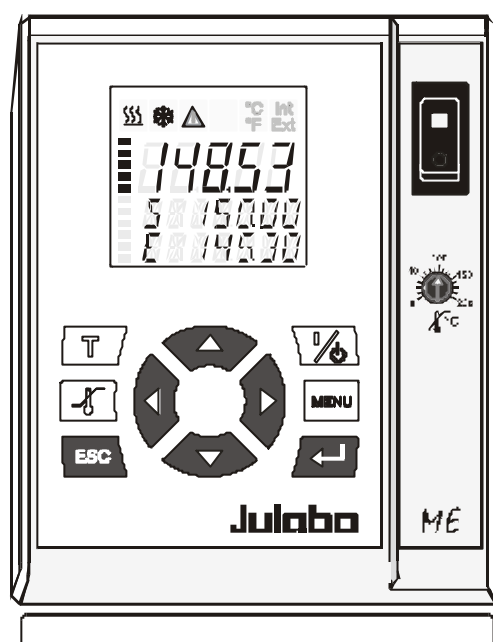


# Operating Manual

## Heating Immersion Circulator

ME



# Julabo

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Printed in Germany  
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1.951.0500 BE2 06/04

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### **Congratulations!**

You have made an excellent choice.

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

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

### **Quality Management System**



#### The JULABO Quality Management System:




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

Certificate Registration No. QA 051004008

### **Unpacking and checking**

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

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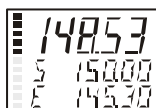
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# Operating manual

## Description

JULABO circulators have been designed for temperature application to specific fluids in a bath tank.

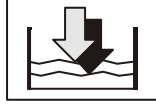


**PID3**

**ATC<sup>3</sup>**

**RS232**

**Pt100**



**PPC**

**IEC  
EN  
DIN**

- The circulators are operated via the splash-proof keypad. The implemented microprocessor technology allows to set and to store different values that can be indicated on the VFD COMFORT-DISPLAY. Three menu keys facilitate adjusting setpoints, warning and safety functions and menu functions.
- The integrated programmer allows storing and running temperature and time-dependent processes.
- The PID cascade temperature control adapts the heat supplied to the thermal requirements of the bath.
- Absolute Temperature Calibration (ATC3) provides a high temperature stability 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 full temperature range.
- Electrical connections:  
 The serial interface RS232 allows modern process technology without additional interface.  
 Connection for Pt100 external 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 conforming to IEC 61010-2-010 is a safety installation independent from the control circuit. This protection can be indicated and set 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 conforming to IEC 61010-2-010 causes a complete shutdown of the main functional elements.
- The pump capacity (electronically adjustable via the motor speed) enables to adapt to varying conditions for internal and external temperature applications.
- The circulator conforms to the relevant requirements specified by European guidelines.



JULABO circulators are not conceived for direct temperature application to food and luxury articles or pharmaceutical and medico-technical products. Direct temperature application means: Unprotected contact of the object with the bath medium (bath fluid).

## Operator responsibility – Safety recommendations

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

### Persons:

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

The operator should be constantly informed about the dangers involved with their job activities as well as preventive actions.


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


When using hazardous materials, the circulator may only be operated by persons that 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

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 [www.julabo.de](http://www.julabo.de)

### Handling:

You received a product conceived for industrial use. Nevertheless, avoid strikes to the housing, vibrations, damages to the keypad foil (keys, display) or contamination.

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

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

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

Magnetic radiation may influence other units with components susceptible to magnetic fields (e.g. a monitor). We recommend to keep a minimum distance of 1 m.

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

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

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

### 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. The summarized user guidance (short manual) and the specification table with information on individual parameters are sufficient for this.

**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 materials.

When using hazardous materials, **the user must** attach the enclosed safety labels to the front of the unit so they are well visible: The yellow warning label W09 (danger area) and the blue mandatory label M018 or Semi S1-0701 Table A1-2 #9 (Carefully read the user information prior to beginning operation).

Warning label W09: Colours: yellow, black		Danger area. Attention! Observe instructions. (operating manual, safety data sheet)
Mandatory label M018 Colours: blue, white		Carefully read the user information prior to beginning operation Scope: EU
Semi S1-0701 Table A1-2 #9		Carefully read the user information prior to beginning operation Scope: NAFTA

Particular care and attention is necessary because of the wide operating range.

There are thermal dangers: Burn, scald, hot steam, hot parts and surfaces that can be touched.

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

**Disposal:**

The circulator contains a so-called back-up battery that supplies voltage to memory chips when the unit is switched off. Do not dispose of the battery in domestic 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.

## EC Declaration of Conformity

Heating Immersion Circulator: ME



**The products mentioned comply with the requirements outlined by the following European guidelines:**

Guideline 73/23/EEC of the Council of 19 February 1973 with respect to legal harmonization of the member countries concerning electric devices for use within certain voltage limits

Guideline 89/336/EEC of the Council of 3 May 1989 with respect to legal harmonization of the member countries concerning electromagnetic compatibility

Guideline 98/37/EC of the European Parliament and the Council of 22 June 1998 for harmonization of legal and administrative regulations of the member countries with respect to machinery

The units conform to the following standards:

EN 1050: 1996-11    EN 292-1: 1991-09    EN 292-2: 1991-09

EN 61010-1: 2001    EN 61010-2-10: 1994-07    EN 60204-1: 1997-12

EN 563: 1994-06    EN 61326: 1997 + A1: 1998 + A2: 2001

# JULABO

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



## Warranty conditions

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

**for a period of ONE YEAR.**

Extension of the warranty period – free of charge



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

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

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

Any other compensation claims are excluded from this guarantee.

## Technical specifications

		ME
Working temperature range	°C	20 ... 200
Temperature stability	°C	±0.01
Temperature selection		digital
via keypad		indication on VFD COMFORT-Display
remote control via personal computer		indication on monitor
Temperature indication		VFD COMFORT-DISPLAY
Resolution	°C	0.1
Absolute Temperature Calibration	°C	±3
Temperature control		PID3 cascade temperatur control
Heater wattage (at 230 V)	kW	2.0
Heater wattage (at 115 V)	kW	1.0
Electronically adj. pump capacity	stages	1 ... 4
Flow rate	l/min at 0 bar	11 ... 16
Pressure max.	bar at 0 liter	0.22 ... 0.45
Electrical connections:		
External alarm device 24-0 V DC / max. 25 mA		
Computer interface RS232		
External Pt100 sensor		
Overall dimensions (WxDxH)	cm	13x15x33
Usable bath depth	cm	8 ... 16,5
Weight	kg	4,0
Ambient temperature	°C	5 ... 40
Ambient temperature	°C	5 ... 40
Mains power connection	V/ Hz	190 ... 253 / 50-60
or	V/Hz	100 ... 115 / 50-60
Current consumption at 208 V / 230 V	A	8 / 9

All measurements have been carried out at:

rated voltage and frequency                      ambient temperature: 20 °C  
 bath fluid: water                                      operating temperature: 70 °C

Technical changes without prior notification reserved.

Safety installations according to IEC 61010-2-010:

Excess temperature protection	adjustable from 0 °C ... 320 °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 >25 °C
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 (for storage and transportation)

Air humidity:

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

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

Protection class according to IEC 60 529 IP21

Power supply: corresponds to Class I; according to VDE 0106 T1

**not for use in explosive atmosphere**

Max. mains fluctuation of  $\pm 10$  % are permissible.

Overvoltage category II

Pollution degree 2

Standards for interference resistance EN 61326: 1997 + A1: 1998 + A2: 2001

Emitted interferences

The unit adheres to the threshold values for emitted interferences according to table 3.

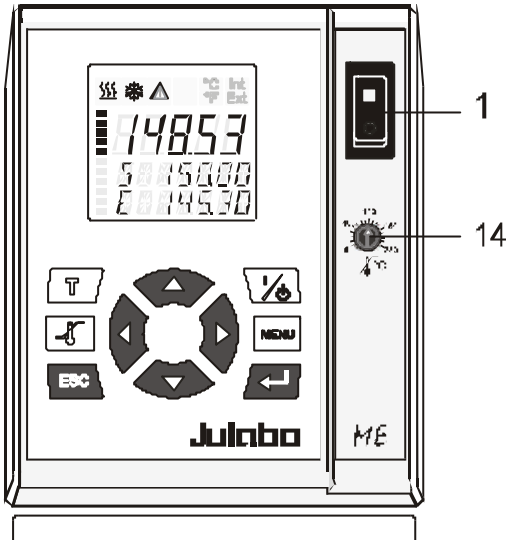
Interference resistance

The unit conforms to the requirements according to table B.1.

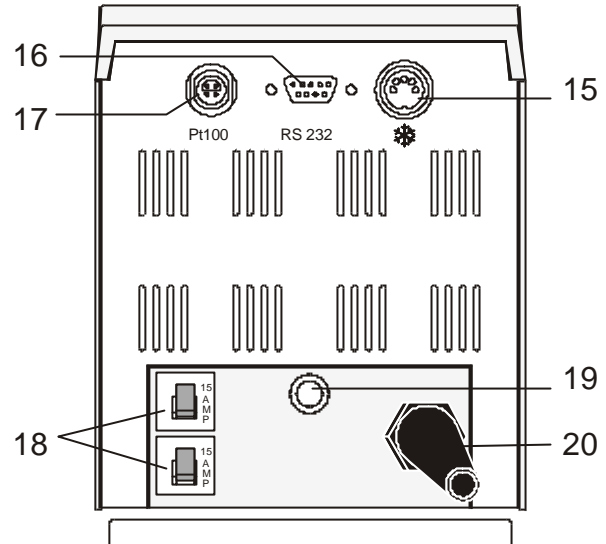
# Operating instructions

## 1. Operating controls and functional elements

Front view



Rear view



1 Mains power switch, illuminated



2 Start / stop key



3 Key for selecting the working temperature - Setpoint 1, 2, 3



4 Key for selecting the warning and safety values



5 MENU button - for selecting the menu functions



6 Cursor keys (left or right)



7 Edit keys (increase or decrease)

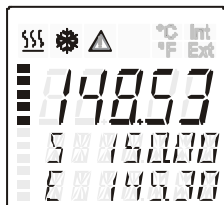


7 Enter key  
1) Store value / parameter  
2) Next lower menu level



8 Escape key  
1. Cancel entries  
2. Return to a higher menu level

10 **VFD COMFORT-DISPLAY**





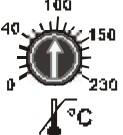








Header: Control indicators see sections 11 and 12





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

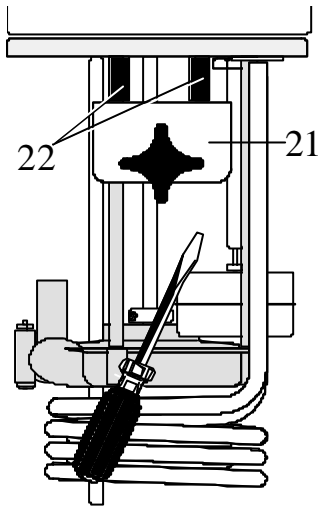
- 11  Control indicators in the header:  
Heating / Cooling / Alarm /  
**R** Remote control
- 12  Control indicators in the header:  
Temperature indication **Internal** or **External** actual value  
Temperature indication in **°C** (**°F** not possible on this unit)
- 13  Display for the adjusted pump pressure stage  
Four stages, adjustable via the  button, in the menu >PUMP<.
- 14  Adjustable excess temperature protection according to IEC 61010-2-010
- Rear view
- 15  Socket: control cable of JULABO refrigerated circulator  
or output for alarm messages
- 16  Interface RS232: remote control via personal computer
- 17  Socket for external measurement and control sensor  
or external setpoint programming
- 18  Mains fuses: Safety cutout 15 A
- 19  Threaded fitting (10 mm) for stand rod attachment
- 20  Mains power cable with plug

## 2. Safety notes for the user

	In addition to the safety warnings listed above, warnings are posted throughout the manual. These warnings are designated by an exclamation mark inside an equilateral triangle. „Warning of a dangerous situation (Attention ! Please follow the documentation).“ The danger is described according to an alarm keyword. Read and follow these important instructions.
	<b>Warning:</b> Describes a possibly highly dangerous situation. If this is not avoided, serious injury and danger to life could result.
	<b>Caution:</b> Describes a possibly dangerous situation. If this is not avoided, slight or minor injuries could result. A warning of possible damage can also be contained in the text.
	<b>Notice:</b> Describes a possibly harmful situation. If this is not avoided, the product or anything in its surroundings can be damaged.

