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Immersion Circulator- Immersion Thermostat

IMMERCIRC

USER'S GUIDE

Manufacturer and service: 1-CUBE s.r.o.
Hamry 3567, 580 01 Havl.Brod
tel. 569 433 620
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Contents:

1. Range of supply

Immersion Circulator- Immersion Thermostat …….....…1 unit

Optional Accessory:

Immersion Circulator can be ordered separately or with bath a bath made of stainless steel eventually plastic material. If the bath is not included in the order it is necessary to order a bath clamp that fits all baths.

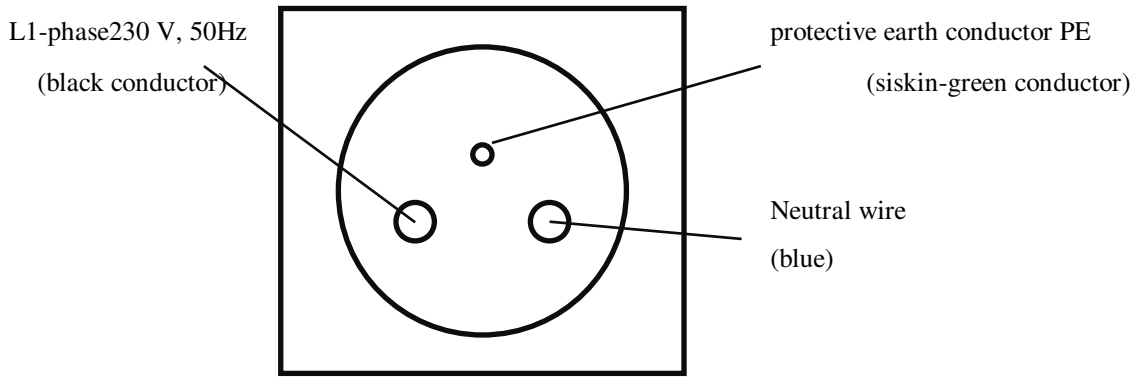
The pump set, which is available as an accessory, provides pumping to external systems for provision of external temperature tasks. An integrated cooling coil for cooling the temperatures under +20°C is also available as an accessory.

2. Installation - putting the device into operation

Immersion Circulator is determined only for work in laboratories which is the ordinary place for laboratory testing. The Bath must be located in the horizontal position (for proper operation of the apparatus) and the Immersion circulator must be attached to the bath with the help a bath clamp.

Plug in the Immersion Circulator with the help of a standardized single-phase plug into el.socket. Before plugging in the technician has to check the condition of the el.circuit that will be used for the Mash Bath operation. If the result of the el.circuit inspection is positive, the Mash Bath can be plugged in.

Plug wiring (front view):



View of the Immersion Thermostat location with the help of the bath clamp on the bath:

3. Safety recommendations

Equipment may be operated only by person who became completely acquainted with its function within the framework of the training, or who became thoroughly acquinted with the user's guide of this device. The Mash Bath must be plugged in with the help of a standardized plug into single-phase el.socket with circuit breaker. Before plugging in the technician has to check the condition of the el.circuit that will be used for the equipment operation. If the result of the el.circuit inspection is positive, the equipment can be plugged in. The Main Switch is located on the front panel – there are two positions of the Main Switch: ON-1, OFF-2. In case of danger switch off the Main Switch, disconnect feed el.cord out of the socket and contact the qualified service personnel who provides service for delivered device if any problem with any water leakage appears.

Warning! . It is hazardous for anyone except for the producer or authorized service company to repair the apparatus.

