




TEMPERATURE CONTROLLER **CLARE 4.0** MANUAL

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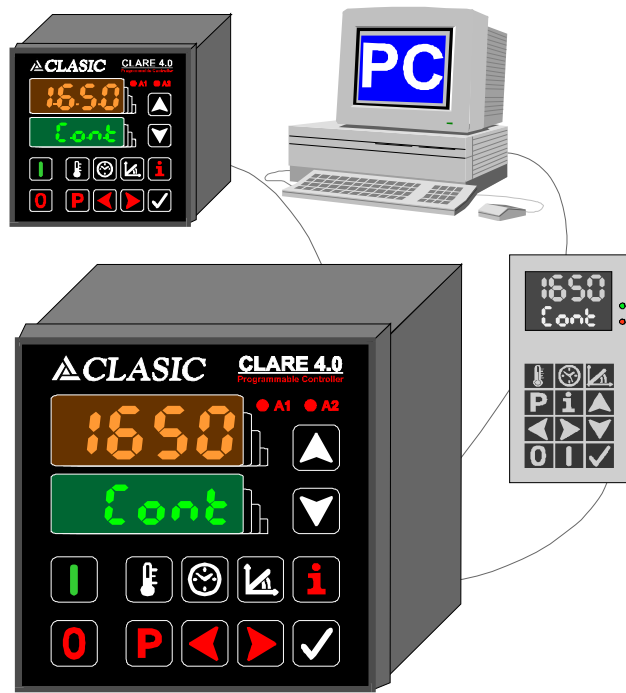
Introduction

The purpose of this manual is to inform users about the programmable controller CLARE version 4.0. The manual is divided into three main parts, which inform about the simplest up to the more complex operations with the controller. The letters A, B, C indicate the parts and Arabic numbers indicate their chapters. For example, the chapter C5 means the chapter 5 in the part C of the manual.

Part A deals with the manual mode and describes the basic operation of the controller. Each chapter contains many examples, in which you can check various procedures in practice. Examples in the entire manual (except several ones) come from the manual mode. The first two chapters of the part A are the inevitable minimum for using the controller.

Part B describes the work in the programming mode. This mode serves for more effective work with the controller and allows using most of its functions. At the end of the part B there are some examples that demonstrate high properties of the programming mode. After studying this part, you will be virtually able to solve any situation, which might appear during the heating process programming.

Part C describes the SETUP mode in which you can set various parameters for the controller. Through this, you can create such environment, which is most suitable for your usage of the controller. This part describes setting the parameters with a long-term character (it is not necessary to change them too often). If the parameters set by the producer are acceptable for you, it is not necessary to study this part of the manual.



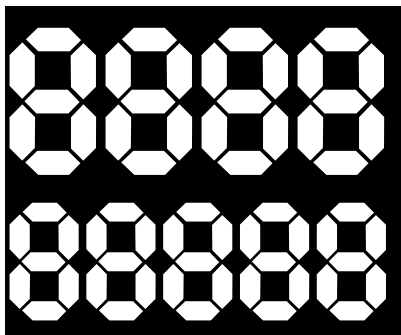
Possibilities of the controller connecting

Connection with the superordinate PC

Addition of another display and keyboard

Connection of unlimited Slave controllers

Display and keyboard of the controller



Upper display

Lower display

Green LED control:

off indicates the program is not running

on indicates the program is running

Flashes indicates waiting for automatic start of the program

Keyboard

Temperature setting

Delay or a real time clock setting

Ramp setting

P Programming mode

i Information, function selection (Programming mode)

Value or a program setting

Value or a program setting

Choice of function; block selection

Choice of function; block selection

0 Cancellation, return, SETUP mode

I Program start, start at set time

Value or function enter

PART A - MANUAL MODE

Due to its simplicity, the manual mode is appropriate for quick operation with the controller. The manual mode is entirely independent and self-sufficient and after becoming familiar with this mode you are virtually able to use all basic operations of the controller.

In the manual mode, you can set two ramps (temperature gradient), two required temperatures and one delay without a necessity of the time limit. It is very practical to start the created program at set time and possible to change all parameters at the program run. You can find out all information about the heating process at any time.







The parameter setting is uniform and there are always simple help messages on the lower display. After stop of the controller, all parameters are kept in the memory until their new setting. You can freely set all parameters without order; they will be set in proper order after the program start, when required temperature is reached first (chapter A1 describes the temperature setting) by using set ramp (chapter A4 or A5). After reaching this temperature the delay time begins (chapter A3). From any situation you can get back to the manual mode as the beginning of any operation by pressing the key **0** repeatedly (for more details see the chapter A9).

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Chapter 1 - TEMPERATURE

1.1 Temperature setting: the key



You can get into the temperature setting mode by pressing the key . The message  °C will appear on the lower display, set temperature in °C on the upper display. The temperature range is from 1 to maximal temperature (see also C3). You can change temperature by the keys  (upward) and  (downward). If you keep pressing the keys, set temperature will increase or decrease automatically with acceleration. After pressing the key  on the value 1, temperature will change into the maximum and oppositely. At the end you have to confirm the set value by the key .

Example

1.1.1 You want to set 1200°C.



1. Get into the temperature setting mode by pressing the key .
2. Keep pressing the key  and temperature will increase with acceleration.
3. Stop pressing the key around the value 1200.
4. Set precisely 1200°C by pressing the key  or , respectively.
5. Confirm set temperature by pressing the key  (by this you will also leave the temperature setting mode).

1.2 Control of set temperature

Enter the temperature setting mode (the key ), make a control of set temperature and leave the mode by the key .


Example

1.2.1 Did you really set 1200°C?



1. Get into the temperature setting mode by pressing the key .
2. Check whether the value is really 1200°C.
3. Return by pressing the key .

Chapter 2 - START AND STOP OF THE PROGRAM

2.1 Start and stop of the program: the key










The program starts by pressing the key . Right after this, the green LED is on; it indicates the program starting. On the lower display regulated temperature will appear, for example **1000°** (if you did not choose the Fast ramp, which will be described later - at the chapter A4, regulated temperature is at the beginning equal to real temperature and is coming close to set temperature). The upper display shows real temperature.

The lighting red LED in the right down corner of the upper display (at the decimal point) by the pulse regulation indicates that the heating is on.

You can stop the program by pressing the key . The message **Pr - 00 / End** (program has stopped) will appear on the lower display. You can get back to the manual mode by pressing the key ; the acoustic signalization will stop.

Example

2.1.1 You want to set 1100°C and after some time to switch off the furnace manually.

1. Get into the temperature setting mode by pressing the key .
2. Set the value around 1100 by keeping the key  or .
3. Set precisely 1100°C by pressing the key  or , respectively.
4. Confirm set temperature by pressing the key  (at the same time you will leave the temperature setting mode).
5. Start the program by pressing the key .
6. After these actions wait till real temperature in a furnace (on the upper display) reaches the value 1100 (on the lower display you will see **Cont** - continual delay, which means the value 1100°C will be kept until the furnace stopping).
7. After fulfilling of required time, stop the regulation by pressing the key  and by pressing the key  again get back to the basic mode.

2.2 Start of the program at set time

If you keep the key **1** for more than 4 seconds, you will get into the time setting mode for the program start. On the lower display the message **⌚ inut** will appear, on the upper display the proper value - it is taken from real time and therefore it is easy to set the required time difference from real time. You can choose the time unit by the keys **◀** and **▶**; the own value setting is made by the keys **▲** and **▼**. You can set minutes (**⌚ inut**), hours (**Hour**) and days (**DAY**) from Monday to Sunday. For more details of the time setting see the chapter A7.

Confirm the setting by pressing the key **✓**. Then on the lower display data about the program start will appear, time and day are changing (e.g. **14:30 / Fr 5** means that the furnace will start on Friday at 14:30). By pressing the key **i**, actual time will appear (by pressing the key **i** for more than 4 seconds the actual date will appear). On the upper display, there is still real temperature in the furnace. The controller is now waiting for required time and then it will automatically start the program. Pressing the key **0** can stop waiting for required time and automatic start of the program.




Example






2.2.1 After an hour (e.g. at 16:23) you want to start the program and to reach temperature that was set at the previous case.

1. It is not necessary to set temperature because it is equal to the one set at the previous case. By long pressing the key **1** (for more than 4 seconds) you will get into the time setting mode.
2. Change the value from 16 to 17 by pressing the key **▲** when the item **Hour** (hour) is displayed (find the item **Hour** by the keys **◀** and **▶**).
3. Confirm the set value by the key **✓**. The program will wait for an hour and then it will automatically start.

Chapter 3 - DELAY







3.1 Delay setting: the key

In the manual mode, the delay comes automatically after reaching required temperature. You will get into the delay setting mode by the key . On the lower display the message  ' will appear, on the upper display the set delay in minutes. The message  indicates that the permanent (continual) delay is set. The delay range is 1-4999 minutes or Cont.










You can change the delay by the keys  (upward) and  (downward). If you keep pressing the keys, the set delay value will increase or decrease automatically with acceleration. If you press the key  on the delay 1', then  will be displayed (permanent delay) and oppositely. After that you have to confirm the set delay by the key .

Examples













3.1.1 You want to set the 120-minutes delay.

1. Get into the delay setting mode by pressing the key .
2. By keeping the key  or  the delay will increase/decrease automatically.
3. Release the key around the value 120.
4. Set precisely 120 minutes by pressing the keys  and , respectively.
5. Confirm the set value by the key  (by this you will also leave the delay setting mode).


