Operating Manual

ME

Beer Forcing Test
Refrigerated/Heating
Circulating Bath

F38-ME
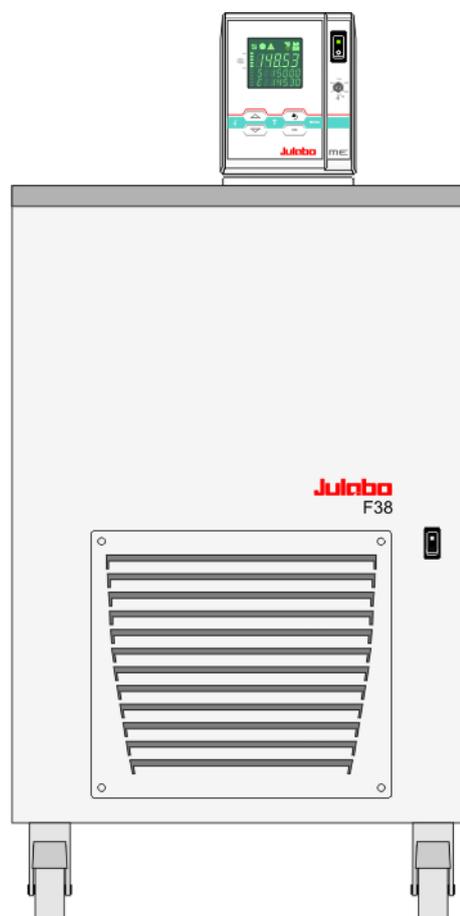
Julabo
THE TEMPERATURE CONTROL COMPANY

1.951.0541-V4   11/17

08.11.17

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 easy way to the Beer Forcing Test   page 39

Notice:
This abbreviated version does not release the user from the duty to instruct the operating personnel on the work with this unit and particularly to point out to possible dangers.

For the general use in the laboratory the refrigerated and heating circulator F38-ME offers a lot of setting possibilities, which are not necessary for doing a „Forcing Test".
In the chapter „The easy way to the Forcing Test" the advices for the necessary settings are summarised.

Advices which are particularly important for doing a forcing test, are marked with the symbol of a bottle (see left side).

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 circulator and accessories and inspect them for possible transport damage. Damage should be reported to the responsible carrier, railway, or postal authority, and a damage report should be requested. These instructions must be followed to the full extent for us to guarantee our full support of your claim for protection against loss from concealed damage. The form required for filing such a claim will be provided by the carrier

Printed in Germany   Changes without prior notification reserved

TABLE OF CONTENTS

Operating manual

1.   Intended use

JULABO circulators have been designed to control the temperature of specific fluids in a bath tank. The JULABO forcing test refrigerated/heating circulating bath in connection with a photometer determines the product life of beer without clouding.

⚠	JULABO circulators 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
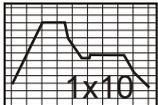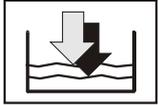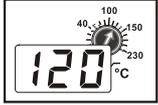
☑ The circulators are operated via the splash-proof keypad. The microprocessor technology allows different values to be set, stored, and displayed on the VFD COMFORT-DISPLAY. Three menu keys facilitate the adjustment of setpoints, warning and safety functions, and menu functions.

☑ Temperature- and time-dependent processes can be stored and executed using the integrated programmer.

☑ The adjustable PID cascade temperature control automatically adjusts the heat supply to the thermal requirements of the bath.

☑ Absolute Temperature Calibration (ATC3) provides high temperature stability at all points in the bath. With the 3-point calibration, an offset is adjusted at three temperatures to ensure an accurate temperature pattern at the selected spot in the bath over the entire temperature range.

☑ Electrical connections:
RS232 interface for modern process technology without an additional interface.
Connection for external Pt100 sensor for external temperature measurement and control.
Alarm output for external alarm message or control of JULABO refrigerating baths or solenoid valve (cooling water).

☑ The excess temperature protection according to IEC 61010-2-010 is a safety device independent from the control circuit. Its safety value can be displayed and adjusted on the VFD COMFORT-DISPLAY.

☑ The early warning system for low level signals that bath fluid needs to be refilled before the low level protection according to IEC 61010-2-010 triggers a safety shutdown of the main functional elements.

☑ Intelligent pump system: the pump capacity (electronically adjustable via the motor speed) can be adapted to different conditions for internal and external temperature-control applications.

2.   Operator responsibility – Safety recommendations

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 circulator may be operated only by persons who are absolutely familiar with these materials and the circulator. These persons must be fully aware of possible risks.

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

Contact	JULABO GmbH	Tel. +49 (0) 7823 / 51-0
	Gerhard-Juchheim-Strasse 1	Fax +49 (0) 7823 / 24 91
	77960 Seelbach / Germany	info.de@julabo.com
		www.julabo.com

Safety instructions for the operator:

➢ You have received a product designed for industrial use. Nevertheless, avoid strikes to the housing, vibrations, damage to the operating-element panel (keypad, display), and contamination.

➢ Make sure the product is checked for proper condition regularly (depending on the conditions of use). Regularly check (at least every 2 years) the proper condition of the mandatory, warning, prohibition and safety labels.

➢ Make sure that the mains power supply has low impedance to avoid any negative effects on instruments being operated on 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 affect other devices with components sensitive to magnetic fields (e.g., monitors). We recommend maintaining a minimum distance of 1 m.

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

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

➢ Do not store the unit in an aggressive atmosphere.

➢ Protect the unit from contamination.

➢ Do not expose the unit to sunlight.

Appropriate operation

Only qualified personnel is authorized to perform configuration, installation, maintenance and repairs of the circulator.
Routine operation can also be carried out by untrained personnel who should however be instructed by trained personnel.

Use:

The bath can be filled with flammable materials. Fire hazard!
There might be chemical dangers depending on the bath medium used.
Observe all warnings for the used materials (bath fluids) and the respective instructions (safety data sheets).
Insufficient ventilation may result in the formation of explosive mixtures. Only use the unit in well ventilated areas.

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

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		Warning label W00: Colors: yellow, black Danger area. Attention! Observe instructions. (operating manual, safety data sheet)
2 **or**		Mandatory label M018: Colors: blue, white Carefully read the user information prior to beginning operation. **Scope: EU**
2		Semi S1-0701 Table A1-2 #9 Carefully read the user information prior to beginning operation. **Scope: USA, NAFTA**

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

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

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

2.1.   Disposal

The circulator contains a back-up battery that supplies voltage to memory chips when the unit is switched off. Do not dispose of the battery with household waste!
Depending on battery regulations in your country, you might be obliged to give back used or defect batteries to gathering places.
The product may be used with oil as bath fluid. These oils fully or partially consist of mineral oil or synthetic oil. For disposal, observe the instructions in the safety data sheets.

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

	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!

2.2. 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

$C\epsilon$

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

Produkt / *Product*: Thermostat / *Circulator*

Typ / *Type*: MA, MB, ME

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 2004/108/EG; *EMC-Directive 2004/108/EC (bis zum / until 19. April 2016)*
EMV-Richtlinie 2014/30/EU; *EMC-Directive 2014/30/EU (vom / from 20. April 2016)*
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

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, 22.02.2016

M. Juchheim, Geschäftsführer / *Managing Director*

2016_007_MA-MB-ME-Thermostat_d_e.docx

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

C E

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

Produkt / *Product*: Kältegerät / *Refrigeration Unit*

Typ / *Type*: F38 **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, 05.10.2017

_____
M. Juchheim, Geschäftsführer / *Managing Director*

2017_015_F38-Kältegerät_d_e.docx
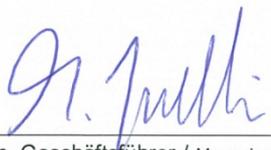
2.3.   Warranty conditions

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

<div align="center">

for a period of ONE YEAR.

</div>

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.

2.4.   Technical specifications

			F38-ME
Working temperature range		°C	-38 ... 80
Temperature stability		°C	±0,05
Temperature selection			digital
via keypad			VFD COMFORT-Display
remote control via personal computer			indication on monitor
Temperature indication			VFD COMFORT-Display
Resolution		°C	0.01
Absolute Temperature Calibration	INT/EXT	°C	±3 / ±9
Temperature control			PID3 cascade temperature control
Heater wattage (at 230 V)		kW	2,0
Cooling capacity		°C	+20 0 -20
Medium ethanol		kW	0.92 0.66 0.32
Refrigerant			R404A
Electronically adj. pump capacity	stages		1 ... 4
Flow rate	at 0 bar	l/min	11 ... 16
Max. pressure	at 0 liters	bar	0.23 ... 0.45
Electrical connections:			
External alarm output			24-0 Vdc / max. 25 mA
Computer interface			RS232
External temperature sensor			Pt100
Overall dimensions	(WxDxH)	cm	44x64x82
Bath opening	(WxL)	cm	35x41
Bath depth		cm	27
Filling volume	from ... to	liters	45
Weight		kg	80
Ambient temperature		°C	5 ... 40
Mains power connection		V/ Hz	230 / 50
Current draw	(at 230 V)	A	14
Current draw	GB, CH (at 230 V)	A	<9+5>
Mains power connection		V/ Hz	230 / 60
Current draw	(at 230 V)	A	14

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

Safety installations according to IEC 61010-2-010:

Excess temperature protection	adjustable from 0 °C ... 230 °C
Low liquid level protection	float switch
Classification according to DIN 12876-1	class III

Supplementary safety installations

Early warning system for low level	float switch
High temperature warning function	optical + audible (in intervals)
Low temperature warning function	optical + audible (in intervals)
Supervision of working sensor	plausibility control
Reciprocal sensor monitoring between working and safety sensors	difference >35 K
Alarm message	optical + audible (permanent)
Warning message	optical + audible (in intervals)

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.

Protection class according to IEC 60 529	IP21
The unit corresponds to Class I	
Overvoltage category	II
Pollution degree	2

Caution:
The unit is not for use in explosive environment

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.

Operating instructions

3.   Safety notes for the user

3.1.   Explanation of safety notes

⚠	In addition to the safety warnings listed, warnings are posted throughout the operating 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 for averting dangers.
⚠	**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.
|/ /|\	This icon is used in the operating instructions to indicate flashing values or parameters which have to be set or confirmed.

3.3. Safety recommendations

Follow the safety instructions to avoid personal injury and property damage. Also, the valid safety instructions for workplaces must be followed.

- Only connect the unit to a power socket with an 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 unit on an even surface on a base made of nonflammable 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.
- Adjust excess-temperature safety device below the flash point of the bath fluid.
- Observe the limited working temperature range when using plastic bath tanks.
- Never operate the unit without bath fluid in the bath.
- Pay attention to the thermal expansion of bath oil during heating to avoid overflowing of the fluid.
- Prevent water from entering the hot bath oil.
- Do not drain the bath fluid while it is hot!
  Check the temperature of the bath fluid prior to draining (e.g., by switching the unit on for a short moment).
- 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 units.
- 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 units 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.

Caution:

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

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

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

i.e.: **dangerous**

The user alone is responsible for the handling of these substances!
The following questions shall help to recognize possible dangers and to reduce the risks to a minimum.

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

Notice: Check the safety installations at least twice a year!

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

4. Operating controls and functional elements

4.1. Circulator
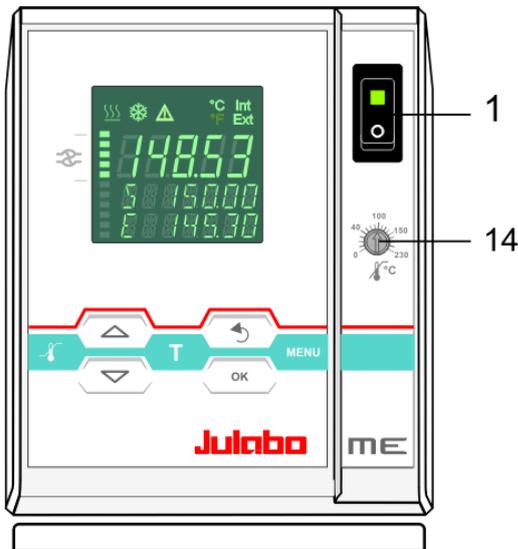
Front view   Rear view
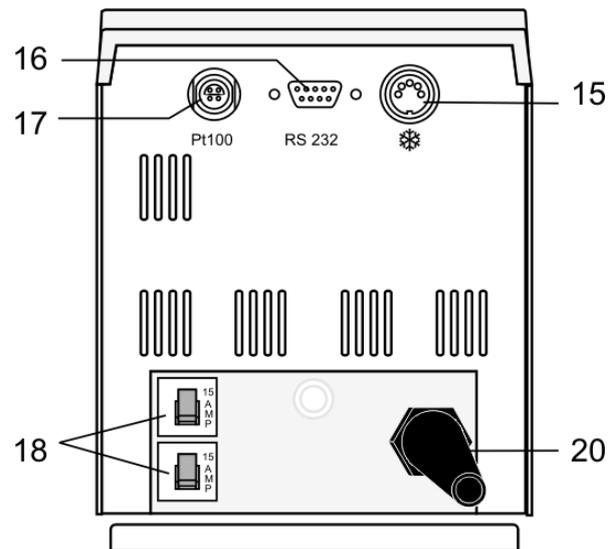
1		Mains power switch, illuminated

		Navigation keys
2	OK	1. Key: >OK< Start / Stop (pump / heater)
		2. >OK< in the menu Menu item / select submenu for setting
		Save set value
		Save selected parameter
		A beep signals the end of setting

	After the actions Start, Stop and change from VFD Display to standard display the key OK is locked for a short time. The above graph "front side" shows an example for standard display.

3		1. Key: >Return< Stop (pump / heater)
		2. >Return< in the menu one menu level down
		Correction function for parameters or values (prior to OK)
		immediately back to standard display

	OK ⏱ - ↺ ⏱ icon for „keep key pressed down".

