## **OPERATING MANUAL**

# ME

# Refrigerated and Heating Circulators

F25-ME

F26-ME

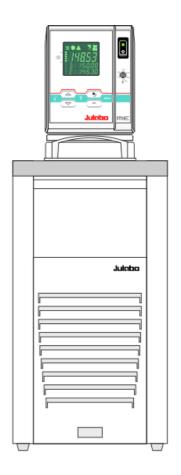
F32-ME

F33-ME

F34-ME

FP40-ME

FP50-ME



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#### Congratulations!

You have made an excellent choice.

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

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

#### **Quality Management System**



#### The JULABO Quality Management System:

Temperature control devices for research and industry are developed, produced, and distributed according to the requirements of DIN EN ISO 9001:2000. Certificate Registration No. 01 100044846

#### Unpacking and inspecting

Unpack the circulator and accessories and inspect them for possible transport damage. Damage should be reported to the responsible carrier, railway, or postal authority, and a damage report should be requested. These instructions must be followed 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.

**1.953.0512 BU0 06/10** Printed in Germany Changes without prior notification reserved

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### **Operating manual**

#### 1. Intended use

JULABO circulators have been designed to control the temperature of specific fluids in a bath tank. The units feature pump connections for temperature control of external systems (loop circuit).



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

#### 1.1. Description













Pt100







- ☑ The circulators are operated via the splash-proof keypad. The microprocessor technology allows different values to be set, stored, and displayed on the VFD COMFORT-DISPLAY. Three menu keys facilitate the adjustment of setpoints, warning and safety functions, and menu functions.
- ☑ Temperature- and time-dependent processes can be stored and executed using the integrated programmer.
- ☑ The adjustable PID cascade temperature control automatically adjusts the heat supply to the thermal requirements of the bath.
- Absolute Temperature Calibration (ATC3) provides high temperature stability at all points in the bath. With the 3-point calibration, an offset is adjusted at three temperatures to ensure an accurate temperature pattern at the selected spot in the bath over the entire temperature range.
- ☑ Electrical connections:

RS232 interface for modern process technology without an additional interface. Connection for external Pt100 sensor for external temperature measurement and control.

Alarm output for external alarm message or control of JULABO refrigerating baths or solenoid valve (cooling water).

- The excess temperature protection according to IEC 61010-2-010 is a safety device independent from the control circuit. Its safety value can be displayed and adjusted on the VFD COMFORT-DISPLAY.
- The early warning system for low level signals that bath fluid needs to be refilled before the low level protection according to IEC 61010-2-010 triggers a safety shutdown of the main functional elements.
- ☑ Intelligent pump system: the pump capacity (electronically adjustable via the motor speed) can be adapted to different conditions for internal and external temperature-control applications.

### 2. Operator responsibility – Safety recommendations

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

- > The operator is responsible for the qualification of the personnel operating the units.
- > The personnel operating the units should be regularly instructed about the dangers involved with their job activities as well as measures to avert these dangers.
- Make sure all persons tasked with operating, installing, and maintaining the unit have read and understand the safety information and operating instructions.
- When using hazardous materials or materials that could become hazardous, the circulator may be operated only by persons who are absolutely familiar with these materials and the circulator. These persons must be fully aware of possible risks.

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

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	<b>(760) 842-8015</b>	<b>(610) 231-0260</b>	
	info @ julabo.com	info @ julabo.com	
	www.julabo.com	www.julabo.com	

#### Safety instructions for the operator:

- You have received a product designed for industrial use. Nevertheless, avoid strikes to the housing, vibrations, damage to the operating-element panel (keypad, display), and contamination.
- Make sure the product is checked for proper condition regularly (depending on the conditions of use). Regularly check (at least every 2 years) the proper condition of the mandatory, warning, prohibition and safety labels.
- Make sure that the mains power supply has low impedance to avoid any negative effects on instruments being operated on the same mains.
- This unit is designed for operation in a controlled electromagnetic environment. This means that transmitting devices (e.g., cellular phones) should not be used in the immediate vicinity. Magnetic radiation may affect other devices with components sensitive to magnetic fields (e.g., monitors). We recommend maintaining a minimum distance of 1 m.
- Permissible ambient temperature: max. 40 °C, min. 5 °C.
- > Permissible relative humidity: 50% (40 °C).
- > Do not store the unit in an aggressive atmosphere.
- Protect the unit from contamination.
- Do not expose the unit to sunlight.

#### **Appropriate operation**

Only qualified personnel is authorized to perform configuration, installation, maintenance and repairs of the circulator.

Routine operation can also be carried out by untrained personnel who should however be instructed by trained personnel.

#### Use:

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

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

Observe all warnings for the used materials (bath fluids) and the respective instructions (safety data sheets).

Insufficient ventilation may result in the formation of explosive mixtures. Only use the unit in well ventilated areas.

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

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

If this unit is intended for use within the United States of America, all 3 warning labels **must** be affixed to the housing of the unit prior to use.

Directions for the positioning of the individual warning labels are enclosed with the warning labels included in the delivery. Warning labels must be easily visible to users.

1

Warning label W00: Colors: yellow, black Danger area. Attention! Observe instructions. (operating manual, safety data sheet)

Mandatory label M018: Colors: blue, white

Carefully read the user information prior to beginning operation.

Scope: EU

or

2

3

9

Semi S1-0701 Table A1-2 #9

Carefully read the user information prior to beginning operation.

Scope: USA, NAFTA

**WARNING:** This product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

Warning label Proposition 65

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

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



Warning label W26: Colors: yellow, black

Hot surface warning.

(The label is put on by JULABO)

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

#### 2.1. Disposal

The circulator contains a back-up battery that supplies voltage to memory chips when the unit is switched off. Do not dispose of the battery with household waste!

Depending on battery regulations in your country, you might be obliged to give back used or defect batteries to gathering places.

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

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



Contact an authorized waste management company in your country.

Disposal with household waste (unsorted waste) or similar collections of municipal waste is not permitted!

#### 2.2. **Technical specifications**

			F25-ME
Working temperature range		°C	-28 200
Temperature stability		°C	±0,01
Cooling capacity		°C	<u>+20 0 -20</u>
Medium ethanol		kW	0.26 0.2 0.06
Refrigerant			R134a
Overall dimensions	(WxDxH)	cm	23x42x61
Bath opening	(WxL)	cm	12x14
Bath depth		cm	14
Filling volume	from to	liters	3 4,5
Weight		kg	31
Mains power connection	230 V/50 Hz	V/ Hz	207-253 / 50
Current draw	(at 230 V)	Α	12
Current draw	(at 230 V) CH	Α	<9 + 2>
Mains power connection	230 V/60 Hz	V/ Hz	207-253 / 60
Current draw	(at 230 V)	Α	12
Mains power connection	115 V/60 Hz	V/ Hz	103-127 / 60
Current draw	(at 115 V)	Α	13
Mains power connection	100 V/50-60 Hz	V/ Hz	90-115 / 50-60
Current draw	(at 100 V)	Α	13

			F26-ME	F32-ME
Working temperature range		°C	-28 200	-30 200
Temperature stability		°C	±0,01	±0,01
Cooling capacity		°C	<u>+20 0 -20</u>	<u>+20 0 -20 -30</u>
Medium ethanol		kW	0.26 0.2 0.06	0.45 0.39 0.15 0.05
Refrigerant			R134a	R134a
Overall dimensions	(WxDxH)	cm	42x42x42	31x42x64
Bath opening	(WxL)	cm	12x14	18x12
Bath depth		cm	14	15
Filling volume	from to	liters	3 4,5	5,5 8
Weight		kg	31	37
Mains power connection	230 V/50 Hz	V/ Hz	207-253 / 50	207-253 / 50
Current draw	(at 230 V)	Α	12	13
Mains power connection	230 V/60 Hz	V/ Hz		207-253 / 60
Current draw	(at 230 V)	Α		10
Mains power connection	115 V/60 Hz	V/ Hz	103-127 / 60	103-127 / 60
Current draw	(at 115 V)	Α	13	14

All measurements have been carried out at:

rated voltage and frequency ambient temperat Technical changes without prior notification reserved. ambient temperature: 20 °C

			F33-ME	F34-ME
Working temperature range		°C	-30 200	-30 150
Temperature stability		°C	±0,01	±0,01
Cooling capacity		°C	+20 0 -20 -30	+20 0 -20 -30
Medium ethanol		kW	0.5 0.32 0.12 0.03	0.45 0.32 0.14 0.3
Refrigerant			R134a	R134a
Overall dimensions	(WxDxH)	cm	36x46x69	38x58x62
Bath opening	(WxL)	cm	23x14	24x30
Bath depth		cm	20	15
Filling volume	from to	liters	12 16	14 20
Weight		kg	44	42
Mains power connection	230 V/50 Hz	V/ Hz	207-253 / 50	207-253 / 50
Current draw	(at 230 V)	Α	12	12
Mains power connection	230 V/60 Hz	V/ Hz	207-253 / 50	207-253 / 60
Current draw	(at 230 V)	Α	12	13
Mains power connection	115 V/60 Hz	V/ Hz	103-127 / 60	103-127 / 60
Current draw	(at 115 V)	Α	15	14

			FP40-ME	FP50-ME
Working temperature range		°C	-40 200	-50 200
Temperature stability		°C	±0,01	±0,01
Cooling capacity		°C	+20 0 -20 -30	+20 0 -20 -30 -40
Medium ethanol		kW	0.68 0.5 0.32 0.04	0.9 0.8 0.5 0.32 0.16
Refrigerant			R404A	R404A or R507
Overall dimensions	(WxDxH)	cm	37x46x69	42x49x70
Bath opening	(WxL)	cm	23x14	18x12
Bath depth		cm	20	15
Filling volume	from to	liters	9 16	5.5 8
Weight		kg	48	55
Mains power connection	230 V/50 Hz	V/ Hz	207-253 / 50	207-253 / 50
Current draw	(at 230 V)	Α	13	14
Current draw	(at 230 V) CH	Α		9 + 4
Mains power connection	230 V/60 Hz	V/ Hz	207-253 / 50	207-253 / 60
Current draw	(at 230 V)	Α	14	14

All measurements have been carried out at:

rated voltage and frequency ambient temperature: 20 °C Technical changes without prior notification reserved.