3.1.2 You want to keep 900°C for 3 hours.

1. Get into the temperature setting mode by pressing the key .
2. Set the value 900 by the keys  and .
3. Confirm the set value by the key  (by this you will also leave the temperature setting mode).
4. Get into the delay setting mode by pressing the key .
5. Set 180 minutes (3 hours) by the keys  and .
6. Confirm the set value by the key  (by this you will also leave the delay setting mode).
7. Start the program by the key .



3.1.3 Today is Monday. Tomorrow at the same time, you want to start the program on 600°C and keep it till the program will be stopped manually.

1. Get into the temperature setting mode by the key .
2. Set the value 600 by the keys  and .
3. Confirm the set value by the key .
4. Get into the delay setting mode by the key .
5. Set **Cont** (continual delay) by the key .
6. Confirm the value by the key .
7. Choose start at set time by long pressing the key .
8. Set **Day** on the lower display by the arrows  and .
9. Set **TU** (Tuesday) by the key .
10. Confirm set time by the key  and then the program will wait till tomorrow.

3.1.4 You want to repeat the previous heating cycle.



1. Because all previously set parameters maintain in the memory of the controller, it is sufficient to start the program by the key .

3.2 Control of the set delay




Enter the delay setting mode by the key , make a control of the set delay and leave the mode by the key .






Example

3.2.1 Did you really set the 120-minutes delay?

1. Get into the delay setting mode by the key .
2. Check whether the delay is really 120 minutes.
3. Return back by the key .









Chapter 4 - RAMP SETTING

You will get into the ramp setting mode by the key . On the lower display the message  will appear, on the upper display the ramp in °C per minute with accuracy of one decimal place. If the message  will appear, the maximal speed of required temperature was set. The ramp range is 0.1-120°C per minute or FAST.














You can change the ramp by the keys  (upward) and  (downward). If you keep pressing the keys, the ramp value will increase or decrease automatically with acceleration. If you press the key  on the ramp 0.1°C/minute, then  will be displayed (that means as fast as possible) and oppositely. After that, you have to confirm the set ramp by the key .

Examples

4.1 You require the ramp: 10°C/minute.

1. Get into the ramp setting mode by pressing the key .
2. By keeping the key  or  the ramp will increase/decrease automatically.
3. Release the key around the value 10.0.
4. Set precisely 10.0 by pressing the keys  and , respectively.
5. Confirm by the key  (you will also leave the ramp setting mode).
6. You can check the set value by pressing the key  and get back by .

4.2 You want to reach 1000°C by the ramp 4°C/minute and keep this temperature for one hour.

1. Get into the temperature setting mode by the key .
2. Set the value 1000 by the keys  and .
3. Confirm the set value by the key  (by this you will also leave the temperature setting mode).
4. Get into the delay setting mode by the key .
5. Set the value 60 (minutes) by the keys  and .
6. Confirm by the key  (you will also leave the delay setting mode).
7. Get into the ramp setting mode by the key .
8. Set the value 4.0 by the keys  and .
9. Confirm the value by the key  and start the program by the key .

Chapter 5 - INFORMATION

You can manage the information system by the only key **i**. In the SETUP mode by the options **YES** or **no** in the **d ISPL** area you can define what information you want to display. So if some information is not displayed it is necessary to allow its displaying. For more details of this setting see the chapter C1.

Some information has parameters that can be modified at the program run.

5.1 Information in the basic mode - green LED off

1. In the basic mode, actual time is displayed (e.g. **08-24**).
2. After pressing **i**, last required temperature is displayed (e.g. **° 1050**).
3. After another pressing **i**, the energy consumption (with accuracy of one decimal place, in kWh) of the last completed cycle is displayed (e.g. **12.3** – means 12,3 kWh).
4. By another pressing the key **i**, the stopwatch is displayed and it shows time of the last completed cycle (e.g. **18:50** or **2 1:34**).
5. By pressing the key **i** you will get back to the step 1.
6. Instead of actual time, it is possible to display actual date by keeping (4 seconds) the key **i** (e.g. **22/06**) and oppositely.
7. Instead of the last completed cycle energy consumption, it is possible to display the total energy consumption (e.g. **00987**) by keeping the key **i** (for more than 4 seconds) and oppositely. The value is directly in kWh. You can also null the counter (see the chapter C2).

5.2 Information in waiting for automatic start green LED flashes

1. In the basic state on the lower display, time and day of the program start are changing (e.g. **15:20 / 28 4**).
2. After pressing the key **i** actual time is displayed (e.g. **08-24**).
3. After another pressing the key **i** you will get back to the step 1.
4. Instead of actual time, it is possible to display actual date (e.g. **03/03**) by keeping the key **i** (for more than 4 seconds) and oppositely.

5.3 Inform. by the program start – green LED on

1. In the basic mode (after the program start), next items are displayed:
2. Regulated temperature (e.g. **1205°**) - during temp. growing or declining. If the ramp is set on **FRSt**, final required temperature is displayed directly.
3. Time remaining till the end of the delay (e.g. **240'**) or the message **Cont** - during the delay time. The keys **▲** and **▼** can change the delay time at the program run. Through this, it is possible e. g. to prolong the delay time (continual delay optional). Only for an actual heating cycle.
4. After pressing the key **i** actual time is displayed (e.g. **08-24**).
5. After another pressing the key **i** the display shows required temperature, to which you want to get or which is kept during the delay (e.g. **° 1050**). You can change this information by the arrows **▲** and **▼** at the program run and thus adjust temperature defined for this delay time at the moment. During the temperature growth or decline you can adjust final required temperature. If you miss real temperature by change of required temperature, the controller will make a next step.
6. After pressing **i**, the actual heating cycle energy consumption is displayed in kWh with accuracy of one decimal place (e.g. **2.4** means 2.4kWh).
7. After another pressing the key **i** the ramp is displayed (e.g. **10/0**) by which temp. grows or grew if the delay is on. There is possibility to change the ramp by the arrows **▲** and **▼** at the program run. If you set the value Fast, there is no chance to change the ramp in this progress any more.
8. After another pressing the key **i** information about your actual position in the program is displayed (**b** is in the middle position). The first two numbers indicate if you are in the manual or programming mode (the program number is here). The second two numbers indicate the part of the program (e.g. **00b0** : means you are in the manual mode and the first ramp is going on).
9. After another pressing **i** the stopwatch is displayed, which shows program run time (e.g. **25n 12** means 25 min and 12 sec, **05h25** means 5 hours and 25 min). By long pressing the key **i** (for more than 4 seconds) you can null the stopwatch. It can be used for counting the time from the certain moment.
10. After another pressing **i** the actual power output is displayed in percentages (e.g. **66%** means 66%).
11. After another pressing the key **i** you will get to the step 1.
12. Instead of actual time, it is possible to display the actual date by long pressing the key **i** (e.g. **20/07**, 20/7 means July 20) and oppositely.
13. Instead of the last completed cycle energy consumption, it is possible to display the total energy consumption in kWh by keeping the key **i** (e.g. **00287**) and oppositely.

5.4 Examples

5.4.1 How much energy have you already spent?

1. Press the key **i** as long as you will get to the last cycle consumption (the second last position on the lower display shows the character **ξ**).
2. After long pressing the key **i**, the total energy consumption will be displayed (in kWh). It will be displayed instead of the cycle consumption - till the next long pressing the key **i**.

5.4.2 What is actual time? (Any mode)

1. Press the key **i** as long as actual time or the actual date appears. If the actual date appears, you can display actual time by keeping the key **i** and oppositely.

5.4.3 On what temperature the program comes up/down? (Program is going - green LED is on.)

1. Press the key **i** until the first position of the lower display shows the character **◊**, behind which you will find temperature.

5.4.4 The program is in progress and the delay is now performing. You want to increase temperature about 100°C and to make the heating cycle for 2 hours longer.






1. Press the key **i** until the first position of the lower display shows the character **◊**.
2. Change regulated temperature about 100°C higher by the arrow **▲**.
3. By the key **i** find information about the remaining delay time (on the last position of the lower display, the character **'** is shown).
4. Add 120 minutes to the value of the delay by the arrow **▲**.

Note: Like this you can make simple temperature curves in the manual mode at the program run without using the programming mode.



5.4.5 You want to switch on the stopwatch from that moment.

1. Press the key **i** as long as the stopwatch is displayed.
2. By long pressing the key **i** you can reset the stopwatch.

Chapter 6 - REAL TIME CLOCK SETTING




















You will get to this state from the basic mode by keeping the key . To set actual time use the keys  and  for changing the time unit; the keys  and  for changing the proper value. You can set these time units (it is not necessary to set them all):

unit	range	green display
Minute	00-59	00 min
Hour	00-23	Hour
Day	Mo-Su (1-7)	DAY
Date	01-31	DATE
Month	01-12	Month
Year	00-99	YEAR

The wrong date setting (e.g. February 31) causes the move to the right date (March 1). After this, you can return by pressing the key ; to cancel all changes and to return use the key .

Example

6.1 The clock displays wrong time. Today is Friday April 25, 2014, 20:56.

1. Get into the actual time setting by long pressing the key .
2. Set the value 56 (minutes) using the keys  and .
3. Go to the hour setting by the key .
4. Set the value 20 using the keys  and .
5. Go to the day setting by the key .
6. Set the value Fr 5 (Friday) using the keys  and .
7. Go to the date setting by the key .
8. Set the value 25 using the keys  and .
9. Go to the month setting by the key .
10. Set the value 4 using the keys  and .
11. Go to the year setting by the key .
12. Set the value 14 using the keys  and .
13. Confirm the set values by the key .

