Ht205

CE

Programmable controller

02 / 2014

1 Introduction

Ht205 is a program controller intended for industrial applications.

Operation manual is diveded into the categories describing installation and switching ON of the device, initial setup, description of particular menu levels (user, operation, configuration, service menu and menu for writing a program),…

In the following two paragraphs you will find the list of chapters suitable for reading, if you install and set up the controller fully or you operate it in the supplied equipment.
Read this manual very carefully please, before you start to work with this device.

You perform the complete installation and set up of the controller

For proper installation, wiring and setting up of the device you should proceed according to the following chapters:
Pro instalaci, zapojení a nastavení přístroje postupujte dle následujících kapitol:

- ***Description of the controller*** (page 4) … basic information about the controller, its operation … .
- ***Installation of the controller*** (page 68) … in this chapter there is a description for how to build in the controller into panel, principals how to reduce influence of interference, … .
- ***Wiring*** (page 69) … description for wiring of the controller.
- ***Putting into operation*** (page 75) … at first power-up you enter the initial menu in which you can configure and set the most important parameters of controller.
- Further we reccomnd you to study the chapters describing particular levels of menu (configuration, operation, program, …).

If you are a final user, the controller is in the default setting by the supplier

If you are a final user and hte controller is already installed in the equipment, you will get the device in the customized setting and you can view and change only the parameters that you need for your own work on the controller.
If you are a new user of the device,focus on the following chapters:

- ***Description of the controller*** (page 4) … basic information about the controller, its operation, … .
- ***User level*** (page 11) … in user level there are parameters palced necessary the operator of the device. The list of accessible parameters is sedlectable.
- ***Program*** (page 18) … all you need about editing a program, running and ending a program, …

1.1 How to get the information about the device ... INFO panel

Overview of basic information you can get in INFO panel.
More information is available on page ***10***.

2 Description of the controller

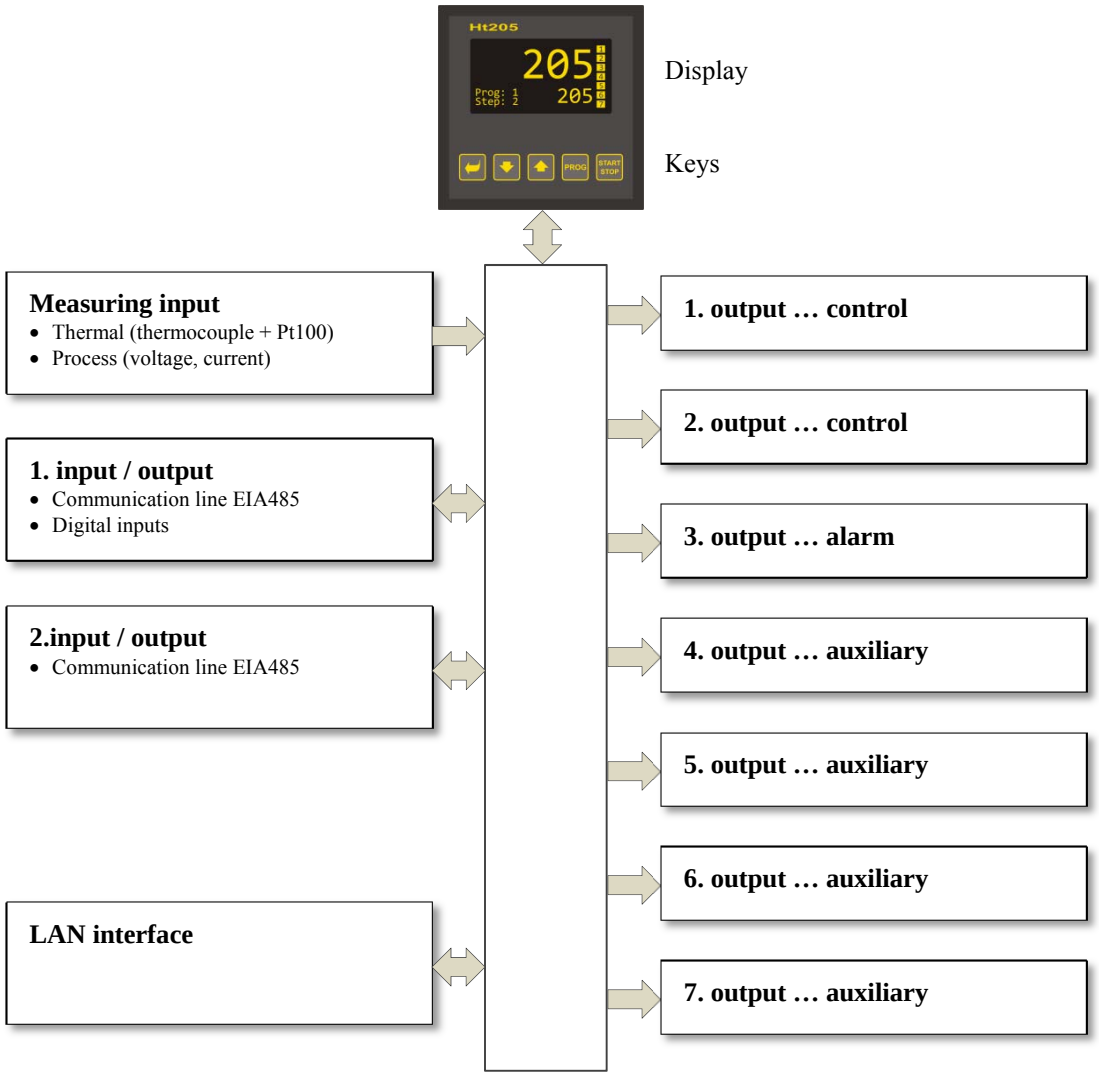
Ht205 is a programmable controller of 96 x 96mm format, for the built into panel. The controller can maintan the set point or it can control the process by the chosen program. You can edit 30 programs in total with 15 steps.The program can be started via keys, digital inputs, communication line or by the real-time clock.

The controller is set up by 5 keys with menu technique, OLED display is used for showing figures.

The controller can be equipped by 1 measuring input, 2 universal iputs/outputs (communication line or digital inputs) and 7 outputs. The devices is powered from the grid.

The device can be enhanced by LAN interface, connector for LAN interface in on the back panel.

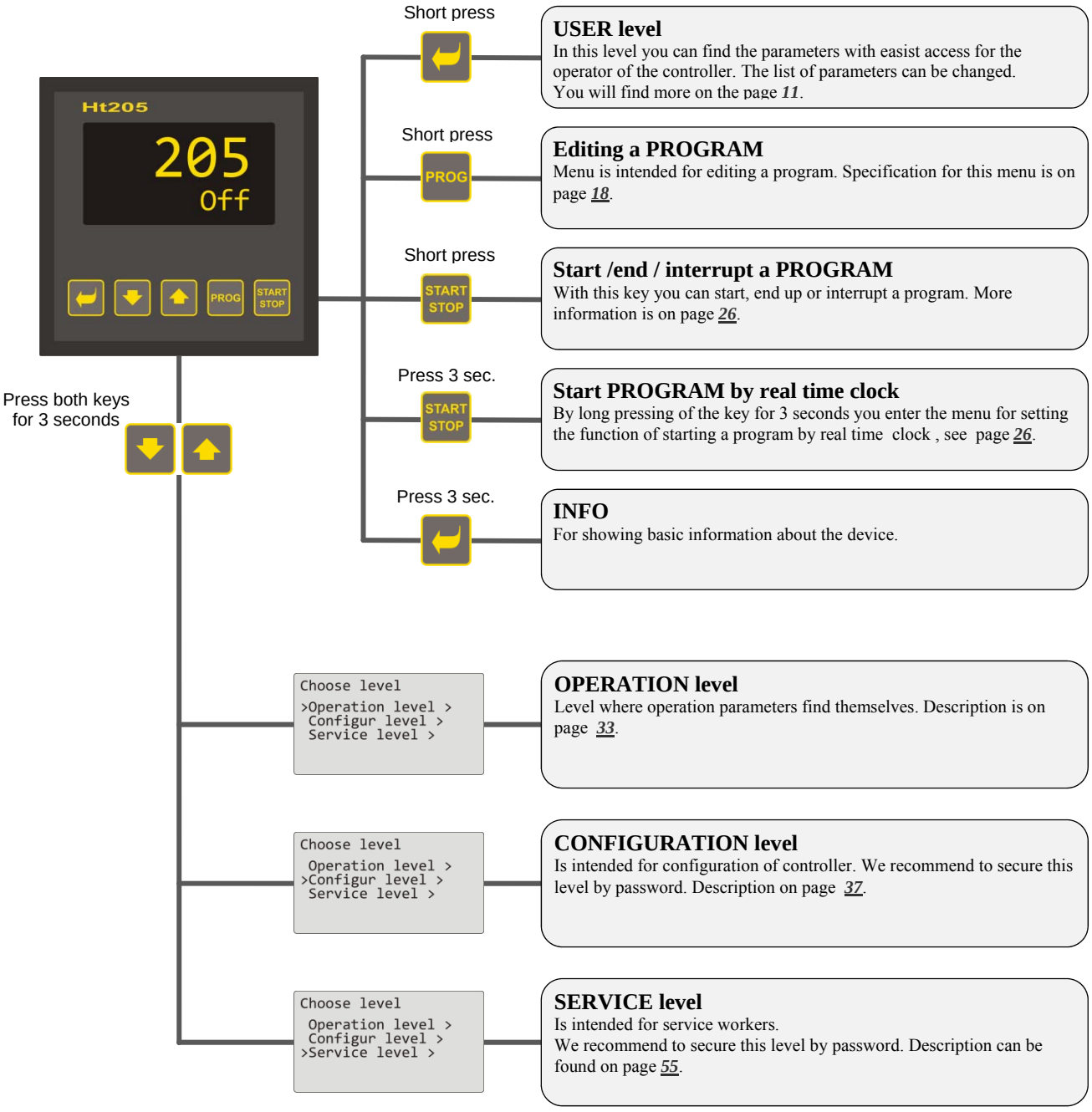
Block structure of the controller



2.1 Overview of levels, menus

The controller is set up by parameters. For better understanding the parameters are sorted out to groups (levels and menus). **Level** is superior to menu, **menu** is a part of level, for example `Input1 >`, `Output1 >`, `Output2 >`, …).