4		1. Key: >Up / Down <temperature – increase/decrease setpoint
		Push key quickly for single steps,
		Keep key pressed for fast change.
		2. >Up/Down< in the menu selection of menu items / parameters

Menu keys

5		Key: start the menu > warning and safety values<
6	T	Key: start the menu >temperature setpoints<
7	MENU	Key: display of MENU structure

| 10		**VFD COMFORT-DISPLAY**
		Header: Control indicators see sections 11 and 12
		Line 1: Actual value internal or external
		The display is depending on the selected control mode in the menu > Control < (internal or external).
		Line 2: Working temp. setpoint, constantly S xxx.xx
		Line 3: Actual value (E = external or I = internal)
		Alternating with the display in line 1

11	〰 ❄ ⚠ R	Control indicators in the header:
		Heating / Cooling / Alarm / **R**emote control

12	°C Int °F Ext	Control indicators in the header:
		Temperature indication **Int**ernal or **Ext**ernal actual value
		Temperature indication in **°C** (**°F** not possible on this unit)

13		Display of set pump pressure stage
		Four stages, can be set via the key MENU , under >MENU - PUMP<.

14		Adjustable excess temperature protection according to IEC 61010-2-010

15	❄	Socket: control cable of JULABO refrigerated circulator
		or output for alarm messages

16	o RS232 o	Interface RS232: remote control via personal computer

17	Pt100	Socket for external measurement and control sensor
		or external setpoint programming

18		Mains circuit breakers (resettable) 15 A

20		Mains power cable with plug

4.2. Cooling Machine
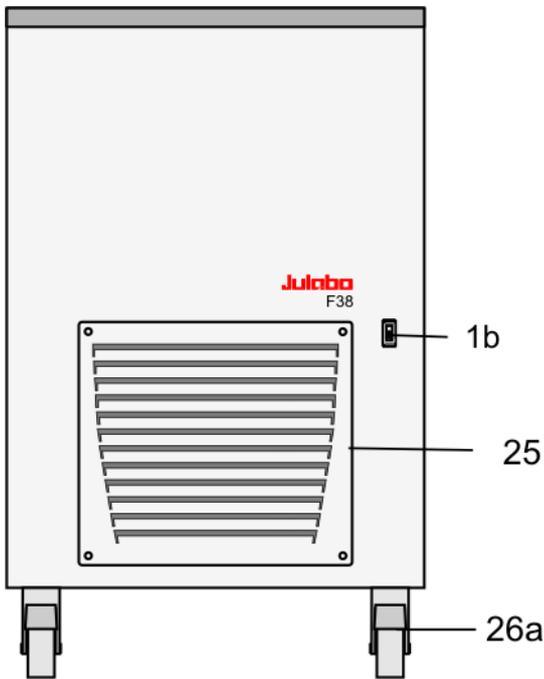
Front view   Rear view
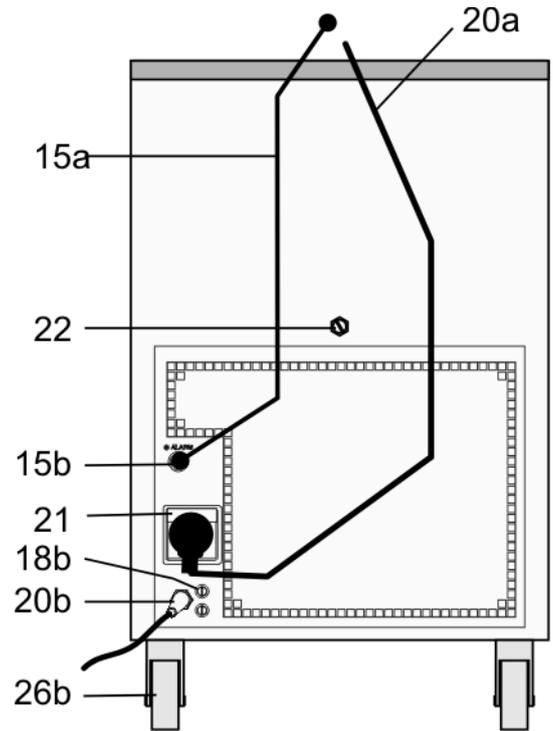
| 1b		Mains power switch, illuminated for cooling machine
15a 15b		Socket: control cable of JULABO refrigerated circulator
18b		Mains fuses for cooling machine, T10A, D5 x 20 mm
20a 20b		Mains power cable with plug for circulator Mains power cable with plug cooling machine
21		Built-in mains outlet for connection of circulator
22		Drain tap / Drain port
25		Venting grid, removable
26a 26b		Castor with brake (at the front) Castor without brake (at the back)
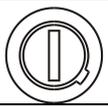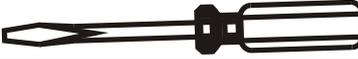
5.   Preparations

5.1.   Installation
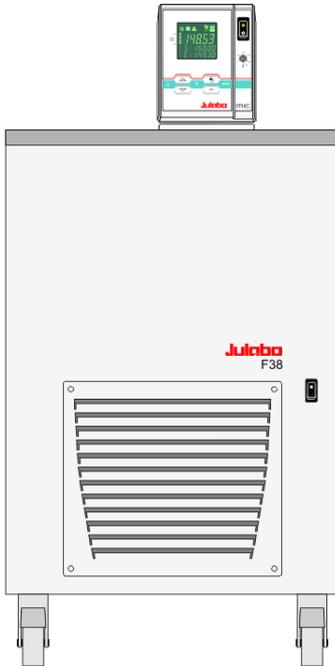
- Place the unit on an even surface on a pad made of **non-flammable** material.
  Using the castors move the unit to the intended location.

- The place of installation should be large enough and provide sufficient air ventilation to ensure the room does not warm up excessively because of the heat the instrument radiates to the environment. (Max. permissible ambient temperature: 40 °C).
  With regard to a disturbance in the cooling loop (leakage), the guideline EN 378 prescribes a certain room space to be available for each kg of refrigerant.
  The necessary amount of refrigerant is specified on the type plate
  > For 0.52 kg of refrigerant R404A, a room space of 1 m^3 is required.

- F38-ME: The circulator fitted with a stainless steel bridge is placed on on the back of the bath tank leaving the bath open on the front side.

- 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, <u>wait about one hour after setting it up.</u> This will allow any oil that has accumulated laterally during transport to flow back down thus ensuring maximum cooling performance of the compressor.

5.2. Bath fluids

⚠	**Caution:** Carefully read the safety data sheet of the bath fluid used, particularly with regard to the fire point! If a bath fluid with a fire point of ≤65 °C is used, only supervised operation is possible. **Water:** The quality of water depends on local conditions. • 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.

Recommended bath fluids:

Bath fluid	Temperature range
soft/decalcified water	5 °C to 80 °C
mixture water/glycol, mixture 1:1	-20°C to 50°C

JULABO bath fluids

JULABO Description		Thermal G	Thermal HY	Thermal H5
Order Number	10 liters	8 940 124	8 940 104	8 940 106
	5 liters	8 940 125	8 940 105	8 940 107
Temperature range	°C	-30 ... 80	-80 ... 55	-50 ...105
Flash point	°C	--	78	124
Fire point	°C	--	80	142
Color		light yellow	clear	clear

☞ See website for list of recommended bath fluids.

ATTENTION: The maximum permissible viscosity is 50 mm^2/s·

| ⚠	**Caution:** **Fire or other dangers when using bath fluids that are not recommended:** Use only nonacidic and noncorrosive bath fluids. JULABO assumes no liability for damage caused by the selection of an unsuitable bath liquid. Unsuitable bath fluids are fluids which, e.g., • are highly viscous (much higher than recommended at the respective working temperature) • have a low viscosity and have creep characteristics • have corrosive characteristics or • tend to crack. • **No liability for use of other bath fluids!**

5.3. Filling / draining

Notice:

- Pay attention to the thermal expansion of bath oil during heating to avoid overflowing of the liquid.
  Do not drain the bath fluid while it is hot!
  Check the temperature of the bath fluid prior to draining (by switching the unit on for a short moment, for example).

- Always turn off the unit and disconnect the mains cable from the power source before cleaning the unit, or before moving the unit.

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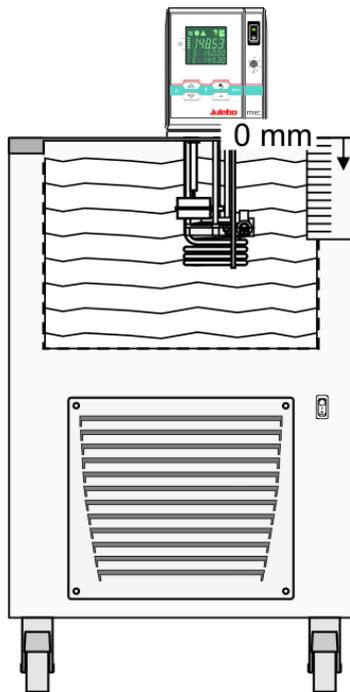
Filling

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

ⓘ By inserting the goods there is a displacement of the bath liquid. This should be considered when filling the bath tank.

Recommendation for the use as forcing test with 20 beer bottles:

Filling level below the tank rim:	46	63	80	97	[mm]
when using	5	10	15	20	bottles

Fill the bath tank according to the table (e.g. Thermal G).
Put the stainless steel insert cage with the beer bottles into the bath tank. Then the filling height should be approx. 25 mm below the bath rim.

Limit value:
Recommended filling level with water as bath fluid:
  max. 25 mm below the tank rim
  min. 70 mm below the tank rim (WARNING >CODE 40<)

ⓘ The circulator provides an early warning system for low level that may be triggered when changing samples in the bath.
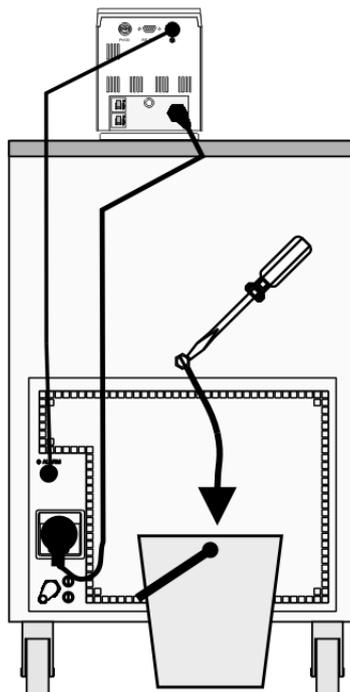
Draining

- Turn off the circulator and cooling machine.
- Unscrew the drain tap (22) and empty the unit completely.
- Tighten the drain tap.

6. Operating procedures

6.1. 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!

Check to make sure that the line voltage matches the supply voltage specified on the identification plate. Deviations of ±10 % are permissible.
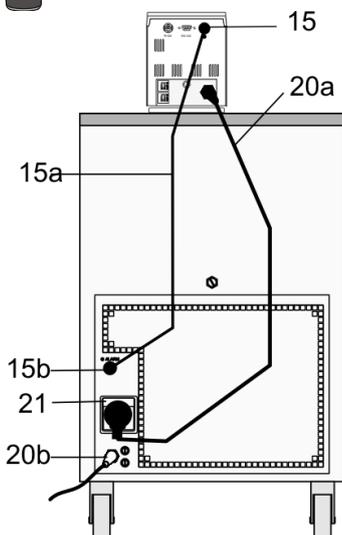
- Connect the circulator with mains power cable (20a) to the mains outlet (21).
- Connect the control cable (15a) between the connectors ❄ (15, 15b).
- Connect the refrigerated circulator with mains power cable (20b) to the mains socket.

6.2. Switching on / Start - Stop

6.2.1. Switching on the circulator
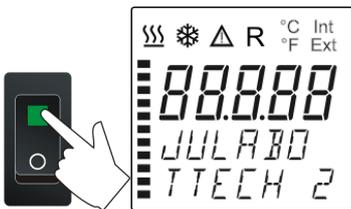
Switching on:
- Turn on the mains power switch (1).

ⓘ The unit performs a self-test.
Then the software version (example: V 1.xx) appears. The display „**OFF**" or „**R OFF**" indicates the unit is ready to operate.

ⓘ 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).

-OFF-
S 50.00
I 24.64

24.64
S 50.00
E------

Start:

- Press OK key.
  The actual bath temperature is displayed on the VFD COMFORT-DISPLAY. The circulating pump starts with a slight delay.

Stop:

- Press OK key.
  or
  Keep ↺ 🕐 key pressed.
  The VFD COMFORT-DISPLAY indicates the message "OFF".

6.2.2. Switching on the Cooling Machine

Switching on:

- Switch on the cooling machine using the switch (1b) .

❄

ⓘ Control of the cooling machine:

With the mains switch (1b) turned on, the circulator automatically switches the cooling machine off and on.

- 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.

7. [T] Setting of temperatures

7.1. Using the pre-settings in the [T] menu

Press the [T] key to call up the menu for temperature selection.

3 different working temperatures can be adjusted. Their values are freely selectable within the operating temperature range.

ⓘ The temperatures can be set in start or stop mode.

ⓘ Press ↺ key if a value is to be retained

Setting of working temperature in the [T] menu

1. Press the key [T]. The value flashes ⅍

Werkseinstellungen:
SETPNT 1   25 °C
SETPNT 2   37 °C
SETPNT 3   70 °C

2. Select SETPOINT 1 or 2 or 3 using the key ▼ or ▲ .

3. Confirm by pressing the OK key.

ⓘ The circulator uses the new working temperature value for temperature control.

Example: Adjustment/modification of the pre-setting of "SETPOINT 3"

1. Press the [T] key.

2. Select SETPOINT 3 by pressing the ▼ key.
    Example: SETPNT 3 / 70.00 °C

3. Keep the OK🕘 key pressed until the integer digits flash ⅍. (example: <70>)

4. Adjust value by pressing the ▼ key and the ▲ key to 85.00 °C and confirm by pressing the OK key.
    The decimal digits flash ⅍ and can be adjusted if desired.
    Confirm once more by pressing the OK key.
    Example on the left: SETPNT 3 / 85.00.

ⓘ If the active setpoint (SETPNT) is changed, the new value is immediately used for the control of the working temperature.
    The heater control indicator flashes.

ⓘ If the other two setpoints (not activated for control) are changed the [T] MENU has to be left by pressing the ↺ key after the decimal digits have been confirmed

☞ Notice: Refer to SETPOINT MAX / MIN in chapter
    9.8.   MENU LIMITS

7.2.   Direct setting of temperatures

24.64
S   25.00
E _ _ _ _ _ _

The circulator uses the setpoint of SETPNT 1 or 2 or 3 for temperature control

The indicated setpoint temperature can be changed directly any time.
Example: change 25.00 °C to 50.00 °C

24.69
SETPNT
1   25.00 ☀

1. By pressing the key ▲ the circulator switches to the active SETPOINT< example on the left: >SETPNT / 1   25.00°C<.
    The integer digits flash ☀ (example: <25>).

24.69
SETPNT
1   50.00

§§§

2. By pressing the keys ▼ and ▲ the value is changed to 50.00 °C and

    is confirmed by pressing the **OK** key.
    The decimal digits flash and can be adjusted if desired.
    Confirm once more by pressing the **OK** key.

24.89
S   50.00
E _ _ _ _ _ _

ⓘ The circulator uses the new working temperature value for temperature control.

ⓘ The temperatures can be set in start or stop mode.

8. 🌡 Safety installations, warning functions

☞ Check the safety installations at least twice a year! Refer to (page 16)

SECVAL
(Security Values)

➢ SAFETMP
➢ AL-TYPE
➢ OVERTMP
➢ SUBTEMP

Settings for the excess temperature protection > **SAFETMP**<
and for the warning functions for high > **OVERTMP**< and low >
SUBTEMP< temperature are made in a menu which is called up by
pressing the key 🌡.