Chapter 7 - ERROR AND INFORMATION MESSAGES

7.1 Break of the measured thermocouple (E C b - according the type of a thermocouple)

After break of the measured thermocouple the controller is not able to find out real temperature and it must immediately stop the program. In this case, you will see the messages E C b and E C L on the display and also the fluent acoustic signal will start (if the acoustic mode is on), for you to notice and to repair the thermocouple. Replacement of the thermocouple is necessary to do when the controller is off.

7.2 Maximal temperature was exceeded (E H °C is displayed)

Maximal temperature was exceeded. You can set maximal temperature (see the chapter C3). After exceeding this temperature the relay 1 and relay 2 is immediately switch off and the message about too high temperature flashes on the upper display. If temperature decreases below the maximum, the regulation will be switched on again and the message will disappear.

7.3 Increased temperature of the controller (E O N P is displayed)

If surrounding temperature reaches too high level, it can damage the controller. After decreasing of surrounding temperature the heating cycle will continue automatically. There is advantageous to use external ventilator operation according surrounding temperature (see the chapter C3).

7.4 Controller memory error (E E N O / E r r o r is displayed)

This error occurs in very exceptional case when failure of memory structure appears. It happens immediately after turn on the controller. It is necessary to initiate the controller then (see the chapter C8) when this error occurs.

Chapter 8 - CONTROLLER AFTER SWITCHING ON

8.1 Period 1 - Testing of the controller

After switching on, the controller will start self-testing. During the controller testing the countdown is going on the lower display (tESt3).

If an error is found in the memory, the message **bAtE ENPEy** will appear on the display. The controller then cannot continue in the program by the power blackout. This error can occur when the battery (for memory secure and the real time clock) is discharged. It is necessary to replace the battery in every 10 years. Battery exchange does not cause any change of user programs or SETUP settings. Real time clock should be set again (chapter A6).

8.2 Period 2 - Testing of the program failure

In this period, the system is checking whether the program has not been interrupted by the power blackout. If the controller finds out the program was interrupted, he will start the program automatically from the place of its stop. Then running message **ProGrama Cont inuE** will appear on the lower display. Automatic start of the program is possible to set (even to negate) in the SETUP mode (chapter C6). If the program has not been interrupted by any mentioned actions, the upper display will show year of the production and the producer's message **CLAS iCSoft rEAdy**.

If the power blackout is longer than time set in SETUP (chapter C6), the message **Pr-00 / Error** will appear on the lower display of the controller.

8.3 Period 3 - Protection against an unauthorized person







It is possible to protect the controller by a password. The password consists of four digits 0-9 and it is possible to set and to remove it in the SETUP mode (after removing the password the controller can be operated by any person).

If the password is enabled, **0000 PASS** will be displayed. At that moment the keyboard works like the calculator keyboard and you can write the password. By the unsuccessful password setting the controller will offer you another chance. If you forget the password, it will be necessary to make an intervention to the controller hardware, which will cause the programs total loss in the memory. It is better to consult such situation with the producer.

After correct password entering, actual temperature will appear on the upper display and actual time on the lower display.

PART B - PROGRAMMING MODE

The programming mode is much more effective than the manual mode. After becoming familiar with this mode you will be able to use most of the controller functions. In the programming mode there is possible to make even very complicated heating processes and the controller can be pre-programmed for weeks or months ahead.

There are 10 programs available in the programming mode and each contains 16 program blocks. It is possible to link various programs together. One program block always contains one chosen function with parameters. The 6 keys only can operate the entire program but you can also use other ones. There are three levels of selection: individual programs can be selected by the arrows  and , program blocks by the arrows  and  and a block parameter can be changed again by the arrows  and .

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Chapter 1 - OPERATING THE PROGRAMMING MODE

1.1 Program selection

You can get from the manual mode into the programming mode by pressing the key **P**. If the message **Pr-00** on the upper display will not be shown instead of actual temperature then it indicates that entering the programming mode is forbidden. Entering is possible by setting **Pr-Mod** in the **StAr-t** area of the SETUP mode (for more details see the chapter C6). You can leave the programming mode by pressing the key **P** or **0**.

After entering the programming mode you will get to the previously left program. The lower display shows for example **P0 1-F** or **P03-U**. Double-digit number (in the range 01-10) indicates in what program you are now. The letter at the end indicates whether the program is **Free** or **Used**. By creating a program you can choose any number of the program by the keys **▲** and **▼**. It is possible to use 75 programs with 50 blocks each.













1.2 Moving block after block in a program

In a chosen program you can move by the keys **◀** and **▶**. The move is block after block, which are the basic units of each program. Each program contains 50 blocks. In the program you can move in a circuit; it means if you press the key **◀** at the beginning, you will get immediately to the program end. By pressing the key **▶** you will get back to the program number and after another pressing the key **▶** you will get to the first block of the program. If you want to get into a different program, you have to stand out of any block (you can jump to the begin of program with the key **0** from any block).

While moving block after block you can see some messages on the lower display like **b0 1-t**, **b 12-d** and so. The letter **b** indicates that you are in the program block (therefore it is impossible to set the program number), next two digits indicate the block number and the letter at the end indicates what function the block contains (function abbreviation). If the program is **Free** it contains only block **b0 1-E** (the letter **E** means End of the program). The upper display always shows the function parameter.









Chapter 2 – WORK WITH PROGRAMS AND BLOCKS

2.1 Changing block function, creating a program










Using the arrows  and  you can choose the block in which you want to change a function. By pressing the key  you will get to the function selection. There is no need to search the basic functions, it means the temperature, delay and ramp; you can use directly their own keys: ,  and . You can see function names on the upper display. Make selection by the arrows  and . Confirm the chosen function by the key  and set its parameter by the keys  and . In order to confirm the set parameter value you have to press the key . You will get to the next block automatically.

Creating a program is analogous. You change functions of single blocks in a chosen program. After parameter confirming you will get to the next block automatically. If you change the program end (you see **End** on the upper display), the end will automatically move to the next block and therefore it is not necessary to set it at the end of the program. After the second last possible block setting, the end of the program will automatically move to the last block that is not possible to rewrite any more. If you need the program longer than 50 blocks, you have to use the Jump function, which will be described later (chapter B5).

2.2 Changing a block parameter

By the program ( and ) and block ( and ) selection you can get to any block. Most of blocks contain functions with a parameter. You can set the parameter by the arrows  and . Make confirmation by the key , after which you will get automatically to the next block. After pressing the key  the value does not change and you will get back to the program start.

2.3 Deleting a program

You can delete a program by setting the program end to the first block. Select the program for deleting (arrows  and ) by pressing the key  you will get to the first block. Through pressing the key  by the arrows  and  you can choose the **STOP** function. After confirmation of the chosen function by the key , **End** will appear on the upper display that indicates the program end. If you return back (key  or ) you will see that the letter **U**(sed) disappeared and the letter **F**(ree) appeared at this program.

Chapter 3 - PROGRAM OPERATION

3.1 Start and stop of the program

The key **▶** starts a chosen program. After pressing this key the green LED is on signaling the program start. Actual temperature will appear on the upper display, regulated temperature on the lower display (by the delay, remaining time till its end). The red LED in the right down corner of the upper display (at the decimal point) by the pulse regulation indicates that the heating is on. The program is possible to start from any block and to skip its part through this.

You can stop the program by the key **0**. On the lower display the message **P-End** flashes (program ended) / **P- 00** (two last numbers indicates the program number) and the controller acoustically signalizes the end of the program. By pressing any key you will get back to the programming mode.

3.2 Starting the program at set time

In the programming mode you can set the program (or the program block), which you want to start. If you keep the key **▶** for more than 4 seconds you will get to the program start time setting. You can use all four arrows for this setting and finish it by the key **✓** (for details see the chapter A7). On the lower display time for the program start is flashing for example **15:20 / 10-2**, the upper display shows actual temperature. The controller is now waiting for set time and then it will automatically start the program. The key **0** can stop waiting for set time and the automatic program start.

3.3 Information, skipping a block

After starting the program from the programming mode, information about the number of just performing block will appear. Pressing the key **i** repeatedly will show on the lower display for example **02:01** (if it is allowed - see the chapter C1), that means the block 01 is now performing at the program 02 (for more details see the chapter A5). The key **▶** skips the program blocks. This is a very effective function of the controller which allows for example to bring back some mistakenly stopped program to the original state (done blocks are skipped, the delay can be right set and so) or to prevent performance of some program blocks.

If you use the **⌘** function (program resumption at set time), then hour and minute of the program start will be shown at the information.

Chapter 4 - BASIC COMMANDS OF THE CONTROLLER

Each program contains blocks of different functions. By change of a block function (see the chapter B2) after pressing the key **F** you can choose required function by the arrows **◀** and **▶**. The functions are described in following three chapters.

4.1 Function Ramp (ramp) - abbr. **r**

On the upper display there is **rRNP**. It can be selected directly by pressing **↵**.

Meaning: ramp setting (see the chapter A4)

Parameters: gradient in 0.1°C/min, range 0.1 - 120.0 or **FRSt** (the fastest way)

Note: By the ramp gradient setting you have to set this function before setting temperature. The set value is valid for all next temperature functions till the new ramp setting (function Ramp or Time). If the ramp is not set at all, the controller will use the Fast ramp (the fastest way).

4.2 Function Temp (temperature) - abbr. **t**

On the upper display there is **tENP**. It can be selected directly by pressing **🌡**.

Meaning: required temperature setting (see the chapter A1)

Parameters: temperature with 1°C increment, range 1-maximal temperature according SETUP (chapter C3)

4.3 Function Dlay (delay) - abbr. **d**

On the upper display there is **dLRy**. It can be selected directly by pressing **🕒**.