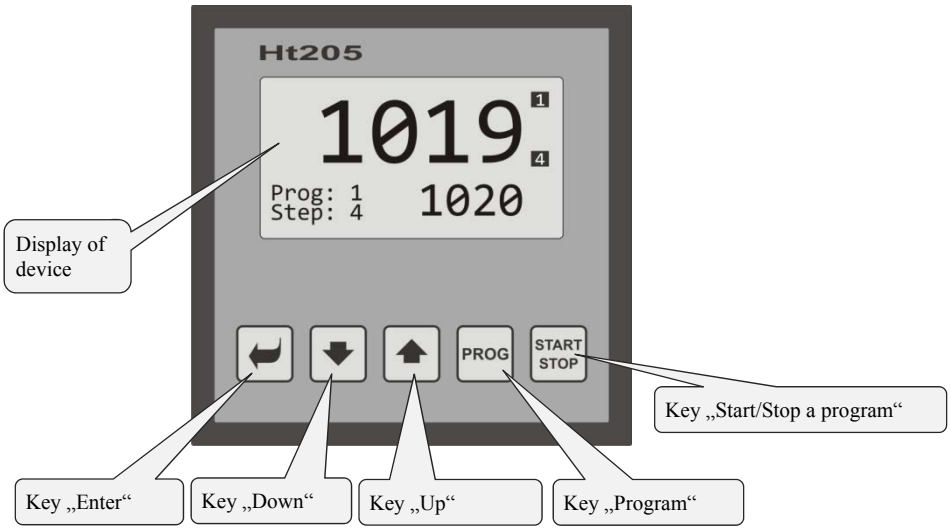
The overview of levels, menus and entering these levels, menus is shown in the following picture:



2.2 Operation of the controller

You can operate and set up the device from the front panel through 5 keys of menu technique.

Appearance of front panel of device

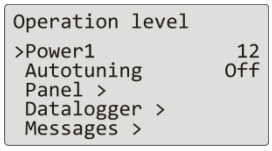


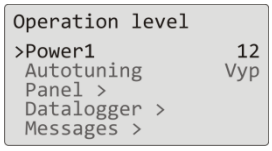
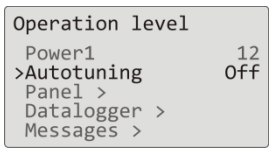
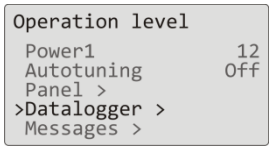
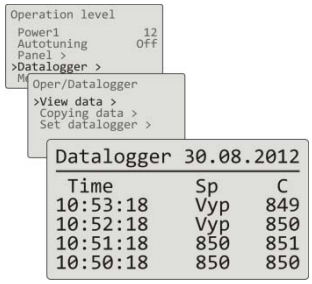
Function of keys:

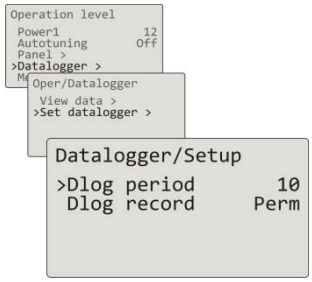
	Key „**ENTER**“ is intended for: • Entering the next menu, • Editing a parameter + saving a new setting of parameter, • By pressing this key for 3 seconds you enter into „INFO“ screen.
	Key „**Down**“ is intended for: • Moving between parameters, • Setting a parameter.
	Key „**Up**“ is intended for: • Moving between parameters, • Setting a parameter.
	Key „**Program**“ is intended for: • Editing a program.
	Key „**Start/Stop a program**“ is intended for: • Starting, interrupting and ending a program (short press), • Setting the start of a program by the real time clock (long press for 3 seconds).
	Pressing both keys: • By short pressing both keys you return to the previous level, • By long pressing (3 seconds) you will reach higher levels (operation, configuration, service).

Description how to operate the controller

The description how to operate the device is stated on the parameters of operation level.

<table>
<tr><td> 
</td><td>Example of screen for operation level. The list of parameters can differ and it depends on the actual facilities of the device and the set up configuration.

• You browse in menu by keys ▼ and ▲.
• Editing a parameter and confirmation of new setup value is done by the key ↵, parameter is set by the keys ▼ and ▲.
• Change to next menu you can do by the key ↵.
• To return from menu, press the both key-arrows for a short ▼▲.</td></tr>
<tr><td colspan="3">In menu you can find 3 types of parameters:</td></tr>
<tr><td>1.</td><td> 
</td><td>Parameter without editing … for example Power 1 12 shows the actual value of the power. This parametr can not be edited.</td></tr>
<tr><td>2.</td><td> 
</td><td>Parameter for editing … for example Autotuning Off can be edited by the key ↵ . Through the key-arrows you can set a new value and by pressing this key ↵ again this value is written. During editing a parameter the value to be set blinks.</td></tr>
<tr><td>3.</td><td> 
</td><td>Change to next menu … for example Datalogger > . Parameter for the change to next menu is added by the arrow key behind the name. By pressing the key ↵ you enter the next menu.</td></tr>
<tr><td colspan="3">In menu the independent screens can be used, for example:</td></tr>
<tr><td> 
</td><td>Showing data from datalogger.

On this screen you can view the trend of setpoint and process value of the controller depending on time.</td></tr>
<tr><td> 
</td><td>Setting of datalogger.

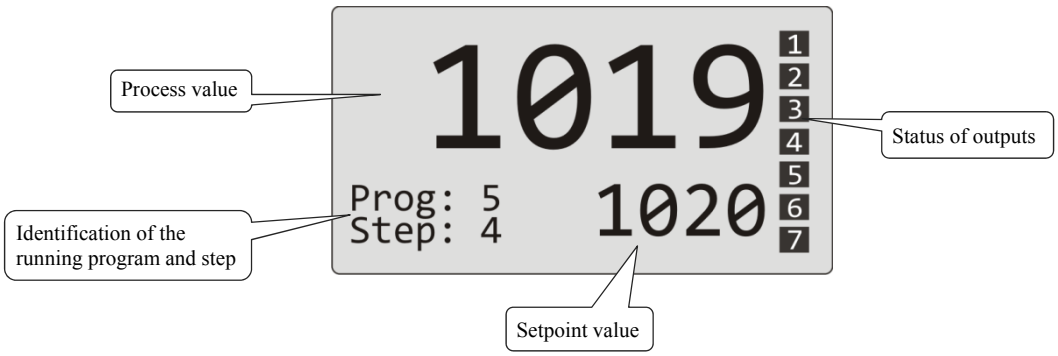
On this screen you can set datalogger.</td></tr>
</table>

2.3 Basic mode of controller

The controller is in Basic mode when powered up (after the initial set-up of the device, see page 75).
In Basic mode one of the screens can be set…… numerical or graph.

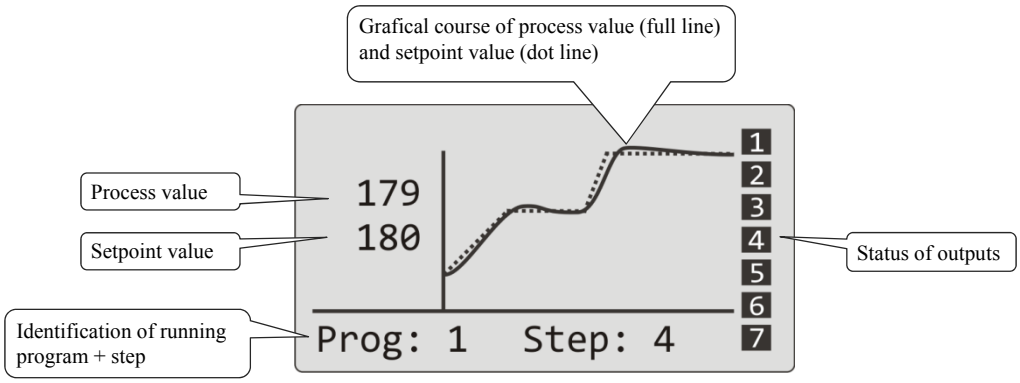
Basic screen - numerical

On numerical screen you can see setpoint and process values, status of all ouputs and the status of the current running program.



Basic screen - graph

On the left side in the screen there are setpoint and process values, in the middle there is a graph, on the right side there are status of outputs of the controller and in the lower part you can see the status of the running program.



Type of screen and parameters of the graph you can set in ***operation level*** (***user level***), menu `Panel >`.

2.4 Information and error messages

Information and error messages are indicated only in basic mode of the controller.