Menu item > **AL-TYPE**< allows choosing between a warning and
an alarm cut-off for the menu items > **OVERTMP**< and > **SUBTEMP**<.

8.1. Excess temperature protection

⚠ **Warning:**
Adjust excess-temperature safety device below the flash point of the bath fluid.
In case of wrong setting there is a fire hazard!
We disclaim all liability for damage caused by wrong settings!

⚠ **Notice:**
On the forcing test avoid an alarm CODE 14.
The program is cancelled. On the restart the count of the cycles (CYCLE)
restarts from zero.
>**SAFETMP**< einstellen auf 70 °C
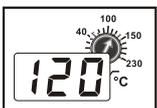
This excess temperature protection is independent of the control circuit.
When activated heater and circulating pump are completely shut down.
The alarm is indicated by optical and audible signals (continuous tone)
and the error message "ALARM-CODE **14**" appears on the VFD
COMFORT-DISPLAY together with the ticker:
> *EXCESS TEMPERATURE PROTECTOR ALARM-CHECK
ADJUSTMENT* <

Setting range: 20 °C ... 230 °C

ⓘ Rough setting can be effected by using the temperature scale.

Exact setting:

1. Press the key 🌡 to display menu >SAFETMP<.

2. Press the OK key and the set shutdown value is indicated.

3. Set the new shutdown value within 30 seconds using a screwdriver.
   The value is indicated on the VFD COMFORT-DISPLAY
   Example: SAFETMP / 100 °C

☞ Recommendation:
Set the excess temperature protection at 5 °C to 10 °C above the working
temperature setpoint.

8.1.1. Early warning system, low level protection
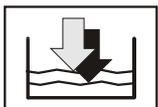
This low level protection is independent of the control circuit and is divided into two sections:

1. Switch in stage 1 recognizes a defined fluid level ☺.
   An audible warning sounds (interval tone) and together with the ticker: > *LOW LEVEL WARNING-FILL MEDIUM* < a message appears on the VFD COMFORT-DISPLAY:

   ```
   88.8.88
   WARNING
   CODE  40
   ```

   Refill the bath fluid!

2. Switch in stage 2 recognizes a low fluid level ☹.
   If stage 2 of the low level protection according to IEC 61010-2-010 is triggered, a complete, all-pole shutdown of heater and circulating pump is effected
   A continuous alarm sounds and together with the ticker: > *LOW LEVEL ALARM-FILL MEDIUM* < a message appears on the VFD COMFORT-DISPLAY:

   ```
   -OFF-
   ALARM
   CODE   1
   ```

   Turn off the unit with the mains switch, refill bath fluid and turn the unit on again!
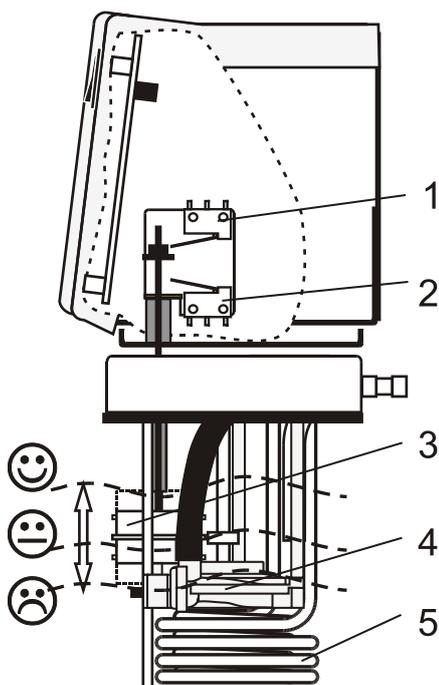
3. Float
4. Circulating pump
5. Heater

Notice:
On the forcing test avoid a low level alarm CODE 1.
The program is cancelled. On the restart the count of the cycles (CYCLE) restarts from zero.
Refill the bath liquid **in time**!

Warning:
When adding bath fluid, always us the type of fluid which is identical with the fluid in the bath.
Bath oils must not contain any water and should be pre-heated approximately to the current bath temperature! Explosion hazard at high temperatures!

8.2. Switch-over from warning to shutdown function

SECVAL
AL - TYPE

If a shutdown of functional elements (e.g. heater, circulating pump) is required when the limit values are exceeded or undercut the circulator can be changed over from warning function >WARNING< to shutdown function >ALARM<.

Factory setting:
>WARNING<

1. Press the key ⬡.

2. Select the menu >SECVAL -AL-TYPE< by pressing the ▼ key.

AL - TYPE
WARNING ⋇

3. Press the **OK** key and the set parameter will flash ⋇.
   (Example: WARNING)

AL - TYPE
ALARM

4. Change the parameter by pressing the ▼ key and confirm by pressing the **OK** key.
   or
   press the ↺ key if the parameter is to retained.

ⓘ Setting >**WARNING**<
A mere warning function with optical and audible warning signal (interval tone) A message appears on the VFD COMFORT-DISPLAY:

888.88
WARNING
CODE 03   or
OVERTMP

888.88
WARNING
CODE 04
SUBTEMP

• Setting >**ALARM**<
Temperature limit with shutdown of heater and circulating pump.
An audible alarm sounds (continuous tone) and a message appears on the VFD COMFORT-DISPLAY:

-OFF-
ALARM
CODE 03   or
OVERTMP

-OFF-
ALARM
CODE 04
SUBTEMP

8.3.   Over and Sub temperature warning function

Over temperature

OVERTMP
200.00

Sub temperature

SUBTEMP
-99.00

Recommendation:

Settings of the forcing test

OVERTEMP   65,0 °C

SUBTEMP   -5,0 °C

If the observance of a working temperature value >SETP< has to be supervised for a sensitive temperature application, then set over and sub temperature warning values. In the example below the SETPOINT 85 °C is surrounded by the values OVERTMP 87 °C and SUBTEMP 83 °C. The electronics immediately register if the actual temperature breaches one of the set limit values. The resulting reaction is defined in a further menu item. (See chapter 8.2.   )
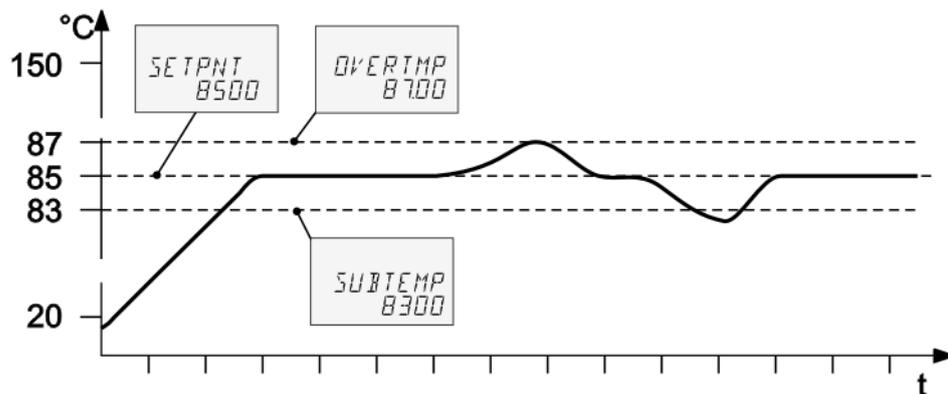
C

1. Press the key 🌡 .

2. By pressing the ▼ or ▲ key select the menu >OVERTMP< or >SUBTEMP<.

3. Press the OK key. The integer digits flash

4. Change the values to 87. °C and/or 83. °C by pressing the ▼ and ▲ key and confirm with the OK key.
   The decimal digits flash and can be adjusted if desired.
   Confirm once more by pressing the OK key.
   See above examples.

ⓘ The warning functions are only activated if the actual bath temperature remains within the set limit values for 3 seconds after switch-on.

☞   **Recommendation:**

Set the over temperature warning value >OVERTMP< 5 °C to 10 °C above the working temperature setpoint.

Set the sub temperature warning value >SUBTMP< 5 °C to 10 °C below the working temperature setpoint.

9. MENU Menu functions

MENU ↓

Menu level 1

MENU
P-START OK →
▲ ▼
	Start program
	    Mode Forcing test
	    Mode Standard
		Page 32

MENU
PROGRAM
	Administration and creation of programs
	    Mode Forcing test
	    Mode Standard
		Page 35

MENU PUMP	Electronically adjustable pump capacity	Page 38

MENU
CONFIG
	Configuration of the unit
	    REMOTE – on / off (remote control via RS232)
	    AUTOST – AUTOSTART on / off
	    OFF-MODE – pump on / off
	    TIME / DATE – setting time and date
	    RESET – factory settings
		Page 44

MENU
CONTROL
	Control characteristics and parameters
	C-TYPE – Internal or external control
	
	    DYNAMICS - internal
	    Control parameter - XP-, TN-, TV- INTERNAL
	
	    Control parameter - XP-, TN-, TV- XPU-, EXTERNAL
		Page 47

MENU SERIAL	Adjustable interface parameters BAUD RATE, PARITY, HANDSHAKE	Page 51

MENU
ATC
	ATC - Absolute Temperature Calibration,
	    Sensor calibration INTERNAL SENSOR,
	    Sensor calibration EXTERNAL SENSOR
	    3-point calibration
		Page 52

MENU
LIMITS
	Limitations of temperature and capacity
	    SETPOINT MAX / MIN - Maximum and minimum setpoint
	    HEAT MAX – Set maximum heating
	    COOLING MAX – Set maximum cooling
	    INTERN MAX / MIN – Limitation of the temperature range
	    BAND HIGH / LOW – Band limit
		Page 58

1. Open the menu by pressing the MENU key.

2. Use the ▼ ▲ keys to scroll in menu level 1.

3. Press the OK key to change to menu level 2.

    Press the ↺ key if settings are to be retained.

9.1. MENU PROGRAM – START

9.1.1. START Mode Forcing test

This menu will start a previously set program.

ⓘ Requirements:
1. Create a program. (refer to chapter >MENU PROGRAM<)
2. Return to the Start-MENU and confirm the desired setting of each MENU item with the key OK

Start-Menu

ⓘ Press the ↩ key if a parameter is to be retained.
Correction function for parameters or values (prior to OK)

> RUNS < Number of repetitions of the warm/cool phase 1 ... 10

> GO <   Start the forcing test (NOW)

MENU ↓

Menu level 1

MENU
P-START

OK ↓

Level 2	Parameter level	
P-START *RUNS* OK → ▼ ▲	*RUNS* 1	• Set number of runs with ▲ ▼ and OK example: 1 run
P-START *GO* OK →	*GO* *NOW*	• Confirm >NOW< with the OK key and the program will start immediately

9.1.2. START Mode Standard

This menu will start a previously set program.

ⓘ Requirements:
3. Create a program. (refer to next chapter)
4. Return to the Start-MENU and confirm the desired setting of each MENU item with the key OK
5. Set a start time (>TIME< >DATE< >YEAR<) if the program is to be started by the internal timer.

Start-Menu

> STEP<   Program start at section 1 … 10

> RUNS <   Number of repetitions 1 ... 99

> END<   Status at end of program (STDBY/SETPNT)
           Standby or last setpoint

> GO <   Time of start (NOW/TIMER)

Menu level 1

MENU
P-START

OK ↓

Level 2	Parameter level	ⓘ Press the ↺ key if a parameter is to be retained. Correction function for parameters or values (prior to OK)
P-START STEP ▼ ▲ OK →	*STEP 1* ☼	• Set program step with ▲ ▼ and OK example: STEP 1
P-START RUNS OK → ▼ ▲	*RUNS 1* ☼	• Set number of runs with ▲ ▼ and OK example: 1 run
P-START END OK → ▼ ▲	*END STDBY* ☼ or *END SETPNT*	• Set desired parameters with ▲ ▼ and OK . ⓘ (STDBY / SETPNT) Parameter **ST**an**DBY:** the circulator switches to –OFF-. Parameter **SETP**oi**NT:** the circulator constantly keeps the temperature at the value of the last step.
P-START GO OK → ↙ *GO TIMER* OK ↓	*GO NOW* ☼ or ▼ *GO TIMER*	• Confirm >NOW< with the OK key and the program will start immediately ⓘ **or** start at the set time under parameter (TIMER). Set time in the example below: 09. August 2009, 11:15 hrs ⓘ set the time for the start of the program in the submenu >TIMER<.
<u>Submenu TIMER</u>	Parameter level	
TIMER TIME OK → ▼ ▲	*TIME 11.15* ☼	>TIME< hours/minutes (hh:mm), set both values one after the other and confirm • hours flash, set by pressing ▲ ▼ + OK minutes flash, set by pressing ▲ ▼ + OK
TIMER DATE OK → ▼ ▲	*DATE 09.08* ☼	>DATE< day/months (TT/MM), set both values one after the other and confirm. • day flashes, set by pressing ▲ ▼ + OK month flashes, set by pressing ▲ ▼ + OK
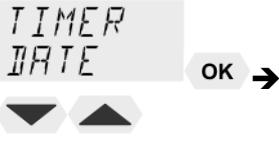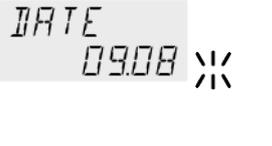
TIMER YEAR OK →	YEAR 2009 ⋈	>YEAR< year • Set the year with ▲ ▼ and OK.
TIMER START OK →	START OK ⋈ OK	ⓘ The program starts at the set time.
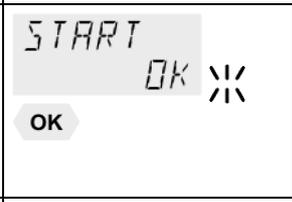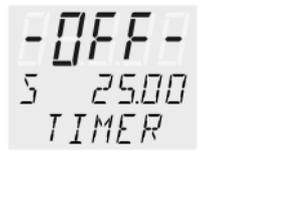
-OFF- S 25.00 TIMER	ⓘ **Display of time until start:** In line 3 the notice >TIMER< and the set values for „TIME" and „DATE/YEAR" are alternately indicated ⓘ Check the correct setting of the internal real time clock if required (see MENU CONFIG)

The started program

After the start the program will indicate the currently calculated setpoint in line 2

S XX.XX. The value increases within the time period >TSLICE< until the target temperature >SETPNT< of the section is reached.
If the time period in a section is set to „0", the next section will not begin until the target temperature has been reached.
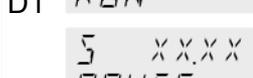
Use the edit keys ▲ ▼ to scroll to line 3. The display changes approximately every 4 seconds between the current section (STEP XX) and the

A   remaining time of the section
B   remaining time of the program
C   current bath temperature
     I xxx.xx - internal actual value or
     E xxx.xx – external actual value
D   RUN – the program has started or
     PAUSE – the progress of the program has been interrupted by pressing the ↻ key. While the time is stopped the temperature will constantly remain at the last calculated setpoint
     Continue with the ↻ key.