### 3. Preparations

#### 3.1. Installation



The heating immersion circulator is mounted using a bath attachment clamp (21) designed for bath wall thicknesses up to 26 mm.

Use the two sleeves (22) supplied with the unit to reduce the immersion depth from 165 mm to 145 mm (see drawing).

For use with glass vessels an upright stand rod (order no. 8 970 020), available as optional accessory, may be screwed in the threaded fitting (19).

#### 3.2. 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  $\leq 65\text{ °C}$  is used, only supervised operation is possible.

**Recommended bath fluids:**

Bath fluids	Temperature range	Flash point	fire point
deionized water	5 °C ... 80 °C		
Thermal M	+40 °C ... +170 °C	>280 °C	>305 °C
Thermal H	+20 °C ... +250 °C	>270 °C	>360 °C
Thermal H10S	-20 °C ... +180 °C	>175 °C	>210 °C
Thermal H20S	+0 °C ... +220 °C	>230 °C	>270 °C
Thermal H250	+60 °C ... +200 °C	>225 °C	>250 °C

Order No. 10 liters	Bath fluids	Order No. 5 liters
8 940 100	Thermal M	8 940 101
8 940 102	Thermal H	8 940 103
8 940 114	Thermal H10S	8 940 115
8 940 108	Thermal H20S	8 940 109
8 940 116	Thermal H250	8 940 117

**Notice:**

Please contact JULABO before using other than recommended bath fluids. JULABO takes no responsibility for damages caused by the selection of an unsuitable bath fluid.

Unsuitable bath fluids are liquids which e.g.

- are very highly viscous  
(much higher than  $50 \text{ mm}^2 / \text{s}$  at the respective working temperature)
- have corrosive characteristics or
- tend to cracking.

ATTENTION: The maximum permissible viscosity is  $50 \text{ mm}^2 / \text{s}$ .

**Caution:**

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

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

Many substances are:

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

i.e.: **dangerous**

**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.

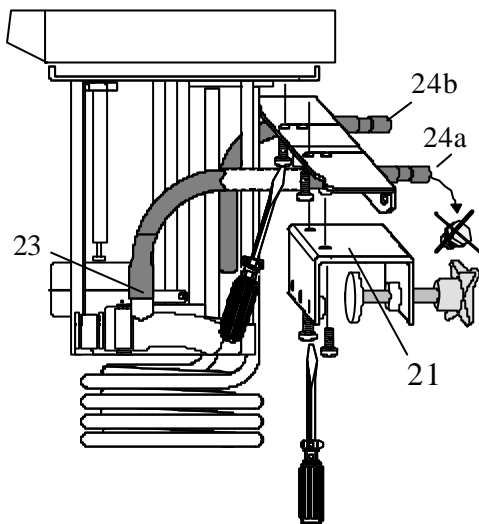
- Are all tubes and electrical cables connected and installed?  
Note:  
sharp edges, hot surfaces in operation, moving machine parts, etc.
- Do dangerous steams or gases arise when heating?  
Is an exhaust needed when working?
- What to do when a dangerous substance was spilled on or in the unit?  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

### 3.3. Temperature application to external systems

The circulator is used for temperature application to external, closed systems (loop circuit).

#### 3.3.1. Pump set

Order No.	Description
8 970 140	Pump set



#### Mounting the pump set:

- Remove the bath attachment clamp (21).
- Screw the pump set to the circulator, and then fix the bath attachment clamp to the pump set.
- Slide the short piece of tubing supplied with the pump set onto the short pump nozzle and the pump connector (23).
- Thus the total immersion depth is reduced to 145 mm.
- Adjusting the pump for external bath circulation see example D on page 28.

#### Connecting an external system:

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



#### **Caution:**

Securely attach all tubing to prevent slipping.

#### 3.3.2. Tubing

##### Recommended tubing:

Order No.	Length		Temperature range
8 930 008	2 m	CR <sup>®</sup> tubing 8 mm inner dia.	-20 °C to 120 °C
8 930 010	2 m	CR <sup>®</sup> tubing 10 mm inner dia.	-20 °C to 120 °C
8 930 108	1 m	Viton tubing 8 mm inner dia.	-50 °C to 200 °C
8 930 110	1 m	Viton tubing 10 mm inner dia.	-50 °C to 200 °C
8 930 410	2 m	Insulation for tubing 8 mm or 10 mm inner dia.	-50 °C to 100 °C
8 930 209	0.5 m	Metal tubing, triple insulated, M16x1 *	-100 °C to +350 °C
8 930 210	1.0 m		
8 930 211	1.5 m		
8 930 214	3.0 m		
8 930 220	0.5 m	Metal tubing, insulated, M16x1 *	-50 °C to +200 °C
8 930 221	1.0 m		
8 930 222	1.5 m		
8 930 223	3.0 m		





\*) Adapter for metal tubing M10x1 on M16x1

Order No. 8 970 444



**Warning:**

Tubing:

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

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

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

Safety recommendations

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

### 3.3.3. External control

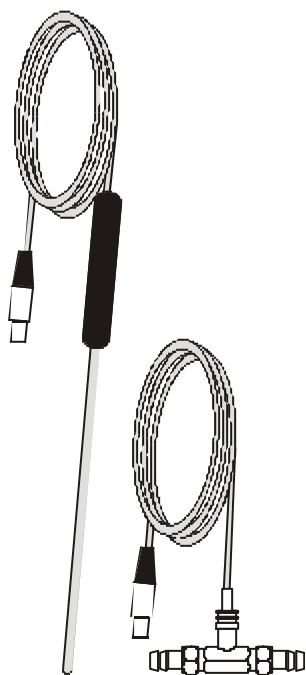


Pt100

The circulator is intended for internal and external temperature control. Switching is carried out in the submenu >Control< (see page 29)

**IMPORTANT:** Measures for external control

- ❗ For external control and temperature measurement an external Pt100 sensor must be connected to the socket (17) on the rear of the circulator.



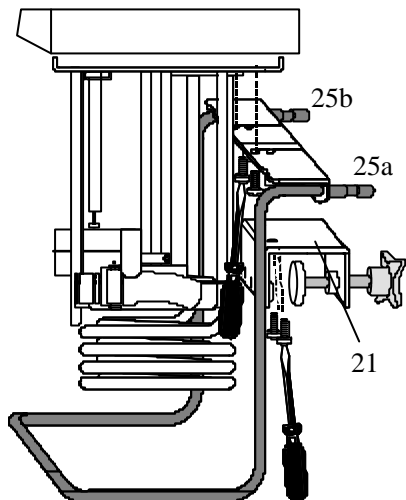
Pt100

M+R

Order No.	Description	Material	cable
8 981 003	200 x 6 mm dia.,	stainless steel	1.5 m
8 981 005	200 x 6 mm dia.,	glass	1.5 m
8 981 006	20 x 2 mm dia.,	stainless steel	1.5 m
8 981 010	300 x 6 mm dia.,	stainless steel	1.5 m
8 981 013	600 x 6 mm dia.,	stainless steel/Teflon	3 m
8 981 014	1200 x 6 mm dia.,	stainless steel/Teflon	3 m
8981103	Extension cable for Pt100 sensor		3.5 m
8 981 020	M+R in-line Pt100 sensor		

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

### 3.4. Countercooling



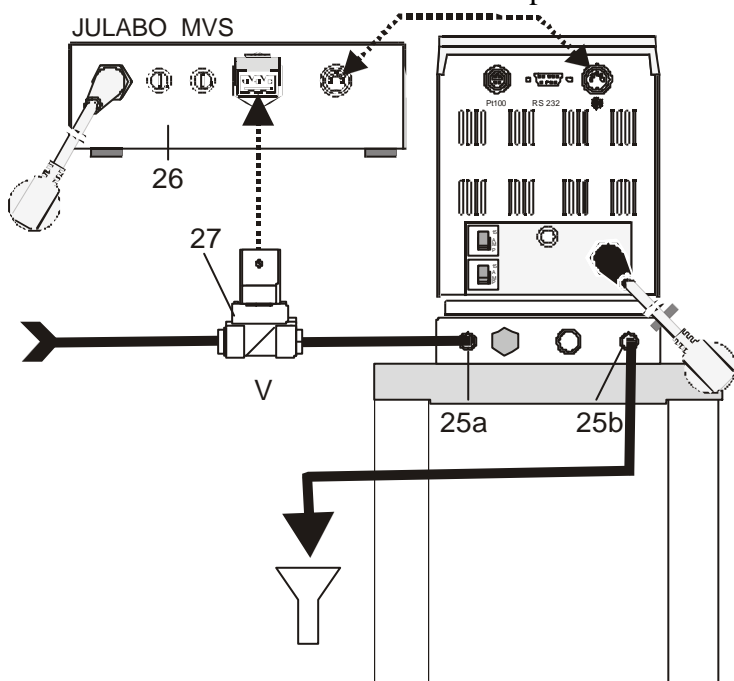
For applications near the ambient temperature, the cooling coil (order no. 8 970 105) must be connected to the water mains.

#### Mounting the cooling coil:

- Remove the bath attachment clamp (21).
- Screw the cooling coil to the circulator, and then fix the bath attachment clamp to the cooling coil.
- Thus the total immersion depth is reduced to 145 mm.
- Using tubing, connect the cooling coil (25a) to the tap water supply, and lead the tap water in a sink through the return connector (25b).

