, or the liquid level is insufficient.	• Replenish the bath tank with the bath liquid.
• Tube breakage has occured (insufficient filling level due to excessive bath liquid pumped out).	• Replace the tubing and replenish the bath tank with the bath liquid.
• The float is defect (e. g., because damaged in transit).	• Repair by authorized JULABO service personnel.
• The safety temperature value lies below the working temperature setpoint.	• Set the safety temperature to a higher value.
• A heat reaction or sudden temperature increase, e.g. caused by an exothermic chemical reaction or by the immersion of preheated samples.	• Set the safety temperature to a higher value.



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



• During the self-test after switching on, a short-circuit is registered between Pin 2 and Pin 4 of the control cable, or the control cable is interrupted during operation.

Reconnect the cable or eliminate the short-circuit.



• The wires of the working temperature sensor are interrupted or short-circuited.



• Defect of the working or safety temperature sensor.
The difference between the working temperature and safety sensors is above 25 °C.







} other errors



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 JULABO service station.



This message appears every 10 seconds as long as the compressor is not switched on although requested by the circulator.

Cooling compressor overload protection

The motor of the cooling compressor is equipped with an overload protector, which will be activated by excessive temperature in the capsule or by excessive current consumption. Poor air circulation (distance to walls, dirt accumulated on condenser) may cause the motor to be disconnected.
After a short cooling interval, the motor will be automatically reconnected and the message "E 21" no longer appears.



If the error message "**C**onfiguration **Err**or" appears, contact an authorized JULABO service station.

Disturbances that are not indicated.

Pump motor overload protection

• The pump motor is protected against overloading. After a short cooling interval, the motor will automatically start running.



Mains fuses

• The mains fuses on the rear of the unit may easily be exchanged as shown on the left.
Circulator: Fine fuse T 10.0 A, dia. 5 x 20 mm
Cooling machine: Fine fuse T 10.0 A, dia. 5 x 20 mm

Only use fine fuses with a nominal value as specified.

7. Safety recommendations

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



- Connect the unit only to a grounded mains power socket!
- Observe the flash point of the bath medium used.
  The excess temperature protection should be set at least 20 °C below the fire point.
- Pay attention to the thermal expansion of bath oil during heating to avoid overflowing of the liquid.
- Prevent water from penetrating into the hot bath oil.
- 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.
- Exercise caution when emptying hot bath liquids!
- Employ suitable connecting tubing.
- Make sure that the tubes are 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).
- Before cleaning the unit, disconnect the power plug from the mains socket.



Recommendation:
When you have finished the application, it is recommended to keep on circulating the liquid in the bath or the external system for some time. Simultaneously set the working temperature to +20 °C to allow the temperature in the system to decrease slowly.
Thus fractional over-heating of the bath liquid is prevented.

8. ATC - Absolute Temperature Calibration



Circulator (T_T)



Measuring point (T_M)

ATC serves to compensate a temperature difference that might occur between circulator and a defined measuring point in the bath tank because of physical properties.

The difference temperature is determined ($\Delta T = T_M - T_T$) and stored as correcting factor (example ΔT = 0.2 °C).







- Press the cursor key and enter **at the same time.**
- The MULTI-DISPLAY (LED) indicates "Atc0".
- With the edit keys select "Atc1" and then press enter.
- Using the cursor keys and the edit keys set the correcting factor (example 0.20 °C) and then press enter.
- Press and **at the same time**.



Measuring point (T_M)

The temperature on the measuring point decreases to a temperature of -15.0 °C and is indicated on the MULTI-DISPLAY (LED).

Note:

The correcting factor always affects the actual working temperature, even if this is set via the interface.

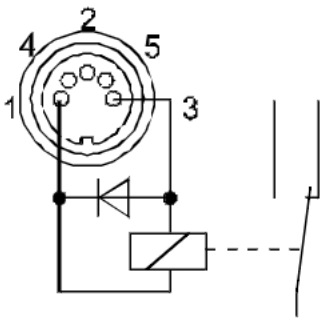
The ATC function stays activated until resetting to 00.00 °C.

Recommendation:

In case a calibrated temperature measuring instrument is used, the ATC function allows the circulator to be used as testing instrument according to DIN/ISO 9000.

9. Electrical connections





❄ - ALARM connector

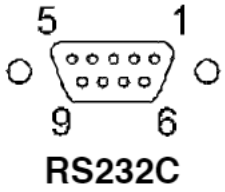
The "❄ - ALARM" connector may be used as output for alarm messages.