Meaning: delay time setting (see the chapter A3)

Parameters: delay with 1-minute increment, range 1-4999 or **Cont** (continual)

4.4 Function Time (time - ramp analogy) - abbr. **c**

On the upper display there is **c::E**. It can be selected directly by long (for more than 4 seconds) pressing the key **↵**.

Meaning: time setting required for reaching temperature

Parameters: time with 1-minute increment, range 1-4999 minutes

Note: By the time setting required for reaching temperature you have to set this function before the temperature function setting. The set value is valid for all next temperature functions till the new ramp/time setting (functions Ramp/Time). If the ramp/time is not set at all, the controller will use the Fast ramp (the fastest way).

Chapter 5 – CONTROL PROGRAM FUNCTION

5.1 Function Jump (jump) - abbr. ↴

On the upper display there is **↴**. Choose the function by the key **i**.

Meaning: jump into a different program

Parameters: program number range 1-maximal program number (chap. B1)

Note: You can use this function in two ways. If you write a very long program and you need more blocks, you can write the Jump function to the second last block with a reference to another free program, in which you can continue in writing. If you write the same program number, as the one you are just writing, it will cause infinite program repeating. The second interesting possibility is to create a common end of program. If you want to create several programs with the same end, it is good to write this end into some free program. Then you can jump to this universal end from all programs.

5.2 Function At (alarm - wait for time) - abbr. ⌚

On the upper display there is **⌚**. Choose the function by the key **i**.

Meaning: program continuation at set time

Parameters: time range from 00.00 to 23.59

Note: You can use it to define the real time schedule. By using delays for this purpose there is a danger that the time schedule will be not succeeded in the ramp gradient changing or in the power blackout. If you use this function it is possible to make a schedule for long-term processes in the only program. By the **⌚** function the regulation on last set temperature is performing.

5.3 Function Stop (end) - abbr. ⌘

On the upper display there is **⌘**. Choose the function by the key **i**.

Meaning: program end, in writing a program it is automatically put to the end

Parameters: none, the message **⌘** on the upper display

Note: This function is used for a part or a whole program deleting.

Chapter 6 - OTHER FUNCTIONS

6.1 Function Proc (power output) - abbr. P

On the upper display there is **P-00**. Choose the function by the key **i**.

Meaning: maximal power output limitation

Parameters: power output in %, range 1-100 or **OFF**

Note: This function enables to limit maximal power output set in the SETUP mode (chapter C2). So it is possible to modify maximal power output at the program run. Through this, the regulation by low temperature can be better. Maximal power output limitation can be cancelled if you set **OFF** (limitation from the SETUP mode is still operative – chapter C2).

In case **PCOOL** is set to YES in the **POWER** area of the SETUP mode, the function Proc can control analog output 0 – 10 V for cooling. This function could be use at any place of program and control the device with analog input this way. Values 1-100 set output level in percent directly. After the program is started or setting the value **OFF** at any place of program is activated automatic cooling control (analogy of heating control). We can change different intensity of cooling gradually by function Proc and from a certain block of program switch on the automatic cooling control.

6.2 Function Out (output) - abbr. O

On the upper display is **Out**. It can be selected by pressing the key **i** for 4 s.

Meaning: output line setting (**Out**)

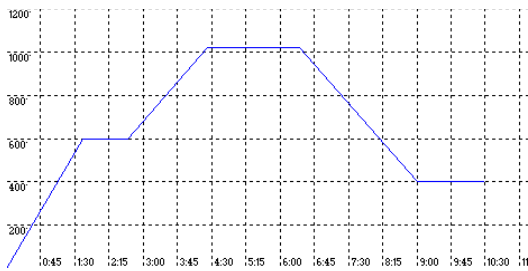
Parameters: number of output line, required line state (0 or 1)

Note: Through this function you can work with the controller peripheries. It is possible to control connected fan or a valve.

In the controller there is module which enables to control 3 outputs by function OUT 1-3 ON or OUT 1-3 OF. The relays are in the off position when program starts and also when program stops. It is not possible to control relay 3 when it is used for cooling (**PCOOL** is set to YES in the **POWER** area of the SETUP mode). The basic version of controller can control only one relay by function OUT 4 ON or OUT 4 OF. This relay is on the backside of the controller called RELE 2 and this relay is in the on position when program starts.

Chapter 7 - EXAMPLES

7.1 The progress is defined by the graph. Use the program 1.



Ramp 6°C/min to 600°C
 Delay 60 minutes
 Ramp 4°C/min to 1020°C
 Delay 120 minutes
 Ramp 4°C/min to 400°C
 Delay 90 minutes

1. Get into the programming mode by the key **P**.
2. Find the program 1 (**PG 1-F**) by the arrows **▲** and **▼**.
3. Get to the first block by the key **▶**.
4. Select the **rAMP** (ramp) function by the key **↗**.
5. Set the value 6.0 (°C/min) by the arrows **▲** and **▼**.
6. Confirm by the key **✓**, by this you will also get to the second block.
7. Select the **tEMP** (temperature) function by the key **🌡**.
8. Set the value 600 (°C) by the arrows **▲** and **▼**.
9. Confirm by the key **✓**, by this you will also get to the third block.
10. Select the **dLAY** (delay) function by the key **⌚**.
11. Set the value 60 (minutes) by the arrows **▲** and **▼**.
12. Confirm by the key **✓**, you are at the fourth block.
13. Select the **rAMP** (ramp) function by the key **↗**.
14. Set the value 4.0 (°C/min) by the arrows **▲** and **▼**.
15. Confirm by the key **✓**, you are at the fifth block.
16. Select the **tEMP** (temperature) function by the key **🌡**.
17. Set the value 1020 (°C) by the arrows **▲** and **▼**. Confirm by the key **✓**.
18. Because the ramp gradient is the same it is not necessary to set it.
19. Select the **dLAY** (delay) function by the key **⌚**.
20. Set 120 (minutes) by **▲** and **▼**. Confirm by **✓**, the seventh block.
21. Select the **tEMP** (temperature) function by the key **🌡**.
22. Set 400 by the arrows **▲** and **▼**. Confirm by **✓**, the eighth block.
23. Select the **dLAY** (dlay) function by the key **⌚**.
24. Set 90 by the arrows **▲** and **▼**. Confirm by **✓**.
25. Press the key **▶** to get back to the program start.
26. Optionally press the key **P** to go back to the manual mode.

7.2 You want to look over the program 1.

1. Get into the programming mode by the key **P**.
2. Select the program 1 (**PC 1-U**) by the arrows **▲** and **▼**.
3. If the last letter on the lower display is **F**, the program is free.
4. Look over the program by the keys **◀** and **▶**.
5. You can get to the program start by the key **0**.
6. You can get to the manual mode by the key **P** or the key **0**.

7.3 You are on the last program block and you want to continue in writing the program but this block cannot be rewritten.

1. You have to set the Jump function on last but one block.
2. You will get to the function selection by the key **i**.
3. Select the **JUMP** (jump) function by the arrows **◀** and **▶**.
4. Select the program number that is free now by the arrows **▲** and **▼**.
5. Confirm the parameter by the key **✓**.
6. Go to the program selection by the key **▶**.
7. Select the program that you set in the jump function by the keys **▲** and **▼**.
8. Get into the first block by the arrow **▶** where you can continue in writing the program. (It is necessary to write again the function which you rewrote by the **JUMP** function.)

7.4 You need to delete the program 7.

1. Get into the programming mode by the key **P**.
2. Select the program 7 (**PC 7-U**) by the arrows **▲** and **▼**.
3. If the last letter on the lower display is **F**, the program is free.
4. Find the first block by the key **▶**.
5. After pressing the key **i** you can start the function selection.
6. Select the **STOP** function by the keys **◀** and **▶**.
7. Confirm the selection by the key **✓** (you will see **END** on the upper display).
8. Get to the programs by the key **▶** and make sure, the program is free.
9. You can return to the manual mode by the key **P** or **0**.

7.5 The program 7 is free. You want to set the delay 120 mins on 1000°C, which you want to reach as fast as possible.

1. Get into the programming mode by the key **P**.
2. Select the program 7 (**PO7-F**) by the arrows **▲** and **▼**.
3. Find the first block by the key **▶**.
4. Select the ramp function (**r-RAMP**) directly by the key **↗**.
5. Set **FRSt** by the arrow **▼**.
6. Confirm by **✓** and get to the second block (the end will move).
7. Select the temperature function (**tTEMP**) directly by the key **🌡**.
8. Set the value 1000 by the arrows **▲** and **▼**.
9. Confirm by **✓** and get automatically to the next block.
10. Select the delay function (**dLRY**) directly by the key **⊗**.
11. Set the value 120 by the arrows **▲** and **▼**. Confirm by the key **✓**.
12. You want to finish at this point and return to the programs by the arrow **▶**.
13. You can return to the manual mode by the key **P** or **0**.

7.6 You need to start the program 7 now.

1. Get into the programming mode by the key **P**.
2. Select the program 7 (**PO7-U**) by the arrows **▲** and **▼**.
3. Start the program by the key **I**.

7.7 You need to start the program 7 in one hour.

1. Get into the programming mode by the key **P**.
2. Select the program 7 (**PO7-U**) by the arrows **▲** and **▼**.
3. Enter the starting time setting by long keeping the key **I** (4 seconds).
4. Select the time unit **Hour** (hour) by the arrows **◀** and **▶**.
5. Enlarge the value about 1 by the key **▲** (if you get to 0, you have to enlarge also day of the week).
6. Confirm by the key **✓** and the program will automatically start in one hour.