ⓘ A specific water flow rate of 100 ml/minute is sufficient to compensate for the characteristic temperature.

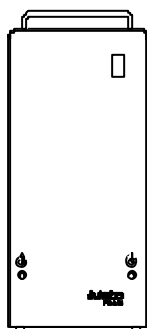
ⓘ For applications near ambient temperature (20 °C), the cooling water temperature should at least be 5 °C below the working temperature.



ⓘ By installing the MVS controller (26) and a solenoid valve (27), sudden temperature increases can be rapidly reversed by tap water flowing through the built-in cooling coil. For applications requiring constant near-ambient temperature, tap water is thus only used in small amounts. The circulator provides the necessary control pulse via the connector (15).

#### Cooling coil connectors (25a, 25b)

Order No.	Description
9 790 000	MVS controller
8 980 700	Solenoid valve



FD200 Flow-through cooler  
Order No. 9 655 825

The FD200 is suitable as cooling device for liquids in closed circuits (loops).

This unit is integrated in the return flow circuit from the external system connected to a circulator, and continuously withdraws heat from the liquid.



#### Caution:

Securely attach all tubing to prevent slipping.

## 4. Operating procedures

### 4.1. Power connection

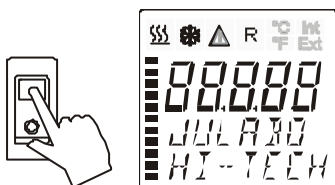


**Caution:**

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

Check to make sure that the line voltage matches the supply voltage specified on the identification plate. Deviations of  $\pm 10\%$  are permissible.

### 4.2. Switching on / Start - Stop



**Switching on:**

- Turn on the mains power switch (1).

① The unit performs a self-test.

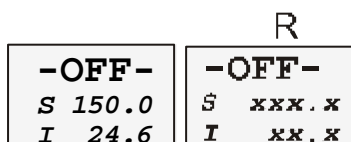
Then the software version (example: V 1.xx) appears. The display „OFF“ or „R OFF“ indicates the unit is ready to operate.

① The circulator enters the operating mode activated before switching the circulator off:

**keypad control mode** (manual operation)

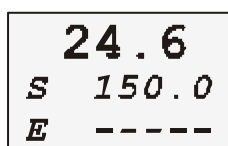
or

**remote control mode** (operation via personal computer).



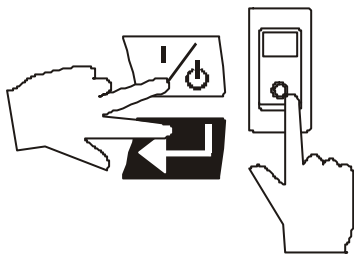
**Start:** Press the start/stop key .

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





**Stop:** Press the start/stop key .

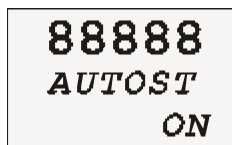
The VFD COMFORT-DISPLAY indicates the message „OFF“.



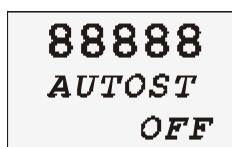
### AUTOSTART ON / OFF

- 1 Keep depressed enter  and the start/stop key 
- 2 and turn on the circulator with the mains power switch.

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



AUTOSTART on



AUTOSTART off

#### Note:

The temperature system has been configured and supplied by JULABO according to N.A.M.U.R. recommendations. This means for the start mode, that the unit must enter a safe operating state after a power failure (non-automatic start mode). This safe operating state is indicated by **OFF**, resp. **R OFF** on the VFD COMFORT-DISPLAY. A complete shutdown of the main functional elements such as heater and circulating pump is effected simultaneously.

The values set on the circulator remain stored, and the unit is returned to operation by pressing the start/stop key (in manual control mode).

In remote control mode, the values need to be reset by the PC via the interface.

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



#### **Warning:**

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

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


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

## 5. Setting the temperatures



Factory settings:

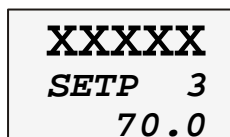
SETP 1 25 °C  
 SETP 2 37 °C  
 SETP 3 70 °C


Press the  key to call up the menu for temperature selection.

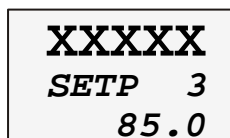
3 different working temperatures are adjustable. Their values are freely selectable within the operating temperature range.

**i** This setting may be carried out with the circulator being in the Start or Stop condition!



### Example: Setting working temperature "SETPoint 3"





1. Press the  key until the desired menu window is indicated on the VFD COMFORT-DISPLAY  
 Example: SETP 3 / 70.0 °C (last digit blinks)



2. **Change the value to 85 °C.**

Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.

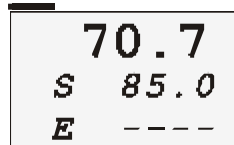
Use the increase/decrease arrows   to change the selected numeral (-, 0, 1, 2, 3, ... 9).  
 see example left: SETP 3 / 85.0.

3. Press enter  to store the value.

**i** In the >Start< condition this value is immediately used for controlling the working temperature.

The indication on the VFD COMFORT-DISPLAY is updated.

The heater control indicator blinks.


**Notice:** See SETMAX and SETMIN in chapter 7.5. MENU LIMITS




### Example: Selecting the working temperature



SETP 1  
 SETP 2  
 SETP 3


1. Press the  key until the desired menu item is indicated on the VFD COMFORT-DISPLAY.

2. Press enter .

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

## 6. Safety installations, warning functions



Settings for the excess temperature protection > SAFETMP< according to IEC 61010-2-010 and for the high > OVERTMP< and low > SUBTMP< temperature warning functions are made in a menu that is called up with the key .

- SAFETMP
- OVERTMP
- SUBTMP
- LIMITSR

Menu item > LIMITSR <: „Warning“ or „Alarm“

For the two menu items > OVERTMP< and >SUBTMP< choose between a warning message being signalled or a complete shutdown of the main functional elements such as heater and circulating pump being effected.

### 6.1. Excess temperature protection



This safety installation is independent of the control circuit. When the temperature of the bath fluid has reached the safety temperature, a complete shutdown of the heater and pump is effected.




The alarm is indicated by optical and audible signals (continuous tone) and on the VFD COMFORT-DISPLAY appears the error message "ALARM-CODE 14".




Setting range: 20 °C ... 320 °C



1. Press the  button until the menu item > SAFETMP < is displayed.

2. Set the new cut-out value using a screwdriver via the VFD COMFORT-DISPLAY (Example: 100 °C)

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



#### Recommendation:

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



#### Warning:

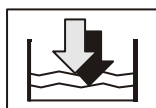


The excess temperature protection >SafeTemp< should be set at least 25 °C below the fire point of the bath fluid used.

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

We disclaim all liability for damage caused by wrong settings!

### 6.1.1. Early warning system, low level protection



(patented)

This low level protection is independent of the control circuit and is divided in two sections.

1. Switch in stage 1 recognizes a critical fluid level 😊.  
An audible warning (interval tone) sounds and a message appears on the VFD COMFORT-DISPLAY.

**XXXXXX**  
**WARNING**  
**CODE 40**

Refill bath fluid!

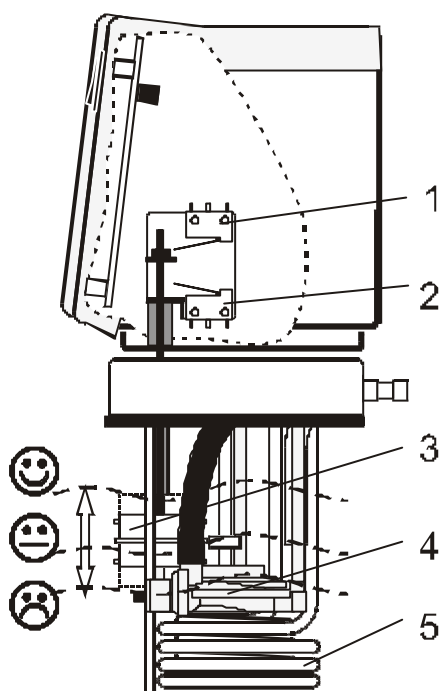
- Switch in stage 2 recognizes a low fluid level ☹️.

If stage 2 of the low level protection device (according to IEC 61010-2-010) is triggered, a complete shutdown of the heater and circulating pump is effected.

A continuous alarm tone sounds and a message >ALARM< >CODE 01< appears on the VFD COMFORT-DISPLAY.

**XXXXXX**  
**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

**Important:** Check the safety installations from time to time.  
See page 51



#### **Warning:**

For refill always use the same bath fluid type that is already in the bath.  
Bath oils must not contain any water contaminants and should be pre-heated to the actual bath temperature! Explosion hazard at higher temperatures!

## 6.2. Over and Sub temperature warning functions

Over temperature

```

XXX.X
OVERTMP
200.0
    
```

Sub temperature

```

XXXXX
SUBTMP
-94.9
    
```

Factory settings:

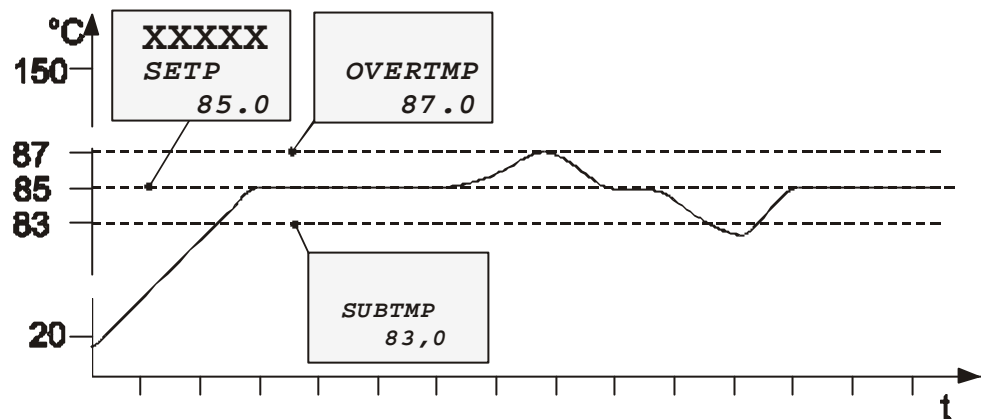
```







OVERTMP 305 °C
SUBTMP -94.9 °C
    
```

If for a sensitive temperature application task adherence to a working temperature value  $> \text{SETP} <$  is to be supervised, then set over and sub temperature warning values.

In the example below, the  $> \text{SETP} <$  of  $85\text{ °C}$  is surrounded by the values  $> \text{OVERTEMP} <$   $87\text{ °C}$  and  $> \text{SUBTEMP} <$   $83\text{ °C}$ . The electronics immediately registers when the actual temperature attains a temperature out of the limits and it follows a reaction according to what is set in the menu item  $> \text{LIMITSR} <$ .