Circuit: Operation = relay powered
Alarm = relay not powered

Pin assignment:

Pin 1: +24 V (max. current 25 mA)
Pin 2: 0 V
Pin 3: Alarm relay
Pin 4: Reserved - do not use!
Pin 5: Cooling pulse

The control cable (19) connected to the connector (13a) of the cooling machine is a straight-through cable (Pin 1 maps to Pin 1, Pin 2 maps to Pin 2, etc.).



RS232C serial interface

This port can be used to connect a computer with an RS232C cable for remote control of the circulator.

Pin assignments:

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

Interface correspondence:

Circulator 9-pole		Computer 25-pole	Circulator 9-pole		Computer 9-pole
Pin 2 RxD	⇔	Pin 2 TxD	Pin 2 RxD	⇔	Pin 3 TxD
Pin 3 TxD	⇔	Pin 3 RxD	Pin 3 TxD	⇔	Pin 2 RxD
Pin 5 GND	⇔	Pin 7 GND	Pin 5 GND	⇔	Pin 5 GND
Pin 6 DTR	⇔	Pin 6 DSR			
Pin 7 RTS	⇔	Pin 5 CTS	Pin 7 RTS	⇔	Pin 8 CTS
Pin 8 CTS	⇔	Pin 4 RTS	Pin 8 CTS	⇔	Pin 7 RTS

Use shielded cables only.

10. Remote control

10.1. Setup for remote control



Interface parameters for the circulator are adjusted at configuration level.

Enter or exit the configuration level by pressing the left arrow and enter at the same time.



The menu item "Atc" appears on the MULTI-DISPLAY (LED). After pressing the cursor key, the second menu item "REMOTE" is indicated. The interface parameters cannot be adjusted unless the display reads "r 0".

Adjusting interface parameters:

Example: changing the baud rate.



① Using the arrow keys move the cursor to the desired menu. The actual parameter is displayed (example: "br 24" = 2400 bauds).



② With the up and down arrows change the number to the desired parameter (example: 4800 bauds). The changed numerals are blinking.



③ The new parameter is stored in memory by pressing enter.

Adjustable interface parameters



REMOTE
- 0 = keypad control mode
- 1 = remote control mode via RS232C



BAUDRATE
- 12 = 1200 bauds
- 24 = 2400 bauds
- 48 = 4800 bauds *
- 96 = 9600 bauds



PARITY
- 0 = no parity
- 1 = odd parity
- 2 = even parity *



HANDSHAKE
- 0 = Protocol Xon/Xoff (software handshake)
- 1 = Protokol RTS/CTS (hardware handshake) *

Data bits: 7; Stop bits: 1*

(* Factory setting)

Like all parameters which can be entered through the keypad, interface parameters are stored in memory even after the circulator is turned off.

10.2. Communication with a PC or a superordinated data system

Suitable terminal programs for communicating with a PC are:
- MS-Windows - TERMINAL.EXE (included with MS-Windows).
- MS-DOS - Procomm Plus, Datastrom Technologies.
- MS-DOS - Norton Utilities.



If the circulator is put into remote control mode via the configuration level, the display will read "r OFF" = REMOTE STOP.

The circulator is now operated via the computer.

In general, the computer (master) sends commands to the circulator (slave). The circulator sends data (including error messages) only when the computer asks for it.

A transfer sequence consists of:
- command
- space (⇔; Hex: 20)
- parameter (the character separating decimals in a group is the period)
- end of file (↲; Hex: 0D)

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 T1 to 55.5 °C:
  out_sp_00 ⇔ 55.5↲
- Command to ask for the working temperature T1:
  in_sp_00↲
- Response from the circulator:
  55.5↲

10.3. List of commands

Command	Parameter	Response of circulator
version	none	Number of software version (V X.xx)
status	none	Status message, error message (see below)
out_mode_01	0	Use working temperature "T1" *
out_mode_01	1	Use working temperature "T2" *
out_mode_05	0	Stop the circulator = r OFF
out_mode_05	1	Start the circulator
out_sp_00	xxx.x	Set working temperature "T1"
out_sp_01	xxx.x	Set working temperature "T2"
out_sp_02	xxx.x	Set high temperature warning limit
out_sp_03	xxx.x	Set low temperature warning limit
in_sp_00	none	Ask for working temperature "T1"
in_sp_01	none	Ask for working temperature "T2"
in_sp_02	none	Ask for high temperature warning limit
in_sp_03	none	Ask for low temperature warning limit
in_pv_00	none	Ask for actual bath temperature
in_pv_01	none	Ask for the heater wattage being used