7.8 You want to start the program 7 from the fifth block.

1. Get into the programming mode by the key **P**.
2. Select the program 7 (**PO7-U**) by the arrows **▲** and **▼**.
3. Press the key **▶** five times and you will get to the third block.
4. Start the program by the key **I**.

7.9 You want to change the delay to 60 min in the program 7.

1. Get into the programming mode by the key **P**.
2. Select the program 7 (**P07-U**) by the arrows **▲** and **▼**.
3. Press the key **▶** three times (or **◀** twice) and you will get to the third block where there is the delay.
4. Change the value to 60 by the arrows **▲** and **▼**.
5. Confirm the new parameter by the key **✓**.
6. You can get to the program selection by the key **0**.
7. You can return to the manual mode by the key **P** or **0**.

7.10 You want very accurate ramp 1°C/minute up to 150°C. Use the program 8.

1. Get into the programming mode by the key **P**.
2. Select the program 8 (**P08-F**) by the arrows **▲** and **▼**.
3. Find the first block by the key **▶**.
4. Get directly to the ramp setting (**rRNP**) by the key **⏏**.
5. Set the value 1.0 by the arrows **▲** and **▼**.
6. Confirm by **✓** and get to the second block (the end will move).
7. Get to the function selection by the key **i**.
8. Select the maximal output function (**P-OC**) by the arrows **◀** and **▶**.
9. Set the value 15 (low temp. and ramp - 15% is enough) by **▲** and **▼**.
10. Confirm by **✓** and get automatically to the third block (the end will move).
11. Select directly the temperature function (**tENP**) by the key **🌡**.
12. Set the value 150 by the arrows **▲** and **▼**.
13. Confirm by **✓** and get automatically to the fourth block.
14. Return to the programs by **0** or **▶**, then to the manual mode by **P** or **0**.

Note: If the process is not able to keep the required ramp gradient with such lower power output you have to increase the value of the **P-OC** function.

7.11 You want to skip the ramp that is now performing at the program run.

1. Press the key **i** as long as **b** will appear in the middle position of the lower display.
2. Skip just performed block (ramp) by the key **⏏**.

7.12 You want to keep 1180°C every day between 6 a.m. and 6 p.m. and 400°C at night. Morning transition time is 1 hour. Use the program 5.

1. Get into the programming mode by the key **P**.
2. Select the program 5 (**POS-F**) by the arrows **▲** and **▼**.
3. Find the first block by the key **▶**.
4. Start the function selection by pressing the key **i**.
5. Select the **⌚** function (activation at time) using **◀**, **▶**.
6. Set the value 5.00 (hours and minutes) by the arrows **▲** and **▼**.
7. Confirm by the key **✓**, get automatically to the second block.
8. Select the **⌚** **⌚** function (time for reaching temp.) by keeping the key **⌚**.
9. Set the value 60 (minutes) by the arrows **▲** and **▼**.
10. Confirm by **✓** and get automatically to the third block.
11. Select the **⌚** **⌚** **⌚** function (temperature) by the key **⌚**.
12. Set the value 1180 by the arrows **▲** and **▼**.
13. Confirm by **✓** and get automatically to the fourth block.
14. Get to the function selection by the key **i**.
15. Select the **⌚** function (activation at time) using **◀** and **▶**.
16. Set the value 18.00 by the arrows **▲** and **▼**.
17. Confirm by **✓** and get automatically to the fifth block.
18. Select the **⌚** **⌚** **⌚** function (ramp) by the key **⌚**.
19. Set **FRSt** (to 400°C as fast as possible) by the arrow **▼**.
20. Confirm by **✓** and get automatically to the sixth block.
21. Select the **⌚** **⌚** **⌚** function (temperature) by the key **⌚**.
22. Set the value 400 by the arrows **▲** and **▼**.
23. Confirm by **✓** and get automatically to the seventh block.
24. Get to the function selection by the key **i**.
25. Select the **⌚** **⌚** **⌚** function (jump) by the arrows **◀** and **▶**.
26. Set the program 5 by the arrows **▲** and **▼**.
27. Confirm the infinite loop by **✓**.
28. You can return to the manual mode by the key **P**.




























7.13 You need to program a cycle defined by a graph. The cycle will perform every day from 6 a.m. After the cycle will be finished, 200°C has to be kept. Use the program 2.

1. Ramp 4 to 400°C
2. Delay 120 minutes
3. Ramp 4 to 900°C
4. Delay 240 minutes
5. In 75 min to 750°C
6. Delay 90 minutes
7. Ramp 2 to 300°C
8. Delay 90 minutes



The set task described here represents relatively difficult task but it is still possible to realise it by the language of the controller quite easily.























1. Get into the programming mode by the key **P**.
2. Select the program 2 (**P02-F**) by the arrows **▲** and **▼**.
3. Find the first block by the key **▶**. You can select the function by **i**.
4. Select the **At** function (activation at time) by **◀**, **▶**.
5. Set the value 6.00 by the arrows **▲** and **▼**.
6. Confirm by **✓**, the second block.
7. Get directly to the ramp (**rRNP**) by the key **↵**.
8. Set the value 4.0 by the arrows **▲** and **▼**. Confirm by **✓**, the 3rd block.
9. Get directly to temperature (**tENP**) by the key **🌡**.
10. Set the value 400 by the arrows **▲** and **▼**. Confirm by **✓**, the 4th block.
11. Get directly to the delay (**dLRY**) by the key **⊗**.
12. Set the value 120 by the arrows **▲** and **▼**. Confirm by **✓**, the 5th block.
13. Get directly to temperature (**tENP**) by the key **🌡**.
14. Set the value 900 by the arrows **▲** and **▼**. Confirm by **✓**, the 6th block.
15. Get directly to the delay (**dLRY**) by the key **⊗**.
16. Set the value 240 by the arrows **▲** and **▼**. Confirm by **✓**, the 7th block.
17. Get directly to time on temperature (**t:NE**) by keeping the key **↵**.
18. Set the value 75 by the arrows **▲** and **▼**. Confirm by **✓**, the 8th block.
19. Get directly to temperature (**tENP**) by the key **🌡**.
20. Set the value 750 by the arrows **▲** and **▼**. Confirm by **✓**, the 9th block.

21. Get directly to the delay (**dLAY**) by the key .
22. Set the value 90 by the arrows  and . Confirm by , the 10th block.
23. Get directly to the ramp (**rRNP**) by the key .
24. Set the value 2.0 by the arrows  and . Confirm by , the 11th block.
25. Get directly to temperature (**tTEMP**) by the key .
26. Set the value 300 by the arrows  and . Confirm by , the 12th block.
27. Get directly to the delay (**dLAY**) by the key .
28. Do not set the value 90 (same as last). Confirm by , the 13th block.
29. Get directly to the ramp (**rRNP**) by the key .
30. Set the value **FAST** by the arrow . Confirm by , the 14th block.
31. Get directly to temperature (**tTEMP**) by the key .
32. Set the value 200 by the arrows  and . Confirm by , the 15th block.
33. You can select the function by the key . Select the **JUMP** function (jump) by the arrows  and .
34. Set the value 2 (infinite loop) by the arrows  and . Confirm by .
35. You can return to the program start by the key **0**.

By creating more difficult programs it is possible to use simpler pattern, which can keep clearness despite the considerable save of space. This program can be written, for example, in this way:

```
a6.00 r4.0 t400 d120 t900 d240 c75 t750 d90 r2.0 t300 d90 rF t200 j2
```

7.14 You need the continual delay on 1100°C by ramp 5°C/min. At the beginning of the delay it is necessary to clip the valve on out 1. Program 3 is free.

1. Get into the programming mode by the key **P**.
2. Select the program 3 (**P03-F**) by  and . Get to the first block by .
3. Select the output function (**OUT**) by keeping pressed  key.
4. Set the value **1-on** (output 1 - valve) by the arrows  and .
5. Select **rRNP** by the key , set 5.0 by the keys  and , confirm by .
6. Select **tTEMP** by the key , set 1100 by the keys  and , confirm by .
7. Select the output function (**OUT**) by keeping pressed  key.
8. Set the value **1-of** (output 1 - valve) by the arrows  and .
9. Select **dLAY** by the key , set **Cont** by the keys  and , confirm by .
10. Return to the programs by **0** or  key.
11. Return to the manual mode by **P** or **0** key.

PART C - SETUP MODE

You can get to the SETUP mode from the manual mode by long pressing the key **0** (for more than 4 seconds). The message **SETUP** will appear on the upper display; that means you entered the SETUP mode. You can return to the basic mode by the key **0**.

In the SETUP mode you can set the controller parameters and values for the proper regulation process. This mode contains 7 areas, in which you can set proper parameters. You can move among these areas by the arrows **◀** and **▶**.

Content of the Part C - Areas of the SETUP Mode

Chapter 1 – Display parameters settings	C-2	DISPL
Chapter 2 – Energy parameters settings	C-3	POWER
Chapter 3 – Temperature parameters settings	C-6	TEMP
Chapter 4 – Thermocouple parameters settings	C-8	TC
Chapter 5 – Regulation parameters settings	C-10	REGUL
Chapter 6 – Controller after start settings	C-14	START
Chapter 7 – Communication module settings	C-18	SECT
Chapter 8 – Special functions	C-20	

Each area has several items. On particular items you can move by the key **✓**. By this you also confirm the set value. You can set a new value by the keys **▲** and **▼**, it can be numerical value or enabling/disabling (**YES / NO**). In following chapters you will see more details.

