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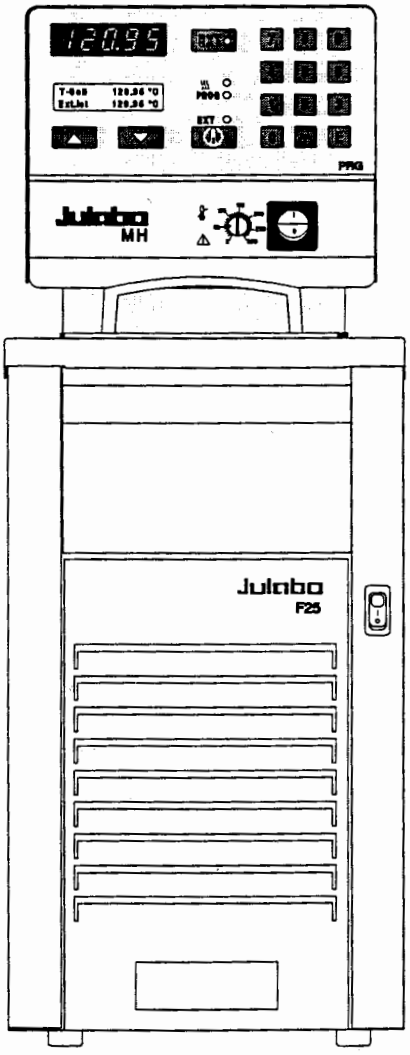
Operating Manual

Refrigerated Circulators
with integrated programmer

F25
F26
F32
F33
F34
FS18
FP40
FP45
FP50

F81
F83

- MH
- MS
- MT



We are ISO 9001 certified

1.951.2628BE4 06/96

Julabo

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Congratulations

You have made an excellent choice.

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

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

Safety Warnings

Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions concerning the operation of your unit or the information in this manual, contact JULABO.

Performance of installation, operation, or maintenance procedures other than those described in this manual may result in a hazardous situation and may void the manufacturer's warranty.

Transport the unit with care. Sudden jolts or drops may cause damages in the interior of the unit.

Observe all warning labels.

Never remove warning labels.

Never operate damaged or leaking equipment.

Never operate the unit without bath fluid in the bath.

Always turn off the unit and disconnect the mains cable from the power source before performing any service or maintenance procedures, or before moving the unit.

Always empty the bath before moving the unit.

Never operate equipment with damaged mains power cables.

Refer service and repairs to a qualified technician.



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

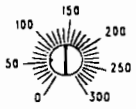
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⚠ Connect the unit to grounded power outlets only (part 4.9)!

1. Setting the upper temperature limit according to DIN 12 879 (part 4.10)



This upper temperature limit must be set to at least 20 K below the flash point of the bath liquid used! (Adjustment is made with a screw driver)
Example: the flash point of the liquid is reached at about 75 °C;
The limit is set to 55 °C.

2. Switching on the circulator (part 5.1)



Switch on the circulator.
The pilot lamp on the power switch will light up.



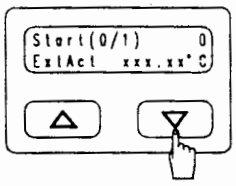
If needed, switch on the refrigerating machine.
The power switch will light up.
The refrigerating machine will only run while the circulator is powered up.

3. External control (part 7.2)



The control of the external system is active when the "EXT" lamp is lit.
Changeover switch for switching control from the circulator bath to the external system.

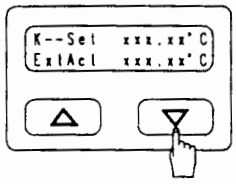
4. Starting the circulator (part 5.5)



Use the scroll-down key to select the start command in the ENTRY LINE.

[1] [E] Enter the start command.

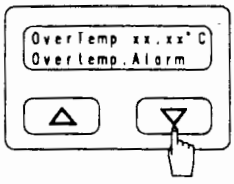
5. Setting the setpoint temperature (part 5.6)



Use the scroll-down key to select the ENTRY LINE for the setpoint temperature.

[2] [5] [E] Enter the setpoint temperature. (e. g. 25°C)

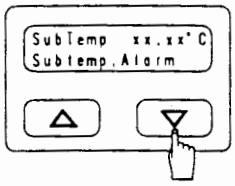
6. Setting the upper temperature limit (part 5.7)



Use the scroll-down key to select the ENTRY LINE for the upper temperature limit.

[3] [2] [E] Enter the upper temperature limit. (e. g. 32°C)

7. Setting the lower temperature limit (part 5.8)



Use the scroll-down key to select the ENTRY LINE for the lower temperature limit.

[1] [8] [E] Enter the lower temperature limit. (e. g. 18°C)

⚠ Please read the following operating manual thourougly, especially the safety recommendations (port 13.). We take no liability for wrong use!

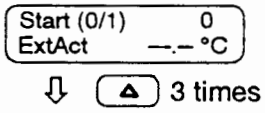
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Microprocessor Circulators of the MH + MS + MT Series

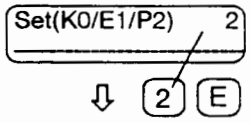
1. Preparations:

After following the instructions for preparation and makeready of the circulator (chapters 4 and 5), the integrated programmer can be activated.

2. Activate the integrated programmer



Select the setpoint entry line with the keys ▲ ▼.



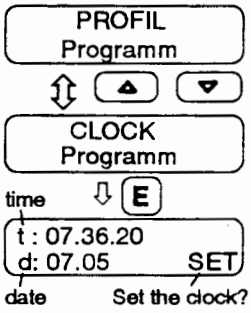
Enter a "2" to activate the integrated programmer.



The DIALOG display indicates what is shown at left.

3. Time / Date

To control the integrated clock follow the instructions:

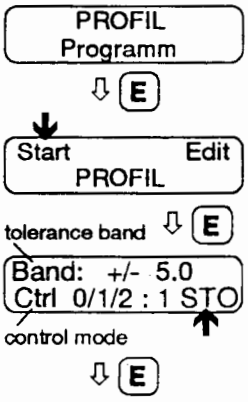


Select the menu item "CLOCK" with the keys ▲ ▼ and press the E-key to activate the item.

Time and date appear on the DIALOG display.
If necessary, confirm "SET" with the E-key to set the clock (chapter A.4.5.1).
If the clock does not have to be set, quit the menu item "CLOCK" by pressing simultaneously the keys ▪ + E (chapter A.4.1).

4. "Start" profiles

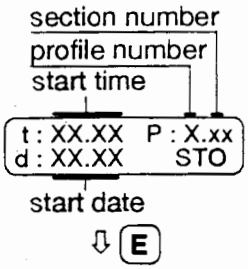
Up to 10 profiles (numbers 0 to 9) can be stored.



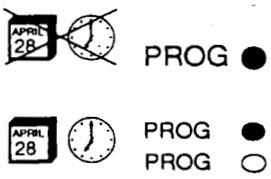
Activate the main menu item "PROFIL" with the E-key. Confirm "Start" in menu level 2 by pressing the E-key.

The DIALOG display indicates the settings for the tolerance band and the control mode (chapter A.4.6.2). Press the E-key to accept the settings.
(See chapter A.4.6.1 to modify the setting.)

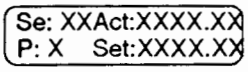
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The entry fields shown at left appears on the DIALOG display (chapter A.4.6.1).
Enter the profile number.
Start time and date do not have to be entered when the profile is immediately started by confirming "STO" with the (E)-key.



The control light "PROG" illuminates on the circulator.
With date and time defined, the program waits and is not started before this time.
The flashing control light "PROG" indicates the "wait" status.

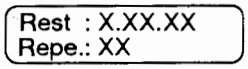


After start the DIALOG display indicates different parameters:

Se : Active program section.
Act : Actual temperature value.
P : Number of the activated profile.
Set : Setpoint value.



To switch the display, use the keys (▲) (▼).

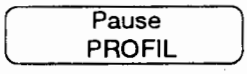


Rest : Indicates the time that remains until the end of the active section.
Repe. : Indicates the number of profile repetitions already started.

5. Interrupt, stop profiles (chapter A.4.6.3)



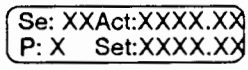
Press the (E)-key to interrupt a profile. This means that setpoint and duration set for the corresponding section are stopped at the values presently achieved.



The message "Pause" flashes on the DIALOG display.



Press the (E)-key to continue the profile from the interrupted position.



The indication shown at left appears on the DIALOG display



The abridged manual does not substitute the operating manual!
Please read the operating manual and the appendix thoroughly, especially the safety recommendations!
We take no liability for wrong use!

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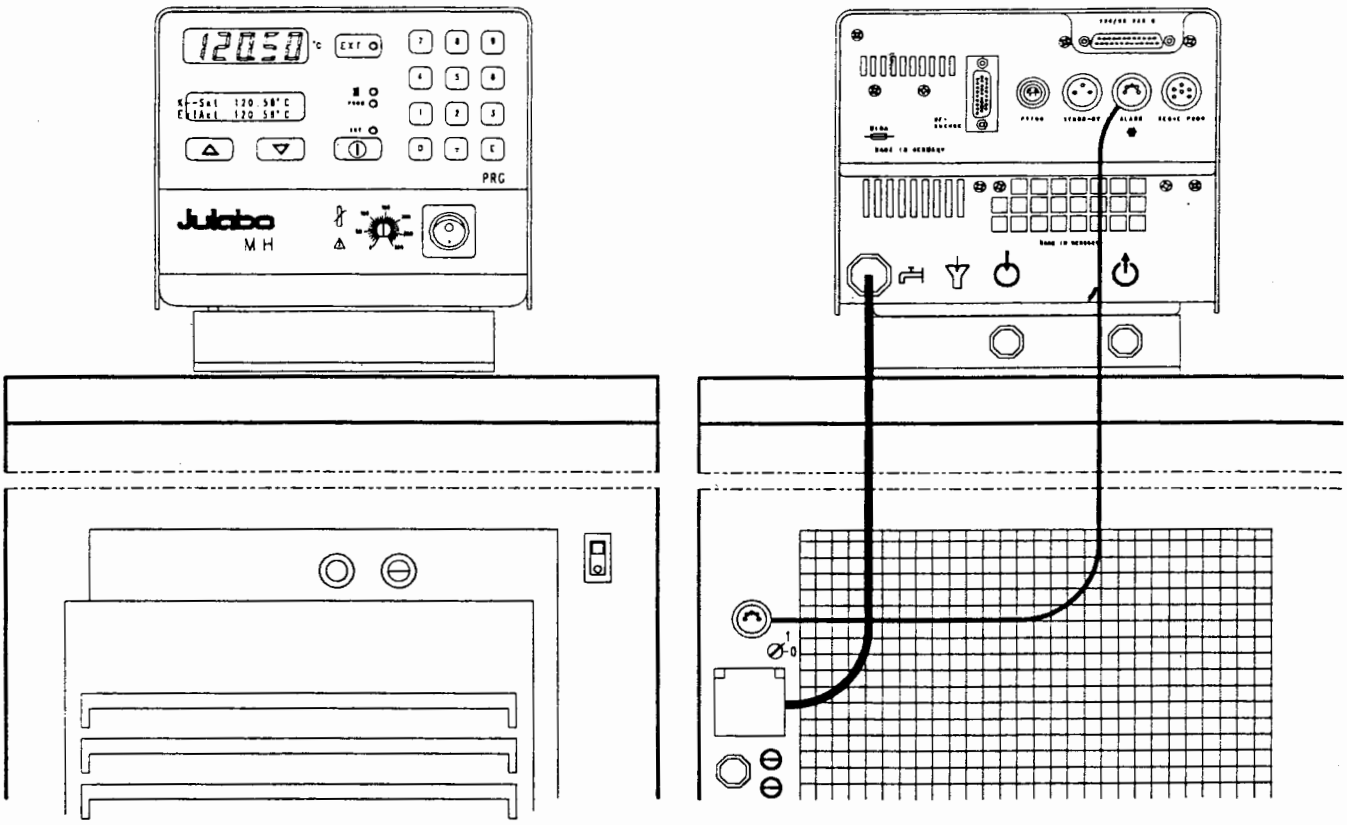
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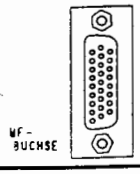
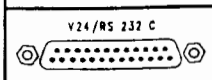
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3. Operating Controls and Functional Elements



Symbol	Designation	Function
	Power switch with integrated pilot light	Switches the unit on/off. The integrated pilot light illuminates when the unit is switched on.
	setting bush	Upper temperature limit according to DIN 12 879
	Membrane switch array Key "E"	All entries are made via this array. Enter/Reset (enter key, or for resetting after error)
EXT	Control light Key	Illuminates for external actual value on LED display. Switches between int./ext. actual value on LED display
	Control light	Indicates operation of the heater.
PROG	Control light	Illuminates for temperature selection by int. programmer
EXT	Control light Key	Illuminates for external control. Switches between internal/external control.
12050 °C	MULTI display (LED)	Actual temperature vaalue display internal/external
K--Set 120.50° C ExtAct 120.50° C	DIALOG display (LCD)	Upper line = entry data Lower line = output data

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Symbol	Designation	Function
	Key	Scrolls the input and output lines upward.
	Key	Scrolls the input and output lines downward.
	Mains switch illuminated	Switches the cooling compressor on/off (independently of the circulator)
	Mains fuses	Mains fuses for cooling machine Fine fuse T 10.0 A, dia. 5 x 20 mm
	Selector dial for cooling machine	Position "1" for operation with "MH" and "MS" (only F25, F26, F34)
	D-sub female connector 26-pin	Multi-function connector Various recorder signals plus control inputs and outputs appear at this connector.
	Connector (Lemosa) 4-pin	Connection for the external measurement and control sensor (Pt100)
	Round connector 3-pin	For remote emergency off switch
	Round connector 5-pin	For control of JULABO refrigerated circulators
	Round connector 6-pin	For recorder signals and programmer (external temperature selection)
	D-sub female connector 25-pin	V24/RS232C serial interface
	Pump connector	Suction pump
	Pump connector	Pressure pump
	Drain port Drain tap	For draining
	Round connector 5-pin	Used for connecting the control line to the circulator.
	Bulkhead socket connector	Power supply for the circulator

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4.4 Filling / draining

* Recommended maximum filling level with water as bath liquid:
  25 mm below the bath cover or rim
* Recommended maximum filling level with bath oils:
  40 mm below the bath cover or rim

⚠ The volume of bath oils will increase due to thermal expansion when the bath temperature rises.
Max. viscosity of bath liquid: 30 mm x s^{-1}

◎ ⊖ Drain port and drain tap for drainig the bath.

⚠ Exercise CAUTION when emptying hot bath liquids!

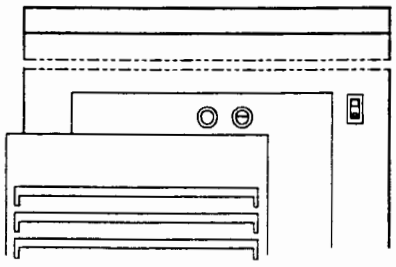
4.5 Cooling compressors

JULABO refrigerated circulators are equipped with virtually noise- and vibration-free refrigerating machines containing hermetically sealed compressors. The heat is indirectly dissipated by an evaporator coil made of high-grade stainless steel in the bath. The built-in fans carry the condensation heat away.

The refrigerated circulators bearing the type designation "FP" are equipped with proportionally-controlled refrigerating machines. The circulator controls the electronic circuitry that is integrated in the refrigerating machine. This circuitry in turn operates a solenoid valve to regulate the cooling loop. As a result, cooling is performed only to exactly the extent required in order to maintain the system at the stipulated setpoint temperature.

Note: The cooling compressors are equipped with an overload protection device that trips if the temperature rises impermissibly (e.g. because the unit is too close to the wall) and then, following a cool-down phase, automatically cuts out again.
At bath temperatures above +150 °C it is very rare for cooling to be required. In order to save energy, it is recommended that the cooling compressors only be switched on if genuinely required.
It is no problem to lower the temperature of the internal bath from 250 °C to e.g. 150 °C. However,if external systems must be cooled from 250 °C to e.g. 150 °C, then the larger amount of heat that must be dissipated can significantly prolong the cooling time.
At cool-down times of more than one hour, the compressor's overload protection device could be tripped and shut down the refrigerating machine. This would adversely affect the temperature constancy in the bath.

In dusty environments, the refrigerating machine's condenser should be cleaned by vacuuming every 1-2 months. The condensor is located behind the removable venting grid on the front of the unit.



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4.6 Pt100 connector



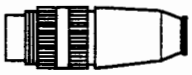
Pt100

Connect the external measurement and control sensor (Pt100) and use either directly in the external system or in the bath liquid of an external bath tank.

(LEMOSA round connector size 1, 4-pin)

4.7 Jumper connector





If the jumper connector has not yet been attached to the circulator, it must be plugged into the STAND-BY socket and secured with its threaded collar.

If the jumper connector is not in place, the message "STAND-BY" will f l a s h in the OUTPUT LINE of the DIALOG display.

4.8 Setup

Connect the circulator's power cable to the bulkhead socket connector on the refrigeroting machine.
Use the control line to connect the "Alarm✱" jack of the circulatar with the corresponding connector an the refrigerating machine.



In order to optimally dissipate the condensation and motor heat from the refrigerating machine, it is essential for the back of the unit to be at least about 20 cm away from the wall.

Before switching on a refrigerating machine for the first time, wait about one hour after setting it up. This will allow any oil that has accumulated laterally during transport and/or storage to flow back down. Otherwise the refrigerating machine will not operate at its maximum efficiency.