			ME
Temperature selection			digital
via keypad			indication on VFD COMFORT-Display
remote control via personal co	mputer		indication on monitor
Temperature indication			VFD COMFORT-DISPLAY
Resolution		°C	0.1
Absolute Temperature Calibration	INT/EXT	°C	±3 / ±9
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	at 0 bar	l/min	11 16
Pressure max.	at 0 liter	bar	0.22 0.45
Electrical connections:			
External alarm device		Vdc/mA	24-0 / max. 25
Computer interface			RS232
External temperature sensor			Pt100
_			
Ambient temperature		°C	5 40

#### Safety installations according to IEC 61010-2-010:

Excess temperature protection adjustable from 0 °C ... 230 °C

Low liquid level protection float switch Classification according to DIN 12876-1 class III

#### Supplementary safety installations

Early warning system for low level float switch

High temperature warning function optical + audible (in intervals)

Low temperature warning function optical + audible (in intervals)

Supervision of working sensor plausibility control

Reciprocal sensor monitoring between

working and safety sensors difference >35 °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

Air humidity:

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

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

Max. mains fluctuations of ±10 % are permissible.

Protection class according to IEC 60 529 IP21

The unit corresponds to Class I

Overvoltage category II Pollution degree 2



#### Caution:

The unit is not for use in explosive environment

Standards for interference resistance according to EN 61326-1

This unit is an ISM device classified in Group 1 (using high frequency for internal purposes) Class A (industrial and commercial range).

## **Operating instructions**

#### 3. Safety notes for the user

#### 3.1. Explanation of safety notes



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

The danger is classified using a signal word.

Read and follow these important instructions for averting dangers.



#### Warning:

Describes a **possibly** highly dangerous situation. If these instructions are not followed, serious injury and danger to life could result.



#### Caution:

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



#### Notice:

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

#### 3.2. Explanation of other notes



#### Note!

Draws attention to something special.



#### Important!

Indicates usage tips and other useful information.



IThis icon is used in the operating instructions to indicate flashing values or parameters which have to be set or confirmed.

#### 3.3. Safety recommendations

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



- Only connect the unit to a power socket with an earthing contact (PE protective earth)!
- The power supply plug serves as a safe disconnecting device from the line and must always be easily accessible.
- Place the unit on an even surface on a base made of nonflammable material.
- Do not stay in the area below the unit.
- Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit.
- Set the excess temperature safety installation at least 25 °C below the fire point of the bath fluid.
- Observe the limited working temperature range when using plastic bath tanks.
- Never operate the unit without bath fluid in the bath.
- Pay attention to the thermal expansion of bath oil during heating to avoid overflowing of the fluid.
- Prevent water from entering the hot bath oil.
- Do not drain the bath fluid while it is hot! Check the temperature of the bath fluid prior to draining (e.g., by switching the unit on for a short moment).
- Use suitable connecting tubing.
- Avoid sharp bends in the tubing, and maintain a sufficient distance from surrounding walls.
- Make sure that the tubing is securely attached.
- Regularly check the tubing for material defects (e.g., for cracks).
- Never operate damaged or leaking units.
- Always turn off the unit and disconnect the mains cable from the power source before performing any service or maintenance procedures, or before moving the unit
- Always turn off the unit and disconnect the mains cable from the power source before cleaning the unit.
- Always empty the bath before moving the unit.
- Transport the unit with care.
- Sudden jolts or drops may cause damage in the interior of the unit.
- Observe all warning labels.
- Never remove warning labels.
- Never operate units with damaged mains power cables.
- Repairs are to be carried out only by qualified service personnel.



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



#### Caution:

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

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

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

i.e.: dangerous

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

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



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

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



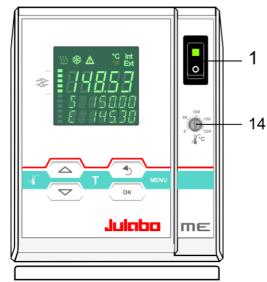
#### WARNING

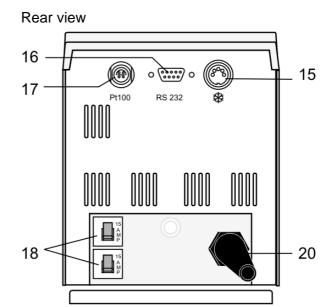
This product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

#### **Operating controls and functional elements** 4.

#### 4.1. Circulator







1



Mains power switch, illuminated

#### **Navigation keys**

2 OK

- 1. Key: >OK< Start / Stop (pump / heater )
- 2. >OK< in the menu Menu item / select submenu for setting Save set value Save selected parameter

A beep signals the end of setting



After the actions Start, Stop and change from VFD Display to standard display the key **OK** is locked for a short time.

The above graph "front side" shows an example for standard display.

3



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



(1) icon for "keep key pressed down".



>Up / Down <temperature – increase/decrease setpoint 1. Key: Push key quickly for single steps, Keep key pressed for fast change.



2. >Up/Down< in the menu selection of menu items / parameters

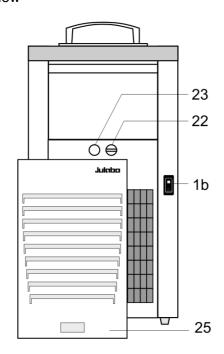
	_		ME
		Menu keys	
5		Key: start the menu > warning and safety values<	
6	T	Key: start the menu >temperature setpoints<	
7	MENU	Key: display of MENU structure	
10	S & A C Int ■ 14853 5 8 4 5 0.00 E 8 4 4 5 3 0	VFD COMFORT-DISPLAY  Header: Control indicators see sections 11 and 12  Line 1: Actual value 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	<b></b>	Control indicators in the header: Heating / Cooling / Alarm / Remote control	
12	°C Int °F Ext	Control indicators in the header:  Temperature indication Internal or External actual value  Temperature indication in °C (°F not possible on this unit)	
13	<del>-</del>	Display of set pump pressure stage Four stages, can be set via the key , under >MENU - PUMP<.	
14	100 40 150 230 °C	Adjustable excess temperature protection according to IEC 61010-2-010	
15	*	Socket: control cable of JULABO refrigerated circulator or output for alarm messages	
16	o ‱ o RS232	Interface RS232: remote control via personal computer	
17	(iii) Pt100	Socket for external measurement and control sensor or external setpoint programming	
18	15 A M P	Mains circuit breakers (resettable) 15 A	

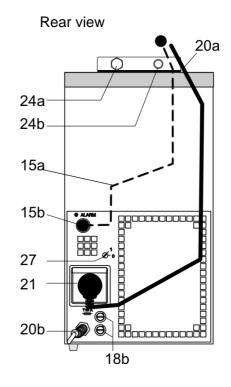
Mains power cable with plug

20

## 4.2. Cooling Machine

Front view





1b



Mains power switch, illuminated for cooling machine

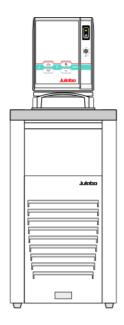
15a 15b	•	Socket: control cable of JULABO refrigerated circulator
18b		Mains fuses for cooling machine, T10A, D5 x 20 mm
20a		Mains power cable with plug for circulator
20b		Mains power cable with plug cooling machine
21		Built-in mains outlet for connection of circulator
22		Drain tap
23		Drain port
24a		Pump connector: feed
24b		Pump connector: return
25		Venting grid, removable

27 1

Selector dial for cooling machine (only F25, F26, F34) Position "1" for operation with ME circulator.

### 5. Preparations

#### 5.1. Installation



 Place the unit on an even surface on a pad made of non-flammable material.

F34: The circulator fitted with a stainless steel bridge is placed on on the back of the bath tank leaving the bath open on the front side.

 The place of installation should be large enough and provide sufficient air ventilation to ensure the room does not warm up excessively because of the heat the instrument radiates to the environment. (Max. permissible ambient temperature: 40 °C).
 With regard to a disturbance in the cooling loop (leakage), the guideline EN 378 prescribes a certain room space to be available for each kg of refrigerant.

The necessary amount of refrigerant is specified on the type plate.

- > For 0.25 kg of refrigerant R134a, a room space of 1 m<sup>3</sup> is required.
- > For 0.48 kg of refrigerant R404A, a room space of 1 m<sup>3</sup> is required.
- > For 0.49 kg of refrigerant R507, a room space of 1 m<sup>3</sup> is required.
- Set selector dial for cooling machine (19) in position "1" for operation
   with ME circulator. (only F25, F26, F34)
- Keep at least 20 cm of open space on the front and rear venting grids.
- Do not set up the unit in the immediate vicinity of heat sources and do not expose to sun light
- Before operating the unit after transport, <u>wait about one hour after</u> <u>setting it up.</u> This will allow any oil that has accumulated laterally during transport to flow back down thus ensuring maximum cooling performance of the compressor.

#### 5.2. Bath fluids



#### Caution:

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

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

Water: The quality of water depends on local conditions.

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

#### Recommended bath fluids:

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



See website for list of recommended bath fluids.

ATTENTION: The maximum permissible viscosity is 50 mm<sup>2</sup>/s·



#### Caution:

Fire or other dangers when using bath fluids that are not recommended:

Please contact JULABO before using other than recommended bath fluids.

Use only nonacidic and noncorrosive bath fluids.

JULABO assumes no liability for damage caused by the selection of an unsuitable bath liquid.

Unsuitable bath fluids are fluids which, e.g.,

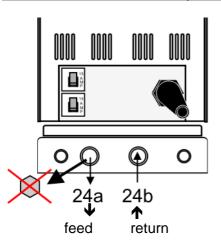
- are highly viscous (much higher than recommended at the respective working temperature)
- have a low viscosity and have creep characteristics
- have corrosive characteristics or
- · tend to crack.
- . No liability for use of other bath fluids!