If you return to the SETUP mode again you will automatically get to the last left area.

Chapter 1 - DISPLAY PARAMETERS SETTING

If you select the **SETUP** area in the SETUP mode by the keys **▲** and **▼** you can enable or disable what will be displayed in the information mode. You can get to the first item by the key **✓**.

Items of the **SETUP** area:

- | | | |
|------------------|--------|-------------------------------------|
| 1. t End | T End | Required temperature |
| 2. E dAtA | E data | Energetic parameters (consumption) |
| 3. rAMP | Ramp | Last settings of ramp gradient |
| 4. Pr-bl | Pr-BI | Number of an actual program - block |
| 5. t INEr | Timer | Time of the automatic program start |
| 6. P ACt | P Act | Actual power output in % |
| 7. t rEG | T reg | Regulated temperature or delay time |
| 8. dst | dst | Automatic Daylight Saving Time |

The item names appear on the lower display. On the upper display you can enable (**YES**) or disable (**no**) the item display by the key **▲** (upward) or **▼** (downward). According this the item will be or not be displayed. Each item has to be confirmed by **✓** and by this you will also move to the next one. Last item **dst** enable or disable automatic Daylight Saving Time. You can return to the area selection of the SETUP mode by the key **0** at any time.




Example



1.1 You do not need to display the ramp gradient but you want to see the actual power output.

1. Get into the SETUP mode by long pressing the key **0**.
2. Find the **SETUP** area by the arrow **◀** or **▶**.
3. Press **✓** as long as the message **rAMP** will appear on the lower display.
4. Set **no** by the key **▼**. Confirm by the key **✓**.
5. Press **✓** till the message **P ACt** will appear on the lower display.
6. Set **YES** by the key **▲** and confirm by the key **✓**.
7. Leave the SETUP mode by double press of the key **0**.

Chapter 2 - ENERGY PARAMETERS SETTING






2.1 Energy coefficient

Select the **POWER** area (Power) on the lower display by the arrow  or . After pressing the key  the **COEF** item will appear on the lower display.


You can set the parameter value by the arrows  and . Energy coefficient **COEF** indicates in how many seconds full heating will spend 1,25kW. This parameter you can easily get if you divide the number 4500 by the power input in kW.


Example

2.1.1 The controller measures the consumption twice as high as the real value.

1. Get into the SETUP mode by long pressing the key **0**.
2. Find the **POWER** area by the keys  or .
3. Press the key  and the message **COEF** will appear on the lower display.
4. Set twice higher value (twice-longer time to spend 1,25kW) by the key .
5. Confirm the setting by  and leave SETUP mode by pressing **0** twice.






2.2 Total energy consumption counter

In the SETUP mode find the **POWER** (Power) area by the arrow  or . Press the key  until the message **ENRCS** will appear on the lower display.




This parameter indicates the total energy consumption. The counter can be nullified or set to any value by request. The value is in kWh. You have to confirm the new value by the key . Setup mode leave by pressing **0** twice.

Example


2.2.1 The new year starts and you want to null the total energy consumption counter.

1. Get into the SETUP mode by long pressing the key **0**.
2. Find the **POWER** area by the arrow  or .
3. Press the key  until the message **ENRCS** will appear on the lower display.
4. Null the counter by the key  and confirm by .
5. Leave the SETUP mode by double press of the key **0**.

2.3 Power output of a furnace

In the SETUP mode find the **POWER** (Power) area by the arrow  or . Press  key until the message **PLOPO** will appear on the lower display.

You can limit the power output by three parameters (**PLOPO**, **P 1/2** and **PXPO**) that indicate the output in 0°C, half of maximum temperature and the output in maximum temperature in the range 0-250%. The controller will make tie lines between parameters (**PLOPO** - **P 1/2**) and (**P 1/2** - **PXPO**). These lines show the maximal output for every temperature. By the value 100% and higher the full output of a furnace is used.














This parameter setting is necessary for the heating with the temporarily dependent resistance (e.g. the superkanthal heating elements) when it is necessary to change their output with increasing temperature. If you use this limitation the dynamic of a furnace will slow down and by setting very low value, the furnace may not be able to reach higher temperature. If you do not want to change parameters, press the key .

In the high temperature furnaces with the superkanthal heating elements, setting higher values than those predefined by the producer can cause considerable reduction of their service life (or even their damage).

If you do not have qualified knowledge of the power output values setting for the superkanthal heating elements it is better to consult these values setting with the producer of the controller.

Examples

2.3.1 Electric wire furnace of the 8 kW power output is plugged into the electric net with limited output of 6 kW. The fuses repeatedly come off.

1. Get into the SETUP mode by long pressing the key .
2. Find the **POWER** area by the key  or .
3. Press the key  until the message **PLOPO** will appear on the lower display.
4. Set the power output to 75 % ($100 * 6 \text{ kW} / 8 \text{ kW} = 75$) by  and  key.
5. Confirm by  and the message **P 1/2** appears on the lower display.
6. Set the power output also to 75 % by the arrows  and  key.
7. Confirm by  and the message **PXPO** appears on the lower display.
8. Set the power output also to 75 % by the arrows  and  key.
9. Leave the SETUP mode by double press of the key  and try the furnace.
If necessary you can change the power output value of the furnace again.

2.3.2 Electric resistant furnace with the superkanthal heating elements is slow.

1. Get into the SETUP mode by long pressing the key **0**.
2. Find the **POWER** area by the arrow **◀** or **▶**.
3. Press the key **✓** until the message **PL⁰PO** will appear on the lower display.
4. Increase the actual value for not more than 5% by the key **▲**.
5. Confirm by **✓** and the message **P¹IR²** appears on the lower display.
6. Increase the actual value for not more than 5% by the key **▲**.
7. Confirm by **✓** and the message **PH⁰PO** appears on the lower display.
8. Increase the actual value for not more than 5% by the key **▲**.
9. Confirm the value by **✓**. If the furnace is still slow, better to consult next steps with the producer.

2.4 PDOWN, PCOOL and R3COL parameters

In the SETUP mode find the **POWER** (Power) area by the arrow **◀** or **▶**. Press **✓** until the message **Pdown (YES / NO)** will appear on the lower display. When you set value **no** the controller will not heat on descending ramp though the actual temperature in the furnace is lower than programmed temperature. After pressing the key **✓** the **PCOOL** item will appear on the lower display.

If this parameter is set to **YES** (by the key **▲**) the controller will control analog ventilation flap when controlled cooling is performed and actual temperature in the furnace is lower than programmed temperature. This parameter could be used only in connection with the analog cooling output. Also it is possible to set analog output to any value by function Proc in programming mode (chapter B6). Confirm the value by pressing the key **✓** and the item **R3COL (YES / NO)** item will appear on the lower display.

This parameter activate output relay in relay module for the ON / OFF cooling function. The relay will switch on during controlled cooling when the programmed temperature is lower than actual temperature in the furnace otherwise the relay is switched off. It is suitable for cooling flap control without analog output from the controller. If this parameter **R3COL** is activated, it is not possible to use block with function OUT 3 in programming mode. Confirm the value by pressing the key **✓** and leave SETUP mode by pressing **0** key.

Chapter 3 - TEMPERATURE PARAMETERS SETTING

3.1 Maximal temperature

In SETUP select the tXiP° area by the arrow \blacktriangleleft or \blacktriangleright . After pressing the key \checkmark , the message $\text{tX } \text{t}^\circ\text{C}$ will appear on the lower display. You can set temperature by the arrows \blacktriangleup and \blacktriangledown in the range 1 to permitted temperature that is constantly set by the producer. Confirm the value by the key \checkmark .

This set maximal temperature will be 5°C higher than the maximal value which is possible to set by the others temperature parameters. You can leave the SETUP mode by double press of the key 0 . When the maximal temperature is exceeded the **control and alarm relay are switched off**.

3.2 Alarm setting

The controller is equipped with alarm, which **switch off the alarm relay** when alarm temperature is exceeded. In SETUP select the tXiP° area by the key \blacktriangleleft or \blacktriangleright . Press the key \checkmark until the message $\text{AL } \text{t}^\circ\text{C}$ will appear on the lower display. You can set temperature (in the range 1 to maximal temperature) of the alarm activation or switch off the alarm (by setting temperature value to 0) by the arrows \blacktriangleup and \blacktriangledown on the upper display. Confirm by \checkmark .

Now next item $\text{AL } \text{t}^\circ\text{C}$ is visible. Set the value of the alarm 1 deactivation by the arrows \blacktriangleup and \blacktriangledown . The temperature $\text{AL } \text{t}^\circ\text{C}$ must be higher than the temperature $\text{AL } \text{t}^\circ\text{C}$. Leave the SETUP mode by double press of the key 0 . The alarm is active even the program is not started. The alarm controls the output signed RELE 2 on backside of the controller.

Example

3.2.1 Set limit max. temperature to 1400°C and alarm to 570°C.

1. Get into the SETUP mode by keeping the key 0 (for more than 4 seconds).
2. Find the tXiP° area by the arrow \blacktriangleleft or \blacktriangleright .
3. Press the key \checkmark and the message $\text{tX } \text{t}^\circ\text{C}$ will appear on the lower display.
4. Set the value 580 by the arrows \blacktriangleup and \blacktriangledown .
5. Confirm by \checkmark key and the item $\text{AL } \text{t}^\circ\text{C}$ will appear on the lower display.
6. Set the value 570 by the arrows \blacktriangleup and \blacktriangledown .
7. Confirm by \checkmark key and the item $\text{AL } \text{t}^\circ\text{C}$ will appear on the lower display.
8. Set desired temperature for switch on relay back by \blacktriangleup and \blacktriangledown (e.g. 560).
9. Confirm by \checkmark key and leave the SETUP mode by double press of 0 key.