4.9 Power connection

Check to make sure that the line voltage matches the supply voltage specified on the identification plate. Deviations of 10% are permissible.
Connect the unit to grounded power outlets only!



We disclaim all liability for damage caused by incorrect line voltages!
Do not modify power cables and plugs!
Only use original replacment parts!

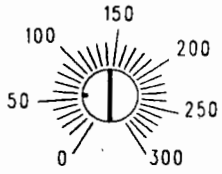
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4.10 Setting the upper temperature limit according to DIN 12 879

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

This upper temperature limit must be set to at least 20 K below the flash point of the bath liquid used!

The setting is carried out with help of a screw driver.



Setting range: 0 °C ... 320 °C

Example:
Flash point of the bath temp. is reached at about 75 °C. Setting of the limit to maximal 55°C.

This safety installation is independent of the control circuit of the appartus and the additional JULABO high temperature adjustment (part 5.7).
When the temperature of the bath liquid has reached the limit set, a complete shutoff of the heater and pump as well as of the cooling compressor is effected.

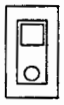
The reading TEMP/LEVEL ALARM appears on the DIALOG-display.

After the cause of malfunction has been eliminated and the bath liquid has cooled, the apparatus can only be put into operation again by turning the mains switch off and on.

5.1 Switching on the circulator



Switch an the circulator.
The pilot lamp on the power switch will light up.



If needed, switch on the refrigerating machine.
The power switch will light up.

The refrigerating machine cannot be operating by itself, i.e. it will only run while the circulator is powered up.

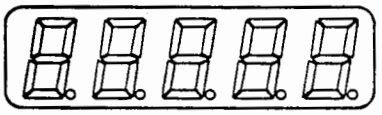
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5.2 Self-test

After power-up the unit automatically performs a test of the display and the indicator lamps; the test takes 5 seconds.

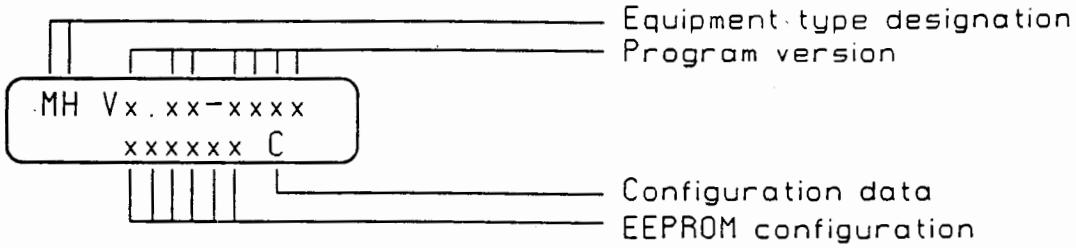
a) The four indicator lamps shown below light up.





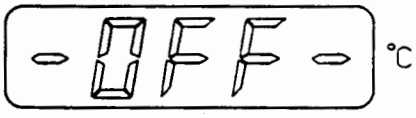
b) All of the segments of the MULTI display (LED) light up.

c) The following messages appear in the DIALOG display (LCD):



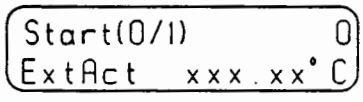
5.3 Stand-by state (ready for entries)

After the self-test has been completed, the circulator is in start-mode and is ready for entries.



The following characters appear in the MULTI Display:

The following appears in the DIALOG display:



ENTRY LINE = Start/stop command

OUTPUT LINE = Temperature of the external system

All of the entered parameters remain stored in memory when the circulator is powered down.

5.4 Correcting wrong entries

a) If an incorrect entry is confirmed by pressing the enter key [E] then the following messages can appear in the DIALOG display

Too Small Too Large invalid

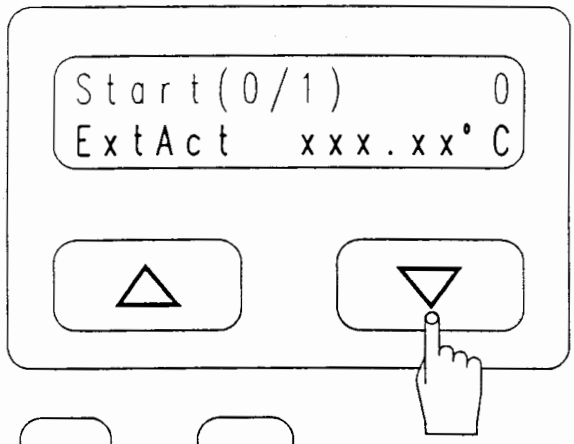
These messages can then be overwritten with new entries.

b) In the case of an entry that has not yet been confirmed by pressing the enter key, [E] the previous value can be recalled by pressing the following keys:

[△] and then [▽] or [▽] and then [△]

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5.5 Starting the circulator

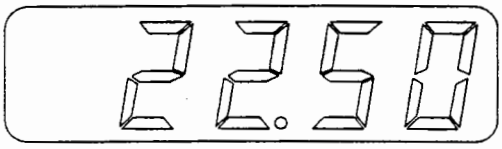


Use the scroll-down key to select the start command, i.e. keep pressing until "Start ..." appears in the ENTRY LINE (top line).

1 E Enter the start command.

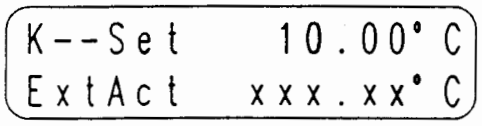
The following messages will then appear in the MULTI and DIALOG displays:

MULTI display



Actual value of the circulator bath **(e.g. 22.50°C)**

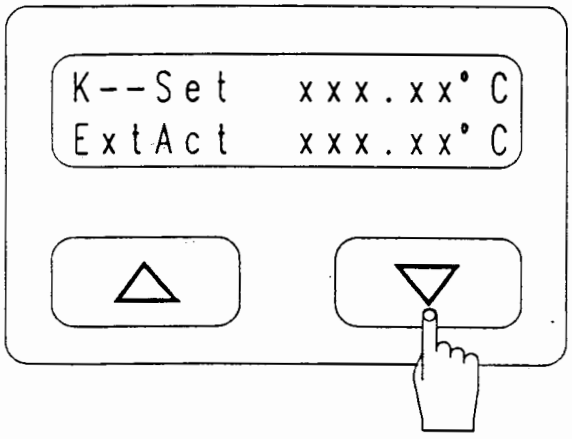
DIALOG display



ENTRY LINE = setpoint temperature

OUTPUT LINE = temperature in external system

5.6 Setting the setpoint temperature



Operating temperature range: see part 15
Resolution: 0.01 K

Press the scroll-down key until the ENTRY LINE for the setpoint temperature as shown at left appears in the DIALOG display.

Enter the setpoint temperature on the membrane keypad, by pressing the following keys:

1 0 0 E **(e.g. 100 °C)**

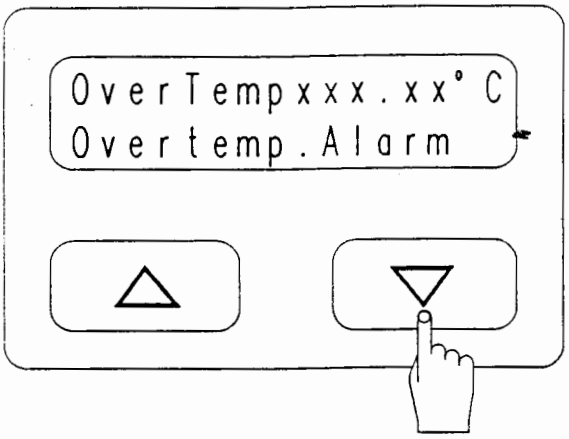
÷ 3 2 ÷ 5 E **(e.g. -32.5 °C)**

⚠ **Set the upper temperature limit according to DIN 12 879! (part 4.10)**

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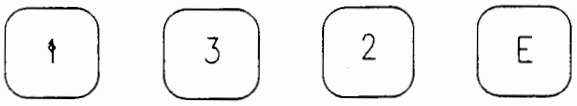
5.7 Setting the upper temperature limit

(JULABO option exceeding the DIN requirements)



High temperature adjustment:
see part 15
Resolution: 0.01 K

Press the scroll-down key until the ENTRY LINE for the upper temperature limit as shown at left appears in the DIALOG display.

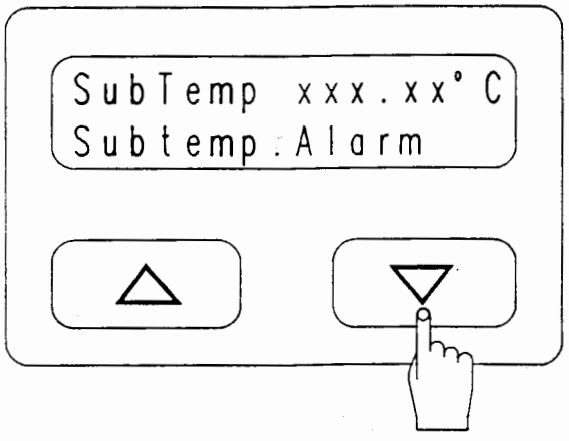


Use the membrane keypad to enter the upper temperature limit, **(e.g. for +132 °C at an operating temperature of 130 °C)** by pressing the keys shown on the left.

This setting should be adjusted to only a few kelvin above the selected working temperature, but below the upper temperature limit according to DIN 12 879 (chapter 4.10).
When the bath liquid reaches the upper temperature limit set, complete shut-off of the cirulator is effected.
An audible alarm is sounded and Overtemp. Alarm f l a s h e s in the OUTPUT LINE (lower line) of the DIALOG display.

5.8 Setting the lower temperature limit

(JULABO option exceeding the DIN requirements)



Low temperature adjustment:
see part 15
Resolution: 0.01 K

Press the scroll-down key until the ENTRY LINE for the lower temperature limit as shown at left appears in the DIALOG display.



Use the membrane keypad to enter the lower temperature limit, e.g. for

-38 °C at an operating temperature of -36 °C
by pressing the keys shown on the left.

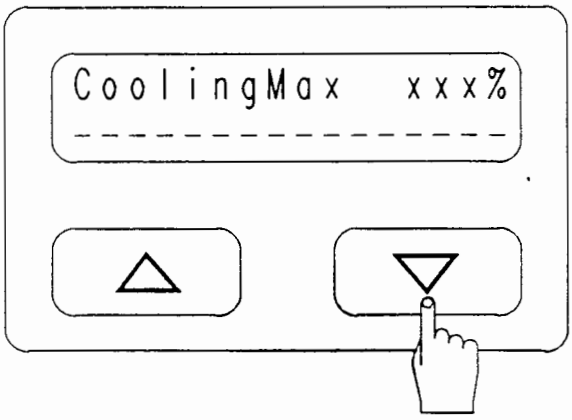
When the bath liquid reaches the lower temperature limit set, complete shut-off of the cirulator is effected.
An audible alarm is sounded and Subtemp. Alarm f l a s h e s in the OUTPUT LINE (lower line) of the DIALOG display.

For circulators without cooling unit, ther is no need to change the value preset in the factory.

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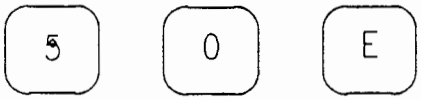
5.9 Setting the cooling percentage

This function can be used to reduce the maximum cooling percentage of a connected cooling unit with **proportional control.**



Setting range: 0% to 100%
Resolution: 1%

Press the scroll-down key until the ENTRY LINE for maximum cooling as shown on the left is displayed.



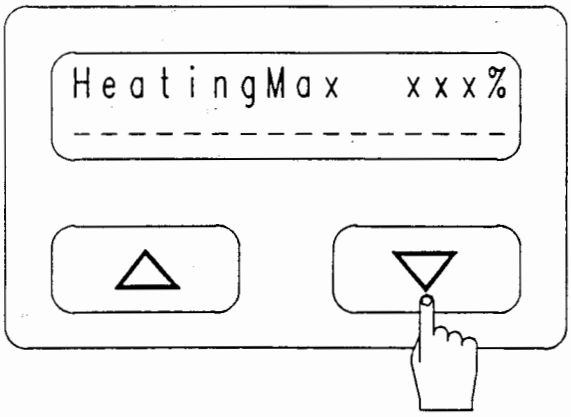
Enter the desired cooling percentage on the membrane keypad **(e.g. as shown on the left for 50%).**

If the cooling percentage is set too low, it is possible that the set setpoint temperature may not be attained.
If a cooling unit without proportional control is connected, the cooling percentage must be set to 100%.

For circulators that are not combined with cooling installations, the cooling percentage must be set to 0 %.

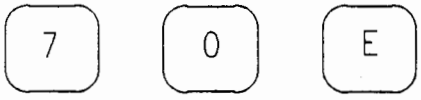
5.10 Setting the heating percentage

This function is used to reduce the maximum heating percentage.



Setting range: 0% to 100%
Resolution: 1%

Press the scroll-down key until the ENTRY LINE for maximum heating as shown on the left is displayed.

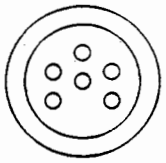


Enter the desired heating percentage on the membrane keypad **(e.g. as shown on the left for 70%).**

If the heating percentage is set too low, it is possible that the set setpoint temperature may not be attained.

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5.11 Analog setpoint input



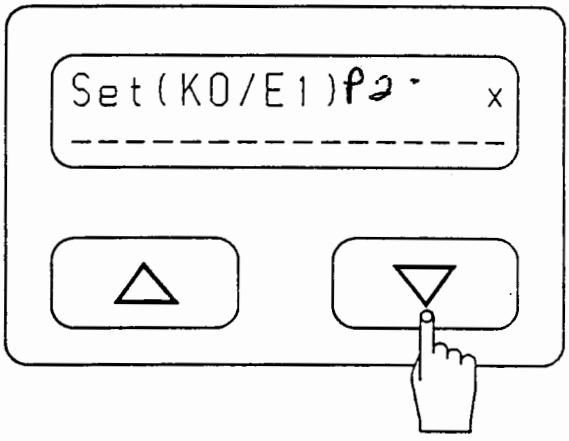
REG+E PROG

An analog signal or a programmer for external setting of the setpoint can be connected to this jack.

Possible voltage values: −10 V to +10 V
Possible current values: 0 mA to 24 mA

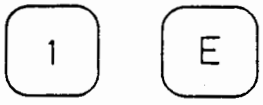
When an analog signal is being applied or a programmer connected for the first time, the input must be configured prior to activation.
See parts 8.7 through 8.9 for information on configuration.

Activation of the setpoint input:



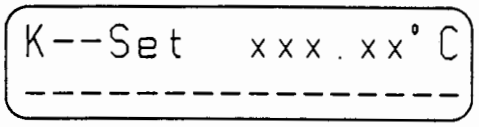
Setpoint entered using keypad = 0
Externally defined setpoint = 1

Press the scroll-down key until the ENTRY LINE for selecting the setpoint as shown at left appears.



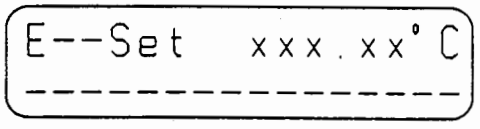
Use the membrane keypad to enter a "1" for an external setpoint signal.

The entry line for the setpoint temperature changes

FROM 

Setpoint entered using keypad

P = PROFILE

TO 

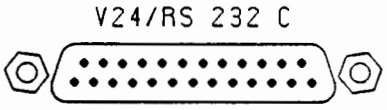
Externally applied setpoint signal

If a "0" is entered in the setpoint entry line; the values set on the circulator automatically become active.

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5.12 Remote mode

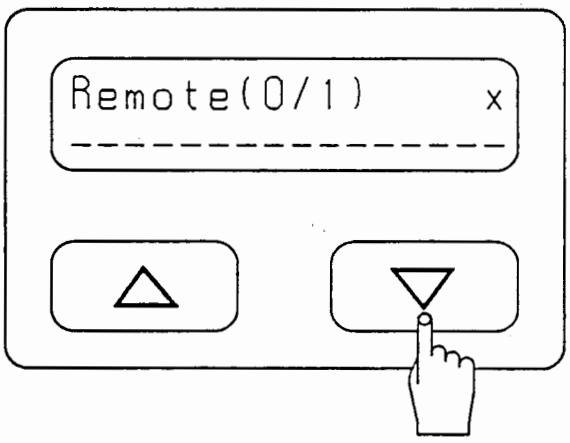
This function permits remote control of the circulator by a computer.



Connect the computer with the interface "V24/RS232C".

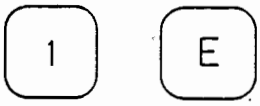
If a computer is being connected for the first time or exchanged for another, the circulator's interface must first be configured. For information on configuration, see parts 8.10 through 8.15.

Takeover of the computer data



Circulator values = 0
Computer values = 1

Press the scroll-down key until the ENTRY LINE for the remote command, as shown on the left, appears in the display.



Enter a "1" using the membrane keypad in order to activate the computer.

As long as the circulator remains in remote mode, scrolling of the ENTRY LINE is disabled.

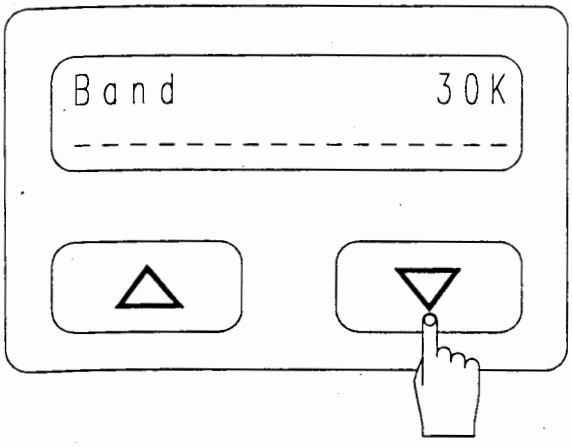
The corresponding software, which is required for control of the circulator by a computer, can be ordered by stipulating article no. 8 901 100.

