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WATER THERMOSTAT - TYPE SU 6.2.

USER'S GUIDE

Manufacturer and service: 1-CUBE s.r.o.

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CONTENT

1. RANGE OF THE SUPPLY

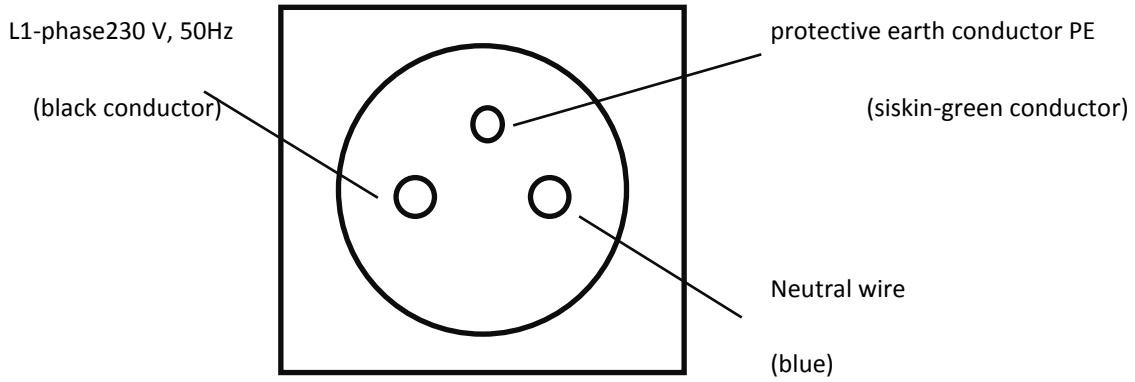
Water thermostat type SU6.2- hot bath..... 1 pc
Water thermostat type SU6.2- cold bath ..... 1 pc
Bottle holder for 6 bottles ..... 2 pcs

2. INSTALLATION INSTRUCTIONS

The Water Bath is determined only for work in laboratories which is the ordinary laboratory place. The Bath must be located in the horizontal position (for proper operation of the apparatus). Plug the Bath with the help of 2 standardized single-phase plugs into el.socket. Connect each bath (cold and hot) with its own cord.

Before plugging in the technician has to check the condition of the el.circuit that will be used for the Water Bath operation. If the result of the el.circuit inspection is positive, the Water Bath can be plugged in.

Plug wiring (front view):



Cold Bath SU6.2. connection:

3. SAFETY RECOMMENDATIONS

Water Bath may be operated only by person who became completely acquainted with its function within the framework of the training, or who became thoroughly acquainted with the user's guide of this device. The Water 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 Water Bath operation. If the result of the el.circuit inspection is positive, the Water Bath can be plugged in.

There is the Main Switch located on front panel. The Main Switch has two positions ON - **1**, OFF - **0**.

In case of danger switch off the Main Switch and disconnect feed el.cord out of the socket. 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 necessary.

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

4. TECHNICAL DATA

Electric data:

- voltage system 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 : hot bath 1500W, cold bath 1800W
- circuit breaker–10A fusible cut out
- plugging in el. network: with the help of flexible cord LYS 3x1,5
- averaged plug and socket outlet protected with 16A circuit breaker

Adjustable data:

- type of method: THERMOSTAT, PROFILE, CALIBRATION
- temperature range: from 25^{0}C to +90^{0}C, cold bath from - 10^{0}C to +30^{0}C with the help of membrane keyboard and display
- time since the begining of test

Accuracy:

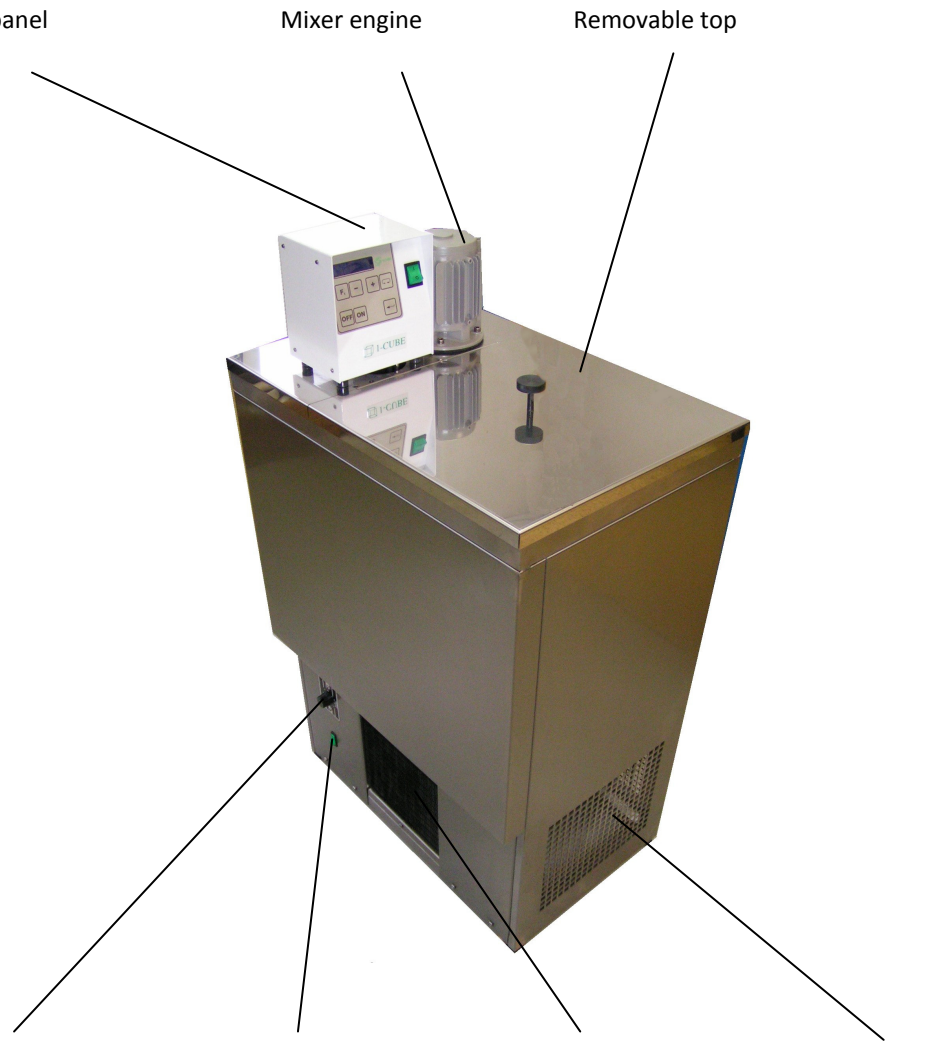
- accuracy of temperature measurement: +-0,01^{0}C
- accuracy of temperature regulation: : $^{+}$_0,1 ^{0}C

Data represented on LCD display:

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

5. USER'S GUIDE

Picture of the cooling bath - SU6.2:



First switch on the Main Switch located on the front panel of the equipment.

NOTICE: It is forbidden to use the device without filling it with water. It could cause device destruction and staff injury. The device warns you if there is not enough water inside the bath. It is necessary to use electrically conductive liquid. If wou use non electrically conductive liquid then the device will notify all the time that there is not enough water inside the bath even if it isn't true. If you use distilled water in the laboratory just add a pinch of salt (NaCl) and you will get electrically conductive liquid.