Information messages, upper display

- **----** … error of input sensor or input is not set.

Information messages, lower display

- **Start** … Starting a program by the real time clock.
- **Aut1** … Autotuning of PID parameters for 1. set of PID parameters for heating, **Prop1-A**, **Int1-A**, **Der1-A**.
- **Aut2** … Autotuning of PID parameters for 2. set of PID parameters for heating, **Prop1-B**, **Int1-B**, **Der1-B**.
- **Aut3** … Autotuning of PID parameters for PID parameters for cooling, **Prop2-A**, **Int2-A**, **Der2-A**.
- **GSD** … Indication that proces value is outside the soak band, see page ***30***.
- **Stop** … Indication that the program is stopped, see page ***27***.
- **Wait** … Indication that the program is stopped and waiting for confirmation by digital input.
- **OutFrz** … Indication that the control outputs are frozen by digital input. The outputs are switched OFF, memory of integral and derivate remains.
- **OutOff** … Indication that the control outputs are switched OFF by digital input. Memory of integral and derivate is deleted.

Error messages, lower display

If there is a error message indicated then the control outputs are switched OFF, the event outputs are switched OFF, the alarm output is activated

- **Error1** … indicates the error in the configuration setting of the device. The error can be solved by re-start in some cases and by new setting of all parameters, re-start of parameters can be performed in service level. This operation can be performed only by an experienced user. If the trouble persists, contact your supplier.

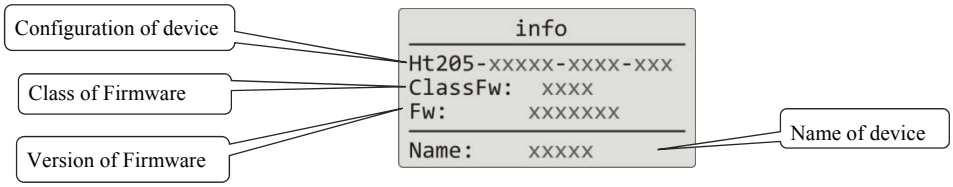
- **Error3** … error in input A/D converter. It can be caused for example by too low temperature and excessive humidity or by damage of convertor by extensive input signal with high amplitude. Switch the controller OFF and ON again. If the problem persists, contact your supplier.

2.5 INFO panel

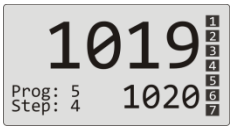
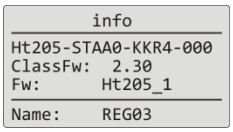
INFO panel provides you with the basic information about the device:

- Configuration of the controller,
- Class of firmware of the device (2.30 to 2.39 for Ht205-S),
- Version of firmware of the device,
- Name of the device (it can be chosen in ***configuration level***, menu **Systém >**).

Appearence of „INFO“ panel



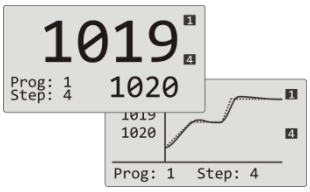
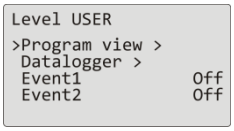
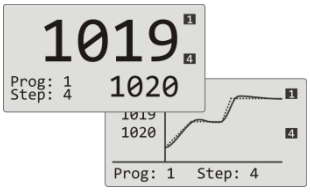
Enter to „INFO“ panel:

	The controller is switched ON, it can be in BASIC mode or in any other menu.
	By pressing the key ↵ for 3 seconds, until you can see panel „INFO“.

3 User level

User level enables access for the most used parameters and menus of the controller.
The list of parameters/menus as well as their sequence can be selected.
As a maximum there can be placed 12 parameters/menus in user menu.

How to enter user level

	The controller is in Basic mode. **To enter the user level, press shortly the key ↵.**
	Example of screen for user level with parameters/references: • **Program view >** … change into menu for the indication of program status, • **Datalogger >** … change into menu for operation of datalogger, • **Event1** … showing / setting of 1. event output, • **Event2** … showing / setting of 2. event output. The technique for setting menu is the same in all the device. Description can be found on page ***6***.
	**To return into basic menu.** To return into basic menu, press shortly the both keys ↓ ↑. If the device is not being set for a while, it will return into basic menu itself after 60 seconds.

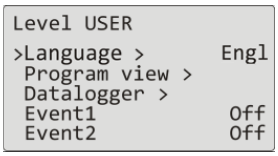
Overview of all possible parameters / menus of user level

In user level the following parameters/menus can be placed:

- **Language >** … menu for setting of language,
- **Program view >** … menu of indication about the program status,
- **Program edit >** … menu for editing the current running step of the program,
- **Power1** ▫▫▫▫▫▫ … indication of the actual power on 1. control output,
- **Power2** ▫▫▫▫▫▫ … indication of the actual power on 2. control output,
- **Power prog** ▫▫▫▫▫▫ … indication of the consumed energy for the last firing (data read from energy meter),
- **Power total** ▫▫▫▫▫▫ … indication of the total consumed energy (data read from energy meter),
- **Alarm Off** ▫▫▫▫▫▫ … switching OFF of the permanent alarm,
- **Autonuning** ▫▫▫▫▫▫ … starting / stopping of Autotuning of PID parameter,
- **Event1** ▫▫▫▫▫▫ … showing (program running) / setting (program not running) 1. event output,
- **Event2** ▫▫▫▫▫▫ … showing (program running) / setting (program not running) 2. event output,
- **Event3** ▫▫▫▫▫▫ … showing (program running) / setting (program not running) 3. event output,
- **Event4** ▫▫▫▫▫▫ … showing (program running) / setting (program not running) 4. event output,
- **Panel >** … menu for setting of basic screen of the controller,
- **Datalogger >** … menu for operation of datalogger with process values,
- **Messages >** … menu for news,
- **Clock >** … menu for setting of the real time clock.

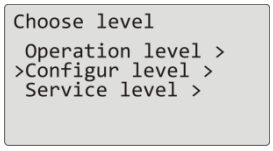
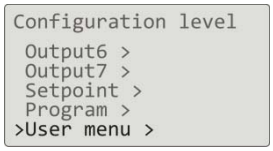
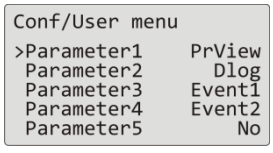
Setting of **language**

Setting of language can be done in the ***user level*.**

	Press the key **„ENTER“**. Choose **Language >** and confirm by the key „**ENTER**“. Set the language by the keys ▲ and ▼ and confirm by the key „**ENTER**“. • **Engl** … English, • **German** … German, • **Czech** … Czech. To return from menu press shortly the both keys ▼ ▲.

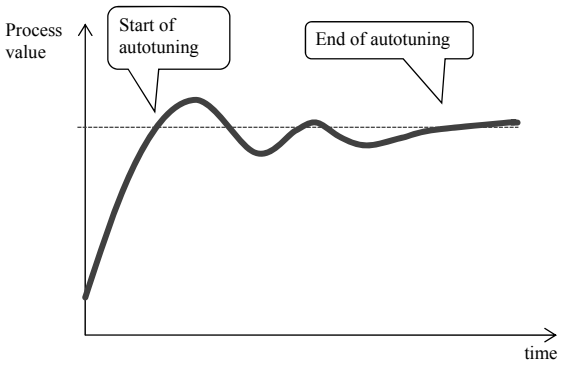
Setting of user level

Setting of user level can be done in ***configuration level***, menu **User menu >**.

	To enter into configuration level: • Press the both arrow keys for at least 3 seconds, • Choose **Configuration level** and confirm by the key „**ENTER**“. If the enter into configuration level is secured with the password, set the right password and confirm it.
	Look up „**User menu >**“ and confirm by the key „**ENTER**“.
	User menu can be set by the standard way: • With the arrow keys you select the parameter to be changed, • By pressing the key „**ENTER**“ you edit the selected parameter, • By arrow keys you set the value of the parameter, • Confirm by the key „**ENTER**“. To return from menu press shortly the both keys.

3.1 Autotuning – automatic setting of PID parameters

The controller is fitted with the function that sets automatically PID parameters for heating and cooling.



When in autotuning mode, on lower display it blinks heading:

- **Aut1** … controller sets the parameters **Prop1-A**, **Int1-A**, **Der1-A** for heating.
- **Aut2** … controller sets the parameters **Prop1-B**, **Int1-B**, **Der1-B** for heating.
- **Aut3** … controller sets the parameters **Prop2-A**, **Int2-A**, **Der2-A** for cooling.

Procedure of starting autotuning:

- Control output must be set for PID controlling or 3-way step controlling.
- Autotuning can be started with the parameter **Autotuning** = **Ht** (setting of parameters for heating) or **Autotuning** = **Cl** (setting of parameters for cooling). Parameter **Autotuning** can be found in ***operation level*** or in ***user level***.
- The controller explores the characteristics of system from switching ON/OFF on the output and determines optimal PID parameters. It can cause an overshoot.
- During the autotuning on lower display you can view the blinking message (**Aut1**, **Aut2**, **Aut3**).
- After the autotuning is finished, new PID parameters are written and the information message stops blinking.