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5.13 Limiting the temperature bandwidth

Only effective with external control (see part 7.2).

This setting is used to define the maximum temperature difference (for heating and cooling) between the internal bath temperature and the external system temperature.



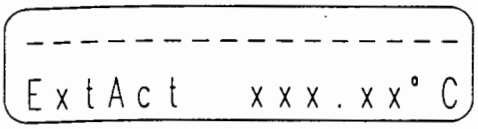
Factory setting: 30 K
Setting range: 0 to 100 K
Resolution: 1 K

Press the scroll-down key until the ENTRY LINE for the temperature bandwidth as shown on the left appears in the display.

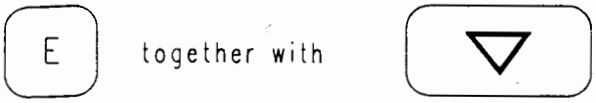


Enter the desired bandwidth using the membrane keypad, (e.g. as shown on the left for 25 K)

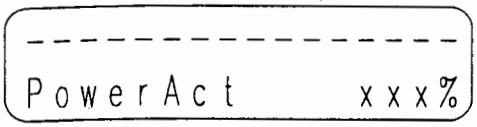
6.1 Switching the output line in the DIALOG display



Previous message in the OUTPUT LINE
Temperature reported by the external sensor

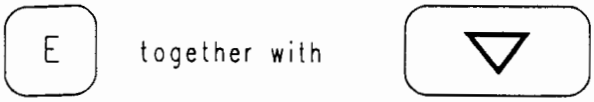


to switch the OUTPUT LINE.

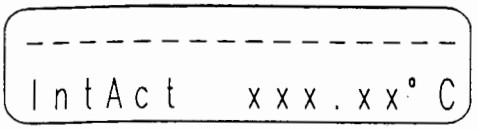


New message in the OUTPUT LINE
Current measured heating or cooling percentage

Positive value = heating
Negative value = cooling



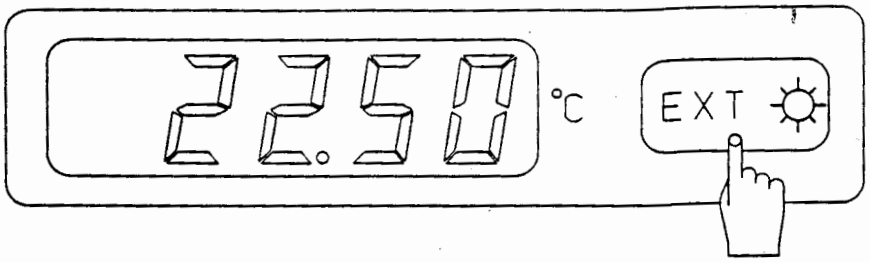
to switch the OUTPUT LINE.



New message in the OUTPUT LINE
Temperature in the circulator bath

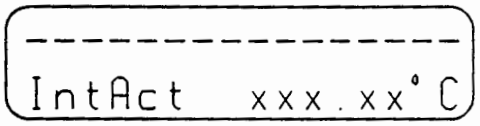
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6.2 Switching the MULTI display



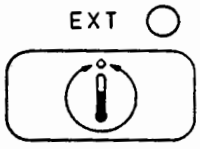
Press the "EXT" key.
The indicator lamp lights up.

Now the temperature reported by the external sensor is displayed instead of the temperature of the circulator bath.



At the same time, the OUTPUT LINE of the DIALOG display switches to show the temperature of the circulator bath.

7.1 Internal control



(Internal) control of the circulator bath is active when the "EXT" indicator lamp is **not** lit.

The heating indicator lamp signals whether or not the heating system is in operation.

If a bath liquid other than water is used, or if the circulator is mounted on a bath with a different filling volume, a new complete system identification must be performed.
See part 8.2 for more information on this.

The circulator is set in the factory for the supplied circulator bath and use of water as the bath liquid.

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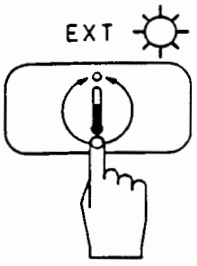
7.2 External control



Pt100

Connect and calibrate the external measurement and control sensor (Pt100) (see part 8.3).
You may then use the sensor in the external system or in an external bath.

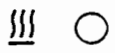
Enter start-command "0".



Press the key for switching control from the circulator bath to the external system.

Control of the external system is active when the "EXT" indicator lamp is lit.

Enter start-command "I".



The heating indicator lamp signals whether or not the heating system is in operation.

If the external system is being operated for the first time or changed, then it is first necessary to perform a complete internal system identification before performing identification of the external system.
See part 8.2 for information.

8.1 Invoking the configuration functions

By means of the configuration functions, operation of the circulator can be optimized for the current application.

To invoke the configuration functions, press the following keys in the indicated sequence:

E	Press and hold depressed.	0	Press and also hold depressed.	△	Press and release.

To exit the configuration functions, repeat the above steps in the same order.

The following measures will then appear in the DIALOG display:



ENTRY LINE

OUTPUT LINE

If no entries are made within one minute, the DIALOG display automatically reverts to the previously active display mode.

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8.2 Identification

The identification function is used to optimize the control behavior of the circulator to the system by determining the control parameters. The circulator is preset in the factory to the optimum values for the supplied circulator bath and use of water as the bath liquid.

A complete new identification should be performed under the following conditions:

* If a different liquid is used.
* If the circulator is mounted on a bath with a different filling volume.
* If the external temperature system is being operated for the first time has been changed.

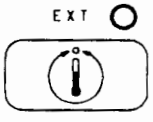
Requirements:

* The circulator must be in "start" mode. (Start = 0; see part 5.5)
* The temperature-control system must be properly filled for operation.
* The temperature-control liquid must be roughly at ambient temperture.
* The temperature-control liquid must not change its temperature faster than 0.01 K per second (this is automatically monitored by the system)
* The temperature difference between the setpoint and actual values should be approx. 20 K.

NOTE: With equipment combinations involving a refrigerating machine without proportional cooling, it is not possible to perform identification (either internally or externally) to temperatures below room temperature (temperature when identification is begun).
In order to identify an internal or external temperature system and and then regulate it, two possibilities exist, depending on the operating temperature range of the heat transfer medium used:

I: The maximum operating temperature of the heat transfer medium used is approx. 20 K higher than the room temperature, i.e. the setpoint temperature should be set to about 20 K above the room temperature and the thermostat started. After completing the identification, the real temperature setpoint temperature can be set.

II: The maximum operating temperature of the heat transfer medium used is near the room temperature, i.e. in this case it is first necessary to attain a temperature about 20 K below the room temperature. Then perform an identification for a temperature about 20 K higher. After completing the identifcation, the real temperature setpoint temperature can be set.

* 

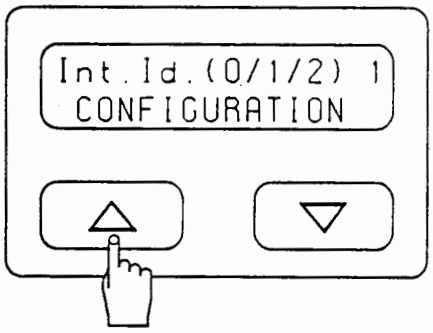
The circulator must be set to internal control (indicator lamp not lit) for internal identification or to external control (indicator lamp lit) for external identification.

00003485
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8.2 (continued)

A) Selecting the internal identification modes

Invoke the configuration functions as explained in part 8.1.



Factory setting = 1

Press the scroll-up key until the ENTRY LINE for internal identification as shown on the left appears.

Entry 0 = No identification

The control parameters identified during the last complete identification are used for control purposes.

Entry 1 = Partial identification

The temperature-dependent control parameters "IdSi" are continuously identified. This achieves optimum response of the control system.
If the circulator is switched off or the start command "0" is entered, the identified temperature-dependent control parameters are replaced by those of the last complete identification.

Entry 2 = Complete identification

All required control parameters "IdSi / IdTi" are identified. When a complete identification is finished, the parameters are stored and the entry value "2" is reset to the previous value (0/1).
When having put the apparatus into operation and not all requirements have been met, the message "Temp not constant" will f l a s h in the OUTPUT LINE. Have these been met, complete identification is triggered. The apparatus will start heating and the message "Identification" flashes in the OUTPUT LINE.
If the circulator is switched off while complete identification is in progress, if the start command "0" is entered, or if identification fails, then the control parameters from the last complete identification are used instead.
Afterwards the entry value "2" is again reset to the previous value (0/1).

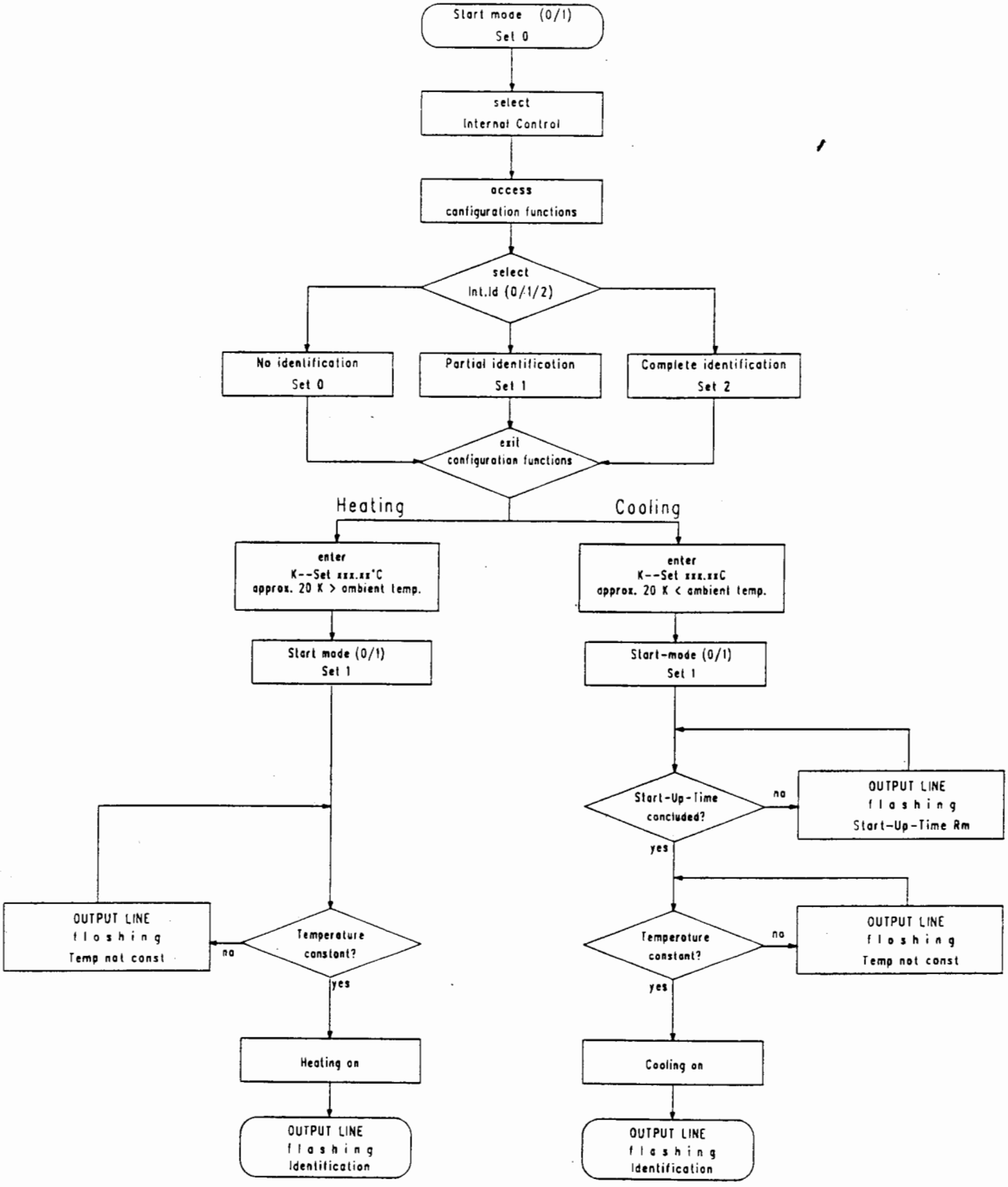
Enter the desired mode number and confirm by pressing the "E" key.

Exit the configuration functions as explained in part 8.1.

Now start the circulator (see part 5.5).

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A) Flow Diagram for Internal Identification

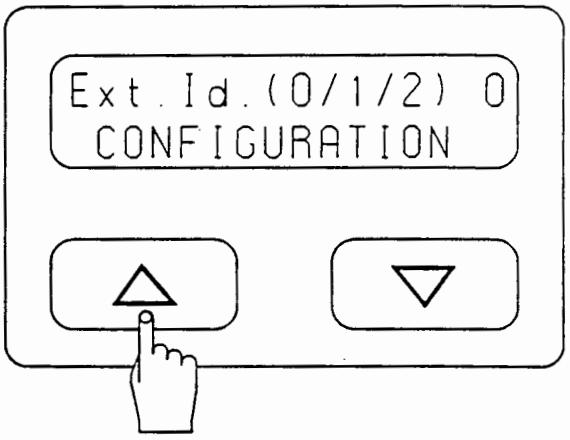


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B) Selecting the external identification modes

Set the thermostat to "External Control" (part 7.2).

Access the configuration functions as explained in part 8.1.



Factory setting = 0

Press the scroll-up key until the ENTRY LINE for external identification as shown on the left appears.

Entry 0 = No identification

The control parameters ascertained during the last complete identification are used for control purposes.

Entry 1 = Single external identification

This setting is reset to "0" after identification, when changing from START to STOP, and when the equipment is powered down.
The required external control parameter "IdTe" is identified once, and stored in memory upon completion of identification.

Entry 2 = Continual external identification

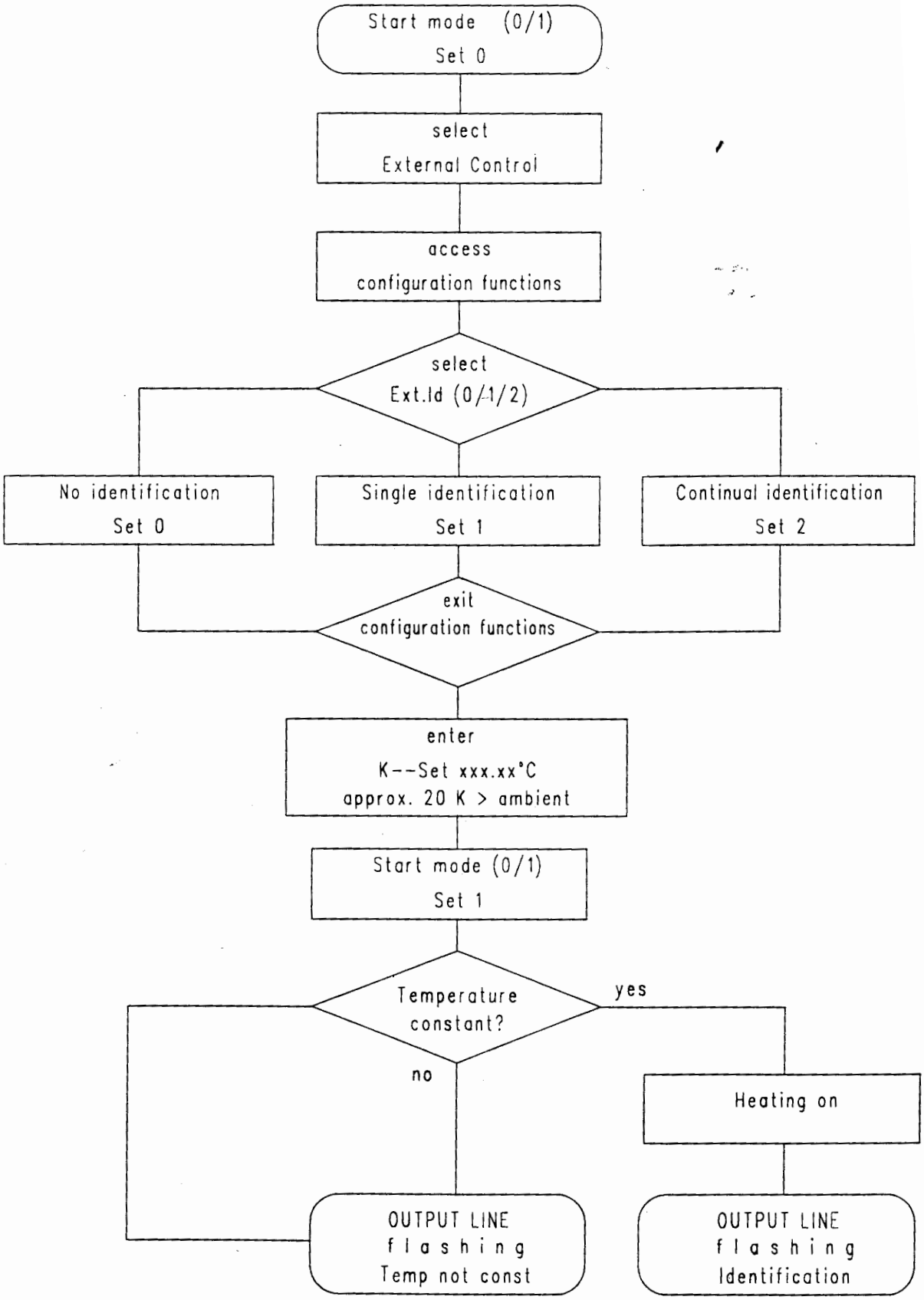
With this setting, the equipment attempts to identify the external control parameter "IdTe" each time a temperature-control process is started. This setting is only automatically reset to "0" in the event of an initialzation. Otherwise, the same conditions hold as in identification mode "1".