(see chapter 6.2.1. Change-over of the warning function to shutdown function)



1. Press the  button until the menu item  $> \text{OVERTMP} <$  or  $> \text{SUBTMP} <$  is displayed.
2. Set value:
  - Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.
  - Use the increase/decrease arrows   to change the selected numeral (-, 0, 1, 2, 3, ... 9).
3. Press enter  to store the value.

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

### Recommendation::

Set the high temperature warning value  $> \text{OVERTMP} <$  at  $5\text{ °C}$  to  $10\text{ °C}$  above the working temperature setpoint.

Set the low temperature warning value  $> \text{SUBTMP} <$  at  $5\text{ °C}$  to  $10\text{ °C}$  below the working temperature setpoint.



### 6.2.1. Change-over of the warning function to shutdown function

For the two menu items > OVERTMP< and >SUBTMP< choose between a warning message being signalled or a complete shutdown of the main functional elements such as heater and circulating pump being effected (see page 24).

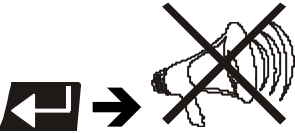
```

XXX.X
LIMITSR
WARNING
  
```

```

XXX.X
LIMITSR
ALARM
  
```

Factory setting:  
>WARNING<



- Setting >WARNING<

An audible warning (**interval tone**) sounds and a message appears on the VFD COMFORT-DISPLAY.

```

XXXXXX
WARNING
CODE 03
  
```

or

```

XXXXXX
WARNING
CODE 04
  
```

OVERTMP

SUBTMP

- Setting >ALARM<

A complete shutdown of heater and circulating pump is effected.

An audible alarm (**continuous tone**) sounds and a message appears on the VFD COMFORT-DISPLAY.

```

XXXXXX
ALARM
CODE 03
  
```





oer

```

XXXXXX
ALARM
CODE 04
  
```

OVERTMP








SUBTMP

1. Press the  button until the menu item >LIMITSR< is displayed.
2. Select the parameter with the keys  .
3. Press enter  to store the selected parameter.

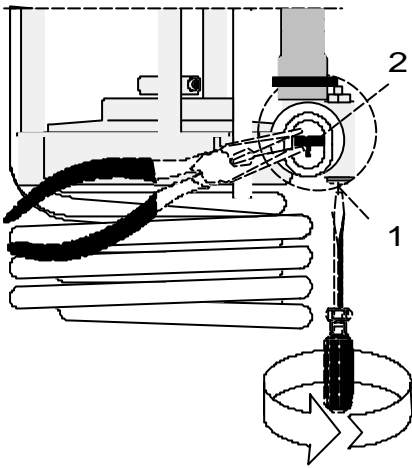
## 7. Menu functions



The term „menu functions“ refers to adjustments such as

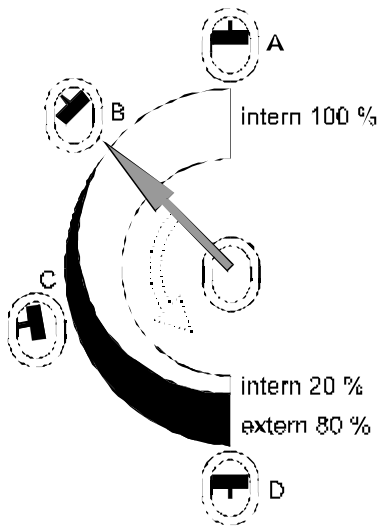
➤ <b>PUMP</b>		electronically adjustable pump capacity	page 27
➤ <b>CONTROL</b>		PID Cascade Control, control parameters CONTROL - internal or external control DYNAMIC - internal COSPEED - external Control parameters - XP, TN, TV internal Control parameters - XP, TN, TV, XPU external	page 29
➤ <b>CONFIG</b>		Configurationen of the unit SET (Setpoint) – keypad control or remote control OFF MODE – Motor on / off RESET – Factory settings TIME / DATE – Setting time and date	page 34
➤ <b>SERIAL</b>		Adjustable interface parameters BAUDRAT, H-SHAKE, PARITY (Baud rate, Handshake, Parity)	page 37
➤ <b>LIMITS</b>		Limits to temperature or capacity SET MAX / MIN - Maximum and minimum setpoint HEAT MAX - Adjusted maximum heating COOL MAX - Adjusted maximum cooling  INTERN MAX / MIN – Limitation of the working temperature range BAND HIGH / LOW – Band limit	page 38
➤ <b>PROGRAM</b>		Integrated programmer	page 40
➤ <b>ADJUST</b>		ATC - Absolute Temperature Calibration, Sensor calibration, 3-point calibration	page 44





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.



Beispiele:

### 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)

## 7.2. MENU CONTROL – Control parameters

XXXXXX  
MENU  
CONTROL

MENU

CONTROL: Press enter  to switch to menu level 2

MENU >CONTROL< (INT / EXT)  
 MENU >DYNINT< (APER / NORM)  
 MENU >XP INT< (0.1 ... 99.9)  
 MENU >TN INT< (1 ... 9999)  
 MENU >TV INT< (0 ... 999)

or

MENU >CONTROL< (INT / EXT)  
 MENU >COSPEED< (0 ... 5)  
 MENU >XP EXT< (0.1 ... 99.9)  
 MENU >TN EXT< (1 ... 9999)  
 MENU > TV EXT (0 ... 999)  
 MENU >XPU EXT< (0.1 ... 99.9)

### 7.2.1. CONTROL – internal / external control

XXX . X  
CONTROL  
INT





Factory setting:  
INT

The circulator is conceived for internal and external temperature control. Switching is carried out in this submenu. Depending on what is set, only the respective set of parameters is indicated.

Possible parameters:

**INT** internal temperature control  
**EXT** external temperature control with external Pt100 sensor

① The control type can only be adjusted in the -OFF- condition

1. Press the  button until the submenu >CONTROL< is displayed.
2. Select the parameter with the keys   (INT / EXT).
3. Press enter  to store the selected parameter.

Continue: Press  or 



Pt100

**IMPORTANT:**

Additional measures for external temperature control.

- ① Connect a Pt100 sensor to the socket on the rear of the circulator.
- ① Suggested adjustments for external temperature control:  
BAND HIGH / LOW and INTERN MAX / MIN  
see chapter > LIMITS < on page 38.
- ① Sensor calibration of the external Pt100 sensor is carried out in the >MENU / ADJUST<, in the submenu >ATC SEN / EXT< (see page 44).



**Notice:**

Place the external sensor into the bath medium and securely fix the sensor.

**7.2.2. DYN INT - Dynamic internal**



Factory setting: APER (aperiodic)

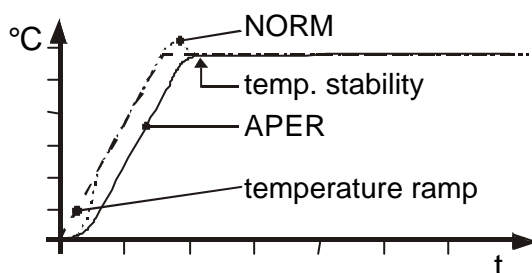
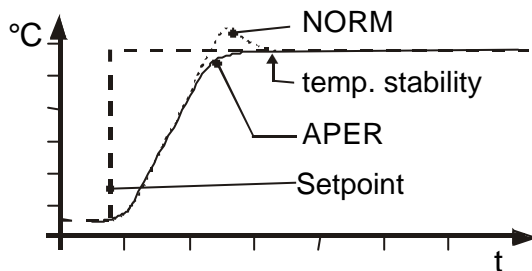
This parameter affects the temperature pattern only in case of **internal** control.

Possible parameters:

**NORM** Allows for reaching the setpoint faster, but overshooting of up to 5 % is possible.

**APER** Target temperature is attained without overshooting.

- ① With both adjustments an adequate temperature stability is reached after approximately the same time.



1. Press the **MENU** button until the submenu > DYN INT < is displayed.
2. Select the parameter with the keys **▼ ▲**.  
(NORM / APER)
3. Press enter **↵** to store the selected parameter.  
Continue: Press **ESC** or

### 7.2.3. Control parameters – XP, TN, TV internal

The control parameters preset in factory are in most cases adequate for achieving an optimum temperature pattern for the samples requiring temperature application.

Each parameter may be manually set via the keypad if necessary, to allow optimum control performance.

```

XXXXXXXX
XP INT
  1.0
  
```

Setting range:  
0.1 ... 99.9

```

XXXXXXXX
TN INT
  100
  
```

Setting range:  
1 ... 9999

```

XXXXXXXX
TV INT
  5
  
```

Setting range:  
0 ... 999

#### Proportional range >Xp<


The proportional range is the range below the selected temperature value in which the control circuit reduces the heating power from 100 % to 0 %.



#### Resetting time >Tn< (Integral component)

Compensation of the remaining control deviation due to proportional regulation. An insufficient resetting time may cause instabilities to occur. Excessive resetting time will unnecessarily prolong compensation of the control difference.

#### Lead time >Tv< (Differential component)

The differential component reduces the control settling time. An insufficient lead time will prolong the time required to compensate for disturbance effects and cause high overshooting during run-up. An excessive lead time could cause instabilities (oscillations) to occur.

1. Press the  button until the desired submenu is displayed - XP INT, TN INT, TV INT.
2. Set value:

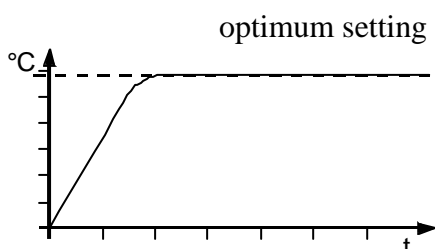
Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.

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

3. Press enter  to store the value.

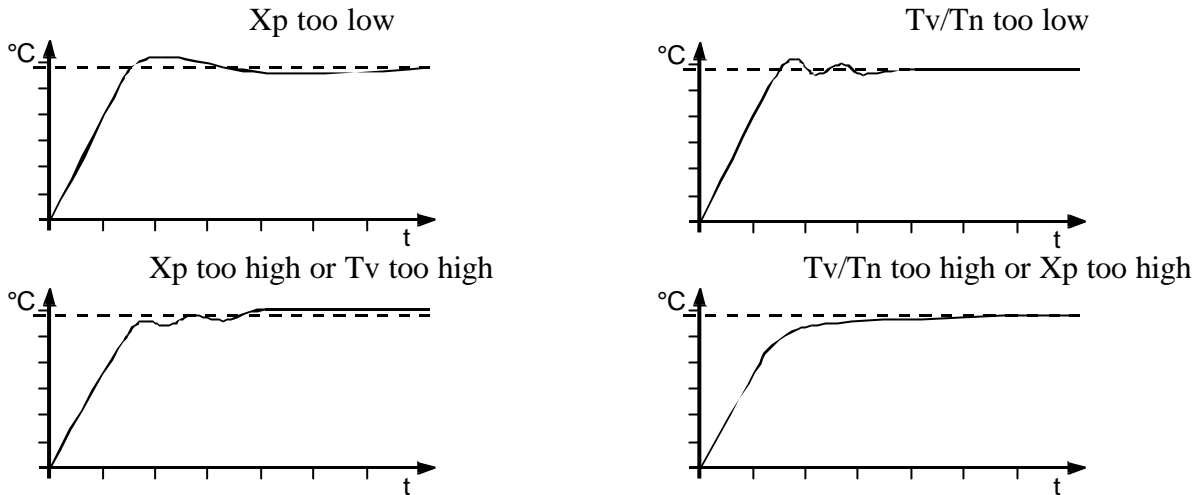
Continue: Press  /  or 

#### Optimization instructions for the PID control parameters: (internal and external)



The heat-up curve reveals inappropriate control settings.