4. Technical data:

Electric data:

- voltage systém TN-S 1+PE+N
- voltage 230V/50 Hz or 110V/60 Hz
- protection IP 20
- the equipment can be used in neutral medium
- the equipment output : 1500W
- circuit breaker–8 A fusible cut out
- plugging in el. network: with the help of flexible cord LYS 3x1,5
- averaged plug and socket outlet protected with circuit breaker

Adjustable data:

- choice of methods: Thermostat, PROFILE, calibration
- temperature range: (-80-+170 ^{0}C) with the help of membrane keyboard and display
- time of the test duration

Data represented on LCD display:

- type of method: THERMOSTAT, PROFILE
- instantaneous temperature of bath or suspension, required temperature of bath or suspension
- time since the begining of test
- communication of the instrument with the service

Accuracy:

- accuracy of temperature measurement: +-0,01 ^{0}C
- accuracy of temperature regulation: to : +- 0,02 ^{0} C

Signalization:

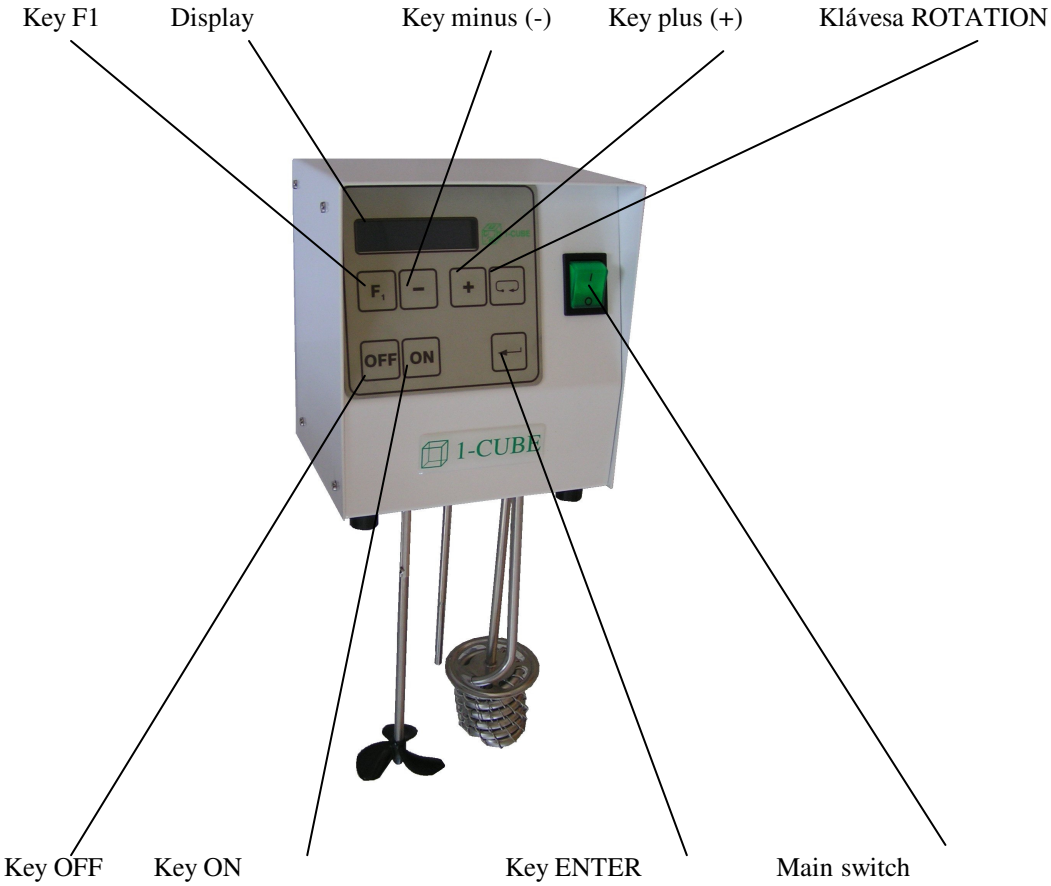
- acoustic and optical alarm (on the display)