#### 5.3. Temperature application to external systems



#### Caution: Securely attach all tubing to prevent slipping.

If the circulator is operated without external system, close the pump connector (24a) with the cap nut.



The circulator is used for temperature application to external, closed systems (loop circuit) with simultaneous temperature application in the circulator bath.

#### Connecting the external system

- Unscrew the collar nuts from the pump connector (24a).
- Slide the tubing onto the pump connector for feed (24a) and return flow (24b) and secure with hose clamps.

#### 5.3.1. **Tubing**

#### **Recommended tubing:**

Order No.	Length		Temperature range
8 930 008	1 m	CR <sup>®</sup> tubing 8 mm inner dia.	-20 °C to 120 °C
8 930 010	1 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	1 m	Insulation for tubing 8 mm or	-50 °C to 100 °C
		10 mm inner dia.	
8 970 480		2 tubing clamps. size 1, tubing 8 mm inner di	a.
8 970 481		2 tubing clamps. size 2, tubing 10 or 12 mm i	nner dia.
8 930 209	0.5 m	Metal tubing, triple insulated,	-100 °C to +350 °C
8 930 210	1.0 m	M16x1 *	
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

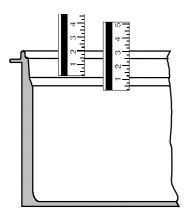
- Employ suitable connecting tubing.
- Make sure that the tubing is securely attached.
- Avoid sharp bends in the tubing, and maintain a sufficient distance from surrounding walls.
- Regularly check the tubing for material defects (e.g. for cracks).
- Preventive maintenance: Replace the tubing from time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

#### 5.4. Filling / draining



#### Notice:

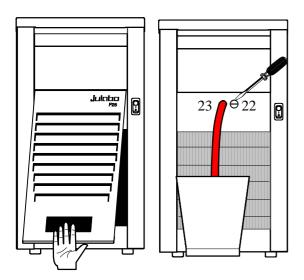
- Pay attention to the thermal expansion of bath oil during heating to avoid overflowing of the liquid.
   Do not drain the bath fluid while it is hot!
  - Check the temperature of the bath fluid prior to draining (by switching the unit on for a short moment, for example).
- Always turn off the unit and disconnect the mains cable from the power source before cleaning the unit, or before moving the unit.
- Store and dispose the used bath fluid according to the laws for environmental protection.



#### **Filling**

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

- Recommended maximum filling level with water as bath fluid:
   30 mm below the tank rim
- Recommended maximum filling level with bath oils:
   40 mm below the tank rim
- (i) After filling, immerse the samples in the bath or place the lid on the bath, in case the opening is not to be used.
- The circulator provides an early warning system for low level that may be triggered when changing samples in the bath.



#### **Draining**

- Turn the unit off with the mains switch.
- Place the heating circulator near the rim of the table. Use a suitable vessel as recipient for the bath fluid.
- Unscrew the drain plug on the front of the bath tank to drain the bath.

### 6. Operating procedures

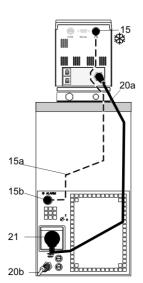
#### 6.1. Power connection



#### Caution:

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

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



- Connect the circulator with mains power cable (20a) to the mains outlet (21).
- Connect the control cable (15a) between the connectors & (15, 15b).
- Connect the refrigerated circulator with mains power cable (20b) to the mains socket.

#### 6.2. Switching on / Start - Stop

#### 6.2.1. Switching on the circulator



# Switching on:

• Turn on the mains power switch (1).

The unit performs a self-test.

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

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

**keypad control mode** (manual operation)

remote control mode (operation via personal computer).





#### Start:

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

#### Stop:

• Press OK key.

Keep 🔵 🤥 key pressed.

The VFD COMFORT-DISPLAY indicates the message "OFF".

#### 6.2.2. Switching on the Cooling Machine



#### Switching on:

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



### (i) Control of the cooling machine:

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

- It is switched off, if:
  - the actual working temperature is increased by >30 °C (cooling is not required).
  - the heater operates at full power (>800 W) for longer than 5 minutes.
- It is switched on, if:
  - cooling is necessary for maintaining the bath temperature. After switch-off, the cooling machine automatically switches on only after a delay of 5 minutes for protecting the cooling compressor.



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

## 7. Setting of temperatures

## 7.1. Using the pre-settings in the menu

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

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

- (i) The temperatures can be set in start or stop mode.
- i Press be key if a value is to be retained

## Setting of working temperature in the T menu

- 1. Press the key T. The value flashes
- 2. Select SETPOINT 1 or 2 or 3 using the key or
- 3. Confirm by pressing the **OK** key.
- (i) The circulator uses the new working temperature value for temperature control.

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

- Press the key.
- Select SETPOINT 3 by pressing the key. Example: SETPNT 3 / 70.00 °C

Example on the left: SETPNT 3 / 85.00.

- i If the active setpoint (SETPNT) is changed, the new value is immediately used for the control of the working temperature. The heater control indicator flashes.
- If the other two setpoints (not activated for control) are changed the MENU has to be left by pressing the key after the decimal digits have been confirmed



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





Werkseinstellungen:

SETPNT 1 SETPNT 2

**SETPNT 3** 

25 °C

37 °C

70 °C





#### 7.2. Direct setting of temperatures



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

24.69 SETPNT 1 2500 XX 24.69 SETPNT The indicated setpoint temperature can be changed directly any time. Example: change 25.00  $^{\circ}$ C to 50.00  $^{\circ}$ C

- By pressing the keys and the value is changed to 50.00 °C and is confirmed by pressing the OK key. The decimal digits flash and can be adjusted if desired. Confirm once more by pressing the OK key.



- (i) The circulator uses the new working temperature value for temperature control.
- ① The temperatures can be set in start or stop mode.

# 8.

### Safety installations, warning functions



Check the safety installations at least twice a year! Refer to (page 15)

**SECVAL** (Security Values)

SAFETMP

AL-TYPE

OVERTMP

SUBTEMP

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

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

#### 8.1. **Excess temperature protection**



#### Warning:

The excess temperature protection must be set at least 25 °C below the fire point of the bath fluid used!

In case of wrong setting there is a fire hazard!

We disclaim all liability for damage caused by wrong settings!





SEEVAL

SAFETMA

This excess temperature protection is independent of the control circuit. When activated heater and circulating pump are completely shut down. The alarm is indicated by optical and audible signals (continuous tone) and the error message "ALARM-CODE 14" appears on the VFD COMFORT-DISPLAY together with the ticker: > EXCESS TEMPERATURE PROTECTOR ALARM-CHECK

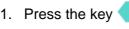
Setting range: 20 °C ... 230 °C

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

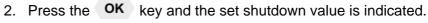


## **Exact setting:**

ADJUSTMENT <



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



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





Recommendation:

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

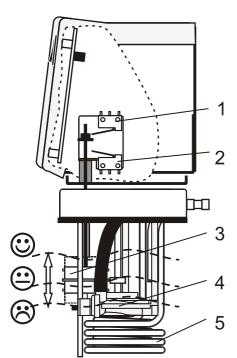
#### 8.1.1. Early warning system, low level protection



This low level protection is independent of the control circuit and is divided into two sections:

1. Switch in stage 1 recognizes a defined fluid level .

An audible warning sounds (interval tone) and together with the ticker: > LOW LEVEL WARNING-FILL MEDIUM < a message appears on the VFD COMFORT-DISPLAY:





Refill the bath fluid!

Switch in stage 2 recognizes a low fluid level :
 If stage 2 of the low level protection according to IEC 61010-2-010 is triggered, a complete, all-pole shutdown of heater and circulating pump is effected

A continuous alarm sounds and together with the ticker: > LOW LEVEL ALARM-FILL MEDIUM < a message appears on the VFD COMFORT-DISPLAY:



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

- 3. Float
- 4. Circulating pump
- 5. Heater

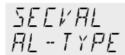


#### Warning:

When adding bath fluid, always us the type of fluid which is identical with the fluid in the bath.

Bath oils must not contain any water and should be pre-heated approximately to the current bath temperature! Explosion hazard at high temperatures!

#### 8.2. Switch-over from warning to shutdown function



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

Factory setting: >WARNING<

1. Press the key



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



AL-TYPE AL ARM

- 3. Press the **OK** key and the set parameter will flash (Example: WARNING)
- 4. Change the parameter by pressing the key and confirm by pressing the **OK** key. or

### (i) Setting >WARNING<

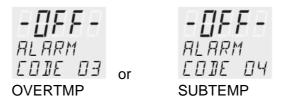
A mere warning function with optical and audible warning signal (interval tone) A message appears on the VFD COMFORT-DISPLAY:



#### Setting >ALARM<

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

**SUBTEMP** 



#### 8.3. Over and Sub temperature warning function

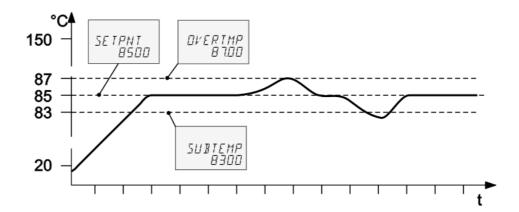
Over temperature

OVERTMP

20000

Sub temperature SUBTEMP - 99.00

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



- 1. Press the key
- By pressing the or key select the menu >OVERTMP< or >SUBTEMP<.</li>
- 3. Press the **OK** key. The integer digits flash
- 4. Change the values to 87. °C and/or 83. °C by pressing the and key and confirm with the **OK** key.

The decimal digits flash and can be adjusted if desired.

Confirm once more by pressing the **OK** key. See above examples.