**Inappropriate settings may produce the following heat-up curves:**




**7.2.4. COSPEED - external**





This parameter affects the temperature pattern only in case of **external** control.

Possible parameters: 0.0 ... 5.0

1. Press the  button until the submenu > COSPEED < is displayed.

2. Set value:

Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.

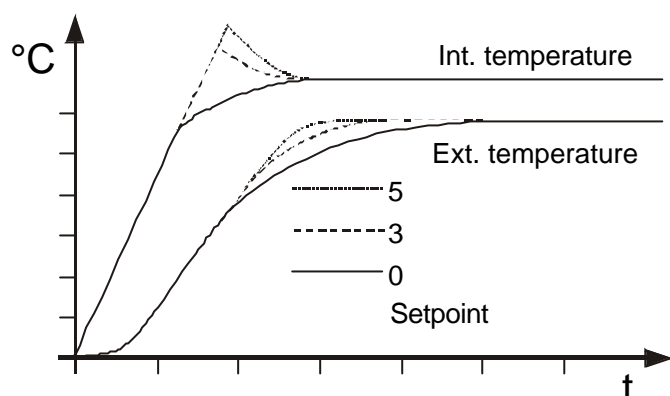
Use the increase/decrease arrows   to change the selected numeral (-, 0, 1, 2, 3, ... 9).

3. Press enter  to store the value.

Continue: Press  /  or 

During selftuning, the control parameters Xp, Tn and Tv of a controlled system are automatically determined and stored. Depending on the controlled system, time for tuning can be unequally longer. This controller layout allows protection of sensitive objects requiring temperature application.





As soon as a co-speed factor is set, it is considered for calculating the control parameters. As shown in the diagram, tuning times become shorter the higher the co-speed factor is, but overshooting can happen in the internal system.

### 7.2.5. Control parameters – XPU, XP, TN, TV external

The control parameters preset in factory are in most cases adequate for achieving an optimum temperature pattern for the samples requiring temperature application.

Each parameter may be manually set via the keypad if necessary, to allow optimum control performance.

```

XXXXXX
XP EXT
  0.7
  
```

Setting range:  
0.1 ... 99.9

```

XXXXXX
TN EXT
  720
  
```

Setting range:  
1 ... 9999

```

XXXXXX
TV EXT
  55
  
```

Setting range:  
0 ... 999

```

XXXXXX
XPU EXT
  5.0
  
```

Setting range:  
0.1 ... 99.9

1. Press the **MENU** button until the desired submenu is displayed - XP EXT, TN EXT, TV EXT, XPU EXT.

2. Set value:

Use the cursor keys **◀▶** to move left or right on the display until the numeral you wish to change blinks.

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

3. Press enter **↵** to store the value.

Continue: Press **MENU** / **ESC** or **🕒**

#### Proportional range >Xpu<

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

### 7.3. MENU CONFIG - configuration

XXXXX  
MENU  
CONFIG

MENU CONFIG: Press enter  to switch to menu level 2

MENU >SETP< (KEY / SERIAL)  
Keypad control or remote control

MENU >OFFMODE< (PMP OFF / PMP ON)  
Motor on / off

MENU >RESET< ( NO / YES ) Factory settings

MENU >TIME< (hh : mm ) Setting time

MENU >DATE< (TT/MM.JJ ) Setting date





EPROG\* Indication only when electronic module is mounted.

#### 7.3.1. SETPOINT – Keypad control or remote control

Werkseinstellung: KEY

XXXXX  
SETP  
KEY

The circulator provides three possibilities for setpoint setting.


**KEY** - Setpoint setting with the keys   and   or the integrated programmer.



**SERIAL** - Setpoint setting via the serial RS232 interface through a PC or superordinated data system..

**i** In the header of the VFD COMFORT-DISPLAY an „R“ illuminates. It indicates that remote control mode is set.



XXXXX  
SETP  
SERIAL

1. Press the  button until the submenu > SETP < is displayed.

2. Select the parameter with the keys   (KEY / SERIAL)

3. Press enter  to store the selected parameter.

Continue: Press  /  or 

 RS232

#### Important:

- i** Connect the circulator to a PC using an interface cable..
- i** Check the interface parameters of both interfaces (on circulator and PC) and make sure they match.  
(see chapter 11.1. Setup for remote control page 53)

### 7.3.2. OFF-MODE – Pump motor on / off








```
XXXXXX
OFFMODE
PMP OFF
```

Factory setting:  
PMP OFF

Normally the circulating pump is switched via the start/stop signal. However, if circulation should be maintained also for the -OFF- condition, the parameter >PMP ON< needs to be set.

Possible parameters:

**PMP ON** Pump motor on  
**PMP OFF** Pump motor off

1. Press the  button until the submenu > OFFMOD < is displayed.
  2. Select the parameter with the keys  .  
(PMP ON / PMP OFF)
  3. Press enter  to store the selected parameter.  
Continue: Press  /  or 
- ❶ In case of an alarm state, a shutdown of the pump motor is still effected.

### 7.3.3. RESET – Factory settings





```
XXXXXX
RESET
NO
```

Factory setting:  
NO

Use this to reset all values to factory setting (except date and time). A RESET can only be carried out in the -OFF- condition.

Possible parameters:

**NO / YES**

1. Press the  button until the submenu > RESET < is displayed.
2. Select the parameter with the keys   (NO / YES).
3. Press enter  to store the selected parameter.

```
XXXXXX
RESET
-RUN-
```

- ❶ As long as the message -RUN- appears all parameters a reset to factory settings.

### 7.3.4. TIME / DATE – setting time and date


The integrated clock allows starting a profile at any date and time. The clock is preset in the factory.

**XXXXXX**  
**TIME**  
**16h43.17**



hh mm

**XXXXXX**  
**DATE**  
**10/12.03**

TT/MM.JJ

1. Press the  button until the submenu > TIME < or > DATE < is displayed.

2. Setting time / date:

Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.

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

3. Press enter  to store the value.

Continue: Press  /  or 

**i** Clock: Only hours and minutes are set.  
Settings are checked for plausibility.

## 7.4. MENU SERIAL - BAUDRATE, HANDSHAKE, PARITY

```
XXXXXX
MENU
SERIAL
```

MENU SERIAL: Press enter  to switch to menu level 2

```
MENU >BAUDRAT<
```

```
MENU >PARITY<
```

```
MENU >H-SHAKE<
```

Factory settings:

4800 Bauds

even

hardware handshake

For communication between circulator and a PC or a superordinated process system the interface parameters of bath units must be identical.

### Adjustable interface parameters

```
XXXXXX
BAUDRAT
4800
```

**BAUDRATE**      4800 bauds  
                   9600 bauds  
                   19200 bauds  
                   38400 bauds





```
XXXXXX
PARITY
EVEN
```

**PARITY**            no  
                       odd  
                       even

```
XXXXXX
H-SHAKE
HARD
```

**HANDSHAKE**  
 SOFT =            software handshake  
 HARD =            hardware handshake


Data bits = 7; Stop bits = 1

1. Press the  button until the desired menu item is displayed.
2. Select the parameter with the keys  .
3. Press enter  to store the selected parameter.

Continue: Press  /  or 

## 7.5. MENU LIMITS

```
XXXXX
MENU
LIMITS
```

```
MENU LIMITS: Press enter  to switch to menu level 2
```

```
MENU >SET MAX<
```

```
MENU >SET MIN<
```

```
MENU >HEATMAX<
```

```
MENU >COOLMAX<
```


```
MENU >INT MAX<
```

```
MENU >INT MIN<
```



```
MENU >BAND H<
```

```
MENU >BAND L<
```

In case of external control these menu items are additionally indicated.

1. Press the  button until the desired submenu is displayed

2. Set value:


Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.

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

3. Press enter  to store the value.

Continue: Press  /  or 

**SETPOINT MAX / MIN** - Maximum and minimum setpoint  
Restriction for the adjustable temperature range.

The limitation of the operating temperature range effects the temperature setting under the menu called up with the  key.

It is possible to adjust only working temperatures that lie within the limit range set here.

Existing settings for SETP 1, 2, 3 and also for >OVERTEMP< and >SUBTEMP< (see page 24) are automatically deferred within the limit range.

Setting range:: -94.99 °C ... +200.0 °C

Factory settings

```
XXXXX
SET MAX
200.0
```

```
XXXXX
SET MIN
-94.99
```

Factory settings

```

XXXXXXXX
HEATMAX
  100

```

```

XXXXXXXX
COOLMAX
   0

```

Factory settings

```

XXXXXXXX
INT MAX
 200.0

```

```

XXXXXXXX
INT MIN
-94.99

```



&gt; SAFETMP &lt;

Factory settings:

```

XXXXXXXX
BAND H
  200

```

```

XXXXXXXX
BAND L
  200

```

**Adjusted maximum heating / cooling.**

Heating and cooling powers of the circulator are adjustable. 100 % corresponds to the values in the technical specifications of the equipment.

Setting range:**HEAT MAX** – 0 to 100 % in steps of 1 %**COOLING MAX** – 0 to 100 % in steps of 1 %**INTERNAL MAX / MIN** Limit settingSetting range: -94.9 °C ... +200.0 °C

The limits INT MAX and INT MIN are only valid for external control. INT MAX and INT MIN are used to limit the expected internal bath temperatures to any upper and lower values. The temperature controller cannot exceed these limits even if it would be required for reaching the temperature in the external system. Consequently the external setpoint may thus not be reached.

Sense of a limit setting:

- Protects the bath fluid from overheating.
- Prevents an undesired alarm shutdown by the excess temperature protection - >ALARM CODE 14<.  
Set >INTMAX:< to a value at least 5 °C below the >SAFETEMP:< value.
- 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.