5. Operating instructions

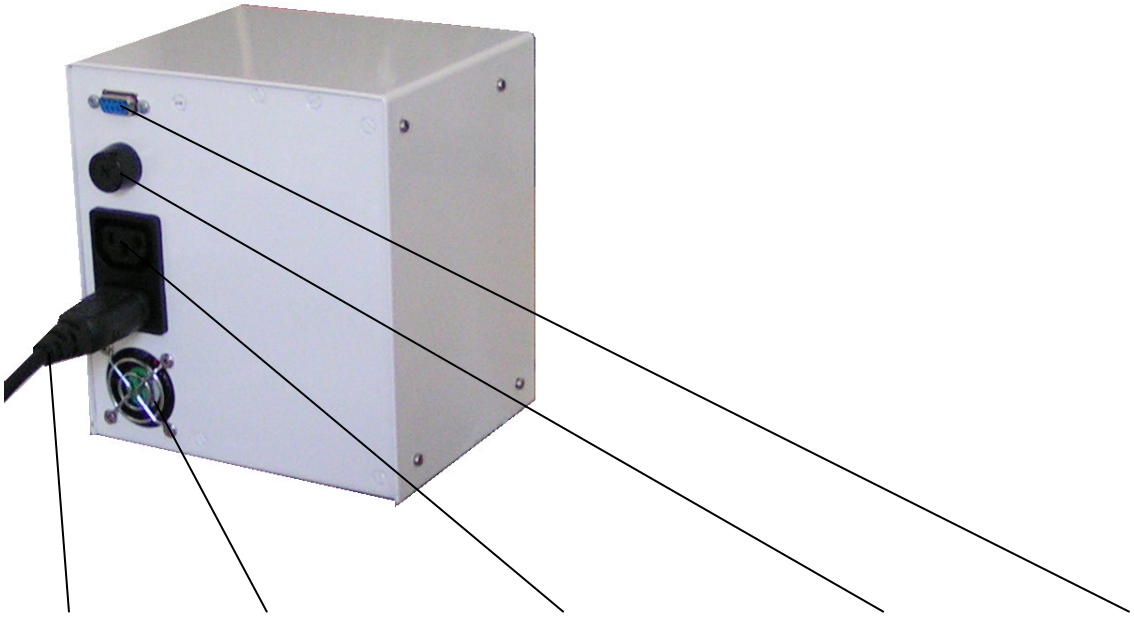
Switch on the Main Switch located on the front panel of the equipment. **NOTICE: It is necessary to check if there is liquid in the bath. The equipment gives a signal when the level of liquid is too low but it is necessary to use electrically conductive liquid. If non-conductive liquid is used then the equipment gives a signal even if there is enough liquid.**

Single-chip processor iss used to control the equipment. Control algorithm is saved int the programme. Program is controlled with the help of 7 keys of the membrane keyboard which is located on the front panel of the equipment. The report about the operating condition can be observed on the 2 lines of the display.

Display and keyboard scheme – front view:



Scheme – back view:



Flexible cord Fan Connection of the cooling compressor Fusible cutout 8 A Connector RS232

After switching on the equipment there is 1-CUBE name and the version of the control programme appears on the display, they disappear after a while and the first item (control algorithms TERMOSTAT) of the Main Menu appears on the display.

Once the work with the equipment is finished switch off the Main Switch.

How to switch on the stirrers:

Press the key **ENTER** on the membrane keyboard to switch on or to switch off the mixing. The only task of the key **ENTER** is switching on and switching off the stirrers.

How to switch on the Cooling unit:

If the temperatures under 20 degrees C are required it is necessary to attach the Immersion Cooler to Immersion Circulator. There is a socket on the back pannel to attach the cooling compressor of the Immersion Cooler. Once the cooling compressor is connected with the help of the supplied flex to Immersion Circulators, the cooling compressor can be switched on. Press the key **F1** on the membrane keyboard during the algorithm TERMOSTAT or PROFILE. After switching on the cooling there is text "**cooling on**" on the display. Press the key **F1** on the membrane keyboard to switch off the cooling compressor. After switching off the cooling there is text "**cooling off**" on the display. The only task of the key **F1** is switching on and switching off the cooling compressor. It is possible to attach any cooling compressor up to output 600W. Cooling can be switched on only in case that the regulation (TERMOSTAT or PROFILE) is on

Control algorithms

The following control algorithms PROFILE, THERMOSTAT can be run.
During the process the following information are automatically displayed on the display.