10.4. Status messages

Message	Description
00 MANUAL STOP	Circulator in "OFF" state
01 MANUAL START	Circulator in keypad control mode
02 REMOTE STOP	Circulator in "r OFF" state
03 REMOTE START	Circulator in remote control mode

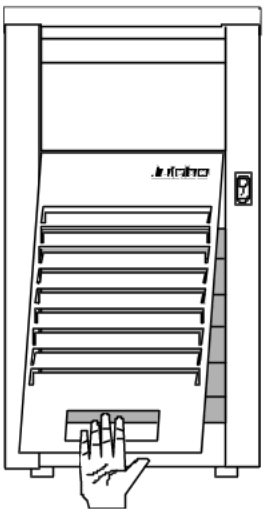
(* see "Note" on page 22).

10.5. Error messages

Message	Description
-01 TEMP / LEVEL ALARM	Safety temperature or low liquid level alarm
-02 REFRIGERATOR ALARM	Control cable disconnected
-03 EXCESS TEMPERATURE WARNING	High temperature warning "  "
-04 LOW TEMPERATURE WARNING	Low temperature warning "  "
-05 TEMPERATURE MEASUREMENT ALARM	Error in measuring system
-06 SENSOR DIFFERENCE ALARM	Sensor difference alarm. Working temperature and safety sensors report a temperature difference of more than 25 °C.
-07 I²C-BUS WRITE ERROR -07 I²C-BUS READ ERROR -07 I²C-BUS READ/WRITE ERROR	Internal error
-08 INVALID COMMAND	Invalid command
-10 VALUE TOO SMALL	Entered value too small
-11 VALUE TOO LARGE	Entered value too large
-12 WARNING : VALUE EXCEEDS TEMPERATURE LIMITS	Value lies outside the adjusted range for the high and low temperature warning limits. But value is stored.
-13 COMMAND NOT ALLOWED IN CURRENT OPERATING MODE	Invalid command in current operating mode

-21 WARNING: COMPRESSOR STAGE 1 DOES NOT WORK	Cooling compressor is switched off (overload protection see page 20)
-25 REFRIGERATOR ERROR	Short-circuit between pin 2 and pin 4 of the control cable!
-30 CONFIGURATION ERROR: CONFIRM BY PRESSING <ENTER> ON CIRCULATOR	Configuration error. Press enter on the circulator or contact technical service.

11. Maintaining the cooling performance



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.

12. Maintenance, Cleaning the unit

The circulator is designed for continuous operation under normal conditions. Periodic maintenance is not required.

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

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



Before cleaning the unit, disconnect the power plug from the mains socket!
Prevent humidity from entering into the circulator.

Repairs

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

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.

13. Technical specifications

		MV	MW
Temperature selection			digital
via keypad			indication on MULTI-DISPLAY (LED)
remote control via personal computer			indication on monitor
Temperature indication			MULTI-DISPLAY (LED)
Resolution	°C		0.1
ATC - Absolute Temp. Calibration	°C		±3
Temperature control			PID
Working temperature sensor			Pt 1000
Safety sensor			Pt 1000
Heater wattage	W		2000 (at 230 V)
	W		or 1000 (at 115 V)
Pressure pump:			
pressure, max. (at 0 l)	mbar	340	340
discharge, max. (at 0 mbar)	l/min	15	20
Suction pump:			
suction, max. (at 0 l)	mbar		220
discharge, max. (at 0 mbar)	l/min		14
Electrical connections:			
Alarm output			24-0 V DC / max. 25 mA
Computer interface			RS232C
Mains power connection ±10 %			230 V / 50 Hz
			or 115 V / 60 Hz
Total power consumption			
(at 230 V)	W	2100	2150
(at 115 V)	W	1100	1150

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

Technical changes without prior notification reserved.