Important:

- Parameters **Prop1-A**, **Int1-A**, **Der1-A**, are set when 1 set of PID parameters is used (**ALGo PID** = **PID**) or when 2 sets of PID parameters are used (**ALGo PID** = **2xPId**) and the actual set point is lower than the value set by the parameter **Switch PID**.
- Parameters **Prop1-B**, **Int1-B**, **Der1-B**, are set when the actual set point value is higher than the value set by parameter **Switch PID** when both sets of PID parameters are used (**ALGo PID** = **2xPId**).

Parameters **ALGo PID** and **Switch PID** can be found in ***configuration level***, menu **Output1 >**.

3.2 Datalogger of process values

Datalogger of process values saves:

- date (DATE) and time (TIME) of the logs,
- set point (SP1) and process (C1) values of the controller Ht205,
- max. 7 process values from SLAVE controllers (C2 to C8), controllers must be connected to communication line Comm1 or Comm2 and system „Master – Slave“ must be set,
- energy consumption measured by energy meter EM24 (E), energy meter must be connected to communication line Comm1,
- number of the running program (PROG).

Maximum number of logs is 500.

Data can be viewed on display or they can be transmitted through the communication line or LAN interface to PC.

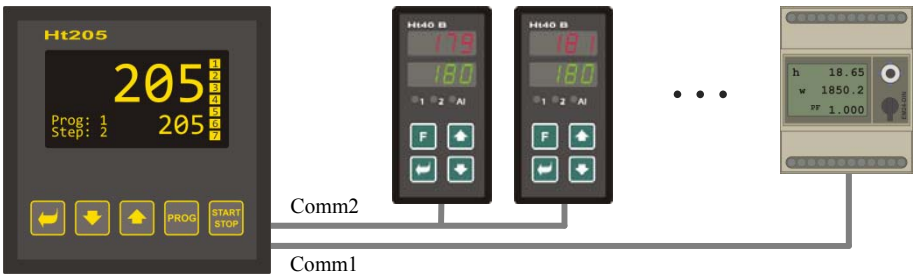


Table of process values transmitted from Ht205

	A	B	C	D	E		K	L	M
1	DATE	TIME	SP1	C1	C2	…	C8	E	PROG
2	05.02.2013	08:55:12	180	179	179		181	44863.2	1
3	05.02.2013	08:54:12	176	175	174		175	44841.9	1
4	05.02.2013	08:53:12	172	172	170		172	44836.4	1
	…								

Date of log

Time of log

Set point value of Ht205

Process value of Ht205

Process value of 1. slave controller (Ht40B)

Process value of 7. slave controller (Ht40B)

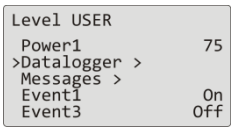
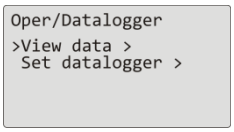
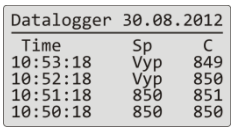
Energy consumption from meter EM24

Number of running program

Table is illustrative and it can contain all the stored values.

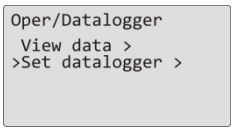
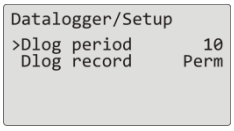
Showing stored values from datalogger on display

Datalogger can show values in ***operation level*** or (if it is set) in ***user level***, menu **Datalogger >** according to the following procedure:

	Enter into ***user level*** (***operation level***) and choose the item **Datalogger >**, confirm.
	In menu **Oper/Datalogger** choose the item **View data >**, confirm.
	It opens menu with stored data: • In upper part you can read date of log (valid for 1st line of shown data), • In lower part you can read time of log, set point and process values.

Setting of datalogger with measured values

You can choose for the datalogger the following items – **period for one log and condition for storing data**.
You can set this in menu **Datalogger >** by the following procedure:

	Enter menu **Datalogger >**, you will find this in ***user level*** or ***operation level***. Go to menu **Set dataloggeru >**.
	In menu you will find 2 parameters: • **Dlog period** … it defines period of logging in seconds (range 10 to 600 seconds). • **Dlog record** … it defines condition for logging (**Off** … logging is OFF, **Prog** … logging only when program runs, **Alarm** … logging only when alarm is active, **Perm** … permanent logging).

3.3 Datalogger of messages (about the activity of the device)

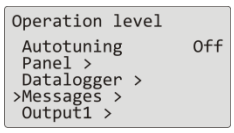
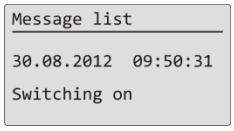
Device stores the messages about its activities and operation (switching ON, start and end of the program, change in parameters of operation and configuration level, restart of parameters, …) in the memory of datalogger for messages. These messages can be shown on display.

Maximum number of logs is 200.

The messages can be shown on the display or they can be transmitted through communication line or LAN interafce to PC.

Showing messages on display

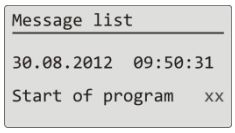
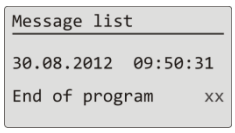
The list of messages can be shown in ***operation level*** or (if it is set in the device) in ***user level***, menu `Messages >`, according to the following procedure:

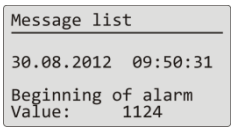
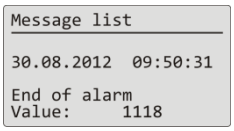
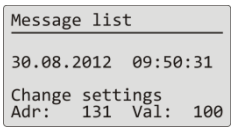
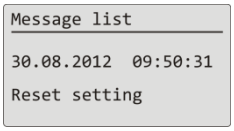
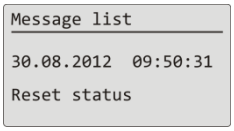
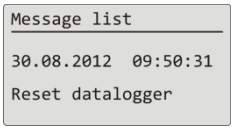
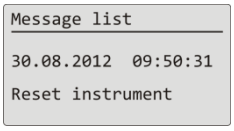
	Enter ***operation level*** (***user level***), choose menu `Messages >` and confirm.
	It opens up menu with the list of messages. You can browse the particular messages by the arrow keys.

Overview of messages stored by the device

Overview of all messages and their displaying is in the following table, the meaning of single columns, is as follows:

- **Message** … name of the message.
- **Showing** … appearence of the message on display including date and time of creating message.
- **Description** … describing data about the message.

Message	Showing	Description
Switching ON of the device		Date and time of switching ON of device.
Start of program		Date and time of starting a program. xx … number of the running program.
End of program		Date and time of end of the program. xx … number of the ended prorgam.
Interruption of program		Date and time of the program interruption. xx … number of the program interrupted.

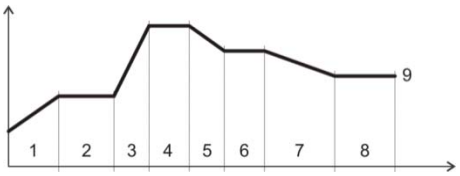
Beginning of alarm		Date and time of alarm start + process value At the start of the alarm.
End of alarm		Date and time of alarm end + process value At the end of the alarm.
Change in settings		Date, time and number of register (Adr) and new value (Hodn) of parameter. List of registers can be found in the description of the communication line.
Reset of setting		Reset of parameters in operation and configuration levels.
Reset of programs		Reset of all programs.
Reset of status		Reset of status (status in the course of program, energy consumption of the actual program, status in counters for errors in writing, reading of convertor, …).
Reset datalogger		Deleting all the dataloggers (data, messages and ambient temperature).
Reset instrument		Reset of all parameters, programs, dataloggers, status.

4 Program

Program manages the requested course of the controlled value (temperature).

In chapter „Program“ you can find the information about:

- Principals of programming,
- writing / editing program,
- start, interruption and ending of program,
- running a program,
- setting parameters connected with the program.



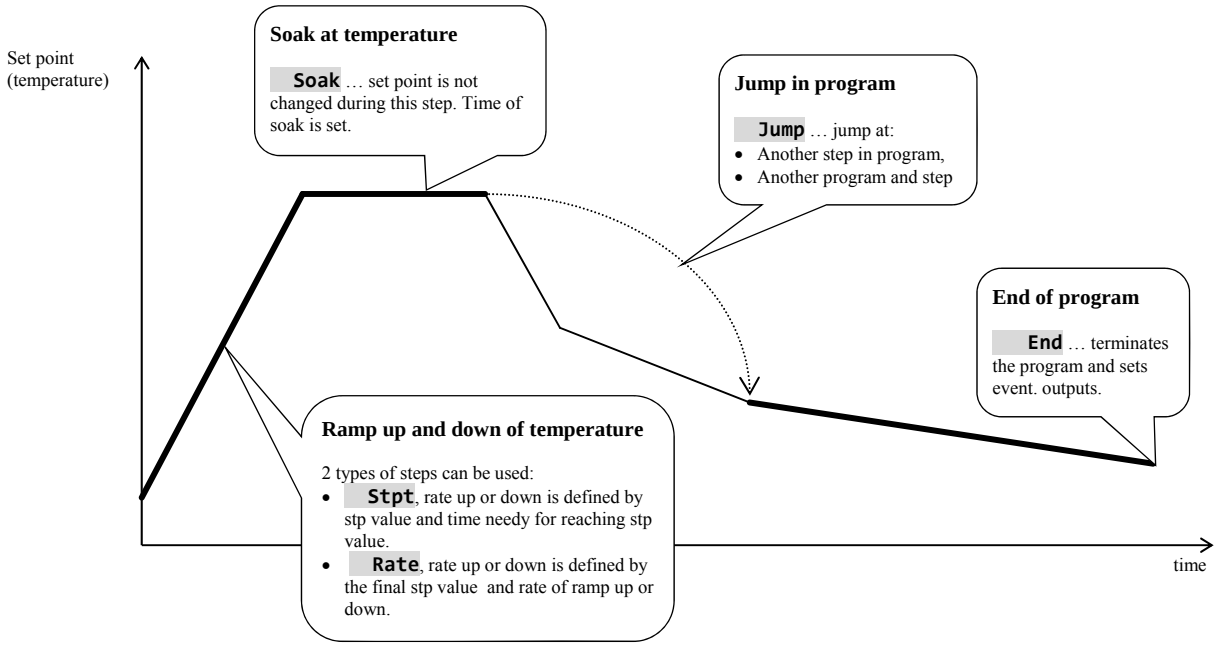
4.1 How to create a program

Program consists of single steps that goes one after another (program starts with the step 1, continues with step 2, …).
Program is ended up with the step „ **End**“.
You can edit as many as 30 programs numbered with 1 to 30 and each program can consist of maximum 15 steps