1. line:

The required temperature is displayed.

2. line:

Information about time given in minutes and instantaneous real working temperature.

Adjustment of the required temperature or time:
The required temperature or time in the methods (menu) THERMOSTAT, PROFILE and CALIBRATION are adjusted by pressing keys plus + (to increase the value) or minus – (to decrease the value). First the required value is changed of tenths of degree or 1 seconds, after ten changes (ten presses of key) the required value is changed of degrees or 10 seconds, after ten following changes (ten presses of key) the required value is changed of 10 degrees or 100 seconds etc.

Method Thermostat:

This algorithm allows to adjust any required temperature and the equipment maintains the temperature for the required time. The equipment has saved the last required temperature and can start the algorithm with the same teperature itself by pressing the key **ON.** There is displayed the required temperature on the first line of the display and the time runned off from the beginning of the test and real temperature on the second line of the display. If you want to change the value of the required temperature you have to do that before pressing the key ON. Temperature is set with the help of keys plus + (to increase the value) or minus – (to decrease the value) – see paragraph: Adjustment of the required temperature or time: in the chapter Control algorithms. After setting the required temperature press the key **OFF** and in that way the temperature is saved in the memory and the text TERMOSTAT appears on the display. Now the new temperature control can start the temperature control (with the required temperature) starts running. The algorithm is stopped by pressing the key **OFF**.

Method PROFILE:

This algorithm allows to adjust any required time behaviour of temperatures. It is possible to adjust as many as 7 points defined with time and temperature coordinates. One can start the algorithm itself by pressing the key **ROTATION**.

After 1 sec the text: START ON:

OTHER PARAMETERS: appears on the display.

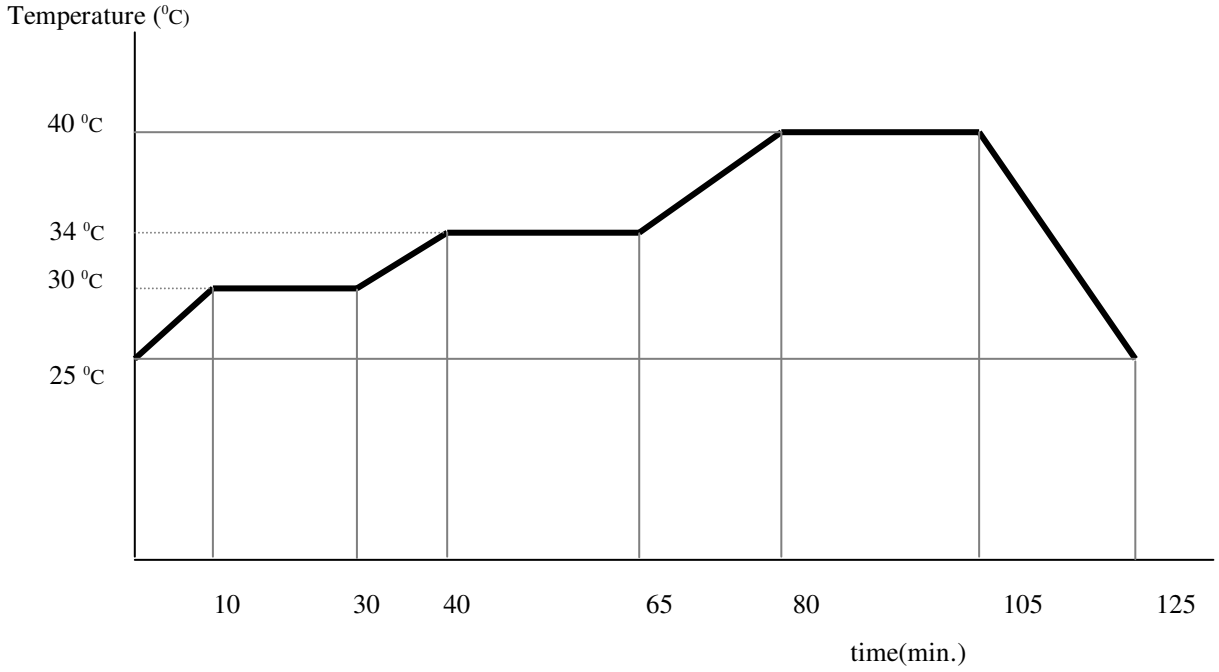
If there has been already set the temperature curve before, one can use it again (because it is saved in the internal memory) by holding the key ON at the time when the text: START ON:

OTHER PARAMETERS: appears on the display.