		FP40	FP45
Working temperature range	°C	-40 ... 200	-45 ... 200
Temperature stability	°C	±0.01	
Cooling capacity	°C	+20 0 -20 -40	+20 0 -20 -40
(bath liquid: ethanol)	W	680 500 320 40	850 700 420 80
Refrigerant		R404a	
Ambient temperature	°C	5 ... 40	
Mains power connection ±10 %		230 V / 50 Hz	
Total power consumption	W	570	750

		FP(W)50
Working temperature range	°C	-50 ... 200
Temperature stability	°C	±0.01
Cooling capacity	°C	+20 0 -20 -40 -50
(bath liquid: ethanol)	W	900 800 500 160 50
Refrigerant		R404a
Ambient temperature	°C	5 ... 40
Mains power connection ±10 %		230 V / 50 Hz
Total power consumption	W	750

		FP40	FP45	FP(W)50
Bath opening	mm	230x140	230x260	180x120
Bath depth	mm	200	200	150
Filling volume	liters	6.5 ... 12	18 ... 26	5.5 ... 8
Overall dimensions	mm	370x460	380x580	420x490
(WxDxH)		x680	x680	x690
Weight	kg	42	49	54

		F25	F26
Working temperature range	°C	-28 ... 200	-28 ... 200
Temperature stability	°C	±0.01	
Cooling capacity	°C	+20 0 -20	+20 0 -20
(bath liquid: ethanol)	W	260 200 60	260 200 60
Refrigerant		R134a	
Ambient temperature	°C	5 ... 40	
Mains power connection ±10 %		230 V / 50 Hz or 115 V / 60 Hz	
Total power consumption	W	250	250

		F32	F33
Working temperature range	°C	-32 ... 200	-33 ... 200
Temperature stability	°C	±0.01	
Cooling capacity	°C	+20 0 -20 -30	+20 0 -20 -30
(bath liquid: ethanol)	W	380 340 150 50	500 320 120 20
Refrigerant		R134a	
Ambient temperature	°C	5 ... 40	
Mains power connection ±10 %		230 V / 50 Hz	230 V / 50 or 60 Hz
or		115 V / 60 Hz	115 V / 60 Hz
Total power consumption	W	420	400

		F34	F12
Working temperature range	°C	-34 ... 200	-20 ... 100
Temperature stability	°C	±0.01	±0.01
Cooling capacity	°C	+20 0 -20 -30	+20 0 -10
(bath liquid: ethanol)	W	450 320 140 30	150 100 60
Refrigerant		R134a	R134a
Ambient temperature	°C	5 ... 40	5 ... 40
Mains power connection ±10 %		230 V / 50 Hz or 115 V / 60 Hz	
Total power consumption	W	330	200

		F25	F26	F32
Bath opening	mm	120x140	120x140	180x120
Bath depth	mm	150	150	150
Filling volume	liters	3 ... 4.5	3 ... 4.5	5.5 ... 8
Overall dimensions (WxDxH)	mm	230x420 x600	420x420 x410	310x420 x630
Weight	kg	30	29	35

		F33	FP34	F12
Bath opening	mm	230x140	240x300	150x130
Bath depth	mm	200	150	150
Filling volume	liters	12 ... 16	14 .. 20	3 ... 4,5
Overall dimensions (WxDxH)	mm	360x460 x680	380x580 x610	200x360 x550
Weight	kg	38	45	23

Safety Installations (DIN 12876)	
Excess temperature protection	adjustable from 20 to 210 °C
Low liquid level protection	float switch
Safety class	III
Supplementary safety installations:	
High temperature warning functionoptical + audible (in intervals)	
Low temperature warning function	optical + audible (in intervals)
Supervision of the working sensor	plausibility control
Reciprocal sensor monitoring between working and safety sensors	difference >25 °C
Alarm indication	optical + audible

Standards:	
EMC regulations	EN 61326
Guideline for first voltage range	EN 61010-1, EN 61010-2-010
Pressure equipment directive	EN 378

14. EC Declaration of Conformity

CE

The following unit complies with the essential safety requirements outlined by the EC Directives concerning the guidelines for electromagnetic compatibility (89/336/EEC), low voltage regulations (73/23/EEC) and the pressure equipment directive (97/23/EEC).

Refrigerated Circulator:

Circulator: **MV, MW**

Refrigerated bath: **F12, F25, F26, F32, F33, F34**
FP40, FP45, FP50, FPW50

This unit is manufactured in compliance with the following guidelines

electrical equipment for control technology and laboratory application – EMC requirements outlined by
EN 61326

safety regulation for electrical devices for measuring, control and laboratory application specified by
EN 61010

refrigerated and heating circulators – safety and environmental – conscious requirements outlined by
EN 378

Julabo

Julabo Labortechnik GmbH
Eisenbahnstr. 45
D-77960 Seelbach / Germany



G. Juchheim, Managing Director

15. 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 no less than

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 or 10.000 working hours; which ever is achieved first.

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.

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