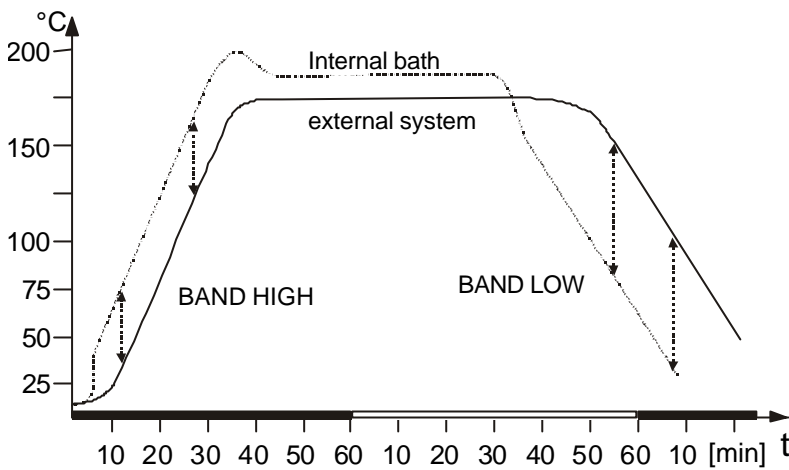
**BAND HIGH / LOW** - Band limit

For the heat-up and cool-down phases different settings to conform to the requirements of the particular application are possible.

Setting range: 0 ... 200 °C

Using **BAND HIGH** and **BAND LOW**, the difference between the temperatures in the internal bath and the external system can be limited to any maximum value for the heat-up or the cool-down phase. During the heat-up phase the difference value always adds to the actual external temperature. During the cool-down phase, the difference value is subtracted.

## Menu functions



Sense of a band limit:

- Ensures gentle heating for the objects requiring temperature application.
- Protects glass reactors, for example, from thermal shock.

The **INTMAX:** and **INTMIN:** values are superordinated to this band limit.

## 7.6. MENU PROGRAM – Integrated programmer

```
XXXXX
MENU
PROGRAM
```

1 Profil  
10 Sections (STEP)  
99 Repetitions

```
MENU
```

PROGRAM: Press enter  to switch to menu level 2

```
MENU
```

```
>PS STEP<
```

Program start at section ...

```
MENU
```

```
> PS RUNS <
```

Number of profile repetitions 1 ... 99

```
MENU
```

```
> PS GO <
```

Start type (NOW/TIME)

```
MENU
```

```
> P TIME <
```

Start time (hh:mm)

```
MENU
```

```
>P DATE<
```

Start date (TT/MM.JJ)

```
MENU
```

```
>PS END<
```

Status at the end of the profile (STBY/SETP)  
(Standby or last setpoint)

```
MENU
```

```
> PE STEP<
```

Edit profile (1 ... 10)

```
MENU
```

```
>Px SEP <
```

Target temperature of section ...

```
MENU
```

```
>Px TIM<
```

Time period of section ...

```
MENU
```

```
>Px DEL<
```

Delete a section (STEP) (YES/NO)

```
MENU
```

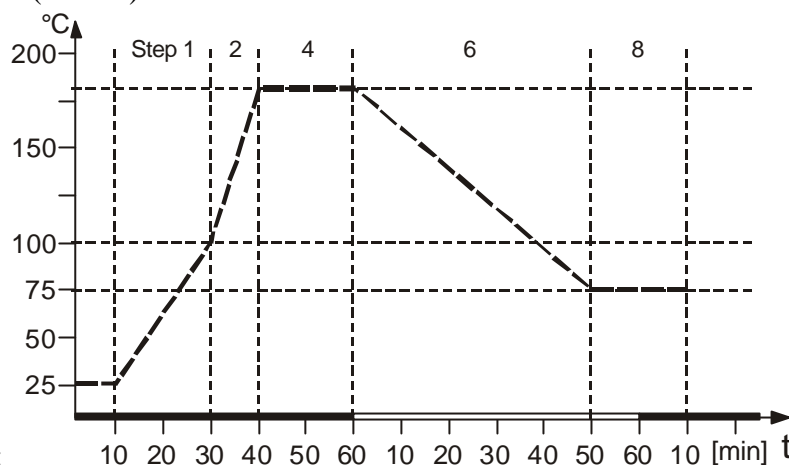
```
> PE DEL<
```

Delete a profile (YES/NO)


The integrated programmer allows any desired temperature program sequences to be realized. Such a temperature sequence is called profile. A profile consists of individual sections defined by duration (t:) and target temperature. Target temperature is the setpoint (T:), that is achieved at the end of a section. The programmer uses time and temperature difference values within a section to calculate a temperature ramp.





PE STEP (No.)	1	2	4	6	8
Px SEP (°C)	100	180	180	75	75
Px TIM (hh.mm)	00:20	00.10	00:20	00:50	00:20





Example:


1. Press the  button until the desired submenu is displayed.
2. Set value:

Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.

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

or

select the parameter with the keys  .

3. Press enter  to store the value / parameter

Continue: Press  /  or 

### Starting a profile

If a profile is stored, the programmer can be started with one of the 3 menu items.

```
XXXXXX
PS STEP
  1
```

>PS STEP< (1 ... 10)

Select the section with which the profile should be started. (STEP)

Example: STEP 1

```
XXXXXX
PS RUNS
 10
```

>PS RUNS< (1 ... 99)

Select the number of profile repetitions. Example: RUNS 10

The profile is repeated 10 times.

```
XXXXXX
PS GO
  TIME
```

>PS GO<

The profile can be started immediately with the parameter (NOW), or at the set time with the parameter (TIME).

Example below: 19 December 2003 14:25 hrs

### The started programmer


The started programmer indicates the actually calculated setpoint S XX.X in line 2. This value increases within the time period >Px TIM< until the target temperature >Px SEP< of the section is reached.

If time in a section is set to „0“, the next section starts only as soon as the target temperature is reached.

Use the edit keys ▼ ▲ to scroll in line 3. The display changes in intervals of approx. 4 seconds between the valid section (STEP X) and

	XXXXXX S XX.X STEP X
A	S XX.X XXhXXxx
B	S XX.X XXhxx
C1	S XX.X I xxx.x
C2	S XX.X E xxx.x
D1	S XX.X RUN
D2	S XX.X PAUSE


- A Remaining time of the valid section or
- B Remaining total time: Profile x number of repetitions or
- C Actual bath temperature
  - I xxx.x – internal actual value or
  - E xxx.x – external actual value
- D RUN – the programmer is started or

PAUSE – the profile was interrupted with the key . Time is stopped and the temperature is maintained constant at the last calculated setpoint value.

Continue: Press 

### Interrupting / Termination of a profile

-OFF-
S xxx.x
I xx.x

❶ A profile can be terminated by pressing .

❶ Power failure with the programmer started:

– The reaction of the circulator is the same as when switched off and on again with the mains switch. The VFD COMFORT-DISPLAY indicates "OFF".

– If the AUTOSTART function is activated, the programmer starts again at a point approx. 20 seconds before the interruption took place. However, an uncontrolled change of the bath temperature happened.

### Setting time/date for the start

XXXXXX
TIME
14h25ss

>TIME<

Enter the start time. Example: 14:25 hrs

XXXXXX
DATE
19/1203

>DATE<

Enter the start date. Example: 19 December 2003

❶ Check the setting of the internal real time clock (see page 36).

### Status at the end of the profile

XXXXXX
PS END
SETP

>PS END< (STBY / SETP)

Set the status for the end of the profile.





With the parameter **ST**and**BY** the circulator enters the –OFF– state.

With the parameter **SETP**oint the circulator maintains the temperature at the value of the last section.

### Compiling profiles, indicating sections

Example: Section 2






```
XXXXXX
PE STEP
  2
```

- 1 Press the  button until the submenu >PE STEP x< is displayed.
  - 1.1 Use the increase/decrease arrows   to set the number of the desired section (1, 2, 3, ... 10).
  - 1.2 Press  to enter menu level 3.

#### Menu level 3:






- 2 Submenu >Px SEP< (SETPOINT)  
Set a temperature value: Example: 180 °C

```
XXXXXX
P2 SEP
 180.0
```

- 2.1 Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.
- 2.2 Use the increase/decrease arrows   to change the selected numeral (-, 0, 1, 2, 3, ... 9).
- 2.3 Press enter  to store new the value.

- 2.4 Continue: Press 

- 3 Submenu >Px TIM< (TIME)  
Set a time. Example: 10 minutes.


- 3.1 Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.
- 3.2 Use the increase/decrease arrows   to change the selected numeral (-, 0, 1, 2, 3, ... 9).
- 3.3 Press enter  to store new the value.

- 3.4 Continue: Press 

- 4 Submenu >Px DEL< (DELETE)  
Standard setting (NO)

Set the parameter to YES to delete the values in this section.

- 4.1 If necessary, use the arrows   to set the parameter to YES and press .

- 5 Press  to return to submenu >Px SEP< in menu level 3.

Or

- 6 Press  to return to submenu >PE STEP x< in menu level 2.

```
XXXXXX
P1 xxx
  ---.-
```



- ① Sections without value or time indication (including the value 0) are skipped. But they can be integrated in the profile at a later time.  
Example: Section 1

### Deleting a profile

```
XXXXXX
PE DEL
  YES
```

- >PE DEL< (YES/NO)

Set the parameter to YES to delete **all sections** >PE STEP / 1 to 10<.

## 7.7. MENU ADJUST – ATC Absolute Temperature Calibration

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.

**XXXXXX**  
**MENU**  
**ADJUST**

MENU

**ADJUST: Press enter  to switch to menu level 2**

MENU

>ATC SEN <

(INT)

or

(EXT)

MENU

> ATCSTAT <

(ON or OFF)

MENU

> ATCSTAT <

(ON or OFF)

MENU

>C ART

>1- point <-, >2- point <- or >3- point <- calibration

MENU

>C ART

MENU

> TTEMP 1<

MENU

> CTEMP 1<

MENU

> TTEMP 1<

MENU

> CTEMP 1<

MENU

> TTEMP 2<

MENU

> CTEMP 2<

MENU

> TTEMP 2<

MENU

> CTEMP 2<

MENU

> TTEMP 3<

MENU

> CTEMP 3<



MENU

> TTEMP 3<

MENU



> CTEMP 3<


1. Press the MENU button until the desired submenu is displayed.
2. Set value /parameter:

Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.

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

or

select the parameter with the keys  .

3. Press enter  to store the value / parameter

Continue: Press MENU / ESC or 

## ATC SENSOR - INTERNAL / EXTERNAL

```

XXX.X
ACT SEN
  INT

```

In the first submenu the ATC function is set for the >INT< internal or >EXT< 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“.

```

XXX.X
ACT SEN
  EXT

```

The circulator is able to store both parameter sets. However, only the one set under this menu item is indicated.

## ATC STATUS - ON / OFF

```

XXX.X
ATCSTAT
  OFF

```

In the second submenu the ATC function for the temperature sensor selected above is activated >ON< or deactivated >OFF<.

>OFF< The controller of the circulator uses the original curve of the temperature sensor.

**Important:** During the calibration process > OFF < needs to be set.

```

XXX.X
ATCSTAT
  ON

```

>ON< The controller of the circulator uses the new calibration curve.

❶ In the ATC STATUS > ON<, the ATC calibration curve always affects the effective working temperature (also the one set via the interface).

## Calibration type

## CALIBRATION ART: 1, 2, 3-point calibration

```

XXX.X
C  ART
x POINT

```

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

First geometrically define the location for calibration (measuring point  $T_M$ ), then determine the temperature values of the calibration points.