If there hasn't been set the temperature curve yet or it is necesary to set it in a different way, one waits about 1 sec till the text SET UP THE CURVE appears on the display

After that the text: time of point 1= appears on the first line and one sets the time in minutes on the second line. Time is set with the help of keys plus + (to increase the value) or minus – (to decrease the value) – see paragraph: Adjustment of the required temperature or time: in the chapter Control algorithms. After setting the time of point 1 press the key **OFF** and in that way time of point 1 is saved in the internal memory and after that the text: time of point 2= appears on the first line and one sets in the same way the time of point 2, the time of point 3, the time of point 4, the time of point 5, the time of point 6, the time of point 7. After setting the time of point 7 press the key **OFF** and the text: temp. of point 1= appears on the first line and one sets the temperature in ^{c} C. on the second line. Temperature is set with the help of keys plus + (to increase the value) or minus – (to decrease the value) – see paragraph: Adjustment of the required temperature or time: in the chapter Control algorithms. After setting the temperature of point 1 press the key **OFF** and in that way temperature of point 1 is saved in the internal memory and

after that the text: temp. of point 2= appears on the first line and one sets in the same way the temperature of point 2, the temperature of point 3, the temperature of point 4, the temperature of point 5, the temperature of point 6, the temperature of point 7 and by pressing the key **OFF** the control of the adjusted curve starts running. There is displayed the required temperature on the first line of the display and the time runned off from the beginning of the test and real temperature on the second line of the display. The algorithm is stopped by pressing the key **OFF**.



Example of the curve adjustement according to picture:

time of point 1=10, time of point 2=30, time of point 3=40, time of point 4=65, time of point 5=80, time of point 6=105, time of point 7=125,

temperature of point 1=30, temperature of point 2=30, temperature of point 3=34, temperature of point 4=34, temperature of point 5=40, temperature of point 6=40, temperature of point 7=25,

Method Calibration:

It s necessary to check the measurement accuracy with the help of etalon once in quarter. If the temperature of the bath does not correspond to the temperature measured with the etalon it is necessary to recalibrate the temperature sensor. The temperature sensor is calibrated only if it is really necessary because the equipment is optimally calibrated by manufacturer.

Calibration Procedure:

It is necessary to calibrate two temperatures for the right measurement of the equipment. The lower temperature (about 20 degrees Celsius) and the upper temperature (about 70 degrees Celsius).

Calibration of the lower temperature 20 degrees Celsius (point 1) :

First check if the temperature in bath is about 20 degrees Celsius and if it is not use the method Thermostat to reach

it. Once temperature of 20 degrees Celsius is reached use the following procedure:

1) Press the key s OFF and ENTER at the same time
2) There is text „dig value of tem“ on the first line and the value on the second line for a second. Write down the digital value.
3) There is text „point 1 - digital“ on the first line and the value on the second line. Overwrite the value with the help of keys + (increase) or – (decrease) to put the digital value that you have written down before. Press the key „OFF“ to set the required value.
4) There is text „point 1 - temp“ on the first line now and the value on the second line. Overwrite the value with the help of keys + (increase) or – (decrease) to put the value that you have measured before with the etalon in the water of the mash bath. Press the key „OFF“ to set the required value.