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



#### Recommendation:

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

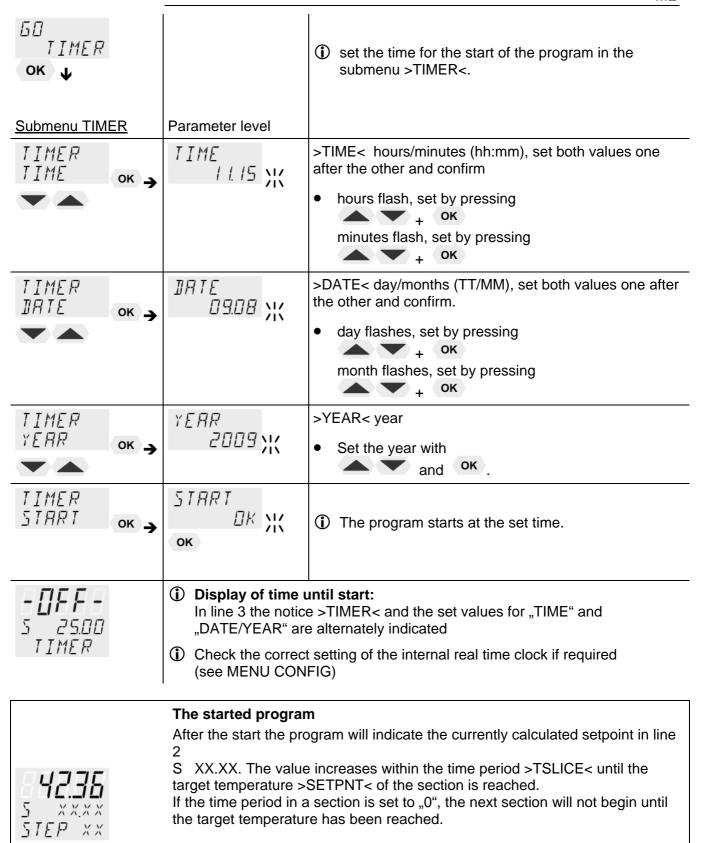
Set the sub temperature warning value >SUBTMP< 5 °C to 10 °C below the working temperature setpoint.

## 9. MENU Menu functions

9. MENU Wienu functions				
MENU 4		The term "Menu functions" refers to settings such as		
Menu level 1				
MENU P-START	ок →	Start program P-51ART 51EP	Page 32	
MENU PROGRAM		Administration and creation of programs Page		
MENU PUMP		Electronically adjustable pump capacity		
MENU EUNFIG		Configuration of the unit  REMOTE – on / off (remote control via RS232)  AUTOST – AUTOSTART on / off  OFF-MODE – pump on / off  TIME / DATE – setting time and date  RESET – factory settings	Page 37	
MENU CONTROL		Control characteristics and parameters C-TYPE – Internal or external control	Page 40	
		DYNAMICS - internal Control parameter - XP-, TN-, TV- INTERNAL		
		Control parameter - XP-, TN-, TV- XPU-, EXTERNAL		
MENU SERIAL		Adjustable interface parameters BAUD RATE, PARITY, HANDSHAKE	Page 44	
MENU RTE		ATC - Absolute Temperature Calibration, Sensor calibration INTERNAL SENSOR, Sensor calibration EXTERNAL SENSOR 3-point calibration	Page 45	
MENU LIMITS		Limitations of temperature and capacity SETPOINT MAX / MIN - Maximum and minimum setpoint HEAT MAX – Set maximum heating COOLING MAX – Set maximum cooling INTERN MAX / MIN – Limitation of the temperature range BAND HIGH / LOW – Band limit	Page 51	
		<ol> <li>Open the menu by pressing the MENU key.</li> <li>Use the keys to scroll in menu level 1.</li> <li>Press the Press the key if settings are to be retained.</li> </ol>		

#### 9.1. MENU PROGRAM – START

This menu will start a previously set program. (i) Requirements: 1. Create a program. (refer to next chapter) Start-Menu 2. Return to the Start-MENU and confirm the desired setting of each MENU item with the key OK 3. Set a start time (>TIME< >DATE< >YEAR<) if the program is to be started by the internal timer. Menu level 1 > STEP< Program start at section 1 ... 10 MENII > RUNS < Number of repetitions 1 ... 99 P-SIRRI > END< Status at end of program (STDBY/SETPNT) Standby or last setpoint OK T > GO < Time of start (NOW/TIMER) ① Press the 5 key if a parameter is to be retained. Parameter level Level 2 Correction function for parameters or values (prior to OK) P-SIARI STEP Set program step with / XX OK and ok example: STEP 1 P-SIRRI RUNS Set number of runs with RUNS / );; and ok ок → example: 1 run P-SIRRI ENI Set desired parameters with 51 11 11 X XX ENIIand ok OK -(I) (STDBY / SETPNT) or Parameter **ST**an**DBY**: the circulator switches to – ENII SETPNI Parameter **SETP**oi**NT**: the circulator constantly keeps the temperature at the value of the last step. P-START 50 Confirm > NOW < with the OK key and the program NONX 50 will start immediately OK \_ or (i) or start at the set time under parameter (TIMER). Set time in the example below: 50 09. August 2009, 11:15 hrs TIMER



Use the edit keys to scroll to line 3. The display changes

approximately every 4 seconds between the current section (STEP XX) and

XXXX

XXXX

XXXX

XXXXX

xxhxx

the

A remaining time of the section

C current bath temperature

B remaining time of the program

I xxx.xx - internal actual value or

XXHXXXX

Α

В

	5 XXXX	E xxx.xx – external actual value
C2	E XXXXX	D RUN – the program has started or
D1	S XXXX RUN	PAUSE – the progress of the program has been interrupted by pressing the key. While the time is stopped the temperature will constantly remain at the last calculated setpoint
D2	S XXXX PRUSE	Continue with the key.



#### Termination / Interruption of a program

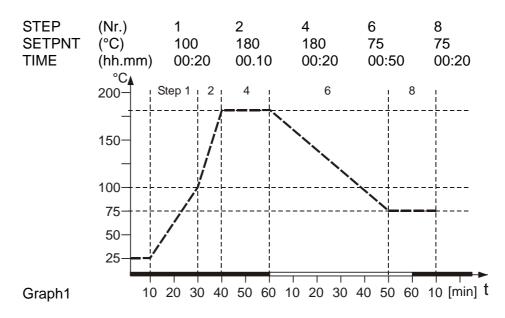
- The program can be terminated any time by pressing the key
- (i) In case of power failure the program is interrupted. The circulator switches to –OFF-.
- (i) If the AUTOSTART-function is activated the programmer starts again at the point in time approx. 5 minutes prior to the interruption. However, an uncontrolled change of the bath temperature has occurred.

#### 9.2. MENU PROGRAM – creation, administration

Menu level 1
MENU
PROGRAM

1 program
10 sections

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



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

Menu level 1				
MENLI				
PROGRAM				
211				
OK 1				

>EDIT< Create, administer program

> STEP< Program step (1 ... 10)

>SETPNT < Temperature setpoint of step ...

>TSLICE< Duration of step ...

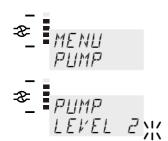
> DELETE< delete program step (01 ... 10, ALL)

(i) Press (b) key, if a parameter is to be retained.

Correction function for parameters or values (prior to OK)

Level 2	Level 3	Parameter level
PROGRAM E II I ok →	EIIII SIEP OK >	57EP / \\(\) (STEP 1 10)
	EDIT DI	<ul> <li>Set program step with and ok</li> <li>← (Example: EDIT STEP 01)</li> <li>i) For STEP 01 the values for SETPOINT 01 and TSLICE 01 are set one after the other</li> </ul>
	EDIT DI SETPNI OK >	SETPNT IDDDD \\ (values within working temp. range)
		• Integer digits flash, set by pressing  + ok
		<ul> <li>Decimal digits flash, set by pressing</li> <li>+ οκ</li> </ul>
	E II I I I I I I I I I I I I I I I I I	TSLICE >::
	(time slice)	Set duration by pressing  and  ok
PROGRAM DELETE OK >	JELETE STEP XX	<ul> <li>Delete program         Program steps can be deleted individually or entirely. (STEP 01, 02, 10, ALL).     </li> <li>Set parameters by pressing and ok</li> </ul>

#### 9.3. MENU PUMP - Setting of pump pressure



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

Settings: stage / LEVEL 1 ... 4

Display: Swith illuminated indicator

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

Factory setting: stage 1

PUMP

LEVEL

1. Press the MENU key.

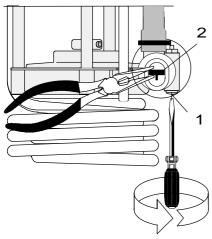
2. Select the menu >PUMP< pressing the key and confirm by

pressing the **OK** key
The set parameter flashes (example: >LEVEL 2<)

3. Change the parameter by pressing and confirm by pressing the

OK key.
 or

Press the be key if the parameter is to be retained.