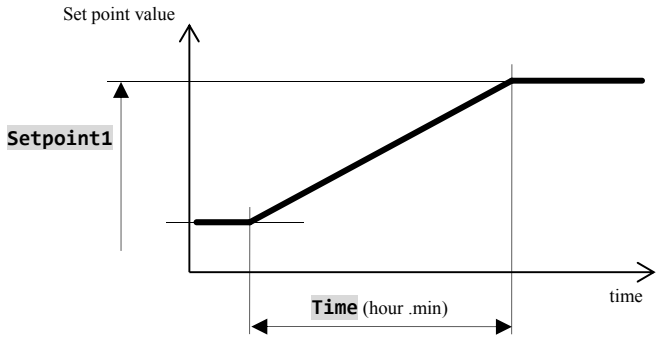
Types of steps

The following picture shows all types of steps that you can use for editing:

- Ramp up (down) to the temperature, „ **Stpt**“, „ **Rate**“
- Soak at the temperature, „ **Soak**“
- Jump at another program and step „ **Jump**“,
- End of the program, „ **End**“.



Stpt ... ramp up or down of stp value defined by time

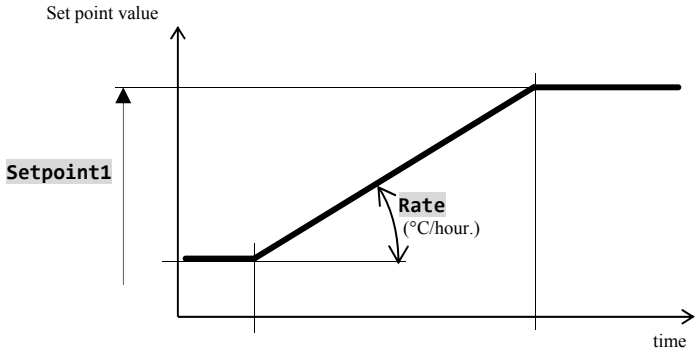


- Initial set point of the step **Stpt** is the same as the final set point value of preceding (former) step.
- I n case of starting a program the initial set point value is equal to the process value.
- Time of step is maximum 99 hours 59 minutes.

The summary of parameters of the step **RaCas**:

Display	Meaning
Setpoint1	**Final set point value**.
Time	**Time needy for reaching set point value**, is stated in format [hours:minutes].
GuarSoak	**GSD function,** see page *30*.
Wait	**Waiting of program**. Program will wait for the confirmation by the digital input. Parameter is shown only when **Dig. input_** = **Wait**.
Event1	**State of the event output 1.** Parameter is displayed only when **Output4** = **Event1**.
Event2	**State of the event output 2.** Parameter is displayed only when **Output5** = **Event2**.
Event3	**State of the event output 3.** Parameter is displayed only when **Output6** = **Event3**.
Event4	**State of the event output 4.** Parameter is displayed only when **Output7** = **Event4**.

Rate ... ramp up or down of set point value defined by rate

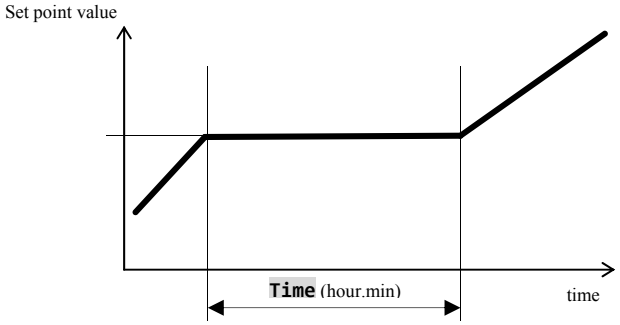


- Initial of set point value of the step „**Rate**“ is the same as the final set point of the preceeding (former) step.
- In case of starting a program the initial set point value is equal to the process value.
- Duration of step is not limited.

The summary of parameters of the step **RaRych**:

Display	Meaning
Setpoint1	**Final set point value**.
Rate	**Rate of ramp up to the set point value is stated in [°C/hour]**.
GuarSoak	**GSD function,** see page *30*.
Wait	**Waiting of program**. Program will wait for the confirmation by the digital input. Parameter is shown only when **Dig. input_** = **Wait**.
Event1	**State of the event output 1.** Parameter is displayed only when **Output4** = **Event1**.
Event2	**State of the event output 2.** Parameter is displayed only when **Output5** = **Event2**.
Event3	**State of the event output 3.** Parameter is displayed only when **Output6** = **Event3**.
Event4	**State of the event output 4.** Parameter is displayed only when **Output7** = **Event4**.

Soak ... soak on temperature



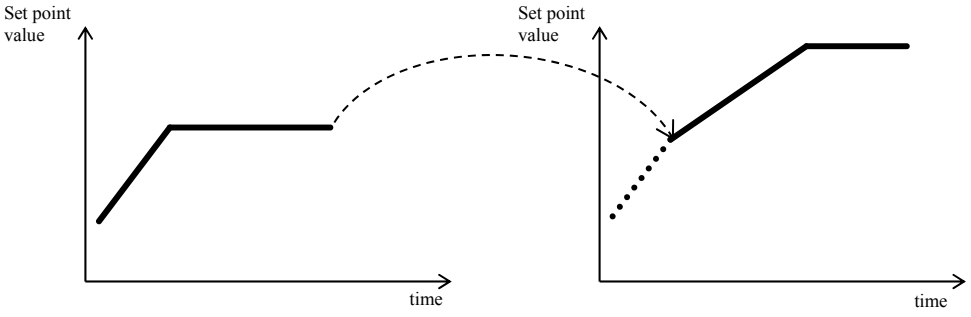
- Set point value of the step **Soak** is the same as the final STP of previous step.
  In case of starting a program the set point value is equal to the process value.
- Time duration of step is maximum 99 hours 59 minutes.

The summary of parameters for the step **Vydrz**

Display	Meaning
Time ▫▫▫▫▫▫	**Time of soak** is stated in format [hours:minutes].
GuarSoak ▫▫▫▫▫▫	**GSD function**, see page *30*.
Wait ▫▫▫▫▫▫	**Waiting of program**. Program will wait for the confirmation by the digital input. Parameter is shown only when **Dig. input_** = **Wait**.
Event1 ▫▫▫▫▫▫	**State of the event output 1.** Parameter is displayed only when **Output4** = **Event1**.
Event2 ▫▫▫▫▫▫	**State of the event output 2.** Parameter is displayed only when **Output5** = **Event2**.
Event3 ▫▫▫▫▫▫	**State of the event output 3.** Parameter is displayed only when **Output6** = **Event3**.
Event4 ▫▫▫▫▫▫	**State of the event output 4**. Parameter is displayed only when **Output7** = **Event4**.

Jump ... jump in program

Step **Jump** enables to jump over in another **Step** in program or at another **Program** and step **Step**.



You can not jump-loop to the step that you are on in that case the program will be ended up.

The summary of parameters for the **Skok**:

Display	Meaning
Jump Prog ▫▫▫▫▫▫	**The number of the program which you want to jump at.**
Jump Step ▫▫▫▫▫▫	**The number of the step that you want to jump at.**

End ... ending a program

Step „**End**“ will end up the program and will set up event outputs.