Termination / Interruption of a program

ⓘ The program can be terminated any time by pressing the key ↻🕐.

ⓘ In case of power failure the program is interrupted.
The circulator switches to –OFF- .

ⓘ If the AUTOSTART-function is activated the programmer starts again at the point in time approx. 5 minutes prior to the interruption. However, an uncontrolled change of the bath temperature has occurred.

9.2.   MENU PROGRAM – creation, administration

☞ *PROGRAM*
    MODE   Program Mode
Set this menu item first!

In the >MENU PROGRAM< you can choose between the „Standard Program"
and the „Forcing Test-Program".

This setting determines which submenu items are available in >PROGRAM
EDIT< and >PROGRAM DELETE<.

MENU ↓

Menu level 1 ▼ ▲ *MENU* *PROGRAM* **OK** ↓		
	ⓘ Press ↻ key, if a parameter is to be retained. Correction function for parameters or values (prior to OK)	
Level 2	Level 3	
PROGRAM *EDIT* ▼ ▲		
PROGRAM *DELETE* ▼ ▲		
PROGRAM *MODE* **OK** →	*MODE* *STANDRD* ⌇ ▼ ▲ *MODE* *FORCIER*	• Set program mode with ▲ ▼ and **OK** FORCING-Test Program page 35 STANDARD-Program page 37

9.2.1.   FORCING-Test Program

>EDIT< PROGRAM – creation, administration
> W-TEMP<   Temperature of the warm phase
            Adjustable from –40 °C up to +80 °C
>W-TIME <   Duration of the warm phase
            Adjustable max. 999 h 59 minutes
> C-TEMP<   Temperature of the cool phase
            Adjustable from –40 °C up to +80 °C
>C-TIME <   Duration of the cool phase
            Adjustable max. 999 h 59 minutes

> DELETE<   without function when forcing test program is set

>MODE< Program Mode

| Menu level 1 ▼ ▲ *MENU PROGRAM* **OK** ↓		ⓘ Press ↺ key, if a parameter is to be retained. Correction function for parameters or values (prior to OK)
Level 2	Level 3	Parameter level
PROGRAM EDIT **OK** ➔ ▼	*EDIT W-TEMP* **OK** ➔ ▼ ▲	*SETPNT 60.00* ☀ Set temperature setpoint of the warm phase (°C). • Integer digits flash, set by pressing ▲ ▼ + **OK** • Decimal digits flash, set by pressing ▲ ▼ + **OK**
	EDIT W-TIME **OK** ➔ ▼ ▲	*TSLICE 24.00* ☀ (time slice) Set duration of the warm phase (h.Min) • Set duration by pressing ▲ ▼ and **OK**
	EDIT C-TEMP **OK** ➔ ▼ ▲	*SETPNT 0.00* ☀ Set temperature setpoint of the cool phase (°C). • Integer digits flash, set by pressing ▲ ▼ + **OK** • Decimal digits flash, set by pressing ▲ ▼ + **OK**
	EDIT C-TIME **OK** ➔ ▼ ▲	*TSLICE 24.00* ☀ (time slice) Set duration of the cool phase (h.Min) • Set duration by pressing ▲ ▼ and **OK**
▲ *PROGRAM DELETE* **OK** ➔ ▼ ▲	*DELETE STEP __*	ⓘ **Delete program** without function when forcing test program is set
PROGRAM MODE **OK** ➔	*MODE FORCIER* ☀ ↺	

36

9.2.2. STANDARD Program

Menu level 1

```
MENU
PROGRAM
```

1 program

10 sections

The integrated programmer permits fast and easy programming of setpoint temperature sequences. This temperature sequence is called program. A program is composed of individual sections (STEP). The sections are defined by duration (TSLICE) and target temperature. The target temperature is the setpoint (SETPNT), which is achieved at the end of a section. The programmer calculates the temperature ramp from the difference in time and temperature.

STEP	(Nr.)	1	2	4	6	8
SETPNT	(°C)	100	180	180	75	75
TIME	(hh.mm)	00:20	00.10	00:20	00:50	00:20
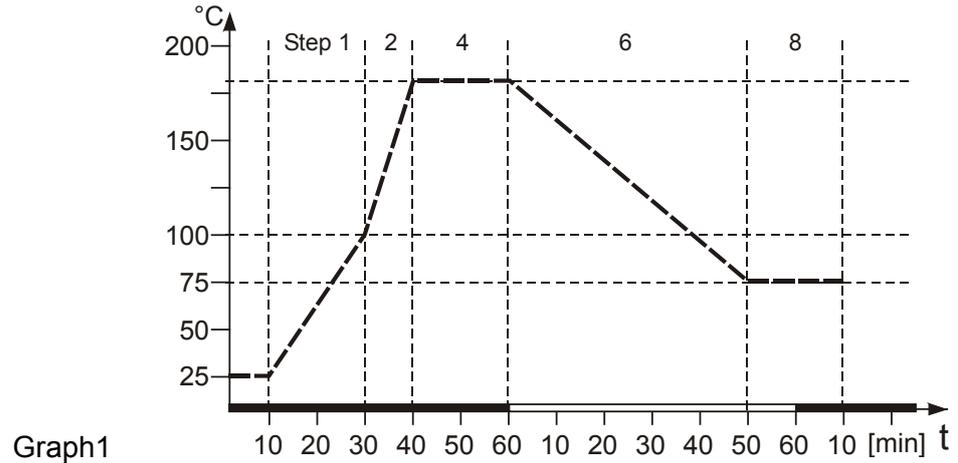
Graph1

ⓘ Sections without set value and time are skipped. They can be defined retroactively and the integrated into the program.

Menu level 1		
▼ ▲ *MENU* *PROGRAM* **OK** ↓	>EDIT<	Create, administer program
	> STEP<	Program step (1 ... 10)
	>SETPNT <	Temperature setpoint of step ...
	>TSLICE<	Duration of step ...
	> DELETE<	delete program step (01 … 10, ALL)

ⓘ Press ↻ key, if a parameter is to be retained.
Correction function for parameters or values (prior to OK)

Level 2	Level 3	Parameter level

PROGRAM
 EDIT **OK** →
 ▼
	EDIT
	 STEP **OK** →
	
	 EDIT 01
	 STEP ←
	 ▼ ▲
		STEP
		     1 ☼ (STEP 1 … 10)
		 • Set program step with
		    ▲ ▼ and **OK**
		 ← (Example: EDIT STEP 01)
		 ⓘ For STEP 01 the values for SETPOINT 01 and TSLICE 01 are set one after the other
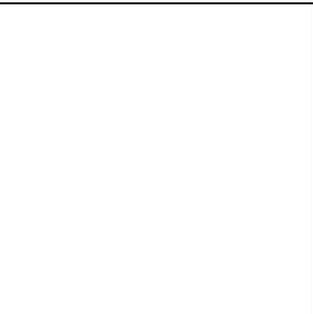
	EDIT 01
	 SETPNT **OK** →
	 ▼ ▲
		SETPNT
		    100.00 ☼ (values within working temp. range)
		 • Integer digits flash, set by pressing
		    ▲ ▼ + **OK**
		 • Decimal digits flash, set by pressing
		    ▲ ▼ + **OK**
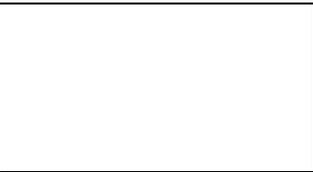
	EDIT 01 *TSLICE* **OK** → (time slice)	*TSLICE* *00.10* ☼ • Set duration by pressing ▲ ▼ and **OK**
▲ *PROGRAM* *DELETE* **OK** →	*DELETE* *STEP --* ☼	ⓘ **Delete program** Program steps can be deleted individually or entirely. (STEP 01, 02,… 10, ALL). • Set parameters by pressing ▲ ▼ and **OK**
PROGRAM *MODE* **OK** →	*MODE* *STANDRD* ☼ ↻	
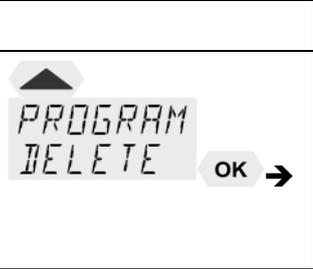
9.2.3.   The easy way to the forcing test

Notice:
On the forcing test avoid low level alarm CODE 1.
The program is cancelled. On a restart the count of the cycles (CYCLE) restarts from zero.
Refill the bath liquid in time!

1. **Installation**   see page 20.

2. **Power connection**   see picture „Rear view" page 23

3. **Filling / Bath fluid**
   Filling: see page 22

4. **Insert the the product**
   Put the stainless steel insert cage with beer bottles into the bath tank and refill the fluid. Maximum filling height approx. 25 mm under the bath edge.

5. **Put on the bath cover**
   In order to reduce the loss of fluid due to evaporation of water, in case of long-term operation.

   ⓘ   The circulator ME is provided with an early-warning system for low level, which activates at a filling height of 65-70 mm below the bath edge. For measuring cycles, which last for several days the liquid level should be peered once a day, in order to not to endanger the course of the forcing test.

6. **Switching on:**
   Circulator and cooling machine may be turned on and off with separate mains switches (1a, 1b).

7. **Safety installations, warning functions**
   Set the following value in the MENU

   Excess temperature protection see page 28
   Set >**SAFETMP**< to 70 °C

   Over and Sub temperature warning functions see page 30

   Set >**OVERTMP**< to 65 °C
   Set >**SUBTMP**< to -5 °C

8. **Setting the test temperature**
   Select e.g. **SETPNT 1** in the MENU   and set 20 °C.
   see page 25

MENU

MENU
PROGRAM OK →

9. Set MENU Program to >Mode Forcier<
See page 35

PROGRAM
MODE → *MODE*
FORCIER ※ OK

---

10. **Start the forcing test**

MODE
FORCIER

As factory-setting the „Forcing test 60 °C" is stored			
Measuring cycle:RUNS		1 flow	(48 h)
Warm phase	W-TEMP	60 °C	
Duration	W-TIME	24 h	
Cool phase	C-TEMP	0 °C	
Duration	C-TIME	24 h	
Setting of other values see page 35 „ FORCING-Test Program "			

Start-Menu

MENU ↓

Menu level 1

MENU
P-START

OK ↓

ⓘ Press the ↺ key if a parameter is to be retained.
Correction function for parameters or values (prior to OK)

> RUNS < Number of repetitions of the warm/cool phase 1 ... 10

> GO <   Start the forcing test (NOW)

Level 2	Parameter level	Level 2
P-START *RUNS* OK → ▼ ▲	*RUNS* *1* ※	*P-START* *RUNS* OK → ▼ ▲
P-START *GO* OK →	*GO* *NOW* ※	*P-START* *GO* OK →

---

11. **Program sequence**
A program sequence is described from page 41 on.

Program sequence:

Example forcing test 60 °C

As factory-setting the „Forcing Test 60 °C" is stored

Measuring cycle:	RUNS	1 repetition
Warm phase	W-TEMP	60 °C
Duration	W-TIME	24 h
Cool phase	C-TEMP	0 °C
Duration	C-TIME	24 h

In the course of the program the VFD-DISPLAY shows messages concerning the process of the forcing test in line 2 and 3.

In line 3 two messages are shown alternately.
Message 1 always indicates the program status (phase of the forcing test), message 2 indicates the status >RUN< (Test runs).

Message 2 can be changed by the editing keys ▲ ▼ .The remaining time of a phase or >E ------< can still be chosen.
(Message >E ------<, temperature value of the external temperature sensor is not important for the forcing test.)

Action diagram:

1. EBC measuring start value at 20 °C   2. EBC measuring after CYCLE 1
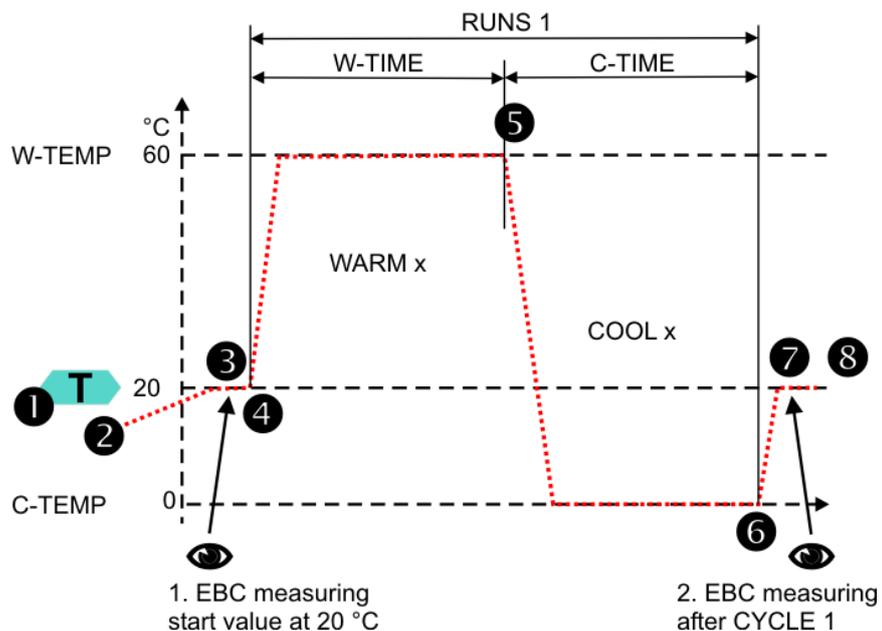
1.   ❶ Set measuring temperature :
     Select in the MENU 〈 T 〉 e.g. SETPNT 1 and set 20 °C.
     (see page 25)

P-START
GO

GO
        NOW ⋇ OK

2.   Start forcing test (see page 32)

`S  20.00`
`STARTUP`
 	
`S   20.00`
`RUN`
	Beginning of the STARTUP-phase
	First the circulators tempers to the measuring temperature.
	Line 2: S 20.00 (SETPNT 1) is shown (Example: 20.0 °C)
	Line 3: Message 1 >STARTUP<, Message 2 >RUN<
	or ▲ ▼ >00h00.00<.
	(The time of the start phase is not defined).

`S  20.00`
`STARTUP`
 	
`S   20.00`
`MEASURE`
	3. The measuring temperature is reached. Measuring window +/-0.2 °C.
	
	Line 3: Message 1 >STARTUP<, Message 2 >MEASURE<
	Additionally the signal tone sounds, which asks for the first measuring
	👁 in order to enter the start value.