NOTE: For normal operation, i.e. when both temperature-control systems are the same, preference should be given to identification mode "1". Identification mode "2" should only be selected if the temperature systems are frequently being changed. When mode "1" or "2" is chosen, after switching on the equipment the message "identification" f l a s h e s in the OUTPUT LINE.

Enter the desired mode number and confirm by pressing the "E" key.
Exit the configuration functions as explained in part 8.1.
Now start the circulator (see part 5.5).

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B) Flow Diagram for External Identification



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C) Warning messages that can occur during identification

Warning 1

This message is displayed during a complete identification of the internal control parameters (see part 8.2 A) if the actual measured temperature reaches the setpoint before the identification has been completed.
In this case, the controller operates with the previously identified control parameters. To acknowledge warning no. 1 and reset, press the "E" key.

Warning 2

For successful external identification, the actual measured external temperature must not be higher or lower than +25 °C/ ±15 K.
If the external temperature is greater than 25 °C / ±15 K when identification begins, then the identification run is aborted, warning no. 2 is displayed, and the controller only regulates the internal temperature system to the setpoint temperature. Depending on the thermal feedback between the internal and external temperature system, actual external temperature then follows suit. When warning no. 2 is acknowledged by pressing the "E" key, the controller continues operating with the previously identified parameters.

Warning 3

For successful external identification, the system must be regulated to a temperature difference (ldXd, part 8.5) between the external and internal baths.
If, because of the system's properties, it is impossible to keep this temperature difference stable, then the identification is aborted and warning no. 3 is displayed.
If warning message no. 3 is output, then thereafter the unit only regulates the internal system to the setpoint temperature. The extent to which the external temperature then follows suit depends on thermal feedback between the internal and external systems.
If warning message no. 3 is acknowledged by pressing the "E" key, the controller then continues operating with the previously identified parameters.

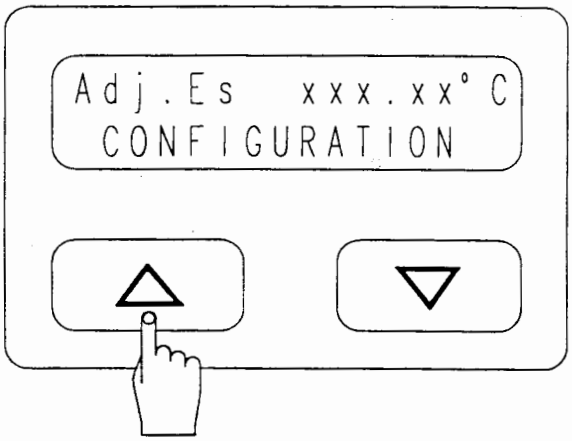
Warning 4

If the circulator is unable to identify the control parameters needed for regulation purposes within 10 minutes following the start of external identfication, then the identification run is aborted as warning no. 4 is displayed. Thereafter the equipment behaves as described for warning no. 3.

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8.3 Calibration of external sensors

When first using or when changing sensors, they should be calibrated as described below. This can be done at any temperature (e.g. 50°C).



Resolution: 0.01 K

Use the scroll-up key to select the ENTRY LINE for calibration of the external sensor.

- Connect the external sensor and lower it into the circulator bath (see part 4.7)
- Once the circulator is in a stable control state, read the temperature of the circulator bath off the MULTI display.
- Enter this value and confirm by pressing the "E" key.

8.4 Calibrating the working sensor

Adj.Ws xxx.xx° C
CONFIGURATION

This setting may nat be changed by the user.

8.5 Parameters for identification

IdSi 0.1K/s
CONFIGURATION

These factory settings may not be changed by the user.

They can be changed as a result of an identification run, however.

IdSi	0.1K/s
IdTi	20s
IdTe	1000s

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8.5 (continued)

This setting can be changed by the user.



When an external identification is performed, the system is regulated to the temperature difference IdXd between the external and internal baths.

In general, the factory setting of IdXd = 10 K will not need to be changed.
Only in certain exceptional operating conditions should IdXd be adjusted.

We recommend increasing the value of IdXd when the systems are poorly coupled with one another, and lowering it when they are well coupled. In addition, IdXd should be set at least high enough so that the sum of the starting temperature (the temperature when identification is begun) and IdXd is within the operating temperature range of the internal heat transfer medium. "By poorly coupled systems", what is meant is that the specific rate of heat transfer between the internal and external systems is low. This rate is also influenced by the containers themselves. A small ratio between the specific thermal capacities of the internal and external heat transfer media can additionally worsen the specific rate of heat transfer.

a) Example of a well-coupled system: The temperature of the external system is directly controlled. In this case, IdXd can be set to 5 K.

b) Example of a poorly coupled system: The external system consists of a double-walled glass container. The specific thermal capacity of the external heat transfer medium is also about twice that of the internal heat transfer medium In this case, IdXd should be set to about 20 K.

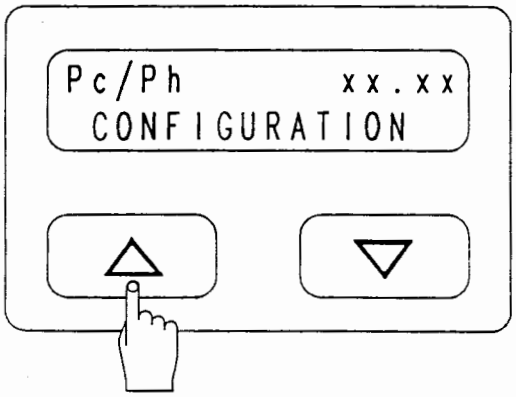
c) Example of a high operating point of the internal heat transfer medium (thermal H): The operating temperature range begins at 50 °C. At a starting temperature of 20 °C, IdXd should be set to 30 K.

ATTENTION: The bandwidth limitation value can additionally constrain the identification temperature. The limiting bandwidth (see part 5.13) is subtracted from the value of IdXd for identification purposes. IdXd can thus be lowered all the way to 0 K. For all practical purposes, no external identification is possible at a temperature difference of 0 K.

8.6 Ratio of max. cooling to max. heating

This setting is used to define the ratio of maximum cooling to maximum heating.
It can only be changed while the circulator is in "stand-by" mode (Start = 0).
For cooling installations without proportionalcooling, thes ratio must be set to 00.00.

For circulators that are not combined with cooling installation, the ratio Pc/Ph must be set to 00.00.



$$Pk/Ph = \frac{\text{Maximum cooling (W)}}{\text{Maximum heating (W)}} = X$$

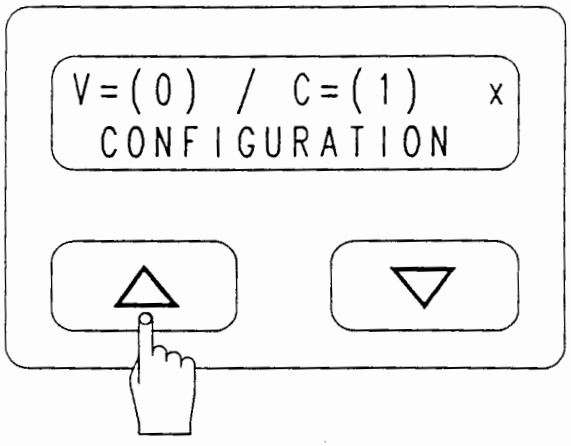
Use the scroll-up key to select the ENTRY LINE for the cooling/heating ratio.

Enter the calculated value - it may not be signed, i.e. no negative values are permitted - and confirm by pressing the "E" key.

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8.7 Analog setpoint signal

This setting is used to define the analog signal for external stipulation of the setpoint.



Input voltage (V) = 0
Current input (C) = 1

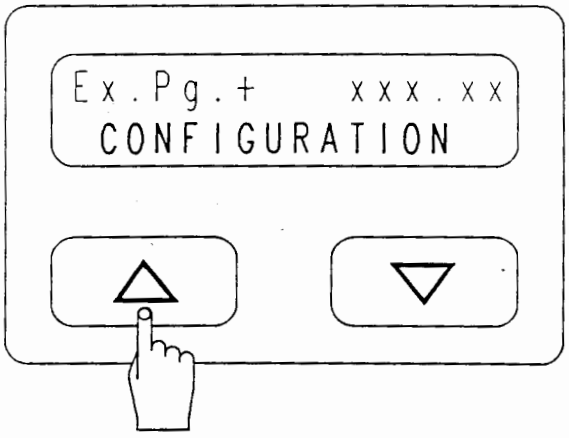
Use the scroll-up key to display the ENTRY LINE for the analog signal.

Enter the desired number and confirm by pressing the "E" key.

8.8 Upper calibration point for analog setpoint input

This setting is used to assign an upper temperature value to the input analog signal or the programmer setting (e.g. 2 V or 20 mA = 200°C).

Possible voltage values: -10 V to +10 V
Possible current values: 0 mA to 24 mA



Use the scroll-up key to display the ENTRY LINE for the upper calibration point.

- Connect programmer to circulator (part 9.5).
- Set programmer to maximum working temperature (250 °C).
- Enter the setpoint temperature on the keypad and confirm by pressing the "E" key.

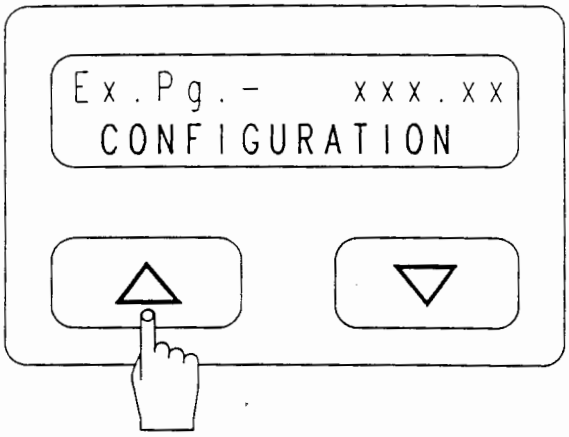
Enter the desired temperature value on the membrane keypad and confirm by pressing the "E" key.

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8.9 Lower calibration point for analog setpoint input

This setting is used to assign a lower temperature value to the input analog signal or the programmer setting (e.g. −1 V or 4 mA = −100°C).

Possible voltage values: −10 V to +10 V
Possible current values: 0 mA to 24 mA



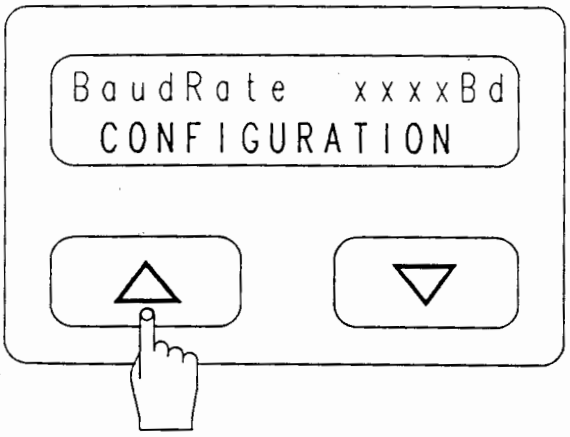
Use the scroll-up key to display the ENTRY LINE for the lower calibration point.

- Connect programmer to circulator (part 9.5).
- Set programmer to minimum working temperature (−100 °C).
- Enter the setpoint temperature on the keypad und confirm by pressing the "E" key.

Enter the desired temperature value on the membrane keypad and confirm by pressing the "E" key.

8.10 Digital data transfer rate

This setting is used to stipulate how many bits should be transferred per second.



Use the scroll-up key to display the ENTRY LINE for the baud rate.

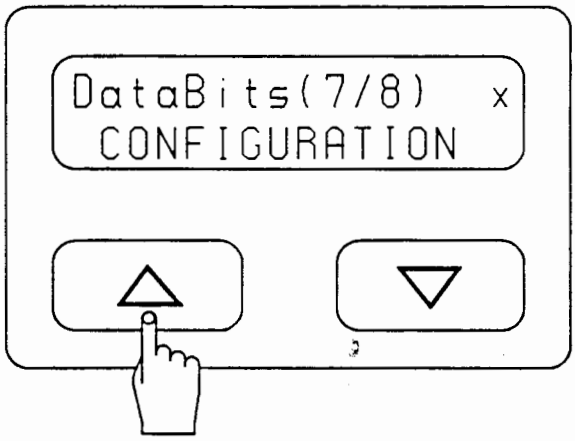
Possible settings: 300 / 600 / 1200 / 2400 /4800 / 9600

Enter the required value and confirm by pressing the "E" key.

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8.11 Data bit format for digital data transfer

This setting is used to stipulate the number of data bits.



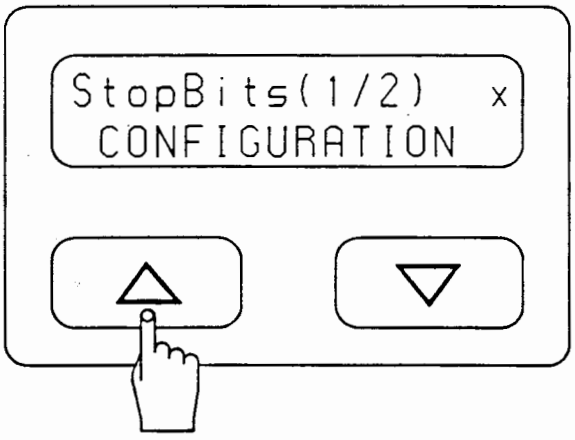
Use the scroll-up key to display the ENTRY LINE for the number of data bits.

Seven data bits = 7
Eight data bits = 8

Enter the required value and confirm by pressing the "E" key.

8.12 Stop-bit format for digital data transfer

This setting is used to stipulate the number of stop bits for each transferred data word.



Use the scroll-up key to display the ENTRY LINE for the number of stop bits.

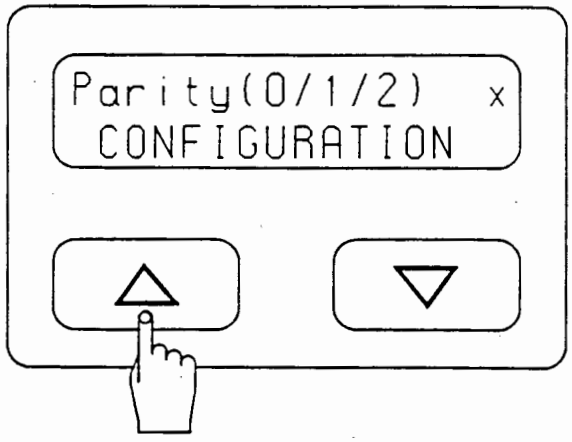
One stop bit = 1
Two stop bits = 2

Enter the required value and confirm by pressing the "E" key.

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8.13 Parity type for digital data transfer

This setting is used to stipulate the type of parity used for checking data integrity.



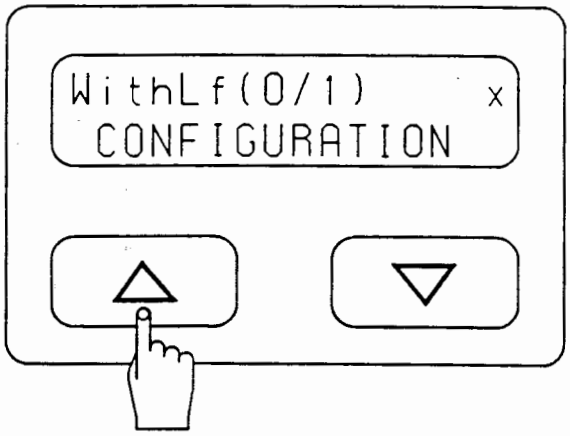
Use the scroll-up key to display the ENTRY LINE for the parity type.

No parity = 0
Odd parity = 1
Even parity = 2

Enter the required value and confirm by pressing the "E" key.

8.14 Line feed for digital data transfer

Adds a line feed to a carriage-return transfer with each data word.



Use the scroll-up key to display the ENTRY LINE for Line-Feed selection.

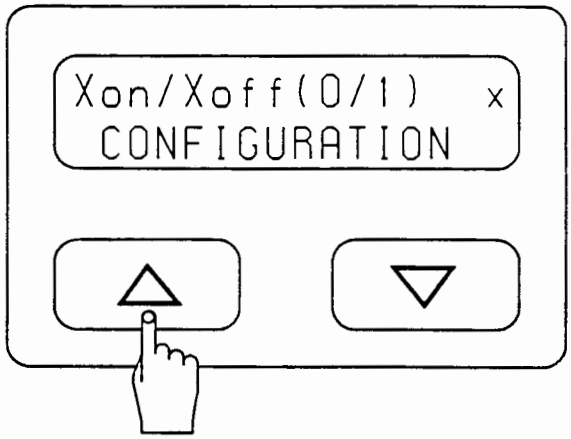
Without line feed = 0
With line feed = 1

Enter the required value and confirm by pressing the "E" key.

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8.15 Data flow control

Software handshaking with Xon/Xoff (DC1/DC3 as per DIN 66003)



Use the scroll-up key to display the ENTRY LINE for Xon/Xoff selection.