5) There is text „point 2 - digital“ on the first line now and the value on the second line. Do not set the point 2 at this moment therefore press the key „OFF“.
6) There is text „point 2 - temp“ on the first line now and the value on the second line. Do not set the point 2 at this moment therefore press the key „OFF“.
7) There is text „**HYSTER1_0=**“ on the first line now and the value on the second line. Do not set the **HYSTER1_0** at this moment therefore press the key „OFF“.
8) There is text „**HYSTER1_100=**“ on the first line now and the value on the second line. Do not set the **HYSTER1_100** at this moment therefore press the key „OFF“.
9) There is text „**HYSTER2-0=**“ on the first line now and the value on the second line. Do not set the **HYSTER2_0** at this moment therefore press the key „OFF“.
10) There is text „**HYSTER2_100=**“ on the first line now and the value on the second line. Do not set the **HYSTER2_100** at this moment therefore press the key „OFF“.
11) There is text „**HYSTER3-0=**“ on the first line now and the value on the second line. Do not set the **HYSTER3_0** at this moment therefore press the key „OFF“.
12) There is text „**HYSTER3-100=**“ on the first line now and the value on the second line. Do not set the **HYSTER3_100** at this moment therefore press the key „OFF“.
The lower temperature (point 1) is calibrated now

Calibration of the upper temperature 70 degrees Celsius (point 2) :

First check if the temperature in bath is about 70 degrees Celsius and if it is not use the method Thermostat to reach it. Once temperature of 70 degrees Celsius is reached use the following procedure:

1) Press the key s OFF and ENTER at the same time
2) There is text „dig value of tem“ on the first line and the value on the second line. Write down the digital value.
3) There is text „point 1 - digital“ on the first line and the value on the second line. Do not set the point 1 at this moment therefore press the key „OFF“.
4) There is text „point 1 - temp“ on the first line now and the value on the second line. Do not set the point 1 at this moment therefore press the key „OFF“.
5) There is text „point 2 - digital“ on the first line now and the value on the second line. Overwrite the value with the help of keys + (increase) or – (decrease) to put the digital value that you have written down before. Press the key „OFF“ to set the required value.
6) There is text „point 2 - temp“ on the first line now and the value on the second line. Overwrite the value with the help of keys + (increase) or – (decrease) to put the value that you have measured before with the etalon in the water of the mash bath. Press the key „OFF“ to set the required value.
7) There is text „**HYSTER1_0=**“ on the first line now and the value on the second line. Do not set the **HYSTER1_0** at this moment therefore press the key „OFF“.
8) There is text „**HYSTER1_100=**“ on the first line now and the value on the second line. Do not set the **HYSTER1_100** at this moment therefore press the key „OFF“.
9) There is text „**HYSTER2-0=**“ on the first line now and the value on the second line. Do not set the **HYSTER2_0** at this moment therefore press the key „OFF“.
10) There is text „**HYSTER2_100=**“ on the first line now and the value on the second line. Do not set the **HYSTER2_100** at this moment therefore press the key „OFF“.
11) There is text „**HYSTER3-0=**“ on the first line now and the value on the second line. Do not set the **HYSTER3_0** at this moment therefore press the key „OFF“.
12) There is text „**HYSTER3-100=**“ on the first line now and the value on the second line. Do not set the **HYSTER3_100** at this moment therefore press the key „OFF“.

The upper temperature (point 2) and temperature sensor are calibrated now.

Hysteresis adjustment to achieve the most accurate regulation

Very complicated regulation algorithm is used to achieved the required temperature. 3 hysteresis ranges are used nad the heating output is regulated according to them, in addition its amplitude is changed linearly in dependance on temperature and on cooling compressor closing. Hold generally – if the volume of the bath is bigger, one has to adjust smaller hysteresis. Procedure of hysteresis adjustment is following:

1) Press the key s OFF and ENTER at the same time

2) There is text „dig value of tem“ on the first line and the value on the second line. Write down the digital value.