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

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

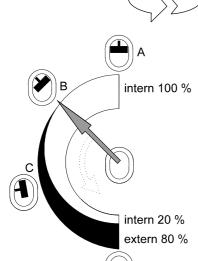


#### Internal applications in the bath

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



- C 40 % external discharge,60 % internal circulation(for large bath tanks)
- D 80 % external discharge,20 % internal circulation(for small bath tanks)



# 9.4. MENU CONFIG – Configuration of unit

Menu level 1  MENU  EUNFIG		ffected only in the >OFF< mode. RESET  by pressing the OK key and call up the menu
Level 2	Parameter level	Press the key if a parameter is to be retained. Correction function for parameters and values (prior to OK).
EONFIG REMOTE OK →	REMOTE OFF XX  OR  REMOTE ON	<ul> <li>Switch on and off remote control by pressing and ok</li> <li>Control display in the topline</li></ul>
EDNFIG RUIDSI OK >	PUIDST OFF );; or PUIDST ON	• Switch on and off autostart by pressing  and  and  ok  AUTOSTART on = on  AUTOSTART off = off  See WARNING page 38
EONFIG OFFMOIE ok →	OFFMOJE PMP ON XX or OFFMOJE PMP OFF	Switch on and off OFFMODE by pressing     and ok  PUMP ON continuous operation of circulating pump  PUMP OFF circulating pump is linked to Start/Stop
	Level 3	Parameter level
EONFIG TIME/IT OK →	IIME/III IIME OK >	TIME 11.15 XX
		<ul> <li>Hours flash, set by pressing</li></ul>
		<ul> <li>Minutes flash, set by pressing</li> </ul>
	IIME/II IRIE OK →	IRTE 08.09 );;
		<ul> <li>Day flashes, set by pressing</li></ul>
		<ul> <li>Month flashes, set by pressing</li></ul>

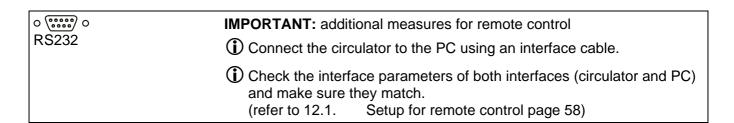
	Level 3	Parameter level
	TIME/IIT YEAR OK →	YEAR  19 );  • Year flashes, set by pressing  • • • • • • • • • • • • • • • • • •
EONFIG RESET OK →	- [] F F - RESET OK ); - [] F F - RESET - RUN -	<ul> <li>Return to factory settings by pressing OK</li> <li>RESET returns all set values to the factory setting except for date and time.</li> <li>A RESET can be effected only in the –OFF- mode.</li> <li>During the message –RUN- all parameters are reset to factory settings.</li> </ul>

#### 9.4.1. **REMOTE**

Factory setting: OFF

The control electronics offer two ways of adjusting a setpoint.

- 1. Adjustment of setpoint using the keypad or the integrated programmer.
- 2. Adjustment of setpoint via the serial interface RS232 using a PC or a superordinated process control system.
- (i) The topline of the VFD-DISPLAY shows a bright "R" for remote control; remote control discontinued.



#### 9.4.2. AUTOSTART



#### Warning

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

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

Factory settings: OFF

#### Notice:

The circulator has been configured and delivered by JULABO in accordance with the NAMUR recommendations. This means for the start mode that the unit must enter a safe operating status after a power failure. This safe operating status is indicated by the message "**OFF**" or "**R OFF**" on the VFD COMFORT-DISPLAY.

A complete, all-pole shutdown of the main functional elements such as heater and pump motor is effected.

The values set on the circulator remain saved and the unit is restarted by pressing the start/stop key in manual control.

In remote control mode the values need to be resent by the PC via the

interface.

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

#### 9.4.3. OFF-MODE

Factory setting: PMP OFF

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

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

#### 9.4.4. Setting of clock and date



TIME

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

- (i) If the unit is operated in a different time zone, the clock can be adjusted in this menu.
- (i) Change summer/winter time in this menu

#### 9.4.5. RESET – Factory settings



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

A RESET can be effected in the >OFF< mode only.</p>
Switch off the circulator by pressing the key OK and call up the menu CONFIGURATION.

## 9.5. MENU CONTROL – Control characteristics and parameters



ок 🗸

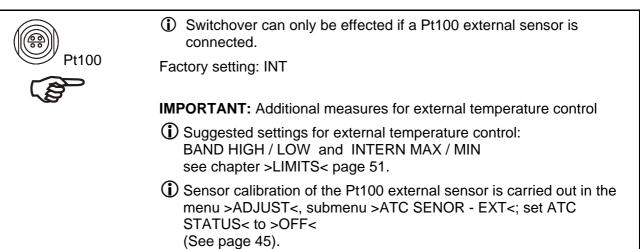
The circulator is qualified for internal and external temperature control The switchover is carried out in the menu >C-TYPE< .(INT or EXT).

- (i) For external temperature control and measurement connect a Pt100 external sensor to the socket at the rear of the circulator.
- (i) Press the (b) key if a parameter is to be retained. Correction function for parameters or values (prior to OK)

Level 2	Parameter level	
EUNTRUL E-TYPE OK >	E-TYPE INT XX	Switchover of control type by pressing     and ok
	or	The control type can be adjusted in the -OFF-
	E-TYPE EXT	mode only.  Depending on the adjustment only the active parameters are displayed.
C-TYPE INTERNAL		
EONTROL IYNAMIE ok →	IYNAMIE APER 米	The parameter flashes, switch by pressing and ok  and
	or IYNAMIE N□RM	This parameter affects the temperature sequence in case of internal control.
EDNIROL XP INI OK >	XP INT !5 \\ 0.1 99.9	<ul> <li>The parameter flashes, set by pressing</li> <li>+ οκ</li> </ul>
EDNIROL IN INI OK >	IN INT	• The parameter flashes, set by pressing  + ok
EUNIRUL IV INI OK >	IV INT 5 \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	• The parameter flashes, set by pressing  + ok
C-TYPE EXTERNAL		
EUNTRUL XP EXT OK >	XP EXT [].7);; 0.1 99.9	<ul> <li>The parameter flashes, set by pressing</li> <li>+ οκ</li> </ul>
EDNIROL IN EXI OK >	IN EXT 720 \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	• The parameter flashes, set by pressing  + ok

Level 2		Parameter level	
EONTROL IV EXI	ок →	TV EXT 55 \\\ 0 999	• The parameter flashes, set by pressing  + ok
EONTROL XPU	ок →	メ <i>PU</i> 3日 <b>)</b> ¦く 0.1 99.9	The parameter flashes, set by pressing  ok  ok

#### 9.5.1. CONTROL - Control INTERNAL / EXTERNAL





#### Attention:

Place the external sensor into the temperature-controlled medium and securely fix the sensor.

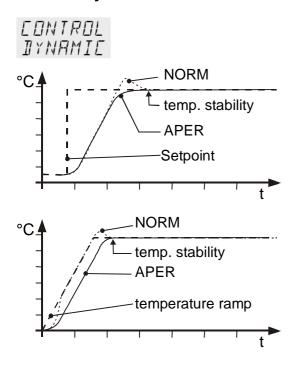


#### Accessory: Pt100 external sensor

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

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

#### 9.5.2. Dynamic internal



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

Factory setting: APER (aperiodic)

#### Possible parameters:

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

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

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

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

XP EXI D.7

Setting range: 0.1 ...99.9

TN EXT 720

Setting range: 3 ...9999

IV EXI 55

Setting range: 0 ... 999

×РU 30

Setting range: 0.1 ... 99.9

In most cases the control parameters preset in the factors are adequate for achieving an optimum temperature sequence.

The control parameters allow adjustment to special control processes.

#### Proportional range >Xpu<

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

#### 9.5.4. Control parameters— XP-, TN-, TV- INTERNAL

In most cases the control parameters preset in the factory are adequate for achieving an optimum temperature sequence.

The control parameters allow adjustment to special control processes...

# XP INT I.B

Setting range: 0.1 ... 99.9

# Proportional range >Xp<

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

# TN INT

Setting range: 3 ...9999

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

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

Setting range: 0 ... 999

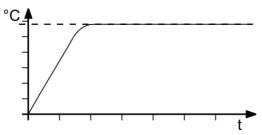
#### Lead time >Tv< (Differential component)

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

#### Optimization instructions for the PID control parameters

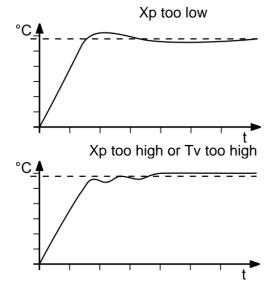
Optimum setting

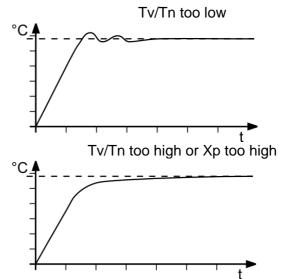
Control parameters XP-, TN-, TV- INTERNAL as well as -EXTERNAL



The heat-up curve reveals possible faulty settings of the control parameter.

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





# 9.6. MENU SERIAL - BAUDRATE, HANDSHAKE, PARITY

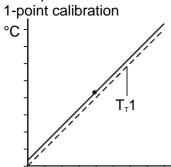
Menu level 1  MENU SERIAL  OK		
Level 2	Parameter level	Press the
SERIAL BRUIRAT OK >	BAUDRAT 4800 XX BAUDRAT 9600 BAUDRAT 19200 BAUDRAT 38400	The parameter flashes, switch by pressing and ok  and ok
SERIAL PARITY OK >	PARITY EVEN XX PARITY OIII PARITY NO	• The parameter flashes, switch by pressing and ok  even: Data bits = 7; Stop bits = 1 odd: Data bits = 7; Stop bits = 1 no: Data bits = 8; Stop bits = 1
SERIAL OK →	HSHAKE HSHAKE SOFT	The parameter flashes, switch by pressing and ok  Xon/Xoff-protocol (Software handshake) Protocol RTS/CTS (Hardware handshake)

#### 9.7. **MENU ATC - Absolut Temperature Calibration**

MENU RTE

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

#### Example:

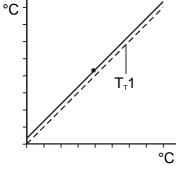


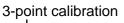
# Principle:

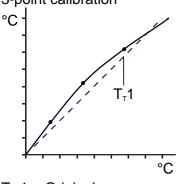


For ATC calibration, in steady state the bath temperature at the location of the temperature sensor (CT) is determined at the respective adjusted working temperature. This value is then set on the circulator in the menu >ATCalibration< under menu item > CTEMP X <.

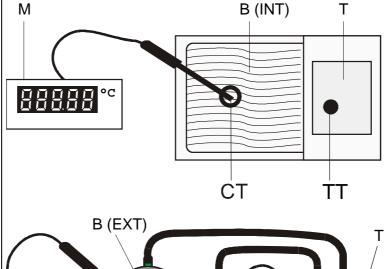
This can be a 1-point, 2-point or 3-point calibration.