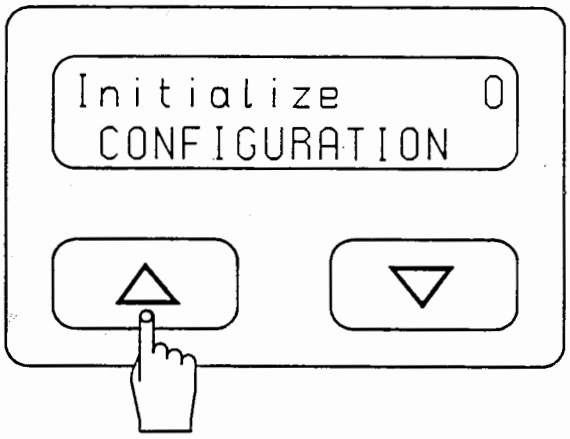
Data flow control via control lines RTS and CTS = 0
Data flow control via data line with Xon/Xoff = 1

Enter the required value and confirm by pressing the "E" key.

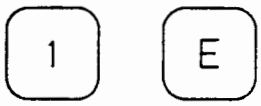
8.16 Initialization of the circulator

Activating the initialization function causes all entered parameters to be reset to the factory (default) settings.

Any parameters entered by the user are thus lost.



Use the scroll-up key to display the ENTRY LINE for initialization.



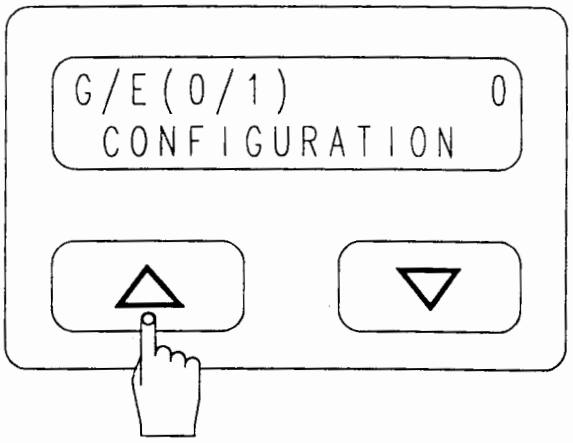
Start initialization by entering a "1" on the membrane keypad.

Once initialization has been completed, the circulator goes into start mode and must be restarted (see part 5.5).

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8.17 Language for dialog display

This setting can be used to set the language for the displayed messages.



German = 0
English = 1

Use the scroll-up key to display the ENTRY LINE for the language.

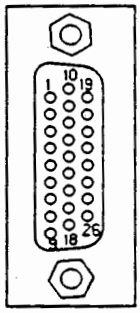
Enter the required value and confirm by pressing the "E" key.

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9.1 Multi-function connector

A number of recorder signals, control inputs and control outputs appear at this connector.

MF-
BUCHSE



Front
view

Pin	Signal
1	Not used
2	Ground potential (chassis)
3	Recorder output (control sensor signal)
4	Not used
5	Recorder output (external measurement and control sensor signal)
6	Recorder output (selected temperature value)
7	Programmer - signal
8	Programmer - 0 V
9	Recorder outputs - 0 V
10	Not used
11	Not used
12	Not used
13	Not used
14	Not used
15	Not used
16	Not used
17	Not used
18	Not used
19	Not used
20	Alarm output (NO contact), floating
21	Alarm output (common contact), floating
22	Alarm output (NC contact), floating max. 1 A/125 V max. 30 W/40 VA contact: Ag Pd 70/30
23	Emergency off switch (stand-by input)
24	Emergency off switch (stand-by input)
25	Reset switch contact input
26	Reset switch contact input

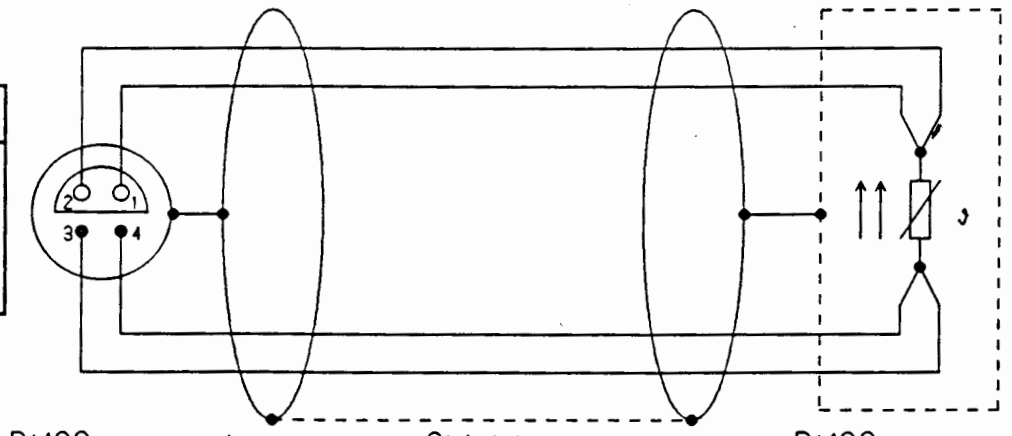
Use shielded cables only.

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9.2 Pt100 connector (Lemosa)

Connector for the external measurement and control sensor.

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



Pt100 connector
Front view

Shield

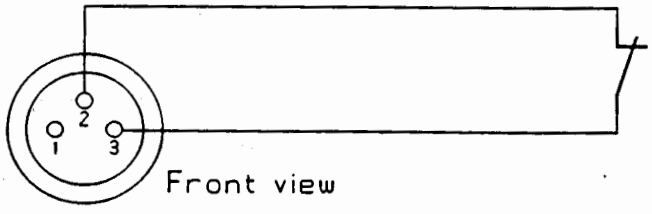
Pt100 sensor

To insure compliance with regulations on electromagnetic fields, only **original** JULABO sensors should be employed.

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

9.3 STAND-BY connector

This connector may be used for remote emergency switch-off.



Front view

STAND-BY

External NC contact

Maximum current: 5 mA
Maximum voltage: 5 V/DC
Contact plating: gold

Pin	Signal
1	Not used
2	5 V/DC
3	0 V

During operation, pins 2 and 3 must be connected together (for standard operation, use the supplied jumper connector).

Should a connection lack, the message "STAND-BY" will appear f l a s h i n g in the output line in the DIALOG display.
The thermometer must be put into operation again.

Use shielded cables only.

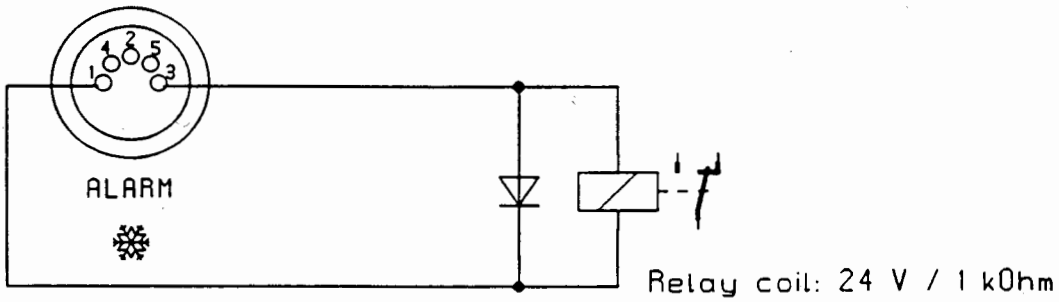
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9.4 Alarm / ❄ connector

A JULABO refrigerated circulator of model types F and FP may be driven from this connector.

These devices are automatically switched off if the circulator enters the alarm state.

Front view



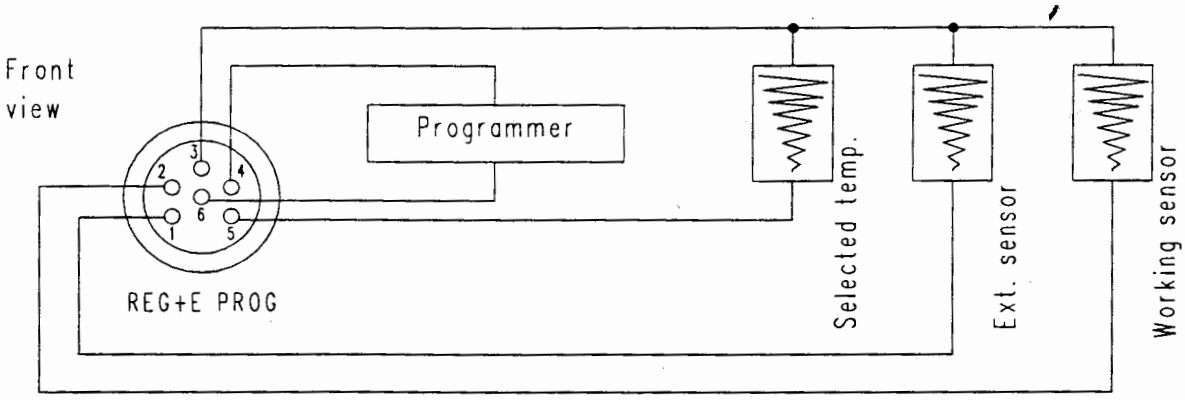
Pin	Signal
1	24 V/DC
2	0 V
3	Operating state 0 V
3	Alarm state 24 V/DC
4	not used
5	Proportional control signal for cooling compressors FP

Use shielded cables only.

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9.5 Recorder and programmer connector

Various analog signals appear on the pins of this connector (e.g., for operation of a recorder).
A programmer (for external temperature selection) may also be connected to this connector.

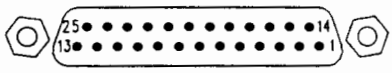


Pin	Signal	Value	Source	Input	Voltage deviation from DIALOG display
1	Ext. sensor	10mV/K 0V=0°C	< 200 Ohm	———	±3 mV
2	Working sensor	10mV/K 0V=0°C	< 200 Ohm	———	±3 mV
3	Recorder reference point	0V	———	———	———
4	Programmer	0–24mA ±10V	———	I = 100 Ohm V = 1 M Ohm	±3 mV
5	Selected Value	10mV/K 0V=0°C	< 200 Ohm	———	±3 mV
6	Programmer Reference	0V	———	———	———

Use shielded cables only.

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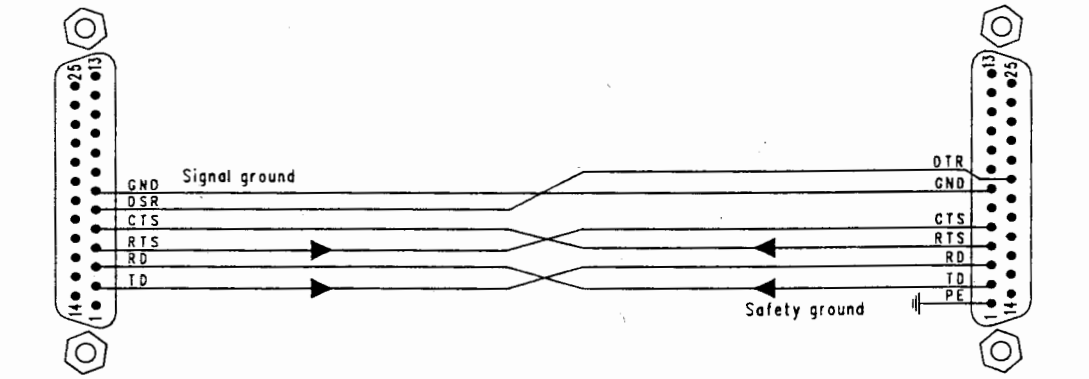
V24/RS 232 C



Front view

A computer may be connected to this interface for remote control of the circulator.

Interface connection
Full duplex with RTS and CTS protocol



Use shielded cables only.

Pin	Abbreviation	EIA Designation
2	TD	Transmit Data
3	RD	Receive Data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
20	DTR	Data terminal ready

High signal = −3 V to −15 V
Low signal = +3 V to +15 V

Appropriate software for control of the circulator by a computer is available by stipulating article number 8 901 100.

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Settable and displayable parameters			
Text	Unit	Code	Function
K--Set	°C	SP_00	Setpoint temperature
OverTemp	°C	SP_01	Upper temperature limit
SubTemp	°C	SP_02	Lower temperature limit
CoolingMax	%	HIL_00	Maximum cooling (controller)
HeatingMax	%	HIL_01	Maximum heating (controller)
IdTe	s	PAR_01	Time constant of external bath
IdSi	K/s	PAR_02	Rise rate of internal bath
IdTi	s	PAR_03	Time constant of internal bath
Pc/Ph	-	SP_11	Ratio of max. cooling to max. heating
Ex.Pg.-	°C	SP_12	Lower calibration point of analog setpoint input
Ex.Pg.+	°C	SP_13	Upper calibration point of analog setpoint input
IdXd	K	SP_15	temperature difference between internal and external bath during external identification
Set(K0/E1)	-	MODE_00	Mode of setpoint definition: K = setpoint input via keypad E = external setpoint source
V=(0) / C=(1)	-	MODE_01	Voltage or current configuration of analog input
Int.Id.(0/1/2)	-	MODE_02	Internal identification
Ext.Id.(0/1/2)		MODE_07	External identification
Band	K	PAR_04	Temperature difference between internal and external system during external control
G/E(0/1)	-	MODE_03	Language for LCD messages
Regulation		MODE_04	Switching between internal/external
Start(0/1)	-	MODE_05	Start command

Displayable parameters			
Text	Unit	Code	Function
IntAct	°C	PV_00	Actual measured internal temperature
ExtAct	°C	PV_01	Actual measured external temperature
PowerAct	%	PV_02	Manipulated control variable
Ss-Act	°C	PV_03	Actual temperature measured by safety sensor
E--Set	°C	SP_14	Externally defined setpoint

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10. 2 (continued)

Commands for defining variables and parameters

OUT_SP_n y / OUT_HIL_n y / OUT_MODE_n z / OUT_PAR_n y

Examples:
OUT_SP_00 50.25 sets the setpoint temperature to the value 50.25°C.
OUT_MODE_05 1 sets the start-enable value of the laboratory device 1

Commands sent by computer to the circulator

IN_SP_n / IN_HIL_n / IN_MODE_n / IN_PAR_n

Examples: IN_SP_00 reads the setpoint temperature
IN_PAR_06 reads the control factor ascertained by interna identification.

STATUS command

1. After receiving the STATUS command, the circulator responds – in normal operating mode – by outputting a status number followed by te

00 MANUAL,START
01 MANUAL,STOP
02 REMOTE,START
03 REMOTE,STOP

2. In the case of a fault or error, the unit responds with a number < 0 and one of the following text messages:

-01 EXCESS TEMPERATURE ALARM
-02 LOW TEMPERATURE ALARM
-03 TEMP/LEVEL ALARM (temp. limit and subtemp. alarm)
-04 EXTERNAL SENSOR ALARM
-05 WORKING SENSOR ALARM
-06 SAFETY SENSOR ALARM
-07 TRIAC SHORTED
-08 TRIAC/RELAY CONNECTION OPEN
-09 RELAY SHORTED
-10 COOLING CONTROL CONNECTION OPEN
-11 SENSOR DIFFERENCE ALARM
-20 INPUT BUFFER OVERFLOW
-21 INVALID COMMAND
-22 VALUE TOO SMALL
-23 VALUE TOO LARGE
-24 NO WRITE ACCESS
-25 NO READ ACCESS
-26 TRANSMISSION ERROR
-27 COMMAND NOT ALLOWED IN CURRENT OPERATING MODE
-28 TEMPERATURE MEASUREMENT ERROR

RESET: Resets the unit in remote mode following alarm message.

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11.1 Safety installations as per DIN 12 879

Safety Class 2

Infinitely adjustable overheating protection

In the event of improper operation, the overheating protection function causes a complete shutdown* of the heater and pump as well as of the connected cooling compressor.

Runaway heating of the bath liquid is thus prevented.

The apparatus can only be put into operation again by turning the mains switch off and on.

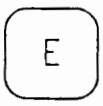
Low liquid level protection

This device is triggered as soon as the bath liquid falls below the minimum filling level in the bath.
A complete shutdown* of the heater and pump as well as of the connected cooling compressor is performed.
The apparatus can only be put into operation again by turning the mains switch off and on.
Check excess temperature protection and low liquid level protection (float switch) in regular intervals.

11.2 Additional JULABO safety installations

* Infinitely adjustable protection against high temperature
* Infinitely adjustable protection against low temperature
* Monitoring of the triac and safety relay at switch-on and every 24 hours during nonstop operation
* Continuous monitoring of the RAM storage device
* Continuous monitoring of the processor by a watchdog circuit
* Plausibility control of the working and safety sensors
* Plausibility control of the external sensor for external control
* Reciprocal monitoring of the working and safety sensors

If any one of these safety installations is triggered, a complete shutdown* of the heater and pump as well as of the connected cooling compressor is performed.



After the defect has been eliminated, press the "E" key.

* Complete shutdown means that both live conductors of the power supply are interrupted by a single switch event (as per DIN 12879, Part 1).

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12.1 Alarm messages in the DIALOG display

For each of the defects indicated, a **complete shutdown** of the heater and pump as well as of the cooling compressor is performed; these remain inoperational until action is taken by the operator. An audible alarm signal sounds, and the following messages can flash in the output line of the DIALOG display.
In case of malfunctions that are not discribed here, have the unit repaired at an authorized service station.