The calibration type also determines the number of pairs of values indicated on the VFD COMFORT-DISPLAY.

## 2 values per calibration point

```

XXX.X
TTEMP 1
x 80.0

```

```

XXX.X
CTEMP 1
x 79.7

```

**TTEMP X:** Temperature on circulator ( $T_T$ ) 1 or 2 or 3

Defined temperature value of the calibration point.

This value is simultaneously stored with > CTEMP < and can be indicated for control purposes.

```

XXX.X
TTEMP 2
x 120.0

```

```

XXX.X
CTEMP 2
x 119.5

```

**CTEMP X:** Calibration temperature 1 or 2 or 3

The „Calibration value“ is determined with a temperature measuring device and stored under menu item > CTEMP <.

```

XXX.X
TTEMP 3
x 160.0

```

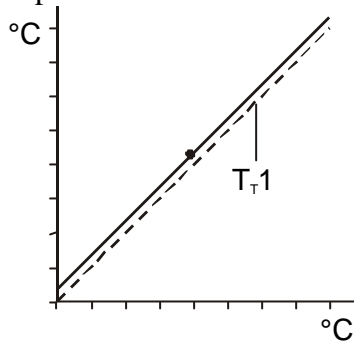
```

XXX.X
CTEMP 3
x 159.3

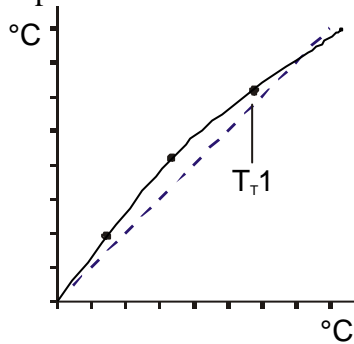
```

Example:

1-point calibration



3-point calibration

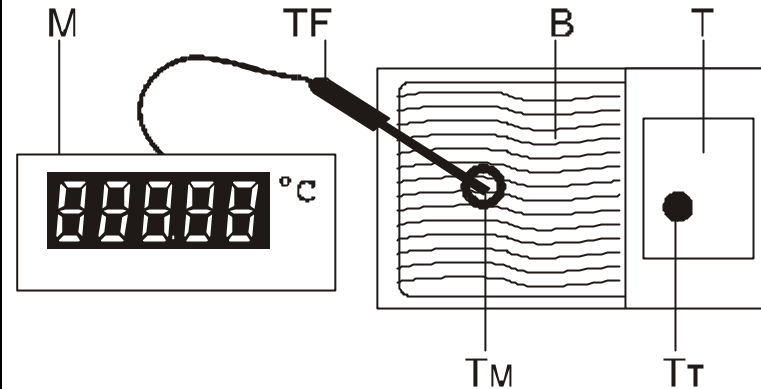


$T_T 1$  = Original curve

**Principle:**

For ATC calibration, in steady state the bath temperature at the location of the temperature sensor ( $T_M$ ) 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 (TF)

B = Bath tank with T = circulator

$T_M$  = Temperature on measuring point

$T_T$  = Temperature on circulator

**Example:**

3-point calibration for internal control.

In the temperature range of 80 °C to 160 °C the calibration curve of the temperature sensor ( $T_T$ ) should be assimilated to the actual temperatures on the measuring point ( $T_M$ ).

**Set controller to internal control:**

ⓘ The control type can only be adjusted in the -OFF- condition

1. Press the **MENU** button until the menu item >MENU / CONTROL< is displayed and press enter **↵**.

1.1. Under the menu >CONTROL< set the parameter to >INT< and press enter **↵** (see page 29).

Continue: Press **ESC**.

2. Press the start/stop key **⏻**.

**Setting working temperature SETP:**

3. Press **T** and set the first temperature value under >SETPoint 1< for example (example 1<sup>st</sup> value = 80 °C).

3.1. Wait until this temperature is maintained constant in the bath for about 5 minutes.

```
XXXXX
MENU
CONTROL
```

```
XXX.X
CONTROL
INT
```

```
XXX.X
SETP 1
80.0
```

```
XXXXX
MENU
ADJUST
```

```

XXX.X
ACT SEN
INT

```

```

XXX.X
ATCSTAT
OFF

```

```

XXX.X
C ART
3 POINT

```

```

XXX.X
CTEMP 1
I 79.7

```

```

XXX.X
TTEMP 1
I 80.0

```

↑ „I“ for internal control

### Examples:

$T_T = 80.0 \text{ }^\circ\text{C}$

$T_M = 79.7 \text{ }^\circ\text{C}$



$T_T = 120.0 \text{ }^\circ\text{C}$

$T_M = 119.5 \text{ }^\circ\text{C}$







$T_T = 160.0 \text{ }^\circ\text{C}$

$T_M = 159.3 \text{ }^\circ\text{C}$

### Calibration procedure:

4. Press the  button until the menu item > MENU / ADJUST < is displayed and press enter .
  - 4.1. Set menu item >ATC SEN< to >INT< ,
  - 4.2. Set menu item >ATCSTAT< to >OFF< ,
  - 4.3. Set menu item >C ART< to >3 POINT <.


ⓘ These 3 settings are maintained for the length of the 3-point calibration procedure.
5. Read the value of  $T_M$  on the temperature measuring device and enter the respective value under menu item > CTEMP 1<
  - 5.1. Set value: (79.7 °C)
 

Use the cursor keys   to move left or right on the display until the numeral you wish to change blinks.  
Use the increase/decrease arrows   to change the selected numeral (-, 0, 1, 2, 3, ... 9).
  - 5.2. Press enter  and the circulator also stores the value of  $T_T$  as value for >TTMP 1< (80.0 °C) .  
The first of the 3 points is now calibrated.  
Continue: Press .
6. Repeat the calibration procedure for 120 °C and 160 °C. (point 3. to 5.).

## 8. Troubleshooting guide / Error messages

**XXXXXX**  
**ALARM**  
**CODE 01**




**Alarm** with a complete shutdown of the unit  
Whenever the microprocessor electronics registers a failure, a complete shutdown of the heater and circulating pump is performed. The alarm light „“ illuminates and a continuous signal tone sounds.  
The VFD COMFORT-DISPLAY indicates the cause for the alarm in form of a code.

**XXXXXX**  
**WARNING**  
**CODE 40**

**Warning** without a complete shutdown of the unit  
The VFD COMFORT-DISPLAY indicates the cause for the warning in form of a code and an acoustic signal sounds in regular intervals.  
These messages appear every 10 seconds.



Press enter  to quit the audible signal.

**ALARM**  
**CODE 01**

- The circulator is operated without bath fluid, or the liquid level is insufficient. Replenish the bath tank with the bath fluid.
- Tube breakage has occurred (insufficient filling level due to excessive bath fluid pumped out). Replace the tubing and replenish the bath tank with the bath fluid.
- The float is defect (e. g., because damaged in transit). Repair by authorized JULABO service personnel.

**ALARM**  
**CODE 02**

- During the self-test after switch-on a short-circuit is registered between pin 2 and pin 4 of the control cable or the control cable is interrupted during operation.  
Reconnect the cable or eliminate the short-circuit.

**WARNING**  
**CODE 03**

- Excess temperature warning  
or  
Excess temperature alarm

**ALARM**  
**CODE 03**

**Warning type:** Set to >Warning< or >Alarm< (see page 25)

**WARNING**  
**CODE 04**

- Low temperature warning  
or  
Low temperature alarm.

**ALARM**  
**CODE 04**

**Warning type:** Set to >Warning< or >Alarm< (see page 25)

**ALARM**  
**CODE 05**

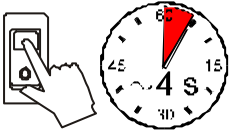
- Cable of the working temperature sensor interrupted or short-circuited.

**ALARM**  
**CODE 06**

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




<b>ALARM CODE 07</b>	<ul style="list-style-type: none"> <li>• Other errors (I<sup>2</sup>C-BUS errors)</li> </ul>
<b>ALARM CODE 12</b>	<ul style="list-style-type: none"> <li>• Error in A/D converter</li> </ul>
<b>ALARM CODE 14</b>	<ul style="list-style-type: none"> <li>• Excess temperature sensors defect.</li> <li>• The excess temperature value lies below the working temperature setpoint. Set the excess temperature to a higher value.</li> </ul>
<b>ALARM CODE 15</b>	<ul style="list-style-type: none"> <li>• External control selected, but external Pt100 sensor not connected or defect.</li> </ul>
<p>❗ Error messages 20 to 25 only appear in combination with refrigerating machines!</p>	
<b>WARNING CODE 20</b>	<ul style="list-style-type: none"> <li>• Cooling of the condenser is affected. Clean air-cooled condenser. Check the flow rate and cooling water temperature on water-cooled condenser.</li> </ul>
<b>WARNING CODE 21</b>	<ul style="list-style-type: none"> <li>• Compressor stage 1 does not work. After a short cooling interval, the compressor motor will be automatically reconnected and the message "CODE 21" no longer appears.</li> </ul>
<b>WARNING CODE 22</b>	<ul style="list-style-type: none"> <li>• Compressor stage 2 does not work.</li> <li>• <u>Cooling compressor overload protection</u> The motor of the cooling compressor is equipped with an overload protector, which will be activated by excessive temperature in the capsule or by excessive current consumption.</li> <li>• Causes for motor disconnection: <ul style="list-style-type: none"> <li>- poor air circulation</li> <li>- small distance to walls</li> <li>- dirt accumulated on condenser</li> <li>- high ambient temperature</li> <li>- switch-off and on for short intervals</li> </ul> </li> </ul>
<b>WARNING CODE 23</b>	<ul style="list-style-type: none"> <li>• Excess temperature in stage 1 of the compressor.</li> </ul>
<b>WARNING CODE 24</b>	<ul style="list-style-type: none"> <li>• Excess temperature in stage 2 of the compressor.</li> </ul>
<b>WARNING CODE 25</b>	<ul style="list-style-type: none"> <li>• Short-circuit in the control cable for the refrigerating machine during self-test.</li> </ul>
<b>ALARM CODE 33</b>	<ul style="list-style-type: none"> <li>• Cable of the excess temperature sensor interrupted or short-circuited.</li> </ul>
<b>WARNING CODE 40</b>	<ul style="list-style-type: none"> <li>• The early warning system for low level signals a critical fluid level. Replenish the bath tank with the bath fluid.</li> </ul>



After eliminating the malfunction, press the mains power switch off and on again to cancel the alarm state.  
If the unit cannot be returned to operation, contact an authorized JULABO service station.



Special message „CONFIGURATION ERROR“  
The configuration of the circulator does not conform to its present use.

Press enter  to automatically perform a single modification of the configuration.

Then contact an authorized JULABO service station.

**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 fuses

The mains fuses on the rear of the unit are safety cutouts – 15A.