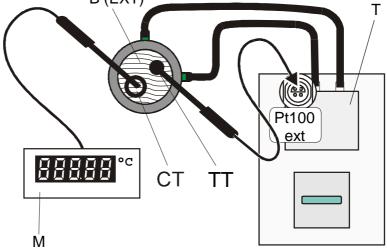






T<sub>T</sub> 1 = Original curve





M = Temperature measuring instrument with temperature sensor

B = Bath tank (INTernal or EXTernal)

T = circulator

CT = Temperature on measuring point

TT = Temperature on circulator

Menu level 1  MENLI  RTE		
ок ↓		
Level 2	Parameter level	Press the key if parameter is to be retained. Correction function for parameters or values (prior to OK).
RIC SENSOR OK -	SENSOR INTERNX	The parameter flashes, switch by pressing and ok  and ok
	or SENSOR EXTERN	① On level 2 a (I) is indicated for internal <b>or</b> an (E) for external.
	LATENN	Example: RTE (I) RTE (E)
RIE (I) SIRIUS OK→	STATUS YES;K	<ul> <li>The parameter flashes, switch by pressing</li> <li>and οκ</li> </ul>
	or	i >NO< Carry out an ATC calibration
	STATUS NO	>YES< return to standard operation after calibration.
RIE (I) IYPE OK >	IYPE I-POINT);	The parameter flashes, switch by pressing and ok  and ok
	TYPE 2-POINT	(i) A >1-point<, >2-point< or >3-point< calibration can be carried out.
	TYPE 3-POINT	The selected calibration is indicated on level 2 by 1 or 2 or 3.
AIE (I)	IMPVALI	The value >TMPVAL< is only indicated
TMPVALI OK >	80.00 (5)	in addition the measured temperature value >CALVAL X< is saved during the next step.
RIE (I) ERLI'RLI OK >	EALVALI 79.70 X	<ul> <li>Integer digits flash, set by pressing</li> <li>+ ok</li> </ul>
		<ul> <li>Decimal digits flash, set by pressing</li> <li>+ οκ</li> </ul>
	indicated anymore	ibration is carried out, the following menu items are not

AIE (I) IMPVAL2 OK →	TMPVAL 2 120.00 (5)	The value is only indicated
ATE (I) ERLVAL2 OK →	EALVAL2 11950米	<ul> <li>Integer digits flash, set by pressing         <ul> <li>+ ok</li> </ul> </li> <li>Decimal digits flash, set by pressing             <ul> <li>ok</li> <li>ok</li> </ul> </li> </ul>
	indicated anymore	ibration is carried out, the following menu items are not
AIE (I) IMPVAL∃ ok →	TMPVAL 3 160.00 5	The value is only indicated
RIE (I) ERLVAL3 OK >	ERLVAL3 159.30 米	<ul> <li>Integer digits flash, set by pressing         <ul> <li>ok</li> </ul> </li> <li>Decimal digits flash, set by pressing             <ul> <li>ok</li> <li>ok</li> </ul> </li> </ul>

#### 9.7.1. ATC SENSOR - INTERNAL / EXTERNAL

RTE SENSOR SENSOR INTERN SENSOR

EXTERN

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

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

#### 9.7.2. ATC STATUS - YES / NO

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

>YES< (factory setting) The controller of the circulator uses the original curve of the temperature sensor or the new curve measured during the ATC calibration.

**Important:** Set to **>NO<** during the calibration process

>NO< An ATC calibration is to be carried out.

Important: Set to >YES< after calibration.

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

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

AIE (I) IYPE

IYPE I-POINI

TYPE 2-POINT

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

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

The type of calibrations also determines the number of the following pairs of values indicated on the LCD DIALOG-DISPLAY.

TMPVRLI CRLVRLI 80.00 79.70

TMPVALZ EALVALZ 120.00 119.50

TMPVAL3 CALVAL3 160.00 159.30

#### Pairs of values:

TMPVAL X: Circulator temperature 1 or 2 or 3 (actual value TT)

The actual temperature of the bath is simultaneously saved with the "calibration value" >CALVAL< and can be indicated for control purposes (value does not flash).

CALVAL X: Calibration temperature 1 or 2 or 3 (actual value CT)

The "calibration value" is determined with a temperature measuring device and saved under menu item >CALVAL<.

(value flashes );

#### 9.7.4. Example: 3-point calibration for internal control

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

# 1. Set circulator to internal control: MENU CONTROL page 40

Menu level 1

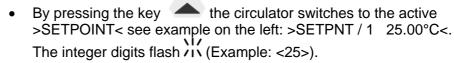
MENU

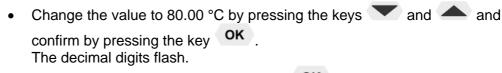
□□NTR□L ok →

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

# 2. Set working temperature setpoint - SETPNT:

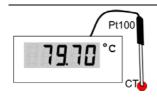
Refer to "Direct temperature setting " page 26





Confirm once more by pressing the key OK

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



80.00°C

120.00 °C

160.00 °C

#### 3. Reading of temperature measuring device

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

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

	4. Calibration	
Menu level 1  MENU  RTE  OK	<ul> <li>Press the</li></ul>	
Level 2	Parameter level	
RIC SENSOR OK >	SENSOR INTERN XX	Set SENSOR INTERN:  The parameter flashes, switch by pressing and ok.

RIE (I) SIRIUS OK →	STATUS NOX	An ATC calibration is to be carried out. Set to >NO<
		The parameter flashes, switch by pressing and ok .
ATE (I) IYPE OK →	TYPE 3-POINT);(	The parameter flashes, switch by pressing     and ok.
		A >3-point< calibration is carried out.
		7770 point combination to carried out
RIE (I)	IMPVALI	The value >TMPVAL< is only indicated
IMPIALI OK >	80.00 (5)	In addition the measured value >CALVAL X< is saved during the following step
AIE (I) EALVALI OK ->	EALVALI 79.70 <b>)</b> ;(	• Integer digits flash, set by pressing  (79) + OK
	12012	• Decimal digits flash, set by pressing  (70) + OK
		The first of 3 points is calibrated.
	Return to 2. Set workin	g temperature value SETPNT: 120.00 °C
ATE (I) TMP/AL2 OK >	TMPVAL2 120.00 (5)	The value is only indicated
RIE (I) ERLVALZ OK →	EALVAL2 11950);(	Integer digits flash, set by pressing     (119) + OK
	77227	• Decimal digits flash, set by pressing  (50) + OK
		The second of 3 points is calibrated.
	Return to 2. set working	g temperature value SETPNT: 160.00 °C
RIE (I) IMPVAL3 ok	TMPVAL 3 150.00 (5)	The value is only indicated.
RIE (I) ERLVAL3 OK ->	EALVAL3 15930 );(	Integer digits flash, set by pressing     (159) + OK
	,	Decimal digits flash, set by pressing     (30) + ok
		The 3-point calibration is completed
	5. Return to standar	d operation
RIE (I) SIRIUS OK >	STATUS YES;K	Set >YES< after calibration. (Standard operation)
	OK	

# 9.8. MENU LIMITS

Menu level 1  MENU LIMITS		
ок 🗸		
Level 2	Parameter level	Press the
LIMIIS SEIMAX OK >	SETMAX 200.00 XX	<ul> <li>Integer digits flash, set by pressing         <ul> <li>Decimal digits flash, set by pressing</li> <li>OK</li> </ul> </li> </ul>
LIMITS SEIMIN OK	SEIMIN -9499;K	<ul> <li>Integer digits flash, set by pressing</li> <li>+ ok</li> <li>Decimal digits flash, set by pressing</li> <li>+ ok</li> </ul>
LIMITS HEATMAX OK >	HEATMAX IDD \\\ 0 100 %	The value flashes, set by pressing
LIMITS EDOLMAX OK >	<i>□□□LM用X</i> □ ;;; 0 100 %	The value flashes, set by pressing mit
	In case of external cont	rol these menu items are additionally indicated.
LIMITS INIMAX OK	INTMRX 20000;;	<ul> <li>Integer digits flash, set by pressing         <ul> <li>OK</li> </ul> </li> <li>Decimal digits flash, set by pressing             <ul> <li>OK</li> <li>OK</li></ul></li></ul>
LIMIIS INIMIN OK >	INIMIN -9499;K	<ul> <li>Integer digits flash, set by pressing         <ul> <li>+ ok</li> </ul> </li> <li>Decimal digits flash, set by pressing             <ul> <li>ok</li> <li>ok</li> </ul> </li> </ul>
LIMIIS BAND-H OK	IANI-H 200;K	The value flashes, set by pressing
LIMIIS BANI-L OK >	IANI-L 200%	The value flashes, set by pressing

#### 9.8.1. Limits for internal control

E-TYPE INT SETPOINT MAX / MIN - Maximum and minimum setpoint

Restriction of the adjustable temperature range

SETMRX 200.00 The limitation of the operating temperature range effects the temperature setting in the menu with the key .

SETMIN - SOOO Only setting of working temperatures which lie within the determined limits is possible

Existing settings for SETPNT 1, -2, -3, as well as those for >OVERTMP< and > SUBTMP < (refer to page 30), are automatically deferred into the limit range.

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

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

#### Set maximum heating / cooling

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

Setting range:

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

HEATMAX 100 EDOLMAX

#### 9.8.2. Limits for external control

#### **INTERN MAX / MIN**

Restriction for the temperature range of the internal bath.

INTMAX 200.00

INTMIN -50.00



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



- ☑ Protects the bath fluid from overheating.
- Prevents an undesired alarm shutdown by the excess temperature protection >ALARM CODE 14<.

  Set the value of > INT MAX at least 5 °C below the value of >SAFETMP<.
- ☑ Protects the pump motor from high viscosity of the bath fluid at low temperatures.
- For refrigerated circulators. Freezing protection when using water as bath fluid.