Message	Probable cause
EXCESSTEMP ALARM	**The temperature of the bath liquid exceeds the upper temperature limit setting.** For external control, the temperature of the internal system may exceed the upper temperature limit setting due to a thermal disturbance in the external system.
LOW TEMP ALARM	**The temperature of the bath liquid is lower than the low temperature limit setting.** For external control, the temperature of the internal system may fall below the low temperature limit setting due to a thermal disturbance in the external system.
TRIAC/RELAY OPEN	**Heater drive is disconnected.** Have the circulator repaired by an authorized service station.
EXT SENSOR ALARM	**Defective external measurement and control sensor** This function is activated only during external control.
SAF SENSOR ALARM	**Defective safety sensor** Have the circulator repaired by an authorized service station.
TRIAC SHORTED	**Short-circuit of power semiconductor (triac) for heater drive** Have the circulator repaired by an authorized service station.

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12.1 (continued)

Message	Probable cause
RELAY SHORTED	**Short-circuit in alarm relay.** Have the circulator repaired by an authorized service station.
SENSORDIFF ALARM	**The values reported by the working and safety sensors differ by more than 25 K from one another.** Incorrect calibration of the working sensor. Defect in the working/safety sensor or the electronics.
WRK SENSOR ALARM	**Working sensor is defect** Have the circulator repaired by an authorized service station.
After the defect has been eliminated, the apparatus can be put into operation again by pressing the "E" key.	

TEMP/LEVEL ALARM	**a) The temperature of the bath liquid is higer than the setting of the high temperature adjustment according to DIN 12 879.** **b) Circulator is runnig dry.**
Check temperature system for leaks and refil bath liquid.	
The circulator may be returned to operation only by turning the power switch off and on.	

12.2 Error messages in the MULTI display

With each of the indicated error messages, the processor goes into its error state, terminating all functions.

The circulator may be returned to operation only by turning the power switch off and on.
If the circulator cannot be returned to operation in this way, send the unit to an authorized service station.



Please enclose a note on the error message.

F1 = error in program memory

F2 = error in internal RAM of processor

F3 = error in auxiliary RAM

F4 = error in the processor integrated watchdog circuit

Error messages F1 to F3 indicate hardware defects.
The error message F4 can indicate hardware or software defects.

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13. Safety recommendations for the user



* Set overtemperature setting to at least 20 K below the flash point of the bath liquid used, as according to DIN 12 879.
* Employ suitable connecting tubing.
* Make sure that the tubes are securely attached.
* Avoid sharp bends in the tubing.
* The temperature application system should only be operated with a suitable bath liquid supplied by JULABO.
* Take account of the thermal expansion of bath oil during heating.
* Make a note of the filling volume or level of the bath liquid.
* If the liquid level in the bath is different than that in the external system, take steps to prevent overflowing when the circulator is switched off.
* Prevent water from penetrating into the hot bath oil.
* Exercise caution when emptying hot bath liquids.
* Connect the unit only to the prescribed line voltage.
* Some parts of the temperature application system and the pump connectors may be heated to high surface temperatures when the working temperature is high. Exercise caution when touching.
* Set the excess and low temperature protection to a few kelvin above and below the working temperature range.
* The flash point of the bath liquid mustn't lie below 40 °C.

14. Cleaning the unit

For cleaning the unit heat the bath, filled with water (and a little soap), to 60 °C until the unit is clean. Then drain the bath and let it dry.
Before cleaning the outside of the unit (use a damp cloth), disconnect the power plug!
Under no circumstances may humidity enter into the inner parts of the circulator.

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15. Technical specifications

Designation		MH	MS	MT
Membrane switch array		⊗	⊗	⊗
Display accuracy	%	0.5	0.5	0.5
Resolution	K	0.01	0.01	0.01
Internal control: Adaptiv/PID		⊗	⊗	⊗
External control: Adaptiv/Kaskade/PID		⊗	⊗	⊗
Temp. control accuracy (int./ext.)	K	±0.01	±0.01	±0.01
Working sensor		Pt100	Pt100	Pt100
Safety sensor		Pt100	Pt100	Pt100
External measurement / control sensor		PT100	Pt100	Pt100
Max. heater wattage (230 V/115 V)	W	2000/1000	2000/1000	3000/.....
Effectiv heater capacity, adjustable	%	0 ... 100	0 ... 100	0 ... 100
Pressure pump:				
maximum pressure	mbar	290	500	500
maximum discharge	l/min	20	24	24
Suction pump:				
maximum suction	mbar	180	360	360
maximum discharge	l/min	14	16	16
Electrical connections:				
Multi-function connector		⊗	⊗	⊗
Pt100 connector for external sensor		⊗	⊗	⊗
Stand-By connector		⊗	⊗	⊗
Alarm connector		⊗	⊗	⊗
Recorder and programmer connector		⊗	⊗	⊗
Serial interface RS232C		⊗	⊗	⊗
Safety installations (DIN 12879):				
Safety class		2	2	2
High temperature adjustment	°C	0 ... 320	0 ... 320	0 ... 320
Low liquid level protection: float switch		⊗	⊗	⊗
Additional installations:				
High temperature adjustment	°C	-100 ... 255	-100 ... 255	-100 ... 305
Low temperature adjustment	°C	-105 ... 250	-105 ... 250	-105 ... 300
Triac and relay monitoring		⊗	⊗	⊗
Ram monitoring		⊗	⊗	⊗
Processor monitoring		⊗	⊗	⊗
Plausibility control of all sensors	°C	-110 ... 260	-110 ... 260	-110 ... 310
Reciprocal monitoring between working and safety sensor	K	>25	>25	>25
Pump motor overload protection		⊗	⊗	⊗
RFI suppression (VDE 0875)		N	N	N

All data have been determined:
Line voltage of 230 V / 50 Hz — Ambient temperature 20 °C
Operating temperature -10 °C; — Bath liquid: Ethanol external;
External systems not connected

standardization:	Guidline for first voltage range	IEC 1010-1: 1990; EN 60601-1: 1990
	Safety	Din 12879 Teil 1; 05.79; Klasse 2

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15. Technical specifications

		F25	F26	F32
Working temperature range	°C	-25...200	-26...200	-32...200
Temperature stability internal/external	(°C) K	±0.01/±0.01	±0.01/±0.01	±0.01/±0.01
Cooling capacity	°C	+20 0 -20	+20 0 -20	+20 0 -20 -30
(Medium ethanol)	W	260 200 60	260 200 60	380 340 150 50
Refrigerant		R134a	R134a	R134a
Bath opening/bath depth:	mm	130x150/150	130x150/150	220x130/150
Filling volume: from ... to	Litre	3...4.5	3...4.5	5.5...8
Dimensions: (WxDxH)	mm	230x420x610	420x420x420	310x420x640
Weight	kg	33	32	38
Mains power connection	V/Hz	230/50	230/50	230/50
	V/Hz	115/60	115/60	115/60

		F33	F34
Working temperature range	°C	-33...200	-34...200
Temperature stability internal/external	(°C) K	±0.01/±0.01	±0.01/±0.01
Cooling capacity	°C	+20 0 -20 -30	+20 0 -20 -30
(Medium ethanol)	W	500 320 120 20	450 320 140 30
Refrigerant		R134a	R134a
Bath opening/bath depth:	mm	300x180/200	300x360/150
Filling volume: from ... to	Litre	12...16	14...20
Dimensions: (WxDxH)	mm	360x460x690	380x580x620
Weight	kg	41	49
Mains power connection	V/Hz	230/50	230/50
	V/Hz	115/60	115/60

		FP40	FP45	FP50
Working temperature range	°C	-40...200	-45...200	-50...200
Temperature stability internal/external	(°C) K	±0.01/±0.01	±0.01/±0.01	±0.01/±0.01
Cooling capacity	°C	+20 0 -20 -40	+20 0 -20 -40	+20 0 -20 -40 -50
(Medium ethanol)	W	680 560 320 40	850 700 420 80	900 800 500 160 50
Refrigerant		R404a	R404a	R404a
Bath opening/bath depth:	mm	300x180/200	300x310/200	230x130/150
Filling volume: from ... to	Litre	9...16	18...26	5.5...8
Dimensions: (WxDxH)	mm	370x460x710	380x580x690	420x490x620
Weight	kg	48	56	58
Mains power connection	V/Hz	230/50	230/50	230/50

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15. Technical specifications

		F81	F83
Working temperature range	°C	-80...100	-83...50
Temperature stability internal/external	(°C) K	±0.02/±0.02	±0.02/±0.02
Cooling capacity	°C	+20 0 20 -40 80	+20 0 -20 -40 -60 -80
(Medium ethanol)	W	450 410 360 320 70	820 800 700 600 380 110
Refrigerant		R404a/R23	R404a/R23
Bath opening/bath depth:	mm	130x150/160	-----
Filling volume: from ... to	Litre	5...6.5	5.5...8
Dimensions: (WxDxH)	mm	500x580x860	495x535x870
Weight	kg	86	95
Mains power connection	V/Hz	230/50	230/50
	V/Hz	115/60	

		FS18
Working temperature range	°C	-30...100
Temperature stability internal/external	(°C) K	±0.01/±0.01
Cooling capacity	°C	+90 +20
(Medium ethanol)	W	380 420
Refrigerant		R134a
Bath opening:	mm	220x130
Filling volume: from ... to	Litre	1.7 ... 3
Dimensions: (WxDxH)	mm	310x420x630
Weight	kg	37
Mains power connection	V/Hz	230/50
	V/Hz	115/60

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16. Accessories

Order-No.	Designation	Data	
8 930 008	2m CR tubing -20...120°C	8 mm int. dia.	Standard accessories
8 930 012	2m CR tubing -20...120°C	12 mm int. dia.	
8 970 490	2 Plug	M 16 x 1	
8 970 446	2 Reducer connection	9.5 mm dia.	
8 970 445	2 Reducer connection	13.5 mm dia.	
8 980 112	Control line for cooling compressor		
8 970 217	Stainless steel bridge (F34, FP45)		
8 970 260	Flat bath cover (F34, FP45)		
8 930 108	1 m Viton tubing -50...200 °C	8 mm int. dia.	Accessories
8 930 112	1 m Viton tubing -50...200 °C	12 mm int. dia.	
8 930 209	0.5 m Metal tubing -90...300 °C		
8 930 210	1.0 m Metal tubing -90...300 °C		
8 930 211	1.5 m Metal tubing -90...300 °C		
8 930 408	2 m Foam rubber insulation	8 mm int. dia.	
8 930 412	2 m Foam rubber insulation	12 mm int. dia.	
8 970 456	Shutoff valve	90 °C max.	
8 970 457	Shutoff valve	250 °C max.	
8 970 470	T-connection	8 mm dia.	
8 970 471	T-connection	12 mm dia.	
8 970 480	Metal tube clamp	8 mm dia.	
8 970 481	Metal tube clamp	12 mm dia.	
	Stainless steel		
8 970 320	Test tube rack for 28 tubes (F25/26)	17 mm dia.	
8 970 321	Test tube rack for 38 tubes (F25/26)	13 mm dia.	
8 970 300	Test tube rack for 36 tubes (F34/FP45)	17 mm dia.	
8 970 302	Test tube rack for 45 tubes (F34/FP45)	13 mm dia.	
8 970 502	Platform, adjustable		
8 910 040	Caster platform		
8 981 003	External measurement and control sensor (Pt100)	200x6 mm dia. stainless steel	
8 981 005	External measurement and contral sensor (Pt100)	200x6 mm dia. glass	
8 981 006	External measurement and control sensor (Pt100)	20x1,8 mm dia. stainless steel	
8 981 020	M+R Adapter with Pt100 sensor (for external clased systems)	12mm in. dia.	
8 970 410	D+S Level Adapter (for external open systems)		
8 940 106	10 l Thermal H5S	-40....+120 °C	
8 940 107	5 l Thermal H5S	-40....+120 °C	
8 940 108	10 l Thermal H20S	+10...+200 °C	
8 940 109	5 l Thermal H20S	+10...+200 °C	
8 940 104	10 l Thermal HY	-60.....+65 °C	
8 940 105	5 l Thermal HY	-60.....+65 °C	
8 901 100	JULABO program "Watch and Control"		

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17. WARRANTY CONDITIONS

JULABO LABORTECHNIK GMBH (JULABO) warrants its products against defects in material or in workmanship, when used under appropriate conditions and in accordance with appropriate operating instructions for a period of no less than

ONE YEAR

from the date of delivery of the products. To avoid forefeiture of the warranty and to allow JULABO to be of continuing service to the scientific community, the record of purchase is requested to be returned to JULABO or one of its authorized representatives within 30 days of receipt of equipment.

JULABO's sole obligation shall be to repair or to replace at JULABO's option, F.O.B. its plant or locally, without charge, any part(s) that prove defective within the warranty period, providing the customer notifies JULABO promptly and in writing of any such defect. Compensation for labour by other than JULABO's employees will not be JULABO's obligation. Part(s) replacement does not constitute an extension of the original warranty period.

JULABO will not assume responsibility for unauthorized product modifications, or for repairs, replacements, or modifications negligently or otherwise improperly made or performed by persons other than JULABO employees or authorized representatives.

JULABO MAKES NO WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, AS TO THE DESIGN, SALE, INSTALLATION, OR USE OF ITS PRODUCTS, AND SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS.

While JULABO's personnel or that of its authorized representatives are available to advise customers concerning general applications of all manufactured products, oral representations are not warranties with respect to particular applications, and should not be relied upon if inconsistent with product specifications or the terms stated herein.

All glassware, such as reference thermometers, etc., are expressly excluded from this warranty declaration.

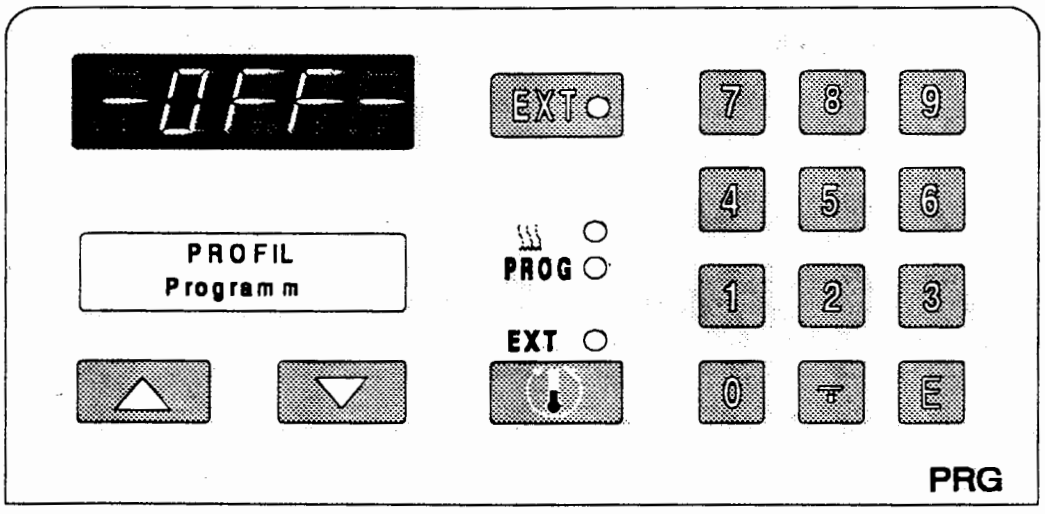
In any event, the terms and conditions contained in JULABO's formal sales contracts shall be controlling and any change must be in writing and signed by an authorized executive of JULABO LABORTECHNIK GMBH.

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Appendix

Integrated Programmer

Microprocessor Circulators of the MH + MS + MT Series



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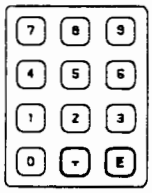
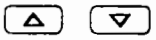
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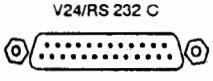
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A.1 Operating controls and functional elements

Elements	Designation	Function
	Membrane keypad ▽-key E-key	All entries are made via this keypad. Enter / Reset (Enter key or for resetting after error)
	DIALOG Display (LCD)	Multifunction display for user guide. Entry and output line.
	Scroll keys	Scroll the entry and output lines up or down.
	Control light	Illuminates when the integrated programmer is used for temperature selection.

A.2 Electrical connections, interface

	Round connector 6-pin	Recorder signal: (setpoint; pin 5) With the integrated programmer being activated, the valid setpoint appears on the recorder connector "REG+E PROG" when a program is run. Otherwise the output is set to 0 Volt (0 V = 0 °C) (chapter 9.5).
	D-sub female connector 25-pin	The serial V24/RS232C interface is used for connecting a computer or printer (chapter 10).