3) There is text „point 1 - digital“ on the first line and the value on the second line. Do not set the point 1 at this moment therefore press the key „OFF“.
4) There is text „point 1 - temp“ on the first line now and the value on the second line. Do not set the point 1 at this moment therefore press the key „OFF“.
5) There is text „point 2 - digital“ on the first line now and the value on the second line. Do not set the point 2 at this moment therefore press the key „OFF“.
6) There is text „point 2 - temp“ on the first line now and the value on the second line. Do not set the point 2 at this moment therefore press the key „OFF“.
7) There is text „**HYSTER1_0=**“ on the first line now and the value on the second line. Overwrite the value with the help of keys + (increase) or – (decrease) to adjust „**HYSTER1_0“** as required. Press the key „OFF“ to set the required value. Hysteresis „**HYSTER1_0** is preadjusted by the manufacturer as 000.30.
8) There is text „**HYSTER1_100=**“ on the first line now and the value on the second line. Overwrite the value with the help of keys + (increase) or – (decrease) to adjust „**HYSTER1_100“** as required. Press the key „OFF“ to set the required value. Hysteresis „**HYSTER1_0** is preadjusted by the manufacturer as 000.10.
9) There is text „**HYSTER2_0=**“ on the first line now and the value on the second line. Overwrite the value with the help of keys + (increase) or – (decrease) to adjust „**HYSTER2_0“** as required. Press the key „OFF“ to set the required value. Hysteresis „**HYSTER2_0** is preadjusted by the manufacturer as 000.15.
10) There is text „**HYSTER2_100=**“ on the first line now and the value on the second line. Overwrite the value with the help of keys + (increase) or – (decrease) to adjust „**HYSTER2_100“** as required. Press the key „OFF“ to set the required value. Hysteresis „**HYSTER2_100** is preadjusted by the manufacturer as 000.05**.**
11) There is text „**HYSTER3_0=**“ on the first line now and the value on the second line. Overwrite the value with the help of keys + (increase) or – (decrease) to adjust „**HYSTER3_0“** as required. Press the key „OFF“ to set the required value. Hysteresis „**HYSTER3_0** is preadjusted by the manufacturer as 000.05**.**
12) There is text „**HYSTER3_100=**“ on the first line now and the value on the second line. Overwrite the value with the help of keys + (increase) or – (decrease) to adjust „**HYSTER3_100“** as required. Press the key „OFF“ to set the required value. Hysteresis „**HYSTER3_100** is preadjusted by the manufacturer as 000.03.

The hysteresis are adjusted now.

6. Monitoring RS232

During all the methods Immersion Circulator the records of the temperature curves in PC are possible. Switch off the Equipment and connect the PC com port with the RS232 com port. Switch on the equipment and start any method. Use any program which makes possible the RS232 communication to record the temperatures in PC. Program Hyperterminál (which is part of WINDOWS) or program Seriál Watcher (which is part of Monitoring Mash Bath supply) can be used. Note. It is necessary to adjust the program for ASCII signs reception.

7. Maintenance

Throughout the Immersion Circulator operation the scale can be sedimented the heating elements. It is important to remove these sediments after point of time. Pour the water with either the acetic acid or citric acid into the bath and hold the temperature of 65 degrees Celsius for one hour in the bath. Then disconnect feed el.cord out of the socket, suck the sediments with the help of a hose and clean the vessel.

9. Important warnings:

If the equipment is transported at temperature below freezing point, it is necesary to leave the instrument for about 2 hours at room temperature before you start to work with it.

It is forbidden to replace the fuse located at back pannel of the equipment by fuse with different value than the value indicated on the equipment.

Service:

For service contact the manufacturer: 1-CUBE, Hamry 3567, 580 01 Havl.Brod, Czech Rep.
tel. 00 420- 569 433 620
fax.00 420-569 422 144
1-cube@1-cube.com

NOTICE: It is forbidden for anyone except for the manufacturer or authorized company to repair the apparatus.
At the end of the apparatus life we recommend that it is according to corresponding waste categorization.

Take the metallic parts made of iron, brass, plastic elements and packing material to the separated collection as a secondary raw material. You can also order the apparatus liquidation at the above mentioned company that ensures the liquidation of the waste according to Waste Act.