`S  60.00`
`WARM  1`
 	
`S   60.00`
`RUN`
 	
`S   60.00`
`23h2804`
	4. Der Thermostat heizt. Die Zeit, >W-TIME< wird auf Null gezählt.
	Press the key OK . Beginning of the warm phase.
	Line 2: S 60.00 (W-TEMP) is shown (Example: 60 °C)
	Line 3: Message 1 >WARM 1<, Message 2 >RUN<
	or ▲ ▼ >23h58.23<.
	The circulator is heating. The time >W-TIME< is counted to zero

`S   0.00`
`COOL  1`
 	
`S    0.00`
`RUN`
 	
`S    0.00`
`21h1806`
	5. The time >W-TIME< is over. Direct beginning of the cool phase
	Line 2: S 0.00 (C-TEMP) is shown (Example: 0.0 °C)
	Line 3: Message 1 >COOL 1<, Message 2 >RUN<
	or ▲ ▼ >21h18.06<.
	The circulator is cooling. The time, >C-TIME< is counted to zero.

`S  20.00`
`WARMUP`
 	
`S   20.00`
`RUN`
	6. The time >C-TIME< is over.
	Direct beginning of the WARMUP-phase
	Line 2: S 20.00 (SETPNT 1) is shown (Example: 20.0 °C)
	Line 3: Message 1 >WARMUP <, Message 2 >RUN<
	or ▲ ▼ >00h00.00<.
	(Time of the WARMUP -Phase is not defined.)

`S  20.00`
`CYCLE  1`
 	
`S   20.00`
`MEASURE`
	7. The measuring temperature is reached.
	Line 3: Message 1 >CYCLE 1<, Message 2 >MEASURE<
	Additionally a signal tone sounds, which asks for measuring 👁
	ⓘ The number of repetitions (RUNS) form **one** measuring cycle
	(CYCLE). In the example the number of >RUNS< has been set to
	>1<,due to which already after a warm- cool phase >CYCLE 1< is
	reached and the demand for measuring is effected.

`S  60.00`
`WARM  2`
 	
`S   0.00`
`COOL  2`
 	
`S  20.00`
`CYCLE  2`
	8. In order start the second measuring cycle for the example, the key
	OK has to be pressed.
	The program skips to position 4. Direct beginning of the warm phase.
	
	ⓘ With each cycle warm phase and cool phase are counted up.

9.3.   MENU PUMP – Setting of pump pressure

MENU
PUMP

PUMP
LEVEL 2

Factory setting:
stage 2

PUMP
LEVEL 1

The capacity of the circulating pump is set by adjusting the motor speed

Settings: stage / LEVEL 1 ... 4

Display: with illuminated indicator

Flow rate: 11 ... 16 l/m
Pump pressure: 0,22 ... 0,45 bar

1. Press the MENU key.

2. Select the menu >PUMP< pressing the ▼ key and confirm by
    pressing the OK key
    The set parameter flashes (example: >LEVEL 2<)

3. Change the parameter by pressing ▼ and confirm by pressing the
    OK key.
    or
    Press the ↺ key if the parameter is to be retained.
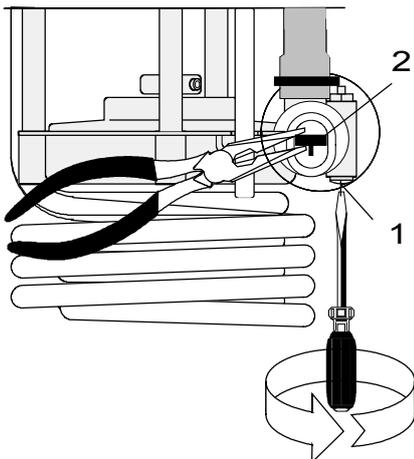
The pump flow is pre-adjusted in the factory and can be modified to
suit user requirements.

- 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.
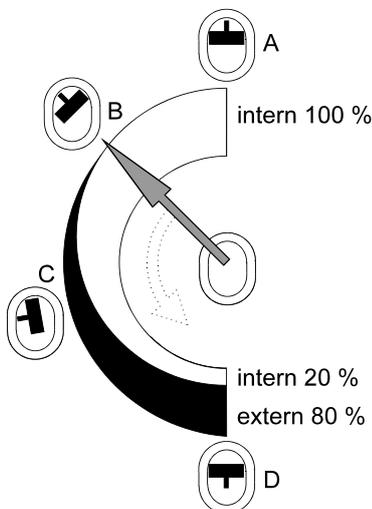
Examples:

Internal applications in the bath

A   100 % internal bath circulation
     (for large bath tanks)
B   Reduced internal bath circulation
     (for smooth surface of bath fluid)

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)

intern 100 %
intern 20 %
extern 80 %

9.4. MENU CONFIG – Configuration of unit

Menu level 1 ▼ ▲ MENU CONFIG OK ↓		ⓘ A RESET can be effected only in the >OFF< mode. -OFF- RESET Switch off circulator by pressing the OK key and call up the menu CONFIGURATION.
Level 2	Parameter level	ⓘ Press the key ↻ if a parameter is to be retained. Correction function for parameters and values (prior to OK).
CONFIG REMOTE OK → ▼ ▲	REMOTE OFF ☀ or REMOTE ON	• Switch on and off remote control by pressing ▲ ▼ and OK ⓘ Control display in the topline ℝ for Remote ⓘ For remote control refer to 65 ⓘ ○ ▭ ○ Connect RS232 with PC.
CONFIG AUTOST OK → ▼ ▲	AUTOST OFF ☀ or AUTOST ON ⚠	• Switch on and off autostart by pressing ▲ ▼ and OK AUTOSTART on = on AUTOSTART off = off See WARNING page 45
CONFIG OFFMODE OK → ▼ ▲	OFFMODE PMP ON ☀ or OFFMODE PMP OFF	• Switch on and off OFFMODE by pressing ▲ ▼ and OK PUMP ON continuous operation of circulating pump PUMP OFF circulating pump is linked to Start/Stop
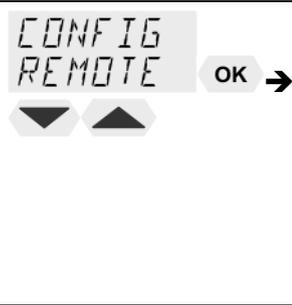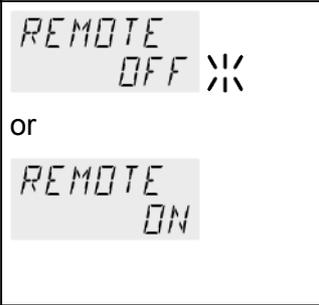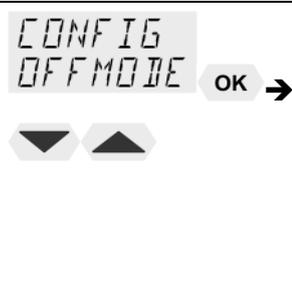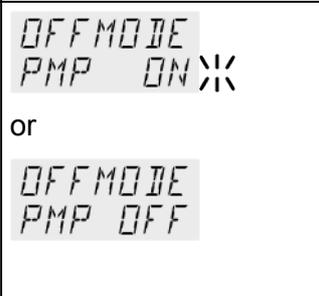
	Level 3	Parameter level
CONFIG TIME/DT OK → ▼ ▲	TIME/DT TIME OK →	TIME 11.15 ☀ • Hours flash, set by pressing ▲ ▼ + OK • Minutes flash, set by pressing ▲ ▼ + OK
	TIME/DT DATE OK →	DATE 08.09 ☀ • Day flashes, set by pressing ▲ ▼ + OK • Month flashes, set by pressing ▲ ▼ + OK

	Level 3	Parameter level
	TIME/DT *YEAR* **OK** →	*YEAR* *09* ☼ • Year flashes, set by pressing ▲ ▼ + **OK**

CONFIG
RESET **OK** →
	-OFF-
	RESET
	  OK ☼
	
	-OFF-
	RESET
	  -RUN-
		• Return to factory settings by pressing **OK**
		
		RESET returns all set values to the factory setting except for date and time.
		
		ⓘ A RESET can be effected only in the –OFF- mode.
		
		ⓘ During the message –RUN- all parameters are reset to factory settings.

9.4.1. REMOTE

Factory setting: OFF

The control electronics offer two ways of adjusting a setpoint.

1. Adjustment of setpoint using the keypad or the integrated programmer.
2. Adjustment of setpoint via the serial interface RS232 using a PC or a superordinated process control system.

ⓘ The topline of the VFD-DISPLAY shows a bright „**R**"FOR remote control; - remote control discontinued.
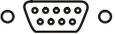
○ ⬚ ○
RS232

IMPORTANT: additional measures for remote control

ⓘ Connect the circulator to the PC using an interface cable.

ⓘ Check the interface parameters of both interfaces (circulator and PC) and make sure they match.
(refer to 12.1. Setup for remote control page 65)

9.4.2. AUTOSTART

⚠️ **Warning**
For supervised or unsupervised operation with the "AUTOSTART" function avoid any hazardous situation to persons or property

Take care to fully observe the safety and warning functions of the circulator.

Factory settings: OFF

Notice:
The circulator has been configured and delivered by JULABO in accordance with the NAMUR recommendations. This means for the start mode that the unit must enter a safe operating status after a power failure. This safe operating status is indicated by the message „**OFF**" or „**R OFF**" on the VFD COMFORT-DISPLAY.
A complete, all-pole shutdown of the main functional elements such as heater and pump motor is effected.
The values set on the circulator remain saved and the unit is restarted by pressing the start/stop key in manual control.
In remote control mode the values need to be resent by the PC via the

interface.
If such a safety standard is not required, the NAMUR recommendations can be bypassed with the AUTOSTART function thus allowing a direct start of the circulator by pressing the mains switch or using a timer.

9.4.3. OFF-MODE

Factory setting:
   PMP OFF

Usually the circulating pump is controlled with the key OK or the start/stop command. If the circulating pump is to work in the –OFF-mode, the adjustment can be set in a sub-menu.

ⓘ The pump motor will be shutdown in case of alarm anyhow.

9.4.4. Setting of clock and date

The internal real time clock allows starting a program any time. The clock is set to the local mean time (MEZ) at the factory.

ⓘ If the unit is operated in a different time zone, the clock can be adjusted in this menu.

TIME
   11.15

ⓘ Change summer/winter time in this menu

9.4.5. RESET – Factory settings

A Reset will return all values to factory setting except for date and time.

ⓘ A RESET can be effected in the >OFF< mode only.

-OFF-
RESET
   OK

Switch off the circulator by pressing the key OK and call up the menu CONFIGURATION.

9.5.   MENU CONTROL – Control characteristics and parameters

Menu level 1	The circulator is qualified for internal and external temperature control

Menu level 1

▼ ▲

MENU
CONTROL

OK ↓

The circulator is qualified for internal and external temperature control
The switchover is carried out in the menu >C-TYPE< .(INT or EXT).

ⓘ For external temperature control and measurement connect a Pt100 external sensor to the socket at the rear of the circulator.

ⓘ Press the ↺ key if a parameter is to be retained. Correction function for parameters or values (prior to OK)
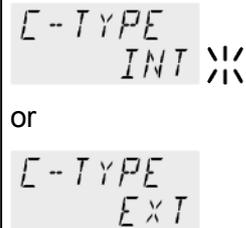
Level 2	Parameter level	
CONTROL *C-TYPE* OK → ▼ ▲	*C-TYPE* *INT* ☼ or *C-TYPE* *EXT*	• Switchover of control type by pressing ▲ ▼ and OK ⓘ The control type can be adjusted in the **-OFF-** mode only. ⓘ Depending on the adjustment only the active parameters are displayed.
C-TYPE INTERNAL		
CONTROL *DYNAMIC* OK → ▼ ▲	*DYNAMIC* *APER* ☼ or *DYNAMIC* *NORM*	• The parameter flashes, switch by pressing ▲ ▼ and OK ⓘ This parameter affects the temperature sequence in case of internal control.
CONTROL *xP INT* OK → ▼ ▲	*xP INT* *1.6* ☼ 0.1 … 99.9	• The parameter flashes, set by pressing ▲ ▼ + OK
CONTROL *TN INT* OK → ▼ ▲	*TN INT* *100* ☼ 3 … 9999	• The parameter flashes, set by pressing ▲ ▼ + OK
CONTROL *TV INT* OK →	*TV INT* *5* ☼ 0 … 999	• The parameter flashes, set by pressing ▲ ▼ + OK
C-TYPE EXTERNAL		
CONTROL *xP EXT* OK → ▼ ▲	*xP EXT* *0.7* ☼ 0.1 … 99.9	• The parameter flashes, set by pressing ▲ ▼ + OK
CONTROL *TN EXT* OK → ▼ ▲	*TN EXT* *720* ☼ 3 … 9999	• The parameter flashes, set by pressing ▲ ▼ + OK

Level 2	Parameter level	
CONTROL TV EXT OK → ▼ ▲	TV EXT 55 ☼ 0 … 999	• The parameter flashes, set by pressing ▲ ▼ + OK
CONTROL XPU OK →	XPU 30 ☼ 0.1 … 99.9	• The parameter flashes, set by pressing ▲ ▼ + OK

9.5.1. CONTROL – Control INTERNAL / EXTERNAL
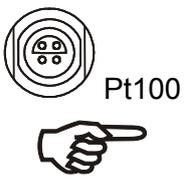
Pt100 ☞	ⓘ Switchover can only be effected if a Pt100 external sensor is connected. Factory setting: INT **IMPORTANT:** Additional measures for external temperature control ⓘ Suggested settings for external temperature control: BAND HIGH / LOW and INTERN MAX / MIN see chapter >LIMITS< page 58. ⓘ Sensor calibration of the Pt100 external sensor is carried out in the menu >ADJUST<, submenu >ATC SENOR - EXT<; set ATC STATUS< to >OFF< (See page 52).

⚠️ **Attention:**
Place the external sensor into the temperature-controlled medium and securely fix the sensor.
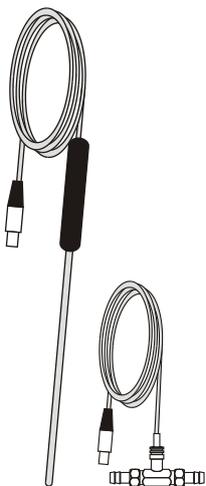
Accessory: Pt100 external sensor

Order No.	Description	Material	Cable
8981003	200x6 mm Ø,	stainless steel	1.5 m
8981005	200x6 mm Ø,	glass	1.5 m
8981006	20x2 mm Ø,	stainless steel	1.5 m
8981010	300x6 mm Ø,	stainless steel	1.5 m
8981015	300x6 mm Ø,	stainless steel / PTFE coated	3 m
8981013	600x6 mm Ø,	stainless steel / PTFE coated	3 m
8981016	900x6 mm Ø,	stainless steel / PTFE coated	3 m
8981014	1200x6 mm Ø,	stainless steel / PTFE coated	3 m
8981103	Extension cable for Pt100 sensor		3.5 m
8981020	M+R in-line Pt100 sensor		

Pt100   M+R

The M+R in-line Pt100 sensor is a flow sensor and can be installed loop circuit

9.5.2. Dynamic internal

```
CONTROL
DYNAMIC
```
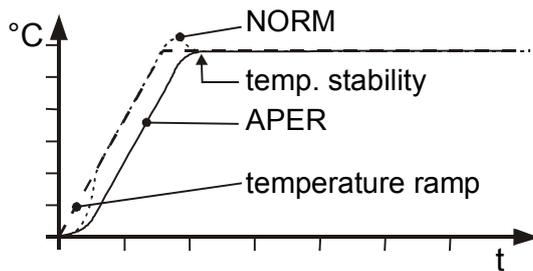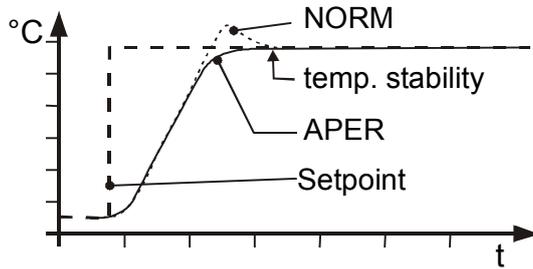
This parameter affects the temperature sequence only in case of internal control.