Switch on the cooling on-off switch except for the main switch in the cooling bath. There is a cooling thermostat just next to cooling on-off switch and we do reccomend to leave its value as preadjusted „value 5"

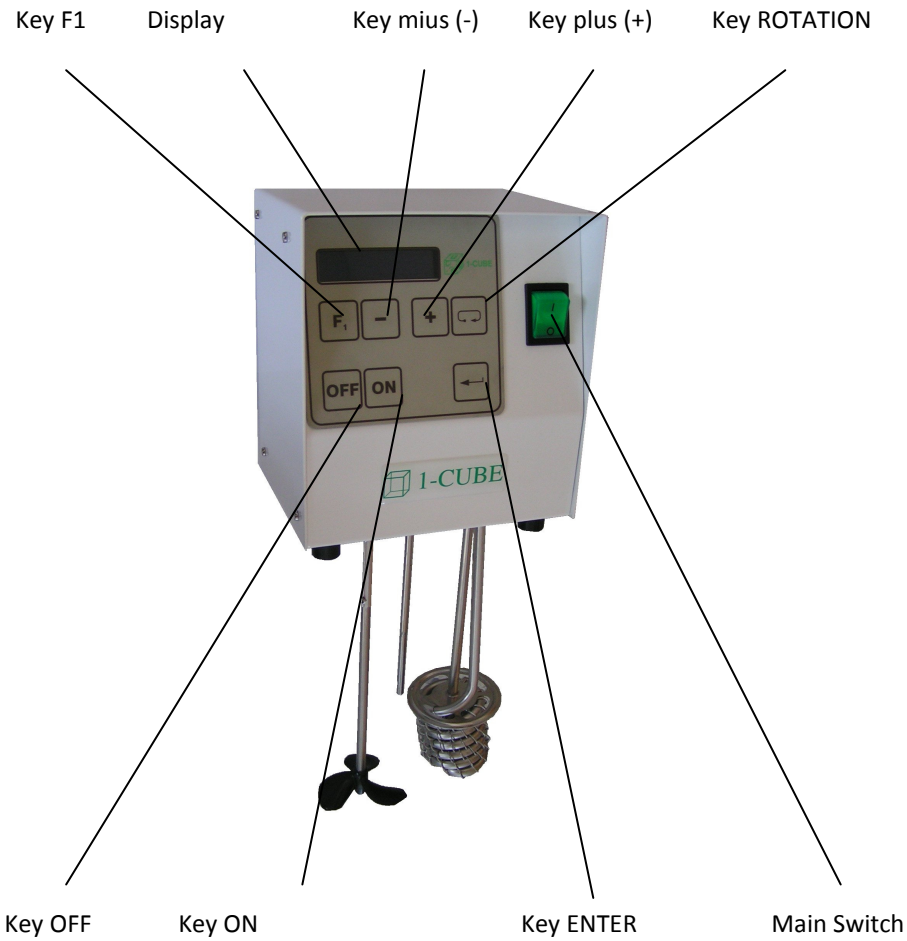
Warning! Do not exceed the temperature+30 degrees Celsius in the cooling bath otherwise the cooling system can be irreversibly damaged!!!!!

The bottles can be put in only into the bottle holder which makes part of the supply. If you put them inside without the bottle holder the bottles may move in the bath and the stirrer can be damaged.