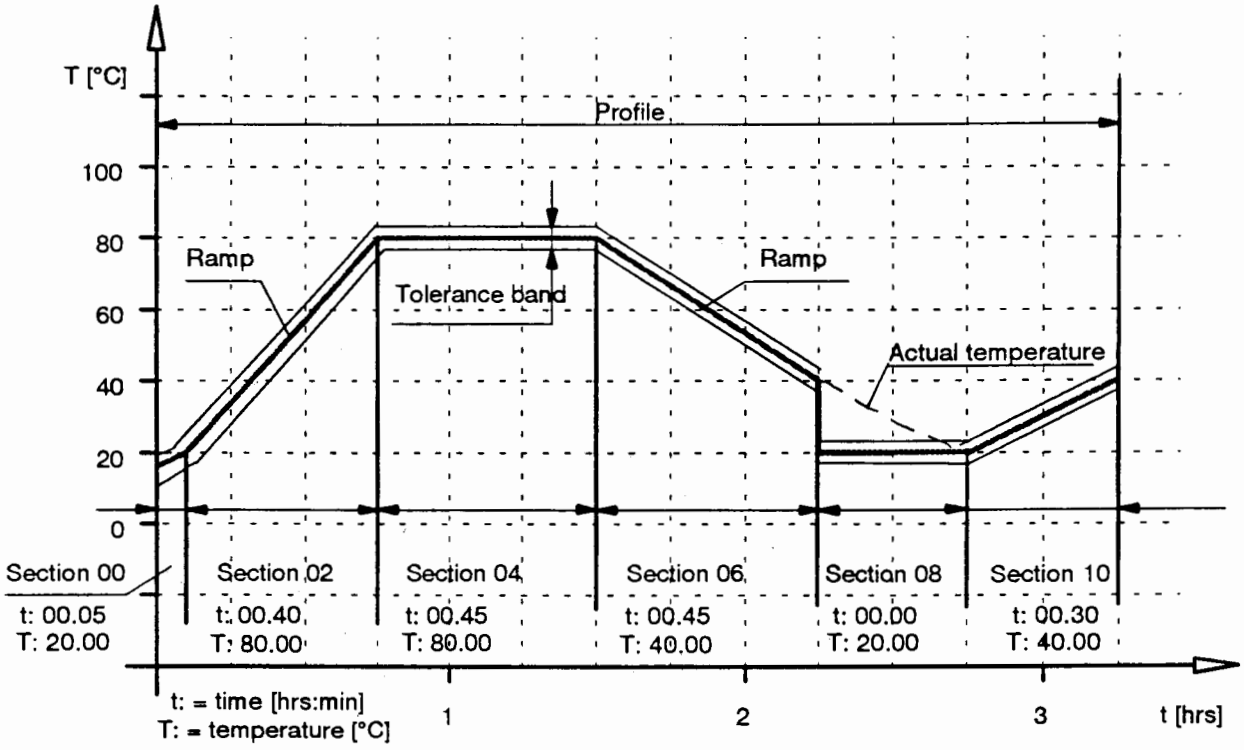
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INTEGRATED PROGRAMMER

A.3 Description

The integrated programmer allows any desired temperature program sequences to be realized. Such a temperature sequence is called profile. A profile consists of individual sections defined by duration (t:) and target temperature. Target temperature is the setpoint (T:), that is achieved at the end of a section. The programmer uses time and temperature difference values within a section (diagram: sections 02 and 06) to calculate a temperature ramp. In case the duration is not defined for a section (diagram: section 08), the program immediately attempts to reach the setpoint. The following section is only started when the actual temperature lies within the tolerance bandwidth of the setpoint.

Diagram:



The integrated programmer is characterized by a number of outstanding features:

- Memory for up to ten profiles.
- Each profile may consist of a maximum of 100 sections and may be repeated up to 99 times. Since the maximum duration for a single section is limited to 99 hours and 59 minutes, the total duration subsequently 990,000 hours.
- Using the integrated clock, a desired profile section may be started at any date and time.

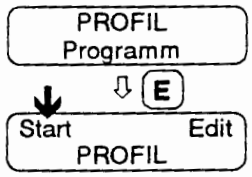
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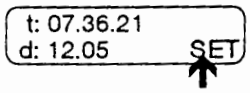
- Definable error message when the selected tolerance band value is exceeded (difference between setpoint and actual value).
- The profile data may be printed via the integrated V24/RS232C interface.
- User guide via backlit interactive DIALOG display (LCD).

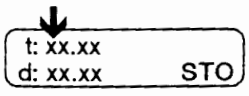
A.4 Operation

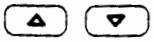
A.4.1 Basic rules for operation

The integrated programmer is easy to operate. The following listing presents the basic functions of display and keypad.

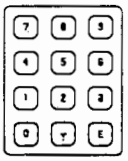
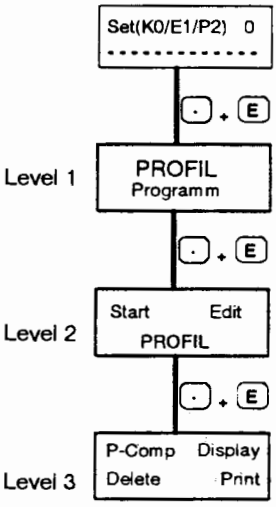
<table>
<tr><td>Menu


Menu item "Start" ("Edit")</td><td rowspan="3">● The selectable menu item, position or entry field is indicated by a blinking cursor or a blinking menu item.</td></tr>
<tr><td>Display


Position "SET" ("t:" and "d:")</td></tr>
<tr><td>Entry line


Entry field (XX.XX)</td></tr>
<tr><td></td><td>● With the scroll keys the desired position or entry field may be selected within the menu level or entry line.</td></tr>
</table>

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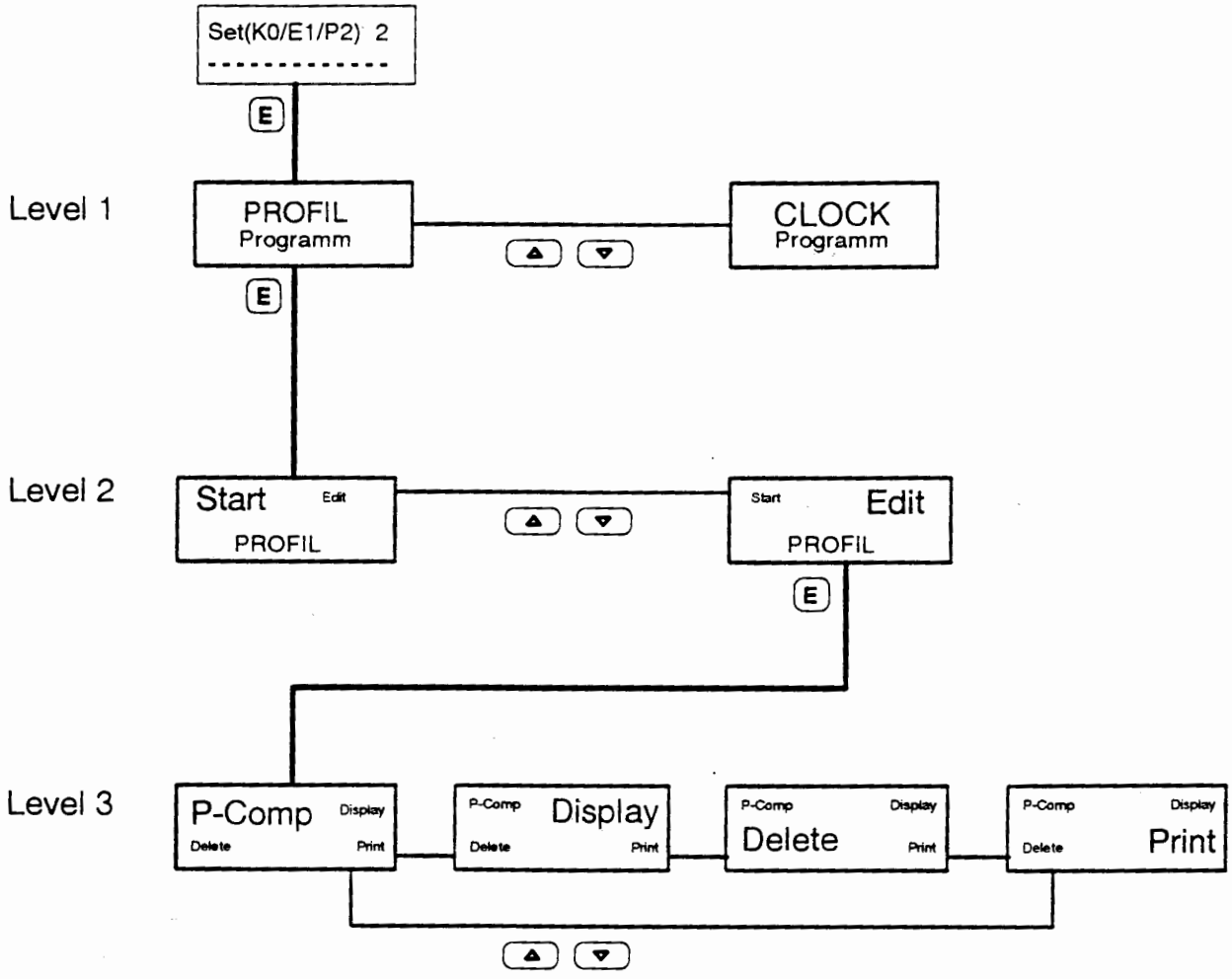
 	● All entries are made via this keypad. After each entry the cursor moves to the next entry field at right. ● With the scroll-down key the cursor can be returned to the previous entry field at left to correct the entry made.
⇩ E	● To confirm and quit a menu item or entry line, press the E-key. Invalid entries are signaled by an error message on the DIALOG display (chapter A.4.8). The message must be confirmed by pressing the E-key before making new entries.
·+E 	● Press simultaneously the keys ·+E for → quitting a menu item, → interrupting data entry, (entries already made are not stored!) → returning from the activated menu structure to the next higher menu level → quitting the programmer. Depending on the position in the menu structure, repeatedly press those keys to quit the programmer. **· Press and hold depressed; E press and release.**

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A.4.2 General information

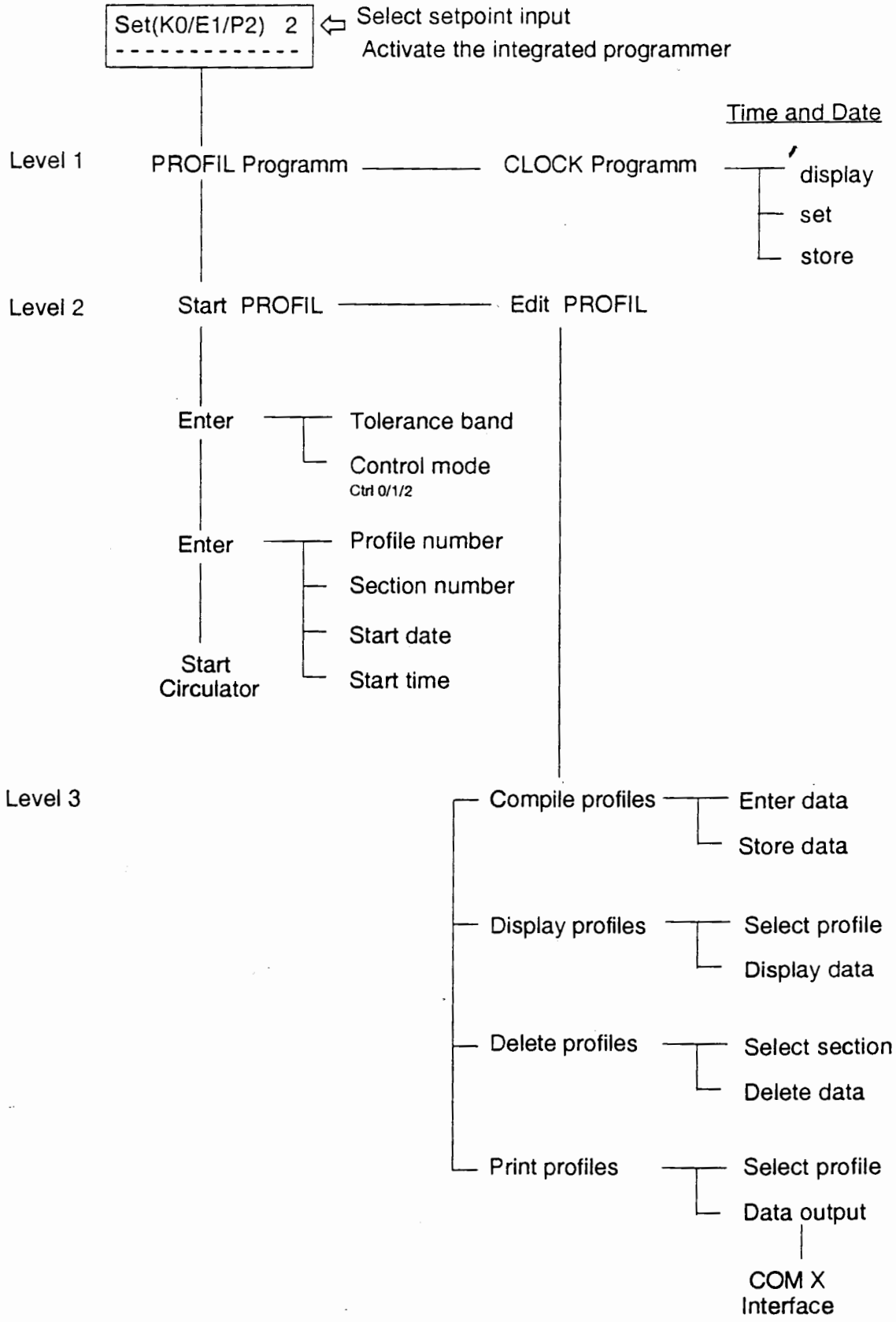
The programmer operates using a hierarchic menu structure.
Select a menu item in the activated menu level with the keys ▲ ▼. In menu levels 2 and 3, the menu item that has been selected is flashing (e.g. "Start" or "P-Comp").
Confirm by pressing the E-key and to reach the next lower menu level. Press the keys ·+E to quit individual menu items after entries, or to return to a higher menu level. From level 3 you can return to level 1 only via level 2.

Menu level structure:



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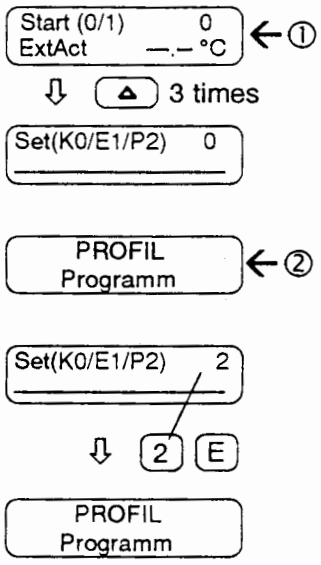
A.4.3 Menu structure



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A.4.4 Activate the integrated programmer

Activation of the setpoint input is described in chapter 5.11. "P2" (for activating the integrated programmer) completes the setpoint entry line on the display.



After power-up and self-test (chapter 5.2) of the circulator, the following is indicated on the DIALOG display:

Entry field ①: The circulator was operated without the integrated programmer before turning the power switch off.

Menu ②: The circulator was operated with the integrated programmer.

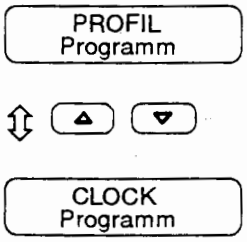
Enter a "2" to activate the integrated programmer.

Level 1, the main menu level, is reached first.
The DIALOG Display indicates what is shown at left.

☞ If a "0" is entered in the setpoint entry line, the setpoint selected on the circulator via the keypad becomes active.

☞ To optimize the control behavior of the circulator, an identification (internal or external) of the system should be performed (chapter 8.2).

A.4.5 Menu level 1 - Main menu level



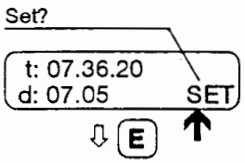
Level 1, the main menu level, provides 2 menu items.

Select the menu item "PROFIL" or "CLOCK" with the keys ▲ ▼ and press the E-key to activate the item.

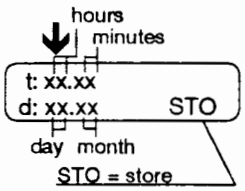
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A.4.5.1 Set time, date

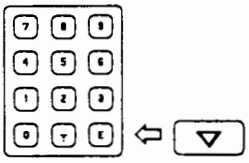
The integrated clock allows starting a profile at any date and time. The clock is preset in the factory. However, the clock must be set to the corresponding local time that might differ from the preset time. In leap years, the dates for February must also be adjusted.



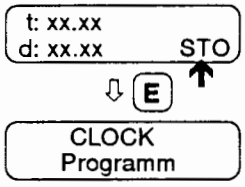
① Activating the main menu item "CLOCK", time and date appear on the DIALOG Display.



② Press the E-key to enter the entry line for time ("t:").



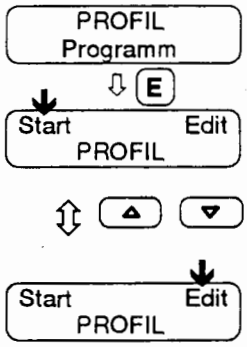
③ Enter time and date or move to the next position with the keys ▲ ▼.



④ Confirm "STO" by pressing the E-key. The entered data is stored.

The display switches to the main menu item "CLOCK".

A.4.6 Menu level 2



Activate the main menu item "PROFIL" with the E-key: The menu enters level 2.

Select the menu item "Start" or "Edit" with the keys ▲ ▼.

Press the E-key to activate the item.

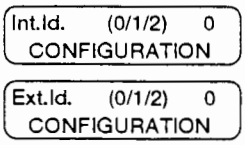
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A.4.6.1 Start profiles - "Start"

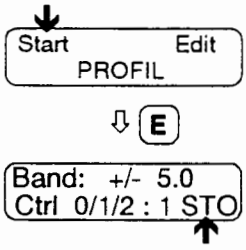


When starting the integrated programmer, the parameters for the internal and external identification modes (chapter 8.2) are automatically set to 0.

Thus a complete new identification should be performed with the circulator system before starting the programmer.

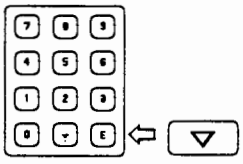


Up to 10 profiles can be stored in the integrated programmer. Select and start a profile under the menu item "Start".



① Selecting the menu item "Start" in menu level 2, the indication on the display is as shown at left with the settings entered last.

① Confirm "STO" with the E-key to accept the values.



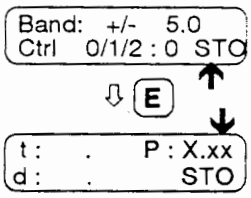
● Select the entry fields with the keys ▲ ▽ and modify the settings.