Factory setting: APER (aperiodic)

Possible parameters:

NORM   Allows for reaching the setpoint faster – with setpoint change or ramp function – but overshooting of up to 5 % is possible.

APER   Ramp function: the increase of temperature occurs temporally offset and achieves the target temperature without overshooting. Setpoint change: The temperature increases at the same rate, the target temperature is achieved without overshooting.

ⓘ With both settings constant temperature is achieved after approximately the same time.

9.5.3. Control parameters – XPU-, XP-, TN-, TV- EXTERNAL

```
XP EXT
      0.7
```
Setting range: 0.1 ...99.9

```
TN EXT
      720
```
Setting range: 3 ...9999

```
TV EXT
      55
```
Setting range: 0 ... 999

```
XPU
      30
```
Setting range: 0.1 ... 99.9

In most cases the control parameters preset in the factors are adequate for achieving an optimum temperature sequence.
The control parameters allow adjustment to special control processes.

Proportional range >Xpu<

The proportional range Xpu of the cascaded controller is only needed for external control.

49

9.5.4.   Control parameters– XP-, TN-, TV- INTERNAL

In most cases the control parameters preset in the factory are adequate for achieving an optimum temperature sequence.
The control parameters allow adjustment to special control processes..

```
XP INT
      1.6
```
Setting range: 0.1 ... 99.9

Proportional range >Xp<

The proportional range is the range below the setpoint in which the control circuit reduces the heating capacity from 100% to 0 %

```
TN INT
     100
```
Setting range: 3 ...9999

Reset time >Tn< (Integral component)

Compensation of the remaining control deviation due to proportional regulation. An insufficient reset time may cause instabilities. Excessive reset times will result in unnecessary prolongation of compensation of the control difference.

```
TV INT
       5
```
Setting range: 0 ... 999

Lead time >Tv< (Differential component)

The differential component reduces the transient time. An insufficient lead time will prolong the time required for compensation of disturbance effects and cause high overshooting during run-up. An excessive lead time could cause instabilities (oscillations)

Optimization instructions for the PID control parameters

Optimum setting

Control parameters XP-, TN-, TV- INTERNAL as well as -EXTERNAL
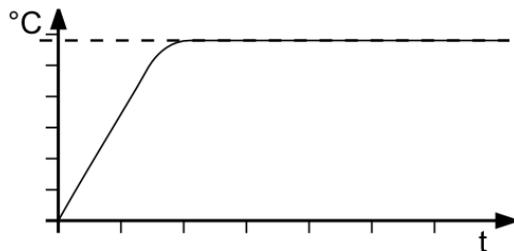
The heat-up curve reveals possible faulty settings of the control parameter.

Inappropriate settings may produce the following heat-up curves:

Xp too low
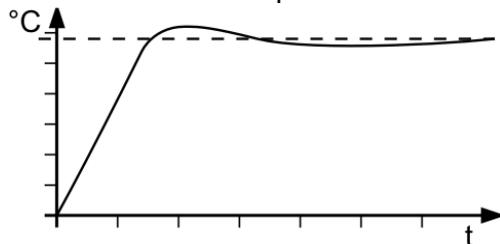
Tv/Tn too low
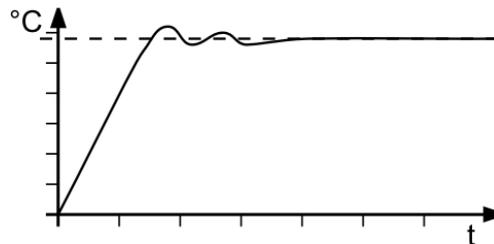
Xp too high or Tv too high
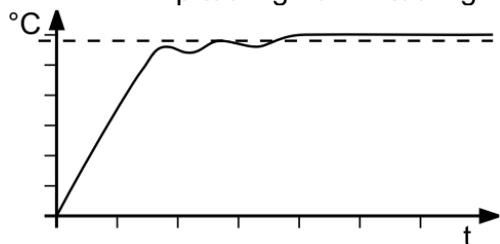
Tv/Tn too high or Xp too high
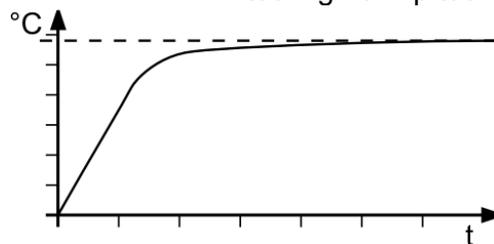
9.6. MENU SERIAL - BAUDRATE, HANDSHAKE, PARITY

Menu level 1	For communication between circulator and a PC or a superordinated process control system the interface parameters of both units must be identical.

▼ ▲
 MENU
 SERIAL
 OK ↓
	ⓘ For remote control refer to page 65
	
	 Factory settings:
	    4800 Baud
	    even
	    hardware handshake

Level 2	Parameter level	ⓘ Press the ↻ key if a parameter is to be retained.

SERIAL
 BAUDRAT OK →
 ▼ ▲
	BAUDRAT
	    4800 ✳
	 BAUDRAT
	    9600
	 BAUDRAT
	    19200
	 BAUDRAT
	    38400
		• The parameter flashes, switch by pressing ▲ ▼ and OK

SERIAL
 PARITY OK →
 ▼ ▲
	PARITY
	    EVEN ✳
	 PARITY
	    ODD
	 PARITY
	    NO
		• The parameter flashes, switch by pressing ▲ ▼ and OK
		
		 even: Data bits = 7; Stop bits = 1
		 odd: Data bits = 7; Stop bits = 1
		 no: Data bits = 8; Stop bits = 1

SERIAL
 HSHAKE OK →
	HSHAKE
	    HARD ✳
	 HSHAKE
	    SOFT
		• The parameter flashes, switch by pressing ▲ ▼ and OK
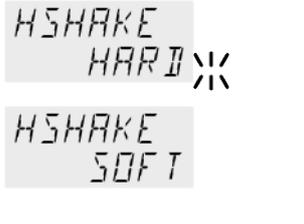		
		 Xon/Xoff-protocol (Software handshake)
		 Protocol RTS/CTS (Hardware handshake)

51

9.7. MENU ATC - Absolut Temperature Calibration

MENU
ATC

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.

Example:
1-point calibration
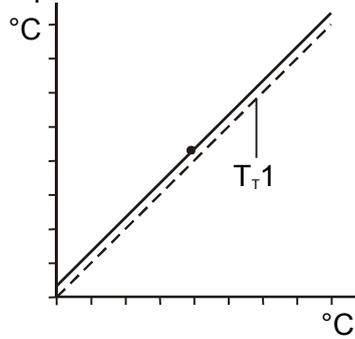
3-point calibration
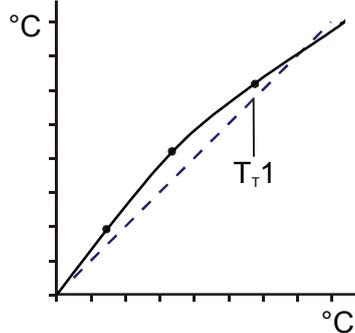
T_T 1 = Original curve

Principle:
For ATC calibration, in steady state the bath temperature at the location of the temperature sensor (CT) is determined at the respective adjusted working temperature. This value is then set on the circulator in the menu >ATCalibration< under menu item > CTEMP X <.
This can be a 1-point, 2-point or 3-point calibration.
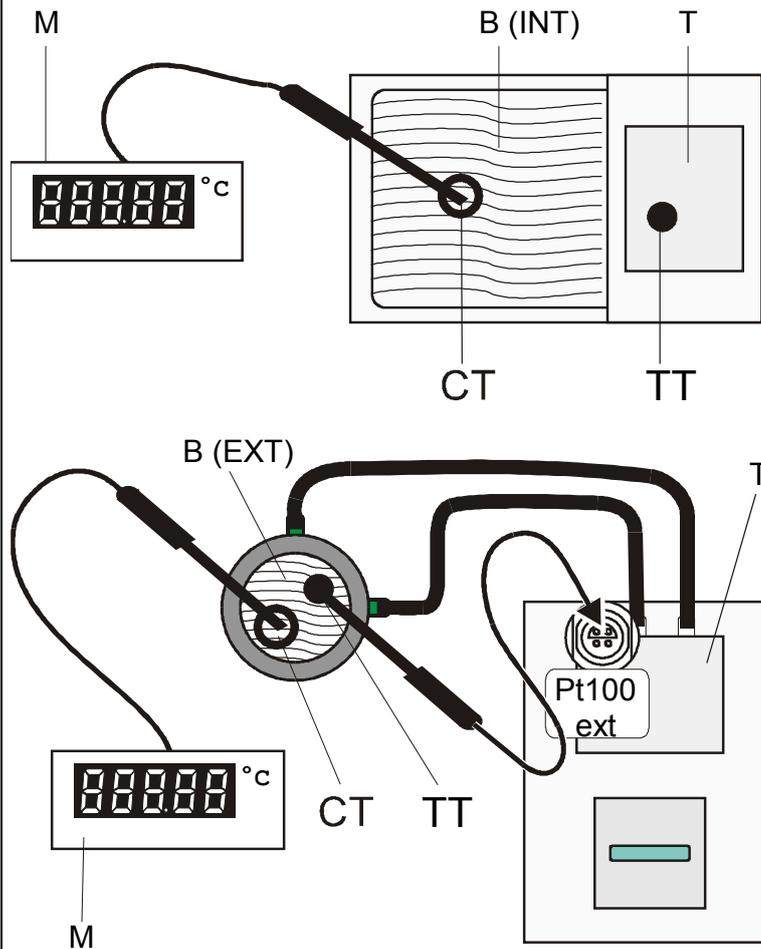
M = Temperature measuring instrument with temperature sensor
B = Bath tank (INTernal or EXTernal)
T = circulator

CT = Temperature on measuring point
TT = Temperature on circulator

Menu level 1		
▼ ▲		
MENU ATC		
OK ↓		

Level 2	Parameter level	ⓘ Press the ↻ key if parameter is to be retained. Correction function for parameters or values (prior to OK).
ATC SENSOR **OK** → ▼ ▲	*SENSOR INTERN* ☼ or *SENSOR EXTERN*	• The parameter flashes, switch by pressing ▲ ▼ and **OK** ⓘ On level 2 a (I) is indicated for internal **or** an (E) for external. Example: *ATC ⟨I⟩ ATC ⟨E⟩*
ATC ⟨I⟩ STATUS **OK** → ▼ ▲	*STATUS YES* ☼ or *STATUS NO*	• The parameter flashes, switch by pressing ▲ ▼ and **OK** ⓘ **>NO<** Carry out an ATC calibration ⓘ **>YES<** return to standard operation after calibration.
ATC ⟨I⟩ TYPE **OK** → ▼ ▲	*TYPE 1-POINT* ☼ *TYPE 2-POINT* *TYPE 3-POINT*	• The parameter flashes, switch by pressing ▲ ▼ and **OK** ⓘ A **>1-point<, >2-point<** or **>3-point< calibration** can be carried out. The selected calibration is indicated on level 2 by 1 or 2 or 3.
ATC ⟨I⟩ TMPVAL1 **OK** → ▼ ▲ *ATC ⟨I⟩ CALVAL1* **OK** → ▼ ▲	*TMPVAL1 80.00* ↻ *CALVAL1 79.70* ☼	The value >TMPVAL< is only indicated ⓘ In addition the measured temperature value >CALVAL X< is saved during the next step. • Integer digits flash, set by pressing ▲ ▼ + **OK** • Decimal digits flash, set by pressing ▲ ▼ + **OK**
	ⓘ If only a 1-point calibration is carried out, the following menu items are not indicated anymore	

ATC ‹I› TMPVAL2 OK →	TMPVAL2 120.00 ↺	The value is only indicated
ATC ‹I› CALVAL2 OK →	CALVAL2 119.50 ✳	• Integer digits flash, set by pressing ▲ ▼ + OK • Decimal digits flash, set by pressing ▲ ▼ + OK
	ⓘ If only a 2-point calibration is carried out, the following menu items are not indicated anymore	
ATC ‹I› TMPVAL3 OK →	TMPVAL3 160.00 ↺	The value is only indicated
ATC ‹I› CALVAL3 OK →	CALVAL3 159.30 ✳	• Integer digits flash, set by pressing ▲ ▼ + OK • Decimal digits flash, set by pressing ▲ ▼ + OK

9.7.1.   ATC SENSOR - INTERNAL / EXTERNAL

ATC
SENSOR

SENSOR
 INTERN

SENSOR
 EXTERN

In the first submenu the ATC function is set for the >**INTERN**< internal or the >**EXTERN**< external temperature sensor.

Calibration can be carried out for the internal temperature sensor and for the external temperature sensor connected to the socket „ext. Pt100". The circulator is able to save both parameter sets. However only the one which has been set under menu item >ATC SENSOR < is displayed.

9.7.2.   ATC STATUS - YES / NO

ATC ‹I›
STATUS

STATUS
  YES

STATUS
  NO

In the second submenu the ATC function for the temperature sensor selected above is activated >YES< or deactivated >NO<.

>**YES**< (factory setting) The controller of the circulator uses the original curve of the temperature sensor or the new curve measured during the ATC calibration.
 Important: Set to >**NO**< during the calibration process

>**NO**< An ATC calibration is to be carried out.
 Important: Set to >**YES**< after calibration.

ⓘ In the > ATC STATUS < >YES< the ATC calibration always affects the current working temperature; also the one set via interface.

54

9.7.3.   CALIBRATION TYPE: 1 -/ 2 -/ 3 POINT

`ATC  <I>`
`TYPE`

`TYPE`
`I-POINT`

`TYPE`
`2-POINT`

`TYPE`
`3-POINT`

A **>1-point<, >2-point<** or **>3-point< calibration** can be carried out.