The summary of parameters for the „**End**“:

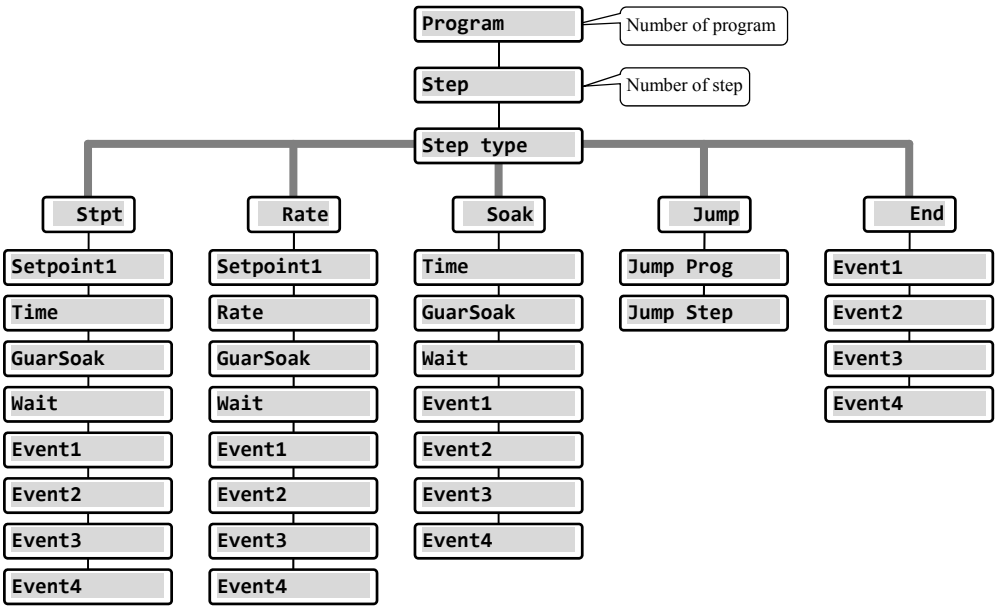
Display	Meaning
Event1 ▫▫▫▫▫▫	**State of event output 1 after ending a program.** Parameter is displayed only when **Output4** = **Event1**.
Event2 ▫▫▫▫▫▫	**State of the event output 2 after ending a program.** Parameter is displayed only when **Output5** = **Event2**.
Event3 ▫▫▫▫▫▫	**State of event output 3 after ending a program.** Parameter is displayed only when **Output6** = **Event3**.
Event4 ▫▫▫▫▫▫	**State of the event output 4 after ending a program.** Parameter is displayed only when **Output7** = **Event4**.

4.2 Writing/editing a program

Menu for writing/editing a program is intended for:
- Writing/editing a new program,
- Viewing a program that has already been edited,
- Change of some parameters in the program already edited.

To enter the menu for **editing a program** from **basic mode** press the key PROG.
To return from menu for **editing a program** to basic mode press the both keys ▼ ▲.
If the device is not being set up, it will return to basic mode after 60 seconds itself.

The overall menu for **editing a program** is illustrated in the following picture:



- Parameters **Event1** to **Event4** are shown only in case when particular outputs are set up as event outputs (outputs 4 to 7).
- Type of the step **Stpt** is displayed only in case if it is allowed (**Ramp type** = **Stpt** or **Ramp type** = **Both**).
- Type of the step **Rate** is displayed only in case if it is allowed (**Ramp type** = **Rate** or **Ramp type** = **Both**).

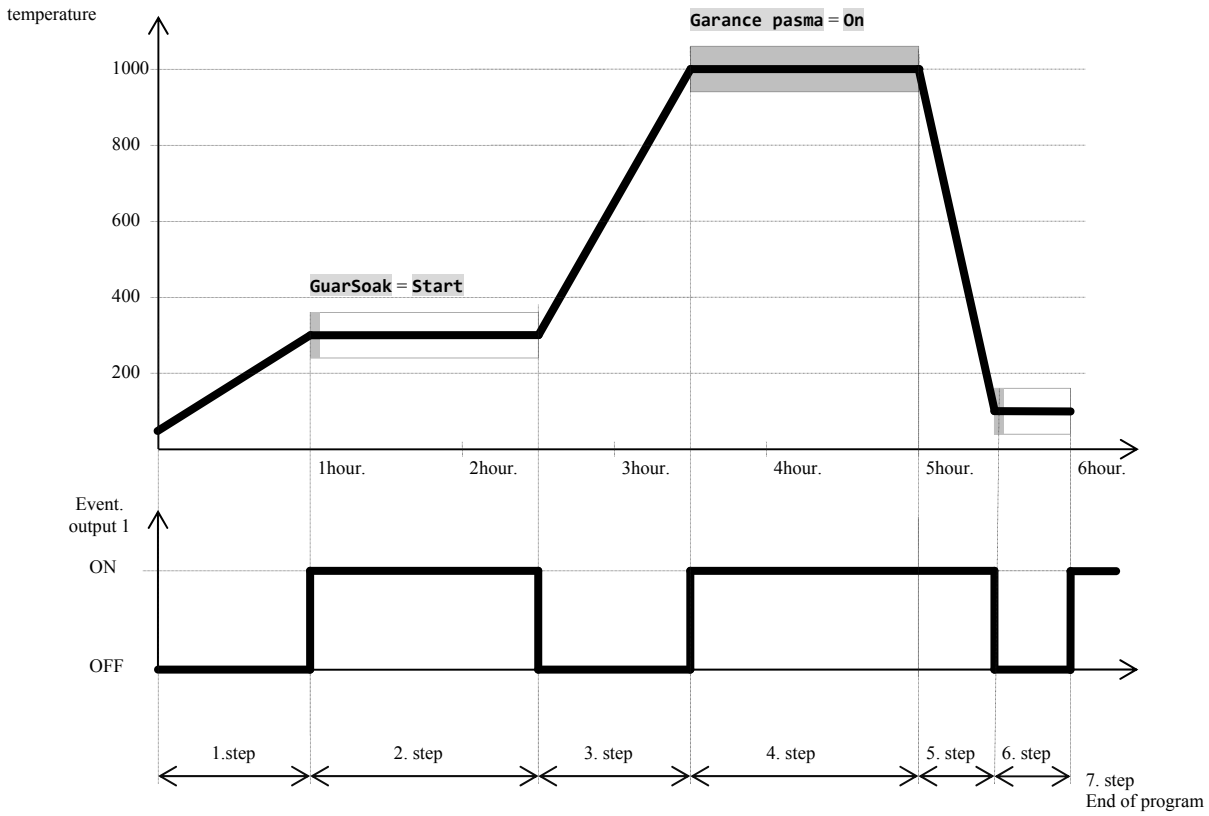
Important:

At each change of parameter **Ramp type** (you will find in ***configuration level***, menu **Program**), we recommend to check again all the written/edited programs.

Writing a program will be detailed in the following example.

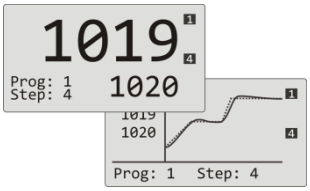
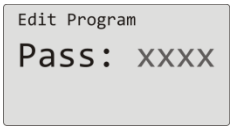
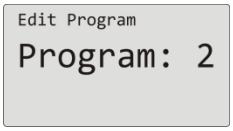
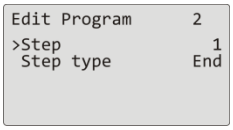
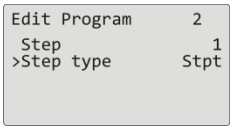
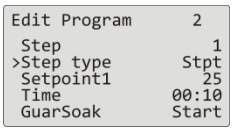
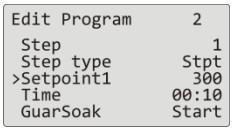
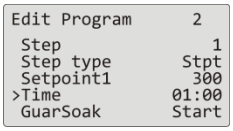
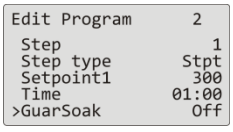
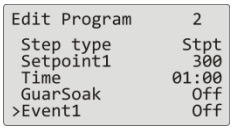
Example how to write a program

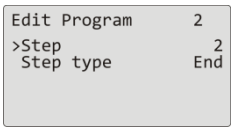
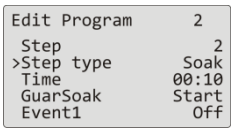
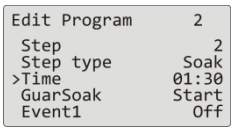
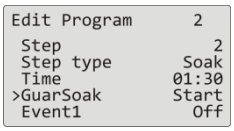
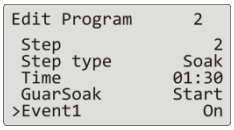
- Write the program into the controller that is shown in the following picture and described in the table.
- You will write the program to the position 2 (program number 2).
- In configuration level the output 4 is set up as event (**Output4** = **Event1**), both types of steps for ramp UP/DOWN are allowed (**Ramp type** = **Both**).



Program number 2												
Step	Step type	Setpoint 1	Time	Rate	GuarSoak	Wait	Jump Prog	Jump Step	Event1	Event2	Event3	Event4
1	Stpt	300	01:00		Off				Off			
2	Soak		01:30		Start				On			
3	Rate	1000		700	Off				Off			
4	Soak		01:30		On				On			
5	Stpt	50	00:30		Off				On			
6	Soak		00:30		Start				Off			
7	End								On			

Writing a program into controller

	The controller is in basic mode (numerical or graphic screen). Press the key „**PROG“** (PROG), it will appear the screen **Edit Program**.
	If the access for writing a program is secured with the password, it will appear the screen with the request for entering a password. Password should be typed with help of arrow keys and confirm with the key „**ENTER**“. If the access is not secured with the password, it will appear the following screen for chosing a program.
	With help of arrow keys you can choose the number of the requested prorgam (2) and confirm with the key „**ENTER**“.
	In upper line there is a number of edited program. In second line there is a number of the actaul step. Leave 1 for the number of the step and with help of arrow keys go to parameter **Step type**. Press the key „**ENTER**“ for editing a parameter. The value of the parameter starts to blink.
	With help of arrow keys choose the type of the step (it is set „ **Stpt**“, ramp function is defined by final set point temperature and time) and confirm with the key „**ENTER**“.
	Is shown the list of parameters of the edited step: • Type of the step, • Set point value, • Time of the step, • …
	With help of arrow keys go to the parameter **Setpoint1** (set point value 1), you can edit the parameter by pressing the key „**ENTER**“ and with arrow keys you will set the set point value (300). Writing a parameter is confirmed by pressing the key „**ENTER**“ again.
	Go to the parameter **Time** (time of step), and set the value **01:00** (1 hour, 0 minute).
	Go to the parameter **GuarSoak** and set **Off** (guaranteed soak deviation – GSD is switched OFF in Step 1).
	Go to the parameter **Event1** and set **Off** (event output is switched OFF in step 1).