Band: Defines the maximum temperature difference between the actual temperature and the setpoint value (chapter A.4.6.2).
+/- XX.X Input range = 00.0 to 99.9 (K)
(factory setting: +/- 5.0 K)

Ctrl 0/1/2 : Defines the control mode of the programmer (chapter A.4.6.2) in case the actual value does not lie within the set bandwidth.
X Input possibilities: 0, 1 or 2 (factory setting: 1)

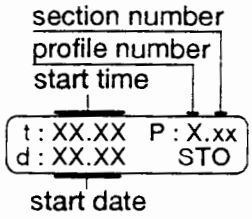
STO: Store the data entered.

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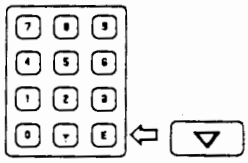
③ Confirm "STO" with the E-key to enter the entry fields of the "Start" menu.

P : Input range: Profile 0 to 9, section 00 to 99.
Defines the profile number and section that is to be run after start.



d : Defines the date when a profile is started by using the integrated clock.

t : The entry field "t:" can be selected with the keys ▲ ▼ only.
Defines the time when a profile is started by using the integrated clock.



● Enter the profile and section numbers, confirm "STO" with the E-key, to immediately start the program.



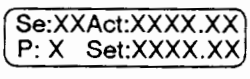
The control light "PROG" illuminates on the circulator.



● With date and time defined, the program waits and is not started before this time.
The flashing control light "PROG" indicates the "wait" status.

<u>Attention:</u> <u>Failure of the power supply voltage - pressing the mains switch.</u>
The defined date and time for start are not affected by mains disconnections during the "wait" status.
However, in case the power supply is disconnected right at the defined starting time, the programmer does not start. (The programmer would not be started again before 12 months.)

④ After start the DIALOG display indicates different parameters:



Se : Active program section.

Act : Actual temperature value.

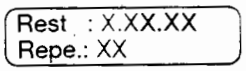
P: Number of the activated profile.

Set : Setpoint value.

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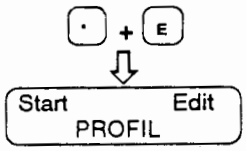


To switch the display, use the keys ▲ ▼.



Rest : Indicates the time that remains until the end of the active section.

Repe. : Indicates the number of profile repetitions already started.

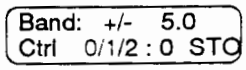


⑤ After a profile has finished running, the heater (compressor) and circulating pump are shut-down. The DIALOG display indicates the last menu item.

Press simultaneously the keys ⊡ + E to return to the next higher menu level.

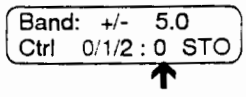
A.4.6.2 Definition: "Band:" / "Ctrl 0/1/2 :"

The tolerance band defines a positive or negative temperature deviation from the setpoint.

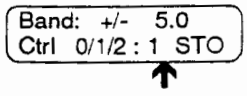


Example: Band: +/- 5,0 K

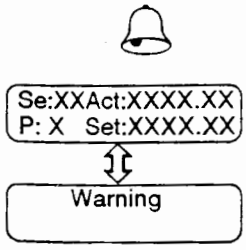
Target temperature	= 80 °C
Setpoint	= 51 °C
Upper band limit	= 56 °C
Lower band limit	= 46 °C



0 : No message indicated on the display.



1 : "Warning" - This message indicates the actual temperature does not lie within the selected bandwidth.



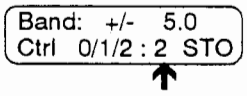
Every two seconds an audible alarm signal sounds, and the DIALOG display switches between the message "Warning" and the parameter display.

If the actual temperature value lies within the tolerance bandwidth, the message "Warning" disappears.

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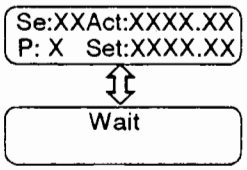
The profile is continued although the message is indicated.
The message cannot be quit. Interrupt or stop the profile (chapter A.4.6.3).



2 : "Wait" - The profile is interrupted and the circulator maintains the setpoint (target) temperature presently achieved. If the actual value lies within the tolerance bandwidth, the profile is continued.



A short audible alarm signal sounds before the wait status is entered.



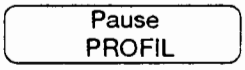
Then, every two seconds, the DIALOG display switches between the message "Wait" and the parameter display.
The message cannot be quit. Interrupt or stop the profile (chapter A.4.6.3).

A.4.6.3 Interrupt, stop profiles

Interrupt profiles:



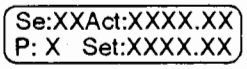
Press the [E]-key to interrupt a profile. This means that setpoint and duration set for the corresponding section are stopped at the values presently achieved.



The message "Pause" flashes on the DIALOG display.

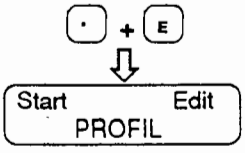


Press the [E]-key to continue the profile from the interrupted position.



The indication shown at left appears on the DIALOG display.

Stop profiles:

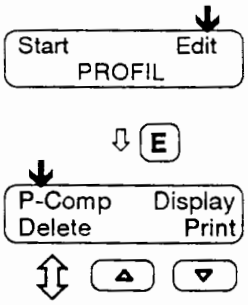


Press simultaneously the keys [·] + [E] to interrupt an already started profile and to return to the menu level 2.

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A.4.7 Menu level 3

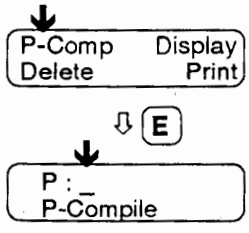
The menu items in level 3 serve to prepare and document the application with the circulator.



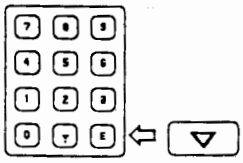
Select and confirm the menu item "Edit" in menu level 2. The indication shown at left appears on the DIALOG display.
Menu level 3 has been reached. Select one of the menu items by pressing the keys ▲ ▼ and press the E-key to call up the menu.

A.4.7.1 Compile, modify profiles - "P-Comp"

This menu item serves to compile or modify profiles. The setpoints, heat-up or cool-down times and number of profile repetitions are stored in memory.
The working temperature range (= temperature setting range) of the circulator or model combination is stored also in a separate memory. Each temperature entry that does not lie within this range invokes an error message to be displayed (chapter A.4.8).
Important factors for determining heat-up or cool-down times are the performance data of the circulator as well as the kind and volume of the substance in the bath. The profile data can be optimized at any time according to the performance previously experienced with an identical temperature application system consisting of circulator and external system connected.

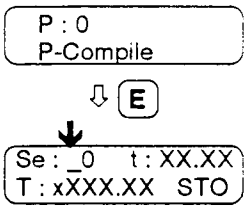


① Select the menu item "P-Comp" in menu level 3. The indication shown at left appears on the DIALOG-Display.



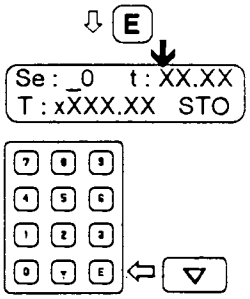
② Enter the number of the profile (0 to 9) that is to be compiled or modified.

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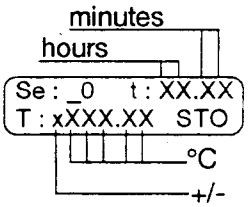
● If the entry is confirmed by pressing the E-key, the display shown at left appears.

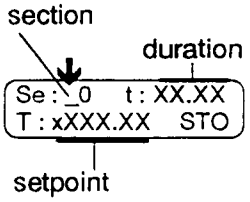
③ Enter a section number.



● When a new profile is compiled, confirm the preset value "0" by pressing the E-key.

④ After entering the value for field "t:" (duration) the cursor moves to field "T:". Enter the setpoint value (target temperature).





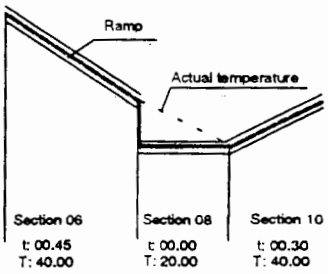
Se : XX Input range = 0 to 99.
Defines the section that is to be compiled or modified. Each time when the menu item "P-Comp" is called up the section number is "0".

Enter the section number via the keypad, or usethe keys ▲ ▼ to increase or lower the section number.

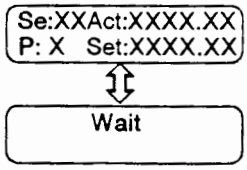
T : +/-XXX.XX Input range = working temperature range of the circulator used.
Defines the setpoint (target temperature) that is to be reached at the end of the section.

t : XX.XX Input range = 00 hrs 00 minutes to 99 hrs 59 minutes
Defines the section duration.

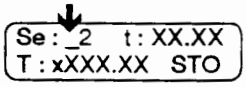
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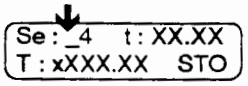
With this parameter set to zero (section 08), the circulator attempts to immediately reach the setpoint (target temperature) after the section start. This means the programmer does not use time and temperature difference values within a section to calculate a temperature ramp. The program then waits until the actual temperature lies within the defined tolerance bandwidth (chapter A.4.6.2) of the setpoint.
The setting for "Ctrl 0/1/2 : X" (chapter A.4.6.2) is ignored during that time and the message "Wait" flashes in the first line of the DIALOG display. The following section is started as soon as the actual temperature lies within the defined tolerance bandwidth.

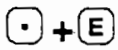


STO : Store the section parameters.

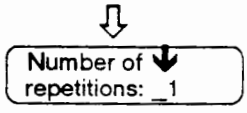


⑤ Confirm "STO" by pressing the [E]-key to store the values entered. The cursor returns to the entry field "Se:". When a new profile is compiled, the section number is automatically increased by two numbers to insert a free memory place after each section. Modifications or additions can thus easily be integrated in an existing profile.

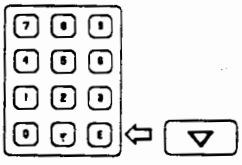




⑥ To store a profile, press simulaneously the keys [·] + [E].

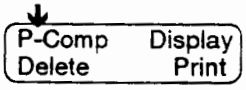


The DIALOG display indicates what is shown at left.



⑦ Enter the desired number (1 to 99) of profile repetitions.





Press the [E]-key to confirm the value and to return to menu level 3.

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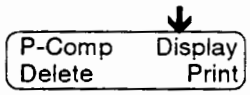
NOTES

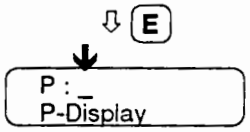
- When an existing profile is modified, the section number is increased by one number after confirming "STO" providing the following section has already been defined. If this is not the ca the section number is increased by two numbers.
  The section number can also be entered via the keypad. Enter new parameters as described abo
- Always begin a new profile with the section number "0" to compile a profile sequence in numeri order. When the program is started, the defined sections are run in numerical order.
- Providing no values are entered for the parameters "t:" and "T:", those are automatically set to ' when confirming "STO" with the E-key.
- Providing invalid parameters are entered for "t:" or "T:", an error message appears in the lower line of the DIALOG display (chapter A.4.8). Confirm the error message by pressing the E-key All values are deleted and the cursor returns to the section number entry field "Se:".

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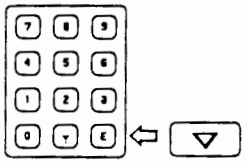
A.4.7.2 Display profiles - "Display"

This menu item allows indicating stored profile data on the DIALOG display of the circulator. Before compiling a new profile, use this function to make sure that the desired profile number does not already exist.





① Selecting the menu item "Display" in menu level 3, the indication shown at left appears on the DIALOG display.

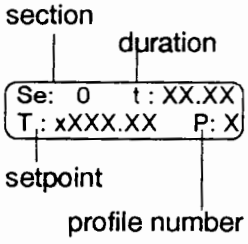


② Enter the profile number (0 to 9) that is to be indicated.

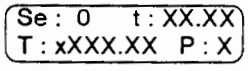


③ Confirm the entry by pressing the [E]-key. The display indicates what is shown at left.

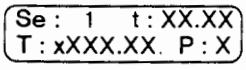
Se : Number of the active section.
t : Section duration.
T : Setpoint (target temperature).
P : Profile number.



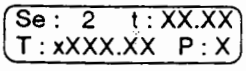
④ Use the keys [▲] [▼] to increase or lower the section number in the display field "Se:".











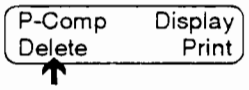


etc.

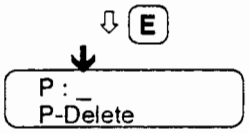
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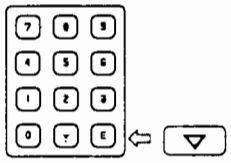
A.4.7.3 Delete profiles - "Delete"

This menu item allows deleting complete profiles or individual, successive sections. Use the functior "Display" to make sure that the desired profile number is no longer needed and can be deleted. Delete the complete profile to remove all old data.



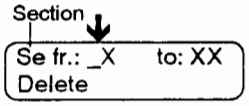
① Selecting the menu item "Delete" in menu level 3, the indication shown at left appears on the DIALOG display.



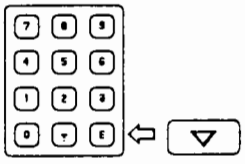


② Enter the profile number (0 to 9) that is to be deleted.



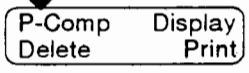


③Confirm the entry by pressing the E-key. The display indicates what is shown at left.



④ Enter the corresponding section numbers. Press the E-key to confirm and to return to menu level 3.





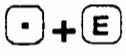
Examples:

Delete sections:

Se fr.: 00 to: 99 = the complete profile

Se fr.: 05 to: 09 = 5 sections

Se fr.: 12 to: 12 = 1 section

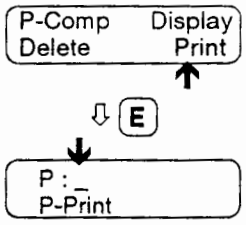


To quit the menu item without deleting any data, press simultaneously the keys + E.

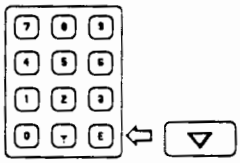
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A.4.7.4 Print profiles - "Print"

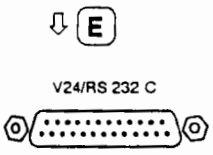
This menu item allows printing profile data via a connected printer. It is important that the interfaces (V24/RS232C) are correctly configured (chapter 8).



① Selecting the menu item "Print" in menu level 3, the indication shown at left appears on the DIALOG display.



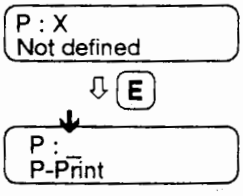
② Enter the profile number (0 to 9) that is to be printed.



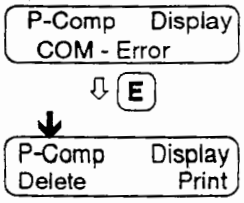
② Confirm the entry by pressing the E-key. The selected profile is printed via the serial interface (V24/RS232C) in the following form.

Section:	Temperature :	Duration:
00	+/- XXX.XX	XX.XX
02	+/- XXX.XX	XX.XX
04	+/- XXX.XX	XX.XX

XX (= number of repetitions)



- If the selected profile has not been defined, the error message at left appears in the lower line of the DIALOG display (chapter A.4.8). Confirm the error message with the E-key, The cursor returns to the profile number entry field "P:".



- In case of transmitting errors on the serial interface (incorrect interface parameters, no printer connected) the program automatically returns to menu level 3, and an error message appears in the lower line of the DIALOG display (chapter A.4.8).
  Confirm the error message with the E-key.

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A.4.8 Error messages

The following error messages are indicated on the DIALOG display for user guide.

Message	Cause
Value Too Small	A parameter value is too small. Note the working temperature range of the circulator.
Value Too Large	A parameter value is too large. Note the working temperature range of the circulator.
Not defined	A profile number has been entered that does not exist.
COM - Error	An error appears when trying to print the profile via the serial interface. Check if both units are properly connected. Also check the interface parameters entered for circulator and printer or computer.
Clock - Error	The connection between clock and battery is interrupted or has been interrupted for a short time. Set time and date after confirming the message (chapter A.4.5.1). When this message appears again after turning the power switch off and on, have the circulator repaired by an authorized JULABO service station. (The life-time of the battery for the clock is about 10 years.)



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EC Declaration of Conformity

CE

The following units comply with the safety requirements outlined by the EC Directives concerning the guidelines for electromagnetic compatibility (89/336/EEC) and low voltage regulations (73/23/EEC).

Circulators: **MH, MS, MT**

Refrigerated baths: **F25, F26, F32, F33, F34, FP40, FP45, FP50, FS18**

This declaration of conformity is only valid for units with a mains power requirement of 230 V.

The units are manufactured in compliance with

- the guidelines for electromagnetic compatibility (EMC) outlined by **EN 50081-2, EN 50082-2**
- the low voltage regulations specified by **EN 61010-1**

Julabo

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G. Juchheim, Managing Director

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EC Declaration of Conformity

CE

The following unit complies with the safety requirements outlined by the EC Directives concerning the guidelines for electromagnetic compatibility (89/336/EEC).

Refrigerator baths: F81, F83

This declaration of conformity is only valid for units with a mains power requirement of 230 V.

The unit is manufactured in compliance with

- the guidelines for electromagnetic compatibility (EMC) outlined by **EN 50081-2, EN 50082-2**

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G. Juchheim, Managing Director

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