3.3 Autotuning temperatures

The controller has possibility for automatic setting of PID constants (chapter C5). It is possible to set two temperatures where the autotuning is performed. In SETUP select the $\text{t}\text{E}\text{N}\text{P}^{\circ}$ area by the key \blacktriangleleft or \blacktriangleright . Press the key \checkmark until the message $\text{t}\text{u}\text{N}\text{E}\text{R}$ will appear on the lower display. You can set first temperature by the arrows \blacktriangleup and \blacktriangledown on the upper display. Autotuning will set PID constants on this temperature. Confirm temperature with the key \checkmark and new item $\text{t}\text{u}\text{N}\text{E}\text{b}$ will appear on the lower display.

There are two possibilities. If you set the temperature to zero or the value similar to the temperature $\text{t}\text{u}\text{N}\text{E}\text{R}$ ($\pm 10^{\circ}\text{C}$) the controller will item $\text{t}\text{u}\text{N}\text{E}\text{b}$ ignore and it will calculate first set of PID constants only. It will use this set of PID constants in whole temperature range.

In case the temperatures $\text{t}\text{u}\text{N}\text{E}\text{R}$ and $\text{t}\text{u}\text{N}\text{E}\text{b}$ are different the controller will measure and calculate both set of PID constants after start of autotuning. It is recommended to set items $\text{t}\text{u}\text{N}\text{E}\text{R}$ / $\text{t}\text{u}\text{N}\text{E}\text{b}$ for often controlled lower / upper temperature. Controller can then recalculate suitable PID constants in wide range of temperatures.

Confirm the value by \checkmark and leave SETUP mode by pressing $\mathbf{0}$ key.

Example

3.3.1 You want to set PID constants automatically. Temperatures 500°C and 900°C are used often.

1. Get into the SETUP mode by long pressing the key $\mathbf{0}$.
2. Find the $\text{t}\text{E}\text{N}\text{P}^{\circ}$ area by the arrow \blacktriangleleft or \blacktriangleright .
3. Press \checkmark until the message $\text{t}\text{u}\text{N}\text{E}\text{R}$ will appear on the lower display.
4. Set the value 500 by the arrows \blacktriangleup and \blacktriangledown .
5. Confirm by \checkmark key and the item $\text{t}\text{u}\text{N}\text{E}\text{b}$ will appear on the lower display.
6. Set the value 900 by the arrows \blacktriangleup and \blacktriangledown .
7. Confirm by \checkmark key and find the $\text{r}\text{E}\text{C}\text{U}\text{L}$ area by the arrow \blacktriangleleft or \blacktriangleright .
8. Start the autotuning by the key $\mathbf{1}$.

Chapter 4 - THERMOCOUPLE PARAMETERS SETTING

4.1 Type of a thermocouple

In SETUP select the tCt area (by \blacktriangleleft or \blacktriangleright) on the lower display. Press the key \checkmark and the message tYpE will appear on the lower display. Find a thermocouple that you use (by \blacktriangleup and \blacktriangledown). The controller is compatible with eight types of a thermocouple: tC 5 (S type), tC 6 (B type), nCr (K type), tC J (J type), P 100 (PT-100), tC C (C type), tC t (T type), Pyro (4-20 mA). Confirm by \checkmark and leave SETUP by double press of the key $\mathbf{0}$.

Example

4.1.1 Thermocouple was replaced. Actual type is NiCr (K type).

1. Get into the SETUP mode by keeping the key $\mathbf{0}$.
2. Find the tCt area by the arrow \blacktriangleleft or \blacktriangleright .
3. Press the key \checkmark and the message tYpE will appear on the lower display.
4. Set the thermocouple type nCr by the arrow \blacktriangleup or \blacktriangledown .
5. Confirm by \checkmark and leave the SETUP mode by double press of the key $\mathbf{0}$.

4.2 Difference from real temperature










In SETUP select the tCt area (by \blacktriangleleft or \blacktriangleright) on the lower display. Press twice the key \checkmark and the message dELtA will appear on the lower display. You can set the anomaly from real temperature in the range -128 to 127°C on the upper display. Confirm by \checkmark and leave SETUP by double press of the key $\mathbf{0}$. Set difference will immediately influence real temperature displaying.





Example

4.2.1 The controller shows about 10°C higher temperature.

1. Get into the SETUP mode by keeping the key $\mathbf{0}$.
2. Find the tCt area by the arrow \blacktriangleleft or \blacktriangleright .
3. Press the key \checkmark until the message dELtA will appear on the lower display.
4. Set the value -10 by the arrows \blacktriangleup and \blacktriangledown .
5. Confirm by \checkmark and leave the parameters setting by the key $\mathbf{0}$.
6. Leave the SETUP mode by pressing the key $\mathbf{0}$.

4.3 Correction of a thermocouple

















In SETUP find the \pm area by the arrow  or . Press the key  until the message :  will appear on the lower display. You are now at the beginning of the chart. Use the keys  and  for moving and the keys  and  for the value setting. Confirm the set parameters by the key  and by this you will also move to the next item.

Differences can be set (select the temperature zone by the arrows  and ) in 50°C intervals up to 2000°C. Individual values are set in °C in the range -128 to 127°C. Leave the chart by pressing the key . Correction of a thermocouple will be immediately manifested, after leaving the SETUP mode by the key .

The correction is efficient to set by the thermocouple replacing. Every thermocouple has a little bit different correction curves towards an etalon and for absolutely exact heating processes (especially for laboratories) it is possible to calibrate the thermocouple in this way.






Example

4.3.1 Thermocouple was replaced. It is necessary to make its correction. The new thermocouple measures up to 1000°C about 2°C less and by higher temperature about 3°C more.

1. Enter SETUP by keeping the key  and find the \pm area by  or .
2. Press the key  until the message :  will appear on the lower display. By this you get to the first chart item. In the chart you can move by the arrows  and . Now you can start the correction setting.
3. Set the value **2** by the arrows  and  and confirm by .
4. Repeat the step 3 until the zone :  will appear on the lower display.
5. Set the value **-3** by the arrows  and  and confirm by .
6. Repeat the step 5 until the required zone (or to the end).
7. Finish the setting by the key  and leave the SETUP mode by .


Chapter 5 - REGULATION PARAMETERS SETTING

5.1 Type of a regulation




In SETUP find the **REGUL** area by  or . After pressing the key  the message **TYPE** will appear on the lower display. On the upper display you can set the type of a regulation by  and : pulse (**PULS**), relay1 (**REL 1**) or phase (**PHAS**) for furnaces with temporally dependent resistance.

The **PULS** regulation you can set if the active unit is the thyristor switch (switched on/off) with the low voltage operation; the **REL 1** regulation you can use if the active unit is the contactor. By this selection the frequency of the contactor switching will 16 times slow down because of low contactor contacts service life (towards the **PULS** regulation with almost unlimited thyristor contactor switching). The **REL 1** regulation is made across the RELE1 involved in the basic equipment of the controller.

The furnaces with temporally dependent heating elements (superkanthal, silits and so) usually use the **PHAS** regulation. For this regulation it is necessary to add another module (other equipment of the controller). From the regulation output (Control Output) the phase moved pulses 0-180° are suitable for immediate thyristors switching. By this type of a regulation it is necessary (from the view of the natural environment) to notice higher disturbing made by fast current increase in the thyristors at the moment of their switching.


Confirm the type of a regulation by .

5.2 Length interval of measurement (PErio)

The item **PER io** will appear on the lower display. The value on the upper display indicates how long the interval for temperature regulating will be. You can set the values by  and  in the range 1 to 255 where one unit is 0.08 sec (in the **REL 1** regulation the unit is 1.28 seconds). Confirm the setting by .

Note: If it is not necessary we do not recommend to set values lower than 4.

5.3 Intensification in the regulation (ProP)

The item **ProP** indicating the intensification will appear on the lower display. The intensification values range is 1-255 where one unit means the change of 1% output to 4°C, so 100 units mean the zone wide-broad 4°C, in which the output changes from 0 to 100% (ProP = 400 / °C). So in this zone the regulation process will be performed. Confirm the value by the key .

5.4 Integral time in the regulation (Int)

In SETUP find the **REGUL** area by the arrow **◀** or **▶**. Press the key **✓** until the message **Int** will appear on the lower display. The constant range is 1-255. From the known value **TI** you can determine the revised value according this: $Int = 12 * TI / PErIo$. Set the value and confirm by **✓**, you can leave SETUP by **0**. In case that you will set **OFF**, the integral unit in the regulation is off.

5.5 Derivational time in the regulation (dEr)

In SETUP find the **REGUL** area by the arrow **◀** or **▶**. Press the key **✓** until the message **dEr** will appear on the lower display. The constant range is 1-255. From the known value **TD** you can determine the revised value according this: $dEr = 12 * TD / PErIo$. Set the value and confirm by **✓**, you can leave SETUP by **0**. In case that you will set **OFF**, the derivational unit in the regulation is off.

Chapter 6 - START AREA

6.1 Continuation of the program after blackout

Enter the SETUP mode by long pressing the key **0**. Find the **Start** area by the arrow **◀** or **▶**. Press the key **✓** until the message **Cont'** will appear on the lower display. The number of minutes in the range 0-255 will appear on the upper display that indicates in how many minutes of the power blackout the program will still continue. The value 255 provides that the program will continue after any power blackout. The value 0 provides that the program will not continue. Confirm the set value by the key **✓**. You can return to the manual mode (leaving the SETUP mode) by the key **0**.