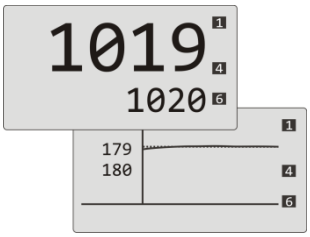
Go to another step of the program	
	With help of arrow keys go to setting of the step (parameter „**Step**“) and set the step number 2.
	Go to the parameter **Step type** and set **Soak**.
	Go to the parameter **Time** and set **01:30** (time of step duration 1 hour 30 minutes).
	Go to the parameter **GuarSoak** and set **Start**.
	Go to the parameter **Event1** and set **On** (the event output 1 is switched ON in the step 2).
In the same manner you can set other steps in program. To return from „Editing a program“ press the both keys (▼ ▲).	

4.3 Starting, interruption and ending up a program

Program can be started up by the following ways:
- With help of the keys,
- By real time o clock,
- By digital inputs,
- Through the communication line from PC.

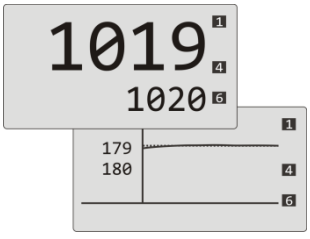
Starting a program with help of the keys

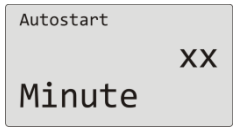
The most used way for starting a program in the controller is with help of the keys.

	The controller is in Basic mode (numerical and graphic screen). No program runs.
	By pressing the key „**START / STOP**“ you will enter menu for starting a program. • By the keys you can set the number of the program that is to be started up, • Confirm by the key „**START / STOP**“, • If it is not set the start by the program and step, the program starts from the first step.
	If it is set the start by the program and step (***configuration level***, menu **Program**, parameter **Start prog = PrSt**), it appears the request for setting of the step on the screen: • With the arrow keys you can edit the step for starting a program, • Confirm with the key „**START / STOP**“, • The program is started from the chosen step.

Starting a program by real time clock

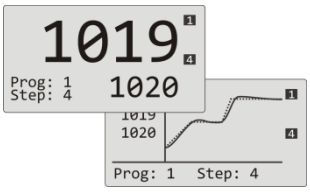
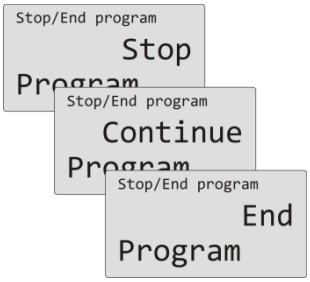
In controller you can choose the automatic starting a program by the real time clock in format:
- **month, day, hour, minute** … program is started in the set month, day, hour, minute,
- **hour, minute** … program is started every day in the chosen hour and minute (when is set **Month** = **Off**).

	The controller is Basic mode (numerical and graphic screen). To enter menu for setting automatic start of the program by real time clock by pressing the key „**START / STOP**“ for 3 seconds.
	Choose the number of the program that you want to run (**Off**, **1**, **2**, .. , **30**). Confirm by the key „**START / STOP**“. If you set **Off**, automatic starting of a program is switched OFF.

	Set the month of starting a program (**Off**, **1**, **2**, .. ,**12**). Confirm with the key „**START / STOP**“. If you set **Off**, it does not appear the parameter **Date** and the program will start everyday.
	Set the date of starting a program (**1**, **2**, .. ,**31**). Confirm with the key „**START / STOP**“. Parameter will not appear, if it is set **Month** = **Off**.
	Set the hour of starting a program (**0**, **1**, .. ,**23**). Confirm with the key „**START / STOP**“.
	Set the minute of starting a program (**0**, **1**, .. ,**59**). Confirm with the key „**START / STOP**“.

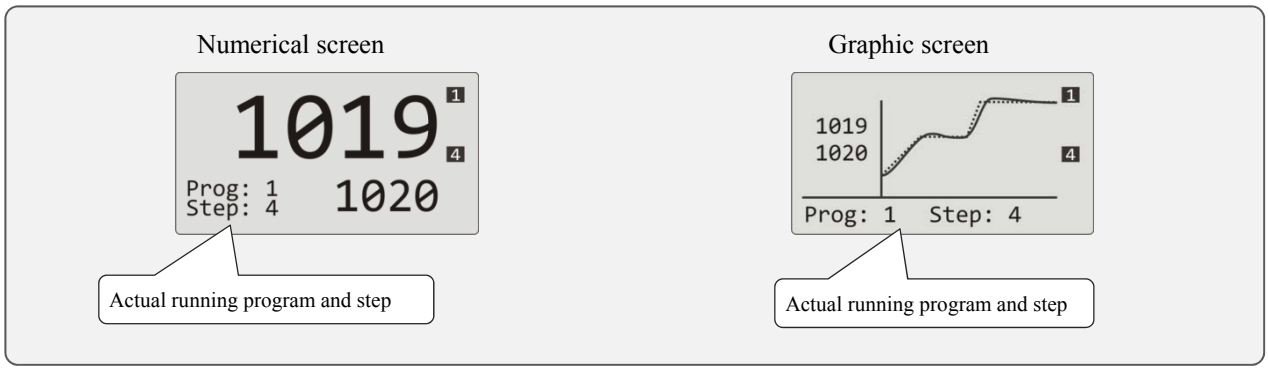
Interruption, ending up a program

Running a program can be interrupted or prematurely ended up.

	The controller is in Basic mode, the program runs. Press the key „**START / STOP**“ shortly.
	Choose one of the opportunities: • **Stop** … program will be interrupted, • **Continue** … program will continue, • **End** … program will be ended up, And confirm with the key „**START / STOP**“. Interruption must be allowed in ***configuration level***, menu **Program >**, parameter **Stop prog** = **Yes**. When program is ended up, the event outputs are set according to the setting in ***configuration level*** of the device, menu **Output4 >**, **Output5 >**, …, parameter **IEvent1**, **IEvent2**, … .

4.4 The course of the program

The course of the program is indicated on display by showing the actual program and the step.



More information about the course of the program can be found in menu **Program view >** .
Change in the parameters of the actual running step can be done in menu **Program edit >** .

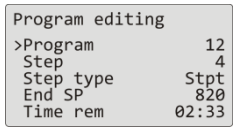
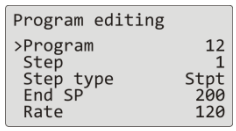
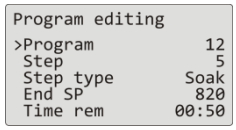
Reading the status of the running program

Reading the status of the running program can be done in menu **Program view >** , that can be made accessible in ***user level***.

Level USER >Program view > Datalogger > Event1 Off Event2 Off	In ***User level*** you will choose the item **Program view >** and confirm. Procedure how to make menu accessible **Program view >** in user level can be found on page ***12***.
Program view >Program 2 Step 4 Step type Stpt End SP 820 Time rem 02:33	Status of program is decribed by 5 parameters: • **Program** … number of the running program, • **Step** … number of the actual step of the program, • **Step type** … type of the actual step, • **End SP** … final set point value of the actual step, • **Time rem** … remaining time till the end of the step.

Editing a running program

Editing a running program can be set in menu **Program edit >** , that can be made accessible in ***user level***.

	In ***User level*** you will choose the item **Program edit >** and confirm it. How to make menu accessible **Program edit >** in user level can be found on page ***12***.
	**Editing a step Stpt** • **Program** … number of the running program, • **Step** … number of the actual step of the program, • **Step type** … type of the actual step, • **End SP** … final set point value of the actual step, **it is possible to EDIT**, • **Time rem** … remaining time till the end of the step, **it is possible to EDIT**.
	**Editing a step Rate** • **Program** … number of the running program, • **Step** … number of the actaul step of the program, • **Step type** … type of the actual step, • **End SP** … final set point value of the actual step, **it is possible to EDIT**, • **Rate** … rate of ramp up of the actual step, **it is possible to EDIT**, • **Time rem** … remaining time till the end of the step.
	**Editing a step Soak** • **Program** … number of the running program, • **Step** … number of the actual step of the program, • **Step type** … type of the actual step, • **End SP** … final set point value of the actual step, **it is possible to EDIT**, • **Time rem** … remaining time till the end of the step, **it is possible to EDIT**.

Important:

- Changed parameters will be effective only in the actual running step.
- Writing of a program will remain unchanged.

4.5 Guaranteed Soak Deviation - GSD

The function of GSD helps to maintain the requested course of the program and checks the deviation of the process value from set point value. If the process value leaves the defined Soak Band, counting down is paused.
Typical example is a furnace where a fast ramp and soak is requested. The function GSD ensures that the counting down of soak time starts after the stp value in the furnace is reached.