# IRNII-H 200

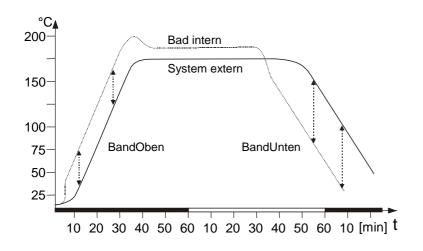
IRNII-L 200

#### **BAND HIGH / LOW - Band limitation**

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

Setting range: 0 °C ... 200 °C

**BAND HIGH** and **BAND LOW** allow for the limitation of the difference between the temperatures in the internal bath and the external system to any maximum value for the heat-up and cool-down phase. During the heat-up phase this difference value is always added to the actual external temperature. During the cool-down phase the difference value is subtracted.



Sense of a band limitation:

- ☑ Protection of objects and samples by gentle temperature control
- ☑ Protection of e.g. glass reactors from thermal shock.

#### Troubleshooting guide / error messages 10.



#### Alarm with complete shutdown:

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



"A" lights up and a continuous signal sounds.

The code for the cause of alarm is indicated on the VFD COMFORT-DISPLAY.



# EDJE 40

#### Alarm without shutdown:

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



	Press the key OK to stop the signal
ALARM COJE O I	Error message with ticker: >LOW LEVEL ALARM-FILL MEDIUM < Low level alarm The circulator is operated without or insufficient bath fluid.
	Switch the unit off with the mains switch, refill bath fluid and switch on!
	Tube breakage has occurred (insufficient filling level of bath fluid caused by pumping-out) Replace the tubing and refill bath liquid.
	The float is defect (e.g. transport damage). Repair by authorized JULABO service personnel.
ALARM COJE OZ	Error message with ticker: > REFRIGERATOR ALARM-CHECK CONNECTION < During the self-test after switch-on a short –circuit is detected between pin 2 and pin 4 of the control line or the control line was disconnected during operation. Reconnect the control line or repair short-circuit.
WARNING COJE O3	Error message with ticker: > EXCESS TEMPERATURE WARNING-CHECK LIMITS <
ALARM COJE 03	Excess temperature warning or Excess temperature alarm  Type of warning: set to >warning< or >alarm< (refer to page 29)
WARNING	Error message with ticker:

> LOW TEMPERATURE WARNING-CHECK LIMITS < LUIE UY Low temperature warning ALARM EDJE DY Low temperature alarm. **Typ of warning:** set to >warning< or >alarm< (refer to page 29)

RLRRM Error message with ticker: EDIE DS > WORKING SENSOR ALARM-CALL SERVICE < Cable of working temperature sensor is disconnected or short-circuited.

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

RLRRM	
$E\square I\!I\!E$	33

Error message with ticker:

> SAFETY SENSOR ALARM-CALL SERVICE <

The cable of the excess temperature protector has been disconnected or short-circuited

WARNING EDJE 40 Error message with ticker:

> LOW LEVEL WARNING-FILL MEDIUM <

The early warning system for low level reports a critical fluid level. Refill bath fluid.



By quickly switching off and restarting the unit the alarm is cancelled. If the error occurs once more after the restart, a remote diagnosis is required.



Error message with ticker:

> CONFIGURATION ERROR-PRESS OK<

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

Press the **OK** key for a non-recurring, automatic change of the configuration.

In this case please call the JULABO Technical Service or an authorized dealer.

#### Disturbances that are not indicated.

The electronic pump motor is overload-protected by an electronic current limiter. If viscosity of the bath fluid is or becomes too high, the motor stops running.



Mains circuit breakers (resettable) 15 A



Cooling machine: Fuse T 10.0 A, dia.5 x 20 mm

The mains fuses (8b) on the rear of the unit may easily be exchanged as shown on the left.



#### Warning:

Before exchanging the fuses, turn off the mains power switch and disconnect the power plug from the mains socket!

Only use fine fuses with a nominal value as specified.

#### Example:

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

#### 11. Electrical connections



#### Notice:

Use shielded cables only.

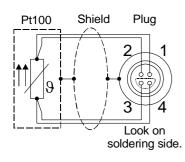
The shield of the connecting cable is electrically connected to the plug housing. The unit ensures safe operation if connecting cables with a maximum length of 3 m are used. The use of longer cables does not affect proper performance of the unit, however external interferences may have a negative impact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



#### Socket for external Pt100 sensor

Pin assignment:

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

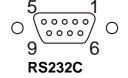


The shield of the connecting cable is electrically connected to the plug housing and the sensor tube.

#### **RS232** serial interface

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





Pin 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

Circulator (9-pol)		PC (9-pol)
Pin 2 RxD	$\Leftrightarrow$	Pin 3 TxD
Pin 3 TxD	$\Leftrightarrow$	Pin 2 RxD
Pin 4 DTR	$\Leftrightarrow$	Pin 6 DSR
Pin 5 GND	$\Leftrightarrow$	Pin 5 GND
Pin 7 RTS	$\Leftrightarrow$	Pin 8 CTS
Pin 8 CTS	$\Leftrightarrow$	Pin 7 RTS

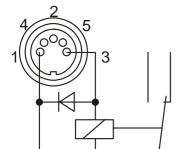
Accessories:	Order No.	Description
	8 980 073	RS232 interface cable 9-pol./9-pol., 2,5 m
	8 900 110	USB interface adapter cable

**♯**/ Control output

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

Circuit: Operation = relay powered

Alarm = relay not powered

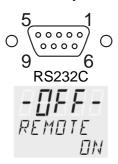


#### Pin assignment:

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

#### 12. Remote control

## 12.1. Setup for remote control



- Check the interface parameters for both interfaces (on circulator and PC) and make sure they match.
  - (Serial interface refer to page 44)
- 2. In the menu > MENU CONFIG < set the menu item > REMOTE < to > ON < .
- 3. Connect both units with an interface cable..



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

#### 12.2. Communication with a PC or a superordinated data system

If the circulator is put into remote control mode via the configuration level, the VFD COMFORT-DISPLAY will read "R -OFF-" = REMOTE STOP. The circulator is now operated via the computer.

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



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

A transfer sequence consists of:

- command
- space (⇔; Hex: 20)
- parameter (decimal separation with a period)
- end of file (↓; Hex: 0D)

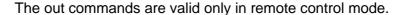
The commands are divided into in and out commands.

in commands: retrieve parameters out commands: set parameters

#### Important times for a command transmission:

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

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



Command to set the working temperature > SETPNT 1< to 55.5 °C out\_sp\_00  $\Leftrightarrow$  55.5. $\downarrow$ 

Command to retrieve the working temperature > SETPNT 1< in\_sp\_00.

Response from the circulator: 55.5. →





# 12.3. List of commands

out commands: Setting temperature values or parameters.

Command	Parameter	Response of circulator
out_mode_01	0	Use working temperature > SETPNT 1<
out_mode_01	1	Use working temperature > SETPNT 2<
out_mode_01	2	Use working temperature > SETPNT 3<
out_mode_04	0	Temperature control of internal bath.
out_mode_04	1	External control with Pt100 sensor.
out_mode_05	0	Stop the unit = R –OFF
out_mode_05	1	Start the unit.
out_mode_08	0	Set the control dynamics - aperiodic
out_mode_08	1	Set the control dynamics - standard
out_sp_00	xxx.xx	Set working temperature. "SETPNT 1"
out_sp_01	xxx.xx	Set working temperature. "SETPNT 2"
out_sp_02	xxx.xx	Set working temperature. "SETPNT 3"
out_sp_03	xxx.xx	Set high temperature warning limit "OVERTMP"
out_sp_04	xxx.xx	Set low temperature warning limit "SUBTMP"
out_sp_07	х	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.
	\	Vn control negroup stag of the intermed controller. 0.4 00.0
out_par_06	XXX	Xp control parameter of the internal controller. 0.1 99.9
out_par_07	XXX	To control parameter of the internal controller. 3 9999
out_par_08	XXX	Tv control parameter of the internal controller. 0 999
out_par_09	XXX	Xp control parameter of the cascade controller. 0.1 99.9
out_par_10	XXX	Proportional portion of the cascade controller. 1 99.9
out_par_11	XXX	Tn control parameter of the cascade controller. 3 9999
out_par_12	XXX	Tv control parameter of the cascade controller. 0 999
out_par_13	XXX	Maximum internal temperature of the cascade controller.
out_par_14	XXX	Minimum internal temperature of the cascade controller.
out_par_15	XXX	Band limit (upper) 0 200 °C
out_par_16	XXX	Band limit (lower) 0 200 °C

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

Command	Parameter	Response of circulator
version	none	Number of software version (V X.xx)
status	none	Status message, error message (see page 62)
in_pv_00	none	Actual bath temperature.
in_pv_01	none	Heating power being used (%).
in_pv_02	none	Temperature value registered by the external Pt100 sensor.
in_pv_03	none	Temperature value registered by the safety sensor.
in_pv_04	none	Setpoint temperature of the excess temperature protection
in_sp_00	none	Working temperature "SETPNT 1"
in_sp_01	none	Working temperature "SETPNT 2"
in_sp_02	none	Working temperature "SETPNT 3"
in_sp_03	none	High temperature warning limit "OVERTEMP"
in_sp_04	none	Low temperature warning limit "SUBTEMP"
in_sp_07	none	Pump pressure stage
in_par_01	none	Te - Time constant of the external bath.
in_par_02	none	Si - Internal slope
in_par_03	none	Ti - Time constant of the internal bath.
in_par_04	none	CoSpeed - Band limit (max. difference between the temperatures in the internal bath and external system).
in_par_05	none	Factor pk/ph0: Ratio of max. cooling capacity versus max. heating capacity
in_par_06	none	Xp control parameter of the internal controller.
in_par_07	none	Tn control parameter of the internal controller.
in_par_08	none	Tv control parameter of the internal controller.
in_par_09	none	Xp control parameter of the cascade controller.
in_par_10	none	Proportional portion of the cascade controller.
in_par_11	none	Tn control parameter of the cascade controller.
in_par_12	none	Tv control parameter of the cascade controller.
in_par_13	none	Adjusted maximum internal temperature of the cascade controller.
in_par_14	none	Adjusted minimum internal temperature of the cascade controller.
in_par_15	none	Band limit (upper)
in_par_16	none	Band limit (lower)