First geometrically define the location for calibration (measuring point CT),
then determine the temperature values of the calibration points.
The type of calibrations also determines the number of the following pairs of
values indicated on the LCD DIALOG-DISPLAY.

`TMPVAL1  CALVAL1`
`   80.00     79.70`

`TMPVAL2  CALVAL2`
`  120.00    119.50`

`TMPVAL3  CALVAL3`
`  160.00    159.30`

Pairs of values:

TMPVAL X: Circulator temperature 1 or 2 or 3 (actual value TT)
The actual temperature of the bath is simultaneously saved with the
"calibration value" >CALVAL< and can be indicated for control purposes
(value does not flash).

CALVAL X: Calibration temperature 1 or 2 or 3 (actual value CT)
The „calibration value" is determined with a temperature measuring
device and saved under menu item >CALVAL<.
(value flashes)

9.7.4. Example: 3-point calibration for internal control

In the temperature range from 80 °C to 160 °C the calibration curve of the temperature sensor (TT) is to be adjusted to the actual temperatures at measuring point (CT).

1. Set circulator to internal control: MENU CONTROL page 47

Menu level 1
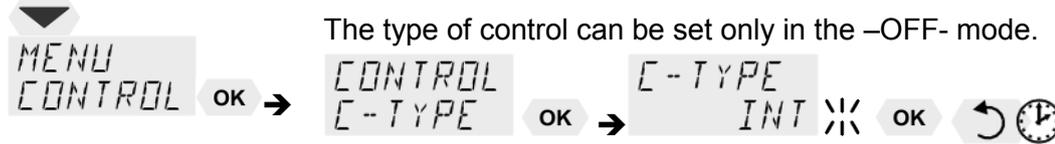
The type of control can be set only in the –OFF- mode.

MENU
CONTROL **OK** → CONTROL
C-TYPE **OK** → C-TYPE
INT ✳ **OK** ↺🕐

2. Set working temperature setpoint – SETPNT:

2464
S 25.00
E_____

2469
SETPNT
1 8000 ✳

80.00 °C
120.00 °C
160.00 °C

Refer to „Direct temperature setting " page 26

- By pressing the key ▲ the circulator switches to the active >SETPOINT< see example on the left: >SETPNT / 1   25.00°C<. The integer digits flash ✳ (Example: <25>).

- Change the value to 80.00 °C by pressing the keys ▼ and ▲ and confirm by pressing the key **OK**. The decimal digits flash.

  Confirm once more by pressing the key **OK**.

- The bath is heated up. Wait for approx. 5 minutes until the temperature is constant.

3. Reading of temperature measuring device

Pt100

79.70 °C

CT
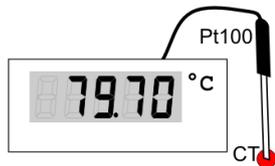
Read the value of measuring point CT on the device and enter under menu item >CALVAL X< by using the keypad.

>CALVAL 1< (79.70 °C)
>CALVAL 2< (119.50 °C)
>CALVAL 3< (159.30 °C)

4. Calibration

Menu level 1

MENU
ATC

OK ↓

ⓘ Press the ↺ key if parameter is to be retained. Correction function for parameters or values (prior to OK).

ⓘ 👁 Setting is required only for the first calibration point.
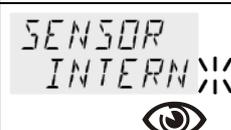
Level 2	Parameter level	
ATC SENSOR **OK** → ▼ ▲	SENSOR INTERN ✳ 👁	Set SENSOR INTERN: • The parameter flashes, switch by pressing ▲ ▼ and **OK**.

ATC (I) *STATUS* **OK** → ▼ ▲	*STATUS* *NO* ☀ 👁	An ATC calibration is to be carried out. Set to >NO< • The parameter flashes, switch by pressing ▲ ▼ and **OK** .
ATC (I) *TYPE* **OK** → ▼ ▲	*TYPE* *3-POINT* ☀ 👁	• The parameter flashes, switch by pressing ▲ ▼ and **OK** . A >3-point< calibration is carried out.
ATC (I) *TMPVAL I* **OK** → ▼ ▲	*TMPVAL I* *80.00* ↺	The value >TMPVAL< is only indicated In addition the measured value >CALVAL X< is saved during the following step

ATC (I)
CALVAL I **OK** →
▼ ▲
	CALVAL I
	79.70 ☀
		• Integer digits flash, set by pressing
		  ▲ ▼ (79) + **OK**
		
		• Decimal digits flash, set by pressing
		  ▲ ▼ (70) + **OK**
		
		The first of 3 points is calibrated.

	Return to 2. Set working temperature value SETPNT: 120.00 °C	
ATC (I) *TMPVAL2* **OK** → ▼ ▲	*TMPVAL2* *120.00* ↺	The value is only indicated

ATC (I)
CALVAL2 **OK** →
▼ ▲
	CALVAL2
	119.50 ☀
		• Integer digits flash, set by pressing
		  ▲ ▼ (119) + **OK**
		
		• Decimal digits flash, set by pressing
		  ▲ ▼ (50) + **OK**
		
		The second of 3 points is calibrated.

	Return to 2. set working temperature value SETPNT: 160.00 °C	
ATC (I) *TMPVAL3* **OK** → ▼ ▲	*TMPVAL3* *160.00* ↺	The value is only indicated.

ATC (I)
CALVAL3 **OK** →
	CALVAL3
	159.30 ☀
		• Integer digits flash, set by pressing
		  ▲ ▼ (159) + **OK**
		
		• Decimal digits flash, set by pressing
		  ▲ ▼ (30) + **OK**
		
		The 3-point calibration is completed

	5. Return to standard operation	
ATC (I) *STATUS* **OK** →	*STATUS* *YES* ☀ **OK**	• Set >YES< after calibration. (Standard operation)

9.8. MENU LIMITS

Menu level 1 ▼ ▲ *MENU LIMITS* OK ↓		
Level 2	**Parameter level**	Press the ↺ key if parameter is to be retained. Correction function for parameters or values (prior to OK).
LIMITS SETMAX OK ➔ ▼ ▲	*SETMAX 200.00* ☀	• Integer digits flash, set by pressing ▲ ▼ + OK • Decimal digits flash, set by pressing ▲ ▼ + OK
LIMITS SETMIN OK ➔ ▼ ▲	*SETMIN -94.99* ☀	• Integer digits flash, set by pressing ▲ ▼ + OK • Decimal digits flash, set by pressing ▲ ▼ + OK
LIMITS HEATMAX OK ➔ ▼ ▲	*HEATMAX 100* ☀ 0 … 100 %	• The value flashes, set by pressing ▲ ▼ + OK
LIMITS COOLMAX OK ➔ ▼ ▲	*COOLMAX 0* ☀ 0 … 100 %	• The value flashes, set by pressing mit ▲ ▼ + OK
	In case of external control these menu items are additionally indicated.	
LIMITS INTMAX OK ➔ ▼ ▲	*INTMAX 200.00* ☀	• Integer digits flash, set by pressing ▲ ▼ + OK • Decimal digits flash, set by pressing ▲ ▼ + OK
LIMITS INTMIN OK ➔ ▼ ▲	*INTMIN -94.99* ☀	• Integer digits flash, set by pressing ▲ ▼ + OK • Decimal digits flash, set by pressing ▲ ▼ + OK
LIMITS BAND-H OK ➔ ▼ ▲	*BAND-H 200* ☀	• The value flashes, set by pressing ▲ ▼ + OK
LIMITS BAND-L OK ➔	*BAND-L 200* ☀	• The value flashes, set by pressing ▲ ▼ + OK

9.8.1. Limits for internal control

`C-TYPE`
`        INT`

`SETMAX`
`    200.00`

`SETMIN`
`    -50.00`

SETPOINT MAX / MIN – Maximum and minimum setpoint
Restriction of the adjustable temperature range

The limitation of the operating temperature range effects the temperature setting in the menu with the key **T** .

Only setting of working temperatures which lie within the determined limits is possible
Existing settings for SETPNT 1, -2, -3, as well as those for >OVERTMP< and > SUBTMP < (refer to page 30), are automatically deferred into the limit range.

Setting range: -94,90 °C ... +200,0 °C

ⓘ SET MAX > SET MIN
  Interchange of values is not possible.

Set maximum heating / cooling

:

`HEATMAX`
`       100`

`COOLMAX`
`         0`

The heating and cooling capacity of the unit are adjustable. 100 % corresponds to the technical specification of the equipment.

Setting range:

HEAT MAX –   0 to 100 % in 1 % steps
COOLING MAX – 0 to 100 % in 1 % steps

9.8.2. Limits for external control

:

`INTMAX`
`    200.00`

`INTMIN`
`    -50.00`

INTERN MAX / MIN
Restriction for the temperature range of the internal bath.

Setting range: -94,9 °C ... +200,0 °C

The limits INT MAX and INT MIN are only active in external control. INT MAX and INT MIN determine fixed limits for the temperature within the internal bath. The temperature controller cannot exceed these limits even if it would be necessary for achieving the temperature in an external system. Therefore it is possible that the external setpoint cannot be achieved.

Sense of limit setting:

☑ Protects the bath fluid from overheating.

☑ Prevents an undesired alarm shutdown by the excess temperature protection - >*ALARM CODE 14*<.
Set the value of > INT MAX at least 5 °C below the value of **>SAFETMP<**.

☑ Protects the pump motor from high viscosity of the bath fluid at low temperatures.

☑ For refrigerated circulators. Freezing protection when using water as bath fluid.

> **SAFETMP** <

BAND HIGH / LOW – Band limitation

```
BAND-H
     200

BAND-L
     200
```

The band limitation is active during external control. Varied, practice-oriented setting are feasible for heat-up and cool-down phases.

Setting range: 0 °C ... 200 °C

BAND HIGH and **BAND LOW** allow for the limitation of the difference between the temperatures in the internal bath and the external system to any maximum value for the heat-up and cool-down phase.
During the heat-up phase this difference value is always added to the actual external temperature. During the cool-down phase the difference value is subtracted.
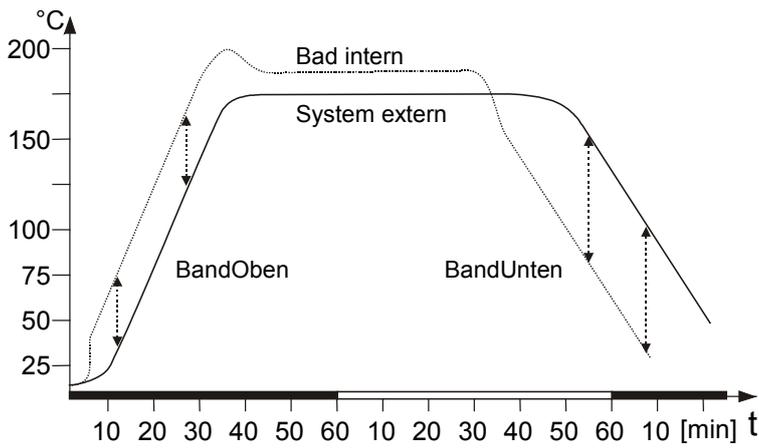
Sense of a band limitation:
☑ Protection of objects and samples by gentle temperature control
☑ Protection of e.g. glass reactors from thermal shock.

10. Troubleshooting guide / error messages

- OFF -
ALARM
CODE 01

Alarm with complete shutdown:

If one of the following failures occur a complete, all-pole shutdown of the heater and circulating pump is effected.

"⚠" lights up and a continuous signal sounds.
The code for the cause of alarm is indicated on the VFD COMFORT-DISPLAY.

⚠ + 📢

88.8.88
WARNING
CODE 40

Alarm without shutdown:

The code for the cause of alarm is indicated on the VFD COMFORT-DISPLAY. The warning signal sounds in regular intervals. The messages appear every 10 seconds.

🔇	Press the key **OK** to stop the signal

ALARM **CODE 01**	Error message with ticker: >LOW LEVEL ALARM-FILL MEDIUM < Low level alarm The circulator is operated without or insufficient bath fluid. Switch the unit off with the mains switch, refill bath fluid and switch on! Tube breakage has occurred (insufficient filling level of bath fluid caused by pumping-out) Replace the tubing and refill bath liquid. The float is defect (e.g. transport damage). Repair by authorized JULABO service personnel.
ALARM **CODE 02**	Error message with ticker: > REFRIGERATOR ALARM-CHECK CONNECTION < During the self-test after switch-on a short –circuit is detected between pin 2 and pin 4 of the control line or the control line was disconnected during operation. Reconnect the control line or repair short-circuit.
WARNING **CODE 03** **ALARM** **CODE 03**	Error message with ticker: > EXCESS TEMPERATURE WARNING-CHECK LIMITS < Excess temperature warning or Excess temperature alarm **Type of warning:** set to >warning< or >alarm< (refer to page 29)
WARNING **CODE 04** **ALARM** **CODE 04**	Error message with ticker: > LOW TEMPERATURE WARNING-CHECK LIMITS < Low temperature warning or Low temperature alarm. **Typ of warning:** set to >warning< or >alarm< (refer to page 29)
ALARM **CODE 05**	Error message with ticker: > WORKING SENSOR ALARM-CALL SERVICE < Cable of working temperature sensor is disconnected or short-circuited.

ALARM CODE 06	Error message with ticker: >SENSOR DIFFERENCE ALARM-CHECK VISCOSITY AND PUMP STAGE< Defect of working or excess temperature protector. Working temperature sensor and excess temperature protector report a temperature difference of more than 35 K.
ALARM CODE 07	Error message with ticker: > INTERNAL HARDWARE ERROR-CALL SERVICE < Other errors
ALARM CODE 12	Error in A/D converter
ALARM CODE 14	Error message with ticker: > EXCESS TEMPERATURE PROTECTOR ALARM-CHECK ADJUSTMENT < Excess temperature protector defect. The protection temperature is below the set working temperature setpoint. Set the protection temperature to a higher value.
ALARM CODE 15	Error message with ticker: > EXTERNAL SENSOR ALARM-CHECK EXTERNAL SENSOR < External control was set but the Pt100 external senor was not connected or is defect.
WARNING CODE 20	Error message with ticker: > CLEAN CONDENSER OR CHECK COOLING WATER < Insufficient cooling of condenser. Clean the air-cooled condenser. Check the flow and the temperature of the cooling water of a water-cooled condenser.
WARNING CODE 21	Error message with ticker: > COMPRESSOR FAILURE-CHECK REFRIGERATOR < Stage 1 of the compressors does not work. Automatic restart after short cool-down, message E 21 goes off.
WARNING CODE 22	Stage 2 of the compressor does not work. <u>Cooling machine – overload protection</u> The driving motor of the cooling compressor is equipped with an overload protection which is triggered by increased internal temperatures or excessive current consumption. Shutdown can be caused by - insufficient ventilation, - insufficient wall distance, - soiled condenser, - high room temperature - switching off and on in short sequence
WARNING CODE 23	Excess temperature in stage 1 of the compressor.
WARNING CODE 24	Excess temperature in stage 2 of the compressor.
WARNING CODE 25	Short circuit of control line to cooling machine during self-test.