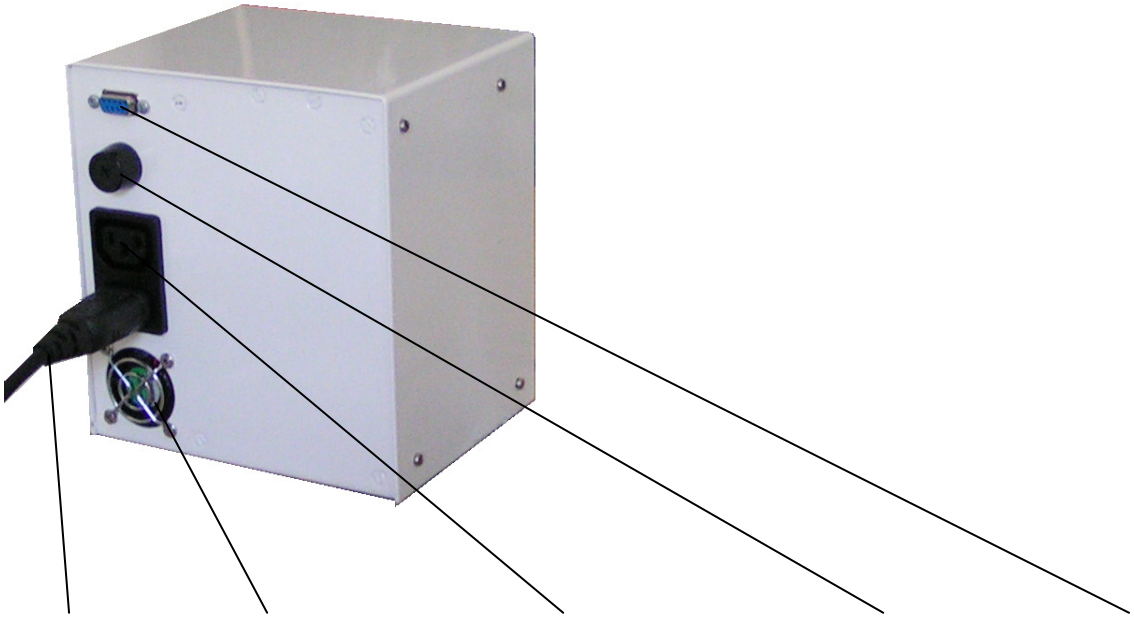
The stirrer is controlled with the help of the switch **„Stirrer“**. We reccommend to leave the stirrer always switched on (in the position **I**) in this way the stirrer will be controlled (switch on/switch off) with **"Main switch"**. Once the main switch is switched on the stirrer is switched on automatically too.

One chip microprocessor is used to control the device. The algorithm is saved in the program. 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.

Control Panel Scheme – front view:



Control Panel Scheme – rear view :



Feed cord Fan Stirrer connection Safety fuse 10 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 the text THERMOSTAT appears on the display. Once you finish working switch off the device with the help of the Main switch.

Control algorithms:

The following control algorithms PROFILE, THERMOSTAT, CALIBRATION can be run with the Water Bath

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, CALIBRATION and PROFILE 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. Once you have adjusted the required data push the key **OFF** to save it into the memory, after this step the text THERMOSTAT appears again on the display.

Method Thermostat:

This algorithm allows to adjust any required temperature and the Water Bath maintains the temperature for the required time. The device has saved the last value adjusted temperature that was regulated. If you do not want to change the value of the temperature start the algorithm itself by pressing the key **ON**. The text: REQ.CONTROL: appears on the first line of the display, there is the time in minutes **„min=“**and the real temperature **„T=“** in ^{0}C on the second line.

If the set temperature doesn't suit you and you need to change it you have to adjust the required temperature before you press the key **ON.** The required temperature is set with the help of keys plus + (to increase the value) or minus – (to decrease the value) – see the paragraph above: **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 required temperature is saved and the text THERMOSTAT appears again on the display. Now you can start the temperature control running by pressing the key **ON**. The algorithm is stopped by pressing the key **OFF**. If there is not enough water in the Bath the text **„add water“** appears automatically on the display and it will disappear once the water is added.

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. After choice of the item PROFILE in the main menu with the help of the key **ROTATION** one can start the algorithm itself by pressing the key **ON**.

After 1 sec the text: START ON:

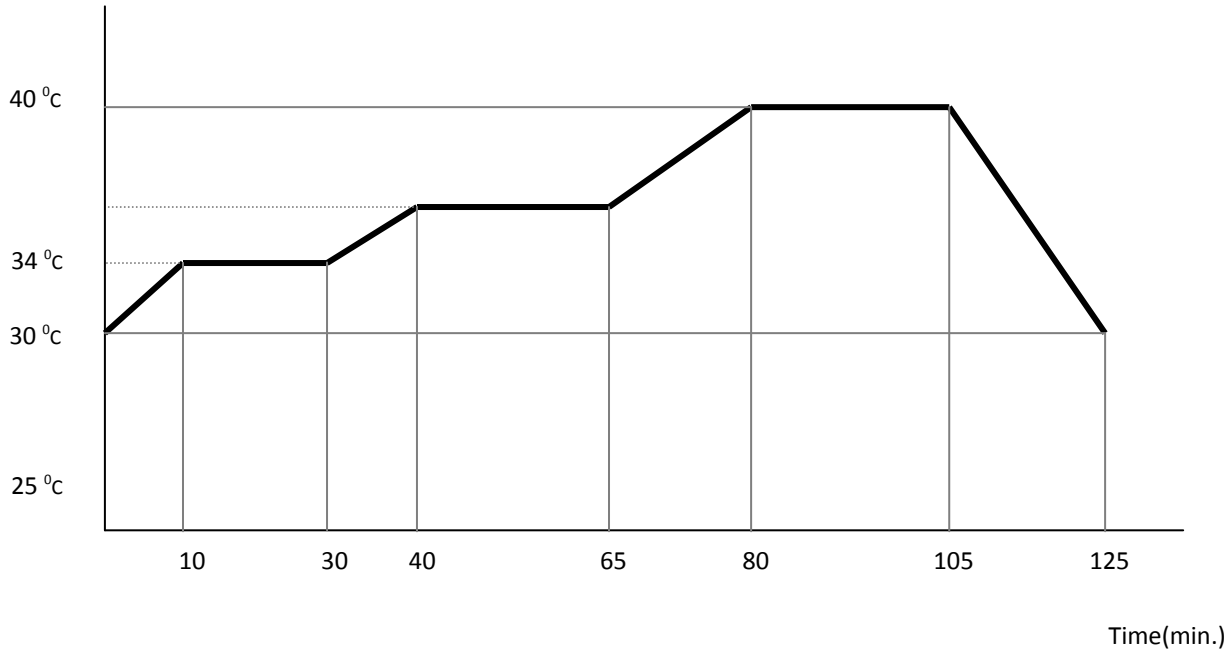
OTHER PARAMETERS: appears on the display.

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 is necessary to check the measurement accuracy with the help of etalon once in a six months. 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 in the opposite ends within device temperature range for the right measurement of the Water Bath - The lower temperature (for example about 5 degrees Celsius) and the upper temperature (about 70 degrees Celsius).

Calibration of the lower temperature 5 degrees Celsius (point 1) :

First check if the temperature in bath is about 5 degrees Celsius and if it is not use the method Thermostat to reach it. Once temperature of 5 degrees Celsius is reached use the following procedure:

1) Press the keys 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. 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 water 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 **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 **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 **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 **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 **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 **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 keys 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 water 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 **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 **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 **HYSTER2_0=** at this moment therefore press the key „OFF“.
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12) There is text „**HYSTER3_100=** “ on the first line now and the value on the second line. Do not set **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 achieve the required temperature. 3 hysteresis ranges are used and the heating output is regulated according to them, in addition its amplitude is changed linearly in dependence 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.

3) There is text „point 1 - digital“ on the first line and the value on the second line. We do not calibrate the temperature sensor now therefore press the key „OFF“.

4) There is text „point 1 - temp“ on the first line now and the value on the second line. We do not calibrate the temperature sensor now therefore press the key „OFF“.

5) There is text „point 2 - digital“ on the first line now and the value on the second line. We do not calibrate the temperature sensor now therefore press the key „OFF“.

6) There is text „point 2 - temp“ on the first line now and the value on the second line. We do not calibrate the temperature sensor now 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 000.02. The hysteresis is adjusted now.

6. MONITORING RS232

During all the methods Heating Immersion Circulator the records of the temperature curves in PC are possible. Switch off the device and connect the PC com port with the RS232 com port with the help of supplied communicating cable. Switch on the device and start any method. Use any program which makes possible the RS232 communication to record the temperatures in PC. Program Hyperterminal (which is part of WINDOWS) or program Serial 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 operation the scale can be sedimented on the heating elements. It is important to remove these sediments. Pour the water with either the acetic acid or citric acid into the bath and heat up 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.

8. IMPORTANT WARNINGS

The Cooling Bath must be always located on the nibs and mustn't be tilted or turned upside down in any case!!!!

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

The fuses are located on the back panel of the Water Bath. It is forbidden to replace the fuse 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.