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

# 12.4. Status messages

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

# 12.5. Error messages

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

Error messages	Description
-06 SENSOR DIFFERENCE ALARM	Sensor difference alarm. Working temperature and safety sensors report a temperature difference of more than 25 °C.
-07 I <sup>2</sup> C-BUS ERROR	Internal error when reading or writing the I <sup>2</sup> C bus.
-08 INVALID COMMAND	Invalid command.
-09 COMMAND NOT ALLOWED IN CURRENT OPERATING MODE	Invalid command in current operating mode.
-10 VALUE TOO SMALL	Entered value too small.
-11 VALUE TOO LARGE	Entered value too large.
-12 TEMPERATURE MEASUREMENT ALARM	Error in A/D converter.
-13 WARNING : VALUE EXCEEDS TEMPERATURE LIMITS	Value lies outside the adjusted range for the high and low temperature warning limits. But value is stored.
-14 EXCESS TEMPERATURE PROTECTOR ALARM	Excess temperature protector alarm
-15 EXTERNAL SENSOR ALARM	External control selected, but external Pt100 sensor not connected.
-20 WARNING: CLEAN CONDENSOR OR CHECK COOLING WATER CIRCUIT OF REFRIGERATOR	Cooling of the condenser is affected. Clean air-cooled condenser. Check the flow rate and cooling water temperature on water-cooled condenser.
-21 WARNING: COMPRESSOR STAGE 1 DOES NOT WORK	Compressor stage 1 does not work.
-22 WARNING: COMPRESSOR STAGE 2 DOES NOT WORK	Compressor stage 2 does not work.
-23 WARNING: HIGH TEMPERATURE ON COMPRESSOR STAGE 1	Excess temperature on compressor stage 1.
-24 WARNING: HIGH TEMPERATURE ON COMPRESSOR STAGE 2	Excess temperature on compressor stage 2.
-25 REFRIGERATOR WARNING	Error in the cooling machine.
-30 CONFIGURATION ERROR: CONFIRM BY PRESSING <ok> ON CIRCULATOR</ok>	The configuration of the circulator does not conform to its present use.  Press OK to automatically perform a single modification of the configuration.
-33 SAFETY SENSOR ALARM	Excess temperature sensor short-circuited or interrupted.
-40 NIVEAU LEVEL WARNUNG	Low liquid level warning in the internal reservoir.

# 13. JULABO Service - Online remote diagnosis

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

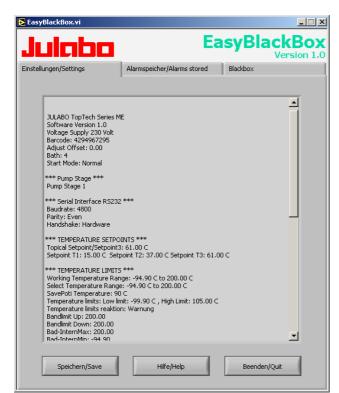
In case of a failure, this data can be read out from the unit by using special software. This software is available as a **free** download from <a href="https://www.julabo.com">www.julabo.com</a> \ EasyBlackBox.

- Installation is easy and is performed step by step.
   Please observe the instructions.
- Data read-out is possible in the conditions "OFF", "R OFF" or "ALARM".
- Connect the circulator to the computer using an interface cable.
- Start the EasyBlackBox program.
   The program asks for the port used (COM1, .....) and the baud rate of the unit.

You do not have this information on hand? Simply try it out! The program continues to send the request until the correct settings are made.



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

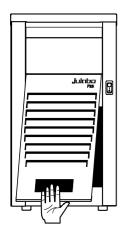


# 14. Cleaning / repairing the unit



#### Caution:

- Always turn off the unit and disconnect the mains cable from the power source before cleaning the unit.
- Prevent humidity from entering into the circulator.
- Electrical connections and any other work must be performed by qualified personnel only.



#### Maintaining the cooling performance

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

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

#### Cleaning:

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

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

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

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

#### Repairs

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

When returning the unit:

- Clean the unit in order to avoid any harm to the service personnel.
- Attach a short fault description.
- During transport the unit has to stand upright. Mark the packing correspondingly.
- When returning a unit, take care of careful and adequate packing.
- JULABO is not responsible for damages that might occur from insufficient packing.



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

#### 15. WARRANTY PROVISIONS

The following Warranty Provisions shall apply to products sold in North America by Julabo ("Seller") to the entity shown as buyer ("Buyer") on Seller's invoice.

- 1. <u>Initial Warranty</u>. Upon Seller's receipt of payment in full for the products and subject to Buyer's compliance with the terms of sale and any other agreement with Seller relating to the products, Seller warrants to the Buyer that the products manufactured by the Seller are free from defects in material and workmanship for a period not to exceed two (2) years or ten thousand (10,000) hours of operation, whichever comes first, from the date the product is shipped by Seller to Buyer (the "Initial Warranty").
- 2. <u>EXCLUSION OF ALL OTHER EXPRESS WARRANTIES; EXCLUSION OF ALL IMPLIED WARRANTIES.</u> OTHER THAN THE INITIAL WARRANTY, NO OTHER EXPRESS WARRANTIES ARE MADE. ALL IMPLIED WARRANTIES OF EVERY TYPE AND KIND, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE EXCLUDED IN ALL RESPECTS AND FOR ALL PURPOSES. SELLER DISCLAIMS AND MAKES NO IMPLIED WARRANTIES WHATSOEVER.
- 3. <u>Exclusions</u>. The Initial Warranty does not include damage to the product resulting from accident, misuse, improper installation or operation, unauthorized or improper repair, replacement or alteration (including but not limited to repairs, replacements, or alterations made or performed by persons other than Seller's employees or authorized representatives), failure to provide or use of improper maintenance, unreasonable use or abuse of the product, or failure to follow written installation or operating instructions. Buyer must return the product's record of purchase to the Seller or one of Seller's authorized representatives within thirty (30) days of the date the product is shipped by Seller to Buyer in order to make a claim under the Initial Warranty. Notwithstanding anything contained herein to the contrary, all glassware, including but not limited to reference thermometers, are expressly excluded from the Initial Warranty.
- Buyer's sole remedies; Limitations on Seller's Liability. Buyer's sole and exclusive remedy under the Initial Warranty is strictly limited, in Seller's sole discretion, to either: (i) repairing defective parts; or (ii) replacing defective parts. In either case, the warranty period for the product receiving a repaired or replaced part pursuant to the terms of the Initial Warranty shall not be extended. All repairs or replacements performed by Seller pursuant to these Warranty Provisions shall be performed at Seller's facility in Allentown, Pennsylvania, U.S.A. or Vista, California, U.S.A or at the facility of an authorized representative of Seller, which location shall be determined by Seller in its sole discretion; provided, however, that Seller may, in its sole discretion perform such repairs or replacements at Buyer's facility in which case Buyer shall pay Seller's travel, living and related expenses incurred by Seller in performing the repairs or replacements at Buyer's facility. As a condition precedent to Seller's obligation to repair or replace a product part under the Initial Warranty, Buyer shall (i) promptly notify Seller in writing of any such defect; (ii) shall have returned the product's record of purchase to Seller or to one of Seller's authorized representatives within thirty (30) days of the date the product is delivered to Buyer; and (iii) assist Seller in all respects in its attempts to determine the legitimacy and basis of any claims made by or on behalf of Buyer including but not limited to providing Seller with access to the product to check operating conditions. If Buyer does not provide such written notice to Seller within the Initial Warranty period or fails to return the product's record of purchase as set forth above, Seller shall have no further liability or obligation to Buyer therefore. In no event shall Seller's liability under the Initial Warranty exceed the original purchase price of the product which is the subject of the alleged defect.
- 5. THE REMEDIES PROVIDED IN THE INITIAL WARRANTY ARE THE SOLE AND EXCLUSIVE REMEDIES AVAILABLE TO THE BUYER. NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED HEREIN, AND EVEN IF THE SOLE AND EXCLUSIVE REMEDIES FAIL OF THEIR ESSENTIAL PURPOSE FOR ANY REASON WHATSOEVER, IN NO EVENT SHALL SELLER BE LIABLE FOR BUYER'S MANUFACTURING COSTS, LOST PROFITS, GOODWILL, OR ANY OTHER SPECIAL, INDIRECT, PUNITIVE,

# INCIDENTAL OR CONSEQUENTIAL DAMAGES TO BUYER OR ANY THIRD PARTY AND ALL SUCH DAMAGES ARE HEREBY DISCLAIMED.

- 6. <u>Assignment</u>. Buyer shall not assign any of its rights or obligations hereunder without the prior written approval of Seller; provided, however, that if Buyer is a distributor of Seller, the rights and obligations of Buyer under these Warranty Provisions shall inure to the benefit of and be binding upon Buyer's customers who provide the product's proof of purchase to Seller pursuant to the terms set forth herein. Seller may assign any or all of its rights or obligations hereunder without Buyer's prior consent.
- 7. <u>Governing Law</u>. The Warranty Provisions and all questions relating to their validity, interpretation, performance, and enforcement shall be construed in accordance with, and shall be governed by, the substantive laws of the Commonwealth of Pennsylvania without regard to its principles of conflicts of law.
- 8. <u>Waiver</u>. Any failure of the part of Seller to insist on strict compliance with the Warranty Provisions shall no way constitute a waiver of such right. No claim or rights arising out of a breach of the Warranty Provisions by Buyer may be discharged in whole or in part by a waiver of the claim or right, unless the waiver is in writing signed by an authorized representative of Seller. Seller's waiver or acceptance of any breach by Buyer of any provisions of the Warranty Provisions shall not constitute a waiver of or an excuse for nonperformance as to any other provision of the Warranty Provisions nor as to any prior or subsequent breach of the same provision.
- 9. <u>Freight</u>. Buyer will arrange and pay for shipping and handling charges for the unit to be returned to the Seller. Seller will arrange and pay for shipping and handling for the return of the unit to the Buyer.