ALARM CODE 33	Error message with ticker: > SAFETY SENSOR ALARM-CALL SERVICE < The cable of the excess temperature protector has been disconnected or short-circuited
WARNING CODE 40	Error message with ticker: > LOW LEVEL WARNING-FILL MEDIUM < The early warning system for low level reports a critical fluid level. Refill bath fluid.
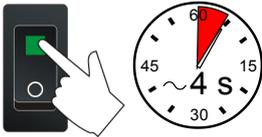
By quickly switching off and restarting the unit the alarm is cancelled.
If the error occurs once more after the restart, a remote diagnosis is required.

C-Err PRESS OK

Error message with ticker:
> CONFIGURATION ERROR-PRESS OK<

The configuration of the circulator does not correspond with its current application.

Press the OK key for a non-recurring, automatic change of the configuration.
In this case please call the JULABO Technical Service or an authorized dealer.

Disturbances that are not indicated.

The electronic pump motor is overload-protected by an electronic current limiter. If viscosity of the bath fluid is or becomes too high, the motor stops running.
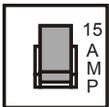
Mains circuit breakers (resettable) 15 A
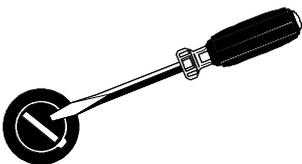
Cooling machine: Fuse T 10.0 A, dia.5 x 20 mm
The mains fuses (8b) on the rear of the unit may easily be exchanged as shown on the left.

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

Example:

| Manufacturer	Supplier	Type	Order No.
Wickmann	Wickmann	G- fuse insert T10,0A 5x20 mm	No. 19195

11. Electrical connections

> ⚠ **Notice:**
> Use shielded cables only.
> The shield of the connecting cable is electrically connected to the plug housing.
> The unit ensures safe operation if connecting cables with a maximum length of 3 m are used. The use of longer cables does not affect proper performance of the unit, however external interferences may have a negative impact on safe operation (e.g. cellular phones).
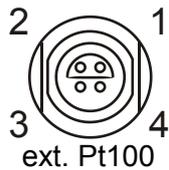
Socket for external Pt100 sensor

Pin assignment:

Pin	Signal
1	I+
2	U+
3	U-
4	I-
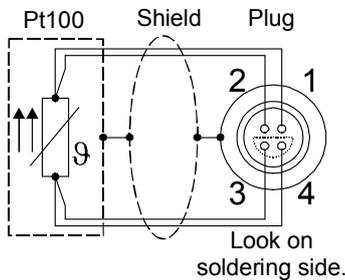
The shield of the connecting cable is electrically connected to the plug housing and the sensor tube.

RS232 serial interface

This port can be used to connect a computer with an RS232 cable for remote control of the circulator.
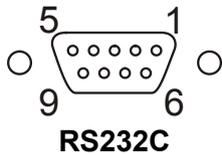
Pin assignments RS232:

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!

RS232 interface cable

Circulator (9-pol)		PC (9-pol)
Pin 2 RxD	⇔	Pin 3 TxD
Pin 3 TxD	⇔	Pin 2 RxD
Pin 5 GND	⇔	Pin 5 GND
Pin 7 RTS	⇔	Pin 8 CTS
Pin 8 CTS	⇔	Pin 7 RTS

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

❄ / Control output

The ❄ connector may be used for control of JULABO refrigerated circulators or as output for alarm messages.

Circuit: Operation   = relay powered
                       Alarm   = relay not powered
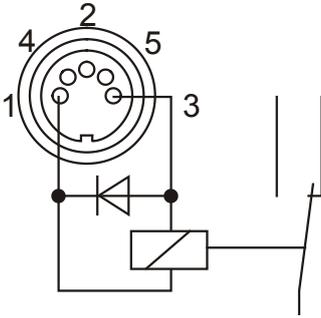
Pin assignment:

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

12. Remote control

12.1. Setup for remote control

RS232C

-OFF-
REMOTE
ON
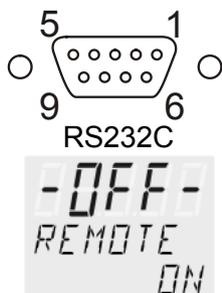
1. Check the interface parameters for both interfaces (on circulator and PC) and make sure they match.

2. In the menu > MENU CONFIG < set the menu item > REMOTE < to > ON < .

3. Connect both units with an interface cable..

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

12.2.   Communication with a PC or a superordinated data system

If the circulator is put into remote control mode via the configuration level, the VFD COMFORT-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 sends a query.

In remote control mode, the start command and all values to be set must be resent by the PC via the interface in case of a power interruption. AUTOSTART is not possible.

A transfer sequence consists of:

- command
- space ($\Leftrightarrow$; Hex: 20)
- parameter (decimal separation with a period)
- end of file (↵; Hex: 0D)

The commands are divided into **in** and **out** commands.
in commands: retrieve parameters
out commands: set parameters

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

The out commands are valid only in remote control mode.

Command to set the working temperature > SETPNT 1< to 55.5 °C
out_sp_00 $\Leftrightarrow$ 55.5↵

Command to retrieve the working temperature > SETPNT 1<   in_sp_00↵

Response from the circulator: 55.5↵

12.3. List of commands

out commands: Setting temperature values or parameters.

Command	Parameter	Response of circulator
out_mode_01	0	Use working temperature > SETPNT 1<
out_mode_01	1	Use working temperature > SETPNT 2<
out_mode_01	2	Use working temperature > SETPNT 3<
out_mode_04	0	Temperature control of internal bath.
out_mode_04	1	External control with Pt100 sensor.
out_mode_05	0	Stop the unit = R –OFF-.
out_mode_05	1	Start the unit.
out_mode_08	0	Set the control dynamics - aperiodic
out_mode_08	1	Set the control dynamics - standard
out_sp_00	xxx.xx	Set working temperature. „SETPNT 1"
out_sp_01	xxx.xx	Set working temperature. „SETPNT 2"
out_sp_02	xxx.xx	Set working temperature. „SETPNT 3"
out_sp_03	xxx.xx	Set high temperature warning limit „OVERTMP"
out_sp_04	xxx.xx	Set low temperature warning limit „SUBTMP"
out_sp_07	x	Set the pump pressure stage. (1 ... 4)
out_par_04	x.x	CoSpeed 0 ... 5.0 Band limit during external control. Setting the maximum difference between the temperatures in the internal bath and external system.
out_par_06	xxx	Xp control parameter of the internal controller. 0.1 ... 99.9
out_par_07	xxx	Tn control parameter of the internal controller. 3 ... 9999
out_par_08	xxx	Tv control parameter of the internal controller. 0 ... 999
out_par_09	xxx	Xp control parameter of the cascade controller. 0.1 ... 99.9
out_par_10	xxx	Proportional portion of the cascade controller. 1 ... 99.9
out_par_11	xxx	Tn control parameter of the cascade controller. 3 ... 9999
out_par_12	xxx	Tv control parameter of the cascade controller. 0 ... 999
out_par_13	xxx	Maximum internal temperature of the cascade controller.
out_par_14	xxx	Minimum internal temperature of the cascade controller.
out_par_15	xxx	Band limit (upper) 0 ... 200 °C
out_par_16	xxx	Band limit (lower) 0 ... 200 °C

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

Command	Parameter	Response of circulator
version	none	Number of software version (V X.xx)
status	none	Status message, error message (see page 69)
in_pv_00	none	Actual bath temperature.
in_pv_01	none	Heating power being used (%).
in_pv_02	none	Temperature value registered by the external Pt100 sensor.
in_pv_03	none	Temperature value registered by the safety sensor.
in_pv_04	none	Setpoint temperature of the excess temperature protection
in_sp_00	none	Working temperature „SETPNT 1"
in_sp_01	none	Working temperature „SETPNT 2"
in_sp_02	none	Working temperature „SETPNT 3"
in_sp_03	none	High temperature warning limit „OVERTEMP"
in_sp_04	none	Low temperature warning limit „SUBTEMP"
in_sp_07	none	Pump pressure stage
in_par_01	none	Te - Time constant of the external bath.
in_par_02	none	Si - Internal slope
in_par_03	none	Ti - Time constant of the internal bath.
in_par_04	none	CoSpeed - Band limit (max. difference between the temperatures in the internal bath and external system).
in_par_05	none	Factor pk/ph0: Ratio of max. cooling capacity versus max. heating capacity
in_par_06	none	Xp control parameter of the internal controller.
in_par_07	none	Tn control parameter of the internal controller.
in_par_08	none	Tv control parameter of the internal controller.
in_par_09	none	Xp control parameter of the cascade controller.
in_par_10	none	Proportional portion of the cascade controller.
in_par_11	none	Tn control parameter of the cascade controller.
in_par_12	none	Tv control parameter of the cascade controller.
in_par_13	none	Adjusted maximum internal temperature of the cascade controller.
in_par_14	none	Adjusted minimum internal temperature of the cascade controller.
in_par_15	none	Band limit (upper)
in_par_16	none	Band limit (lower)

Command	Parameter	Response of circulator
in_mode_01	none	Selected setpoint: 0 = SETPNT 1 1 = SETPNT 2 2 = SETPNT 3 3 = Last setpoint setting was carried out through an external programmer
in_mode_04	none	Internal/external temperature control: 0 = Temperature control with internal sensor. 1 = Temperature control with external Pt100 sensor.
in_mode_05	none	Circulator in Stop/Start condition: 0 = Stop 1 = Start
in_mode_08	none	Adjusted control dynamics 0 = aperiodic 1 = standard

12.4.   Status messages

Status messages	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.

12.5.   Error messages

Error messages	Description
-01 LOW LEVEL ALARM	Low liquid level alarm.
-02 REFRIGERATOR ALARM	Control cable of the refrigerated circulator or MVS solenoid valve controller short-circuited or interrupted.
-03 EXCESS TEMPERATURE WARNING	High temperature warning.
-04 LOW TEMPERATURE WARNING	Low temperature warning.
-05 WORKING SENSOR ALARM	Working temperature sensor short-circuited or interrupted.

Error messages	Description
-06 SENSOR DIFFERENCE ALARM	Sensor difference alarm. Working temperature and safety sensors report a temperature difference of more than 35 K.
-07 I²C-BUS ERROR	Internal error when reading or writing the I²C 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.
-13 WARNING : VALUE EXCEEDS TEMPERATURE LIMITS	Value lies outside the adjusted range for the high and low temperature warning limits. But value is stored.
-14 EXCESS TEMPERATURE PROTECTOR ALARM	Excess temperature protector alarm
-15 EXTERNAL SENSOR ALARM	External control selected, but external Pt100 sensor not connected.
-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.
-21 WARNING: COMPRESSOR STAGE 1 DOES NOT WORK	Compressor stage 1 does not work.
-22 WARNING: COMPRESSOR STAGE 2 DOES NOT WORK	Compressor stage 2 does not work.
-23 WARNING: HIGH TEMPERATURE ON COMPRESSOR STAGE 1	Excess temperature on compressor stage 1.
-24 WARNING: HIGH TEMPERATURE ON COMPRESSOR STAGE 2	Excess temperature on compressor stage 2.
-25 REFRIGERATOR WARNING	Error in the cooling machine.
-30 CONFIGURATION ERROR: CONFIRM BY PRESSING <OK> ON CIRCULATOR	The configuration of the circulator does not conform to its present use. Press OK to automatically perform a single modification of the configuration.
-33 SAFETY SENSOR ALARM	Excess temperature sensor short-circuited or interrupted.
-40 NIVEAU LEVEL WARNUNG	Low liquid level warning in the internal reservoir.

13. 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.
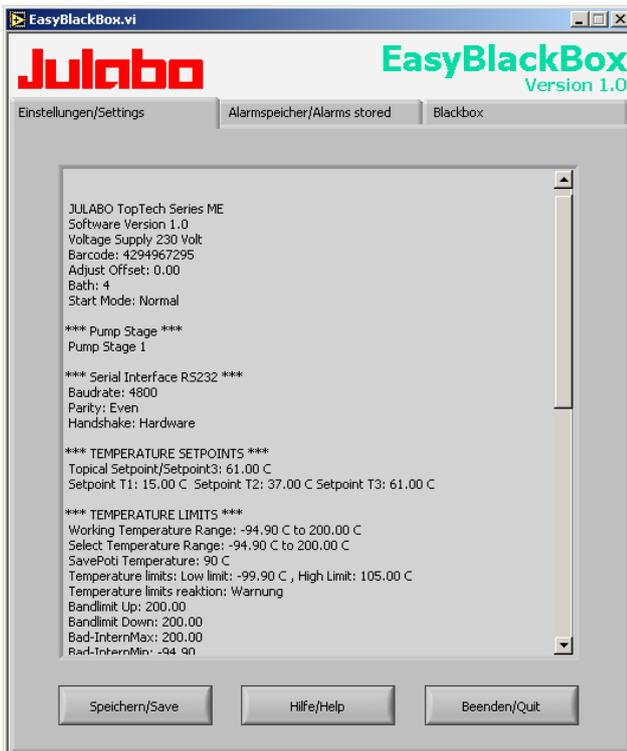
- Data is read out and shown on the monitor divided into the sections
  >Einstellungen/Settings<,
 >Alarmspeicher/Alarms stored<,
  >Blackbox<

  ← see example

- After pressing >Speichern/Save<, a text file is created. The program suggests a filename - >C:\model description and barcode no.<.
  Modifications are possible.

- E-mail this file to service@julabo.de, JULABO's service department. JULABO is thus able to provide rapid support.

14. 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.
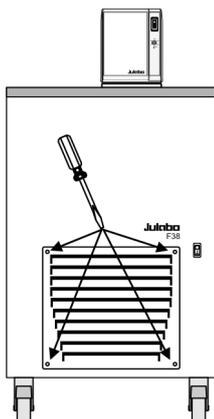
Maintaining the cooling performance

To maintain the full cooling performance, clean the condenser from time to time.
- Switch off the unit, disconnect mains power cable.
- Remove the venting grid.
- Clean the ribbed condenser with a vacuum cleaner.
- Replace the venting grid.
- Switch on the unit.

Cleaning:

For cleaning the bath tank and the immersed parts of the circulator, use low surface tension water (e.g., soap suds).
Clean the outside of the unit using a wet cloth and low surface tension water.

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

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

Repairs

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

When returning the unit:
- Clean the unit in order to avoid any harm to the service personnel.
- Attach a short fault description.
- During transport the unit has to stand upright. Mark the packing correspondingly.
- 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.