## 9. Safety recommendations

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



- Connect the unit only to a grounded mains power socket!
- Place the instrument on an even surface on a pad made of **non-inflammable** material.
- Do not stay in the area below the unit.
- Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit.
- Observe the fire point of the bath medium used.  
The excess temperature protection should be set at least 25 °C below the fire point.
- Never operate the unit without bath fluid in the bath.
- Pay attention to the thermal expansion of bath oil during heating to avoid overflowing of the fluid.
- Prevent water from penetrating into the hot bath oil.
- Exercise caution when emptying hot bath fluids!  
Check the temperature of the bath fluid prior to draining (by switching the unit on for a short moment for example).
- Observe the limited working temperature range when using plastic bath tanks.
- Employ suitable connecting tubing.  
Make sure that the tubes are securely attached.
- Never operate damaged or leaking equipment.
- Always turn off the unit and disconnect the mains cable from the power source before performing any service or maintenance procedures, or before moving the unit.
- Always empty the bath before moving the unit.
- Never operate equipment with damaged mains power cables.



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



### **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 shutdown point (actual temperature).
- Low level protection according to IEC 61010-2-010  
To check the function of the float, it can be manually lowered with a screwdriver for example.

## 10. Electrical connections

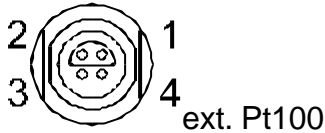


**Notice:**

Use shielded cables only.

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

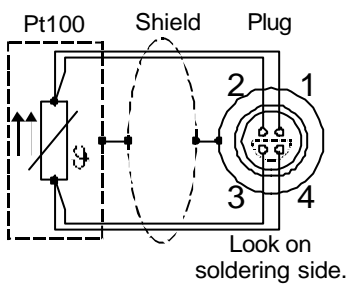
The unit ensures safe operation if connecting cables with a maximum length of 3 m are used. The use of longer cables does not affect proper performance of the unit, however external interferences may have a negative impact on safe operation.



**Socket for external Pt100 sensor**

Pin assignment:

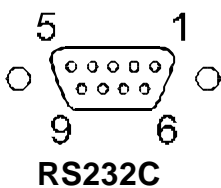
Pin	Signal
1	I+
2	U+
3	U-
4	I-



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 6	DTR	Data terminal ready
Pin 7	RTS	Request to send
Pin 8	CTS	Clear to send

RS232 interface cable 9-pin / 9-pin, 2.5 m  
Order No.: 8 980 073

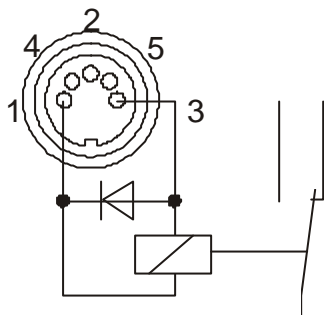


☼ / Control output



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

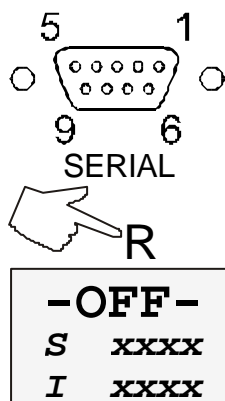


Pin assignment:

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

## 11. Remote control

### 11.1. Setup for remote control



1. Check the interface parameters for both interfaces (on circulator and PC) and make sure they match.  
(Serial interface see page 37)
2. In the menu > MENU / CONFIG < set the menu item > SETPoint < to > SERIAL <.  
(see 7.3.1. SETPOINT – Keypad control or remote control on page 34)
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.

## 11.2. 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: After a power interruption the order to start and all values which have to be adjusted must be resent from the personal computer via the interface.

AUTOSTART is not possible.

A transfer sequence consists of:

- command
- space (↔; Hex: 20)
- parameter (the character separating decimals in a group is the period)
- end of file (↵; Hex: 0D)

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

**in** commands: asking for parameters to be displayed

**out** commands: setting parameters



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

Command to set the working temperature > SETP 1< to 55.5 °C  
**out\_sp\_00** ⤴ 55.5⤵

Command to ask for the working temperature > SETP 1<  
**in\_sp\_00**⤵

Response from the circulator:  
55.5⤵

### 11.3. List of commands

**out commands:** Setting temperature values or parameters.

Command	Parameter	Response of circulator
out_mode_01	0	Use working temperature > SETP 1<
out_mode_01	1	Use working temperature > SETP 2<
out_mode_01	2	Use working temperature > SETP 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. „SETP 1“
out_sp_01	xxx.xx	Set working temperature. „SETP 2“
out_sp_02	xxx.xx	Set working temperature. „SETP 3“
out_sp_03	xxx.xx	Set high temperature warning limit „OVERTEMP“
out_sp_04	xxx.xx	Set low temperature warning limit „SUBTEMP“
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. 0 ... 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. 0 ... 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.

Remote control

Command	Parameter	Response of circulator
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 57)
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 „SETP 1“
in_sp_01	none	Working temperature „SETP 2“
in_sp_02	none	Working temperature „SETP 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.





Command	Parameter	Response of circulator
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)
in_mode_01	none	Selected setpoint: 0 = SETP 1 1 = SETP 2 2 = SETP 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

#### 11.4. Status messages

Status messages	Description
<b>00 MANUAL STOP</b>	Circulator in „OFF“ state.
<b>01 MANUAL START</b>	Circulator in keypad control mode.
<b>02 REMOTE STOP</b>	Circulator in „r OFF“ state.
<b>03 REMOTE START</b>	Circulator in remote control mode.

## 11.5. Error messages

Error messages	Description
<b>-01 LOW LEVEL ALARM</b>	Low liquid level alarm.
<b>-02 REFRIGERATOR ALARM</b>	Control cable of the refrigerated circulator or MVS solenoid valve controller short-circuited or interrupted.
<b>-03 EXCESS TEMPERATURE WARNING</b>	High temperature warning.
<b>-04 LOW TEMPERATURE WARNING</b>	Low temperature warning.
<b>-05 WORKING SENSOR ALARM</b>	Working temperature sensor short-circuited or interrupted.
<b>-06 SENSOR DIFFERENCE ALARM</b>	Sensor difference alarm. Working temperature and safety sensors report a temperature difference of more than 25 °C.
<b>-07 I<sup>2</sup>C-BUS ERROR</b>	Internal error when reading or writing the I <sup>2</sup> C bus.
<b>-08 INVALID COMMAND</b>	Invalid command.
<b>-09 COMMAND NOT ALLOWED IN CURRENT OPERATING MODE</b>	Invalid command in current operating mode.
<b>-10 VALUE TOO SMALL</b>	Entered value too small.
<b>-11 VALUE TOO LARGE</b>	Entered value too large.
<b>-12 TEMPERATURE MEASUREMENT ALARM</b>	Error in A/D converter.
<b>-13 WARNING : VALUE EXCEEDS TEMPERATURE LIMITS</b>	Value lies outside the adjusted range for the high and low temperature warning limits. But value is stored.
<b>-14 EXCESS TEMPERATURE PROTECTOR ALARM</b>	Excess temperature protector alarm 
<b>-15 EXTERNAL SENSOR ALARM</b>	External control selected, but external Pt100 sensor not connected.
<b>-20 WARNING: CLEAN CONDENSOR OR CHECK COOLING WATER CIRCUIT OF REFRIGERATOR</b>	Cooling of the condenser is affected. Clean air-cooled condenser. Check the flow rate and cooling water temperature on water-cooled condenser.
<b>-21 WARNING: COMPRESSOR STAGE 1 DOES NOT WORK</b>	Compressor stage 1 does not work.
<b>-22 WARNING: COMPRESSOR STAGE 2 DOES NOT WORK</b>	Compressor stage 2 does not work.
<b>-23 WARNING: HIGH TEMPERATURE ON COMPRESSOR STAGE 1</b>	Excess temperature on compressor stage 1.
<b>-24 WARNING: HIGH TEMPERATURE ON COMPRESSOR STAGE 2</b>	Excess temperature on compressor stage 2.

Error messages	Description
<b>-25 REFRIGERATOR WARNING</b>	Error in the cooling machine.
<b>-30 CONFIGURATION ERROR: CONFIRM BY PRESSING &lt;ENTER&gt; ON CIRCULATOR</b>	The configuration of the circulator does not conform to its present use. Press enter  to automatically perform a single modification of the configuration.
<b>-33 SAFETY SENSOR ALARM</b>	Excess temperature sensor short-circuited or interrupted.
<b>-40 NIVEAU LEVEL WARNUNG</b>	Low liquid level warning in the internal reservoir.

## 12. JULABO Service – Online remote diagnosis

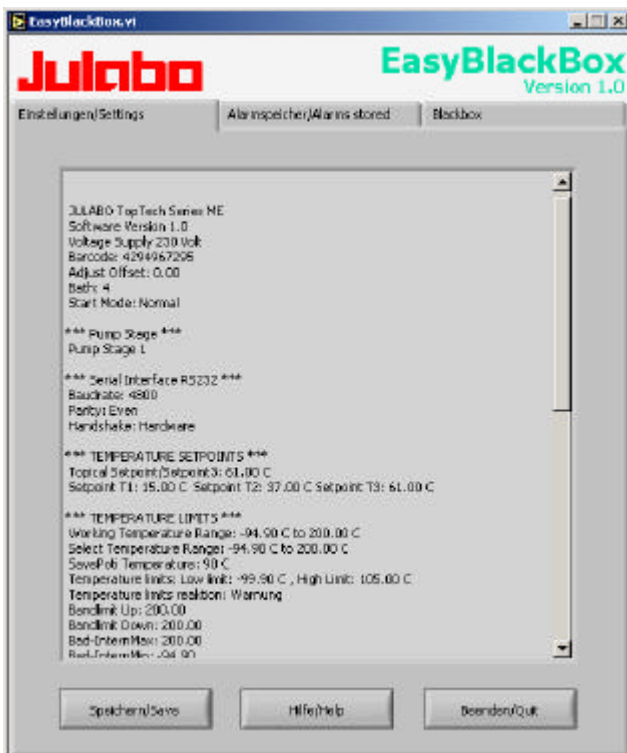
JULABO circulators of the HighTech series are equipped with a so-called black box. This box is implemented in the controller and records all significant data for the last 30 minutes.

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

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



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



- Data is read out and shown on the monitor divided in the sections  
>Einstellungen/Settings<,  
>Alarmspeicher/Alarms stored<,  
>Blackbox<  
  
← see example
- After pressing >Speichern/Save< a text file is compiled. The program proposes a filename - >C:\model description and barcode no.<. Modifications are possible.
- E-mail this file to [service@julabo.de](mailto:service@julabo.de), JULABO's service department. JULABO is thus able to provide rapid support.

## 13. Cleaning the unit

**Caution:**

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

For cleaning the bath tank and the immersed parts of the circulator, use low surface tension water (e.g., soap suds).

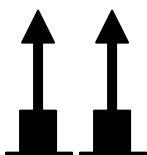
Clean the outside of the unit using a wet cloth and low surface tension water.

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.