After the power blackout the controller scans the situation. If the blackout was not longer than defined value of the **Cont'** parameter then the message **PrOGrAm COntinue** (program continue) will run on the upper display and the program continues from the point of its stopping. On the contrary the message **Pr-00 / Error** will appear and the program will not continue. From the title you can find out which program was stopped by the blackout.

Examples






6.1.1 You do not want the program to continue after blackout.


1. Get into the SETUP mode by keeping the key **0**.
2. Find the **Start** area by the arrow **◀** or **▶**.
3. Find the **Cont'** item by the key **✓**.
4. Set the value 0 by the arrows **▲** and **▼**.
5. Confirm by the key **✓**.
6. Leave the SETUP mode by pressing the key **0**.

6.1.2 You need the program to continue only when the power blackout is maximally 5 minutes.

1. Get into the SETUP mode by keeping the key **0**.
2. Find the **Start** area by the arrow **◀** or **▶**.
3. Find the **Cont'** item by the key **✓**.
4. Set the value 5 by the arrows **▲** and **▼**.
5. Confirm by the key **✓**.
6. Leave the SETUP mode by pressing the key **0**.







6.2 Enable / disable of the programming mode

In the SETUP mode find the **StArt** area by the arrow  or . Press the key  until the message **PrNod** will appear. If you see **YES** on the upper display (you can set it by ) you are permitted to enter the programming mode. On the contrary when **no** is displayed (the key ) it is not possible to enter the programming mode.









The prohibition for entering the programming mode is useful from two reasons. First, you can prevent an unauthorized person to enter the programs. Second, the prohibition is helpful for beginners whom entering the programming mode can cause confusion in the controller operation. You can return to the manual mode (leaving the SETUP mode) by double pressing the key .

Example

6.2.1 You need to protect entering the programming mode







1. Enter the SETUP mode by long pressing the key .
2. Find the **StArt** area by the arrow  or .
3. Press the key  until the message **PrNod** will appear on the lower display.
4. Set the value **no** by the key .
5. Leave the SETUP mode by double press of the key .

6.3 Locking SETUP mode




In the SETUP mode find the **StArt** area by the arrow  or . Press the key  until the message **SECUR** will appear. If you see **no** on the upper display (you can set it by ) you are permitted to enter the SETUP mode (by  for 4 s). On the contrary when **YES** is displayed (by ) it is not possible to enter the SETUP mode only for very short time after switching the controller on. The password is always required if password protection is enabled. Confirm the set value by the key . You can return to the manual mode (leaving the SETUP mode) by the key .


Example

6.3.1 You need to disable entering the SETUP mode

1. Enter the SETUP mode by long pressing the key .
2. Find the **StArt** area by the arrow  or .
3. Press the key  until the message **SECUR** will appear on the lower display.
4. Set the value **no** by  and leave SETUP mode by double press  key.






6.4 Ramp after the power blackout

In the SETUP mode find the **StArt** area by the arrow  or . Press the key  until the message **CoPrC** will appear. This item will influence the regulation only when temperature will decrease by the power blackout. Now you can choose from two ways. If the time schedule is important for you, set **YES** and the controller will try to reach the original program curve as fast as possible. But if you have for example some sensitive material where it is not possible to overcome certain temperature ramp, set **no** and the controller will continue according required ramp gradient from actual temperature (so with certain delay).






The **CoPrC** function is standardly set on **YES**. Confirm the new setting by the key  and leave the SETUP mode by double press of the key **0**.

Example

6.4.1 You cannot overcome the ramp because of the material.






1. Get into the SETUP mode by keeping the key **0**.
2. Find the **StArt** area by the arrow  or .
3. Find the **CoPrC** item by the key .
4. Set the value **no** by the arrow .
5. Confirm by  and leave the SETUP mode by double press of the key **0**.

6.5 Locking user programs






In the SETUP mode find the **StArt** area by the arrow  or . Press the key  until the message **PEd t** will appear. If you see **YES** on the upper display (you can set it by ) you are permitted to enter and change the user programs. On the contrary when **no** is displayed (the key ) it is not possible to enter or change any program in the programming mode.

Example

6.5.1 You want to lock user programs

1. Enter the SETUP mode by long pressing the key **0**.
2. Find the **StArt** area by the arrow  or .
3. Press the key  until the message **PEd t** will appear on the lower display.
4. Set **no** on the upper display by the key .
5. Confirm by  and leave the SETUP mode by double press of the key **0**.





6.6 Controller password protection

In SETUP find the **StArt** area (by the arrow  or ) and the **PASS:** item (pressing the key ) on the lower display. The message **0000** will appear on the upper display. Now you can set the admission password with four digits. Confirm by the key  and leave the mode by the key **0**. If you want to change the password, follow the same way. You can cancel the password by the key **1** and confirm by . The password will not change if you do not change anything and confirm.






After forgetting the password the hardware intervention into the controller is necessary and all programs and settings in the memory will be lost. It is better to consult such situation with the producer.

Examples

6.6.1 You want to cancel the password protection of the controller.

1. Enter the SETUP mode by keeping the key **0**.
2. Find the **StArt** area by the arrow  or .
3. Press the key  until the message **PASS:** will appear on the lower display.
4. The message **0000** will appear on the upper display.
5. Press the key **1** to cancel the password.
6. Confirm by the key .
7. Leave the SETUP mode by the key **0**.

6.6.2 You want to protect the controller against an unauthorized usage by the password **i P**.

1. Enter the SETUP mode by keeping the key **0**.
2. Find the **StArt** area by the arrow  or .
3. Press the key  until the message **PASS:** will appear on the lower display.
4. The message **0000** will appear on the upper display.
5. The keyboard works now like the calculator keyboard.
6. Write the password by the keys   **i P**.
7. The title will flash three times and the message **StArt** will appear.
8. Leave the SETUP mode. After next switching the controller will ask the password.

Chapter 7 - COMMUNICATION MODULE SETTING

7.1 Serial number of the controller

In SETUP find the **የፎርክ** area by the arrow **◀** or **▶**, press the key **✓** until you get to the **የፎርኑ** item, which indicates the controller number in the net. The range is 1-15 therefore you can connect up to 15 controllers to the net with the PC. Each controller has to have its own serial number otherwise the net will not work properly. Confirm the number of the controller by the key **✓** and leave the SETUP mode by double press of the key **0**.

7.2 Communication speed of the controller with the computer

In SETUP find the **የፎርክ** area by the arrow **◀** or **▶**. Press the key **✓** until the message **የፎርኑ** will appear on the lower display. The upper display shows the communication speed between the controller and the PC in 1000 kbps units per second. You can select one from seven speeds (0,3; 0,6; 1,2; 2,4; 4,8; 9,6 and 19,2 kbps) by the arrows **▲** and **▼**. All controllers in the net must be set with the same value. Confirm this value by the key **✓** and leave SETUP by the key **0**.

7.3 Length of the temperature pattern interval

In the SETUP mode find the **የፎርክ** area by the arrow **◀** or **▶**. Press the key **✓** until the message **ገጽ 5** will appear on the lower display. The constant indicates the time interval among automatic temperature measuring. The interval range is 1-3600 (in seconds). If the program runs, the controller automatically stores actual temperature in chosen time intervals to the memory space used for this. The interval range is broad (1 second - 1 hour) and the setting depends on the proper application. For fast processes it is better to set lower interval and for slow processes you can set longer one.

Be careful not to set too short interval because it can quickly fill all the memory for storing measured temperatures. You have up to 4000 free blocks (measurements) and if the measuring interval is only 1 second, 66 minutes of the process is available. On the contrary if the interval is 1-hour, temperatures are stored for almost half a year.

If you have enough free space in the memory you can store more than one process. Each process takes 7 blocks for its heading in which you can find information about time and date of the process, the program number, the

energy consumption, the checksum and other important values. If you do not take measured data to the PC the measuring storing will continue. After overcoming the memory capacity, the oldest data will be automatically deleted and measuring continues over the unblocked memory. In this way the controller will always store a new process that is possible to transmit to the computer at any time. After the communication end between the controller and the PC, the memory is all free for the new measurements storing.

Example

7.3.1 By the controller with the communication module you want to measure temperature in 1-minute intervals.

1. Get into the SETUP mode by long pressing the key **0**.
2. Find the **SETUP** area by the arrow **◀** or **▶**.
3. Press the key **✓** until the message **int 5** will appear on the lower display.
4. Set the value 60 (in seconds). Confirm by the key **✓**.
5. Leave the SETUP mode by the key **0**.

7.4 Master/Slave mode

In the SETUP mode find the **SETUP** area by the arrow **◀** or **▶**. Press the key **✓** until the message **SLAVE** will appear on the lower display. If you see **YES** on the upper display (you can set it by **▲**), the controller works in the Slave mode (it can be connected with the PC, it can receive regulated temperature from the Master controller). On the contrary by setting **no** (the key **▼**) the controller works in the Master mode (the external display and keyboard can be added, the controller sends regulated temperature to all Slave controllers). Confirm the set value by the key **✓** and leave the SETUP mode by the key **0**.

7.5 Move of Slave regulation temperature

In the SETUP mode find the **SETUP** area by the arrow **◀** or **▶**. Press the key **✓** until the message **SLAVE** will appear on the lower display. On the upper display you can see the regulation anomaly of the Slave controller from the Master one. By the value 2000 the anomaly is 0, by higher values is plus and oppositely. The unit is in °C. Confirm the set value by the key **✓** and leave the SETUP mode by the key **0**.