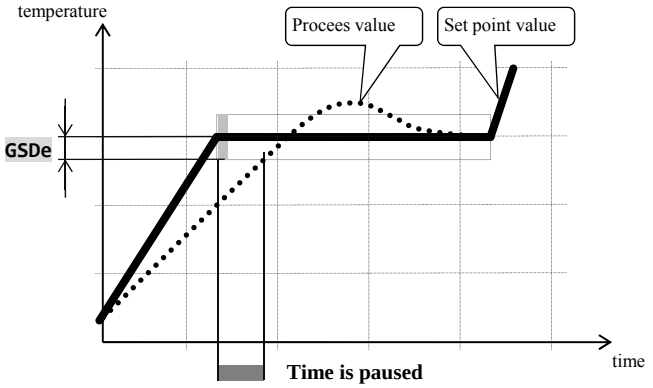
The function GSD is defined for each step separately and can be set up in the following way:

- **GuarSoak** = **Start** … GSD is turned ON only at the beginning of the step.
- **GuarSoak** = **On** … GSD is turned ON for the whole step.
- **GuarSoak** = **Off** … GSD is turned OFF at that step (counting down is not paused in that step).

Width of soak band **GSD** can be set in ***configuration level***, menu **Program**, parameter **GSDe**.

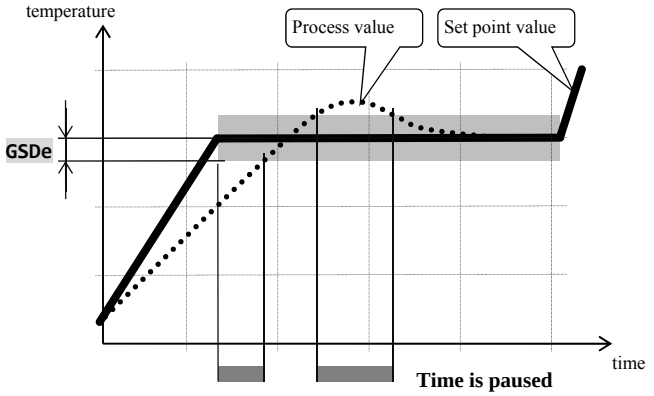
GuarSoak = **Start**

- In example there is GSD of type **Start** set up for the soak (2. step).
- Counting down of the soak starts at the moment when process value is within the chosen band **GSDe.**
- From this moment the whole step will be performed without interruption.



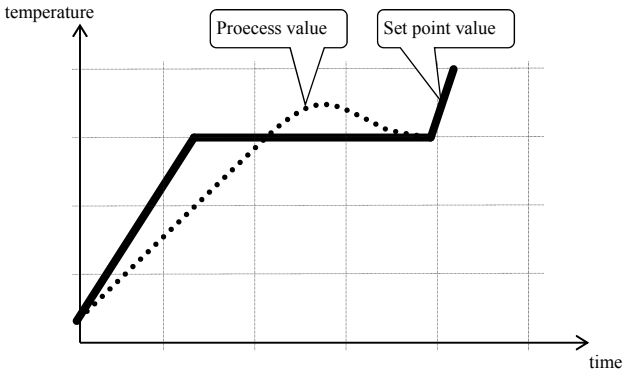
GuarSoak = **On**

- In example there is a GSD of the type **On** set up for the soak (2. step).
- During the whole course of the step the deviation of process value from set point value is checked.
- If the process value is outside the band **GSDe**, it is paused the time of the course of the program.



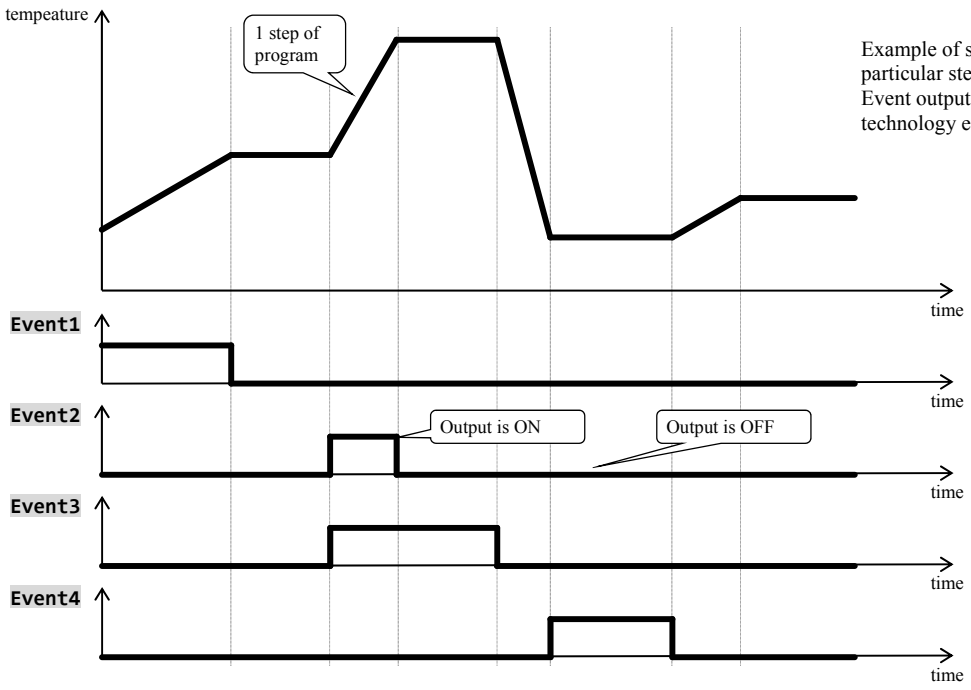
GuarSoak = **Off**

- In this example there is GSD switched OFF for the 2. step.
- Counting down of soak time of program is not paused in the whole step.



4.6 Event outputs

Event outputs are intended for controlling of external actions/events (cooling flap of the furnace, fan, …) by the program. In particular steps of the program the event output can be switched ON (**Event_** = **On**) or switched OFF (**Event_** = **Off**).



Example of setting for event outputs at particular steps of the program. Event outputs can control external technology equipment.

Options for the configurations of event output

Output 4 to 7 can be configured as the event one (**Event1** to **Event4**). You can carry out this setting in ***Configuration level***, menu:

- **Output4 >**, parameter **Output4** = **Event1**,
- **Output5 >**, parameter **Output5** = **Event2**,
- …

State of event output at the interruption of the program

If you end up the program before (interruption of firing), you want the event outputs to be set in the defined status by you (e.g. opening of cooling flap). The response of the event outputs to the interruption of program can be configured in ***configuration level***, menu **Output4 >** to **Output7 >**, parameter **IEvent1** to **IEvent4** as follows:

- **IEvent_** = **Hold**, state of the event output remains unchanged.
- **IEvent_** = **Off**, the event output is switched OFF at the interruption of the program.
- **IEvent_** = **On**, the event output is switched ON at the interruption of the program.

Controlling of event output outside the course of program

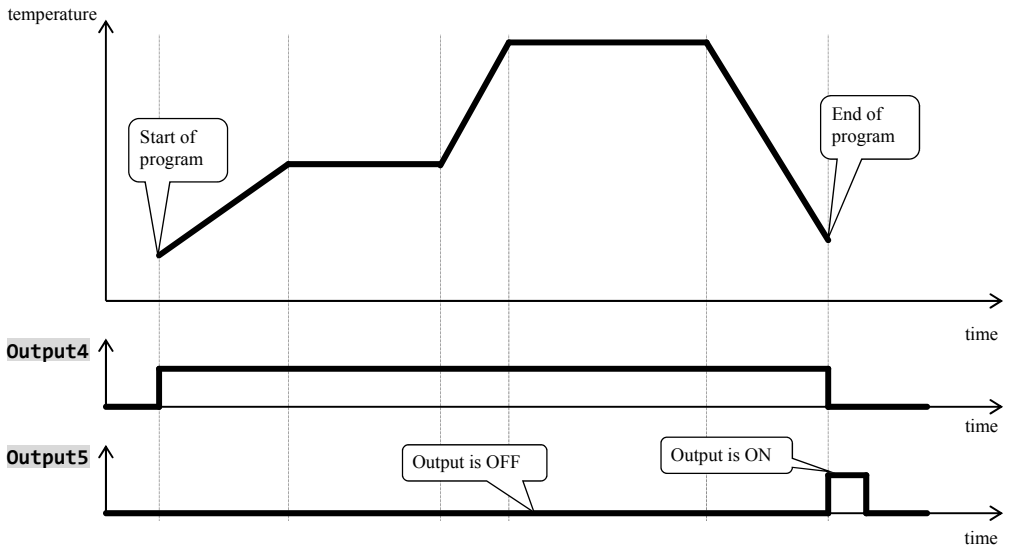
In ***operation level*** with help of parameter **Event_** (this parameter can be placed as well as in ***user level***) you can control the status of the event. output. **When in program you can only view the state of the event output.**

4.7 Signalling of the run of a program and the end of a program

The auxiliary outputs (**Output4** to **Output7**) can indicate the run of a program as well as the end of a program.

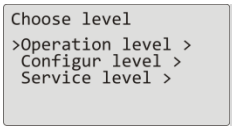
Example … output 4 will indicate the run of a program, output 5 will indicate the end of a program (the duration for the switching ON of relay will be adjusted to 15 seconds).
You will set in ***configuration level***:

- **Output4** = **Prog**.
- **Output5** = **PrEnd**, parameter **SgTime5** = **15**.
-



5 Operation level

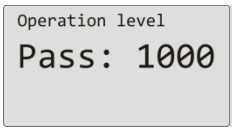
To enter operation level press both keys for 3 seconds



After 3 seconds you will see screen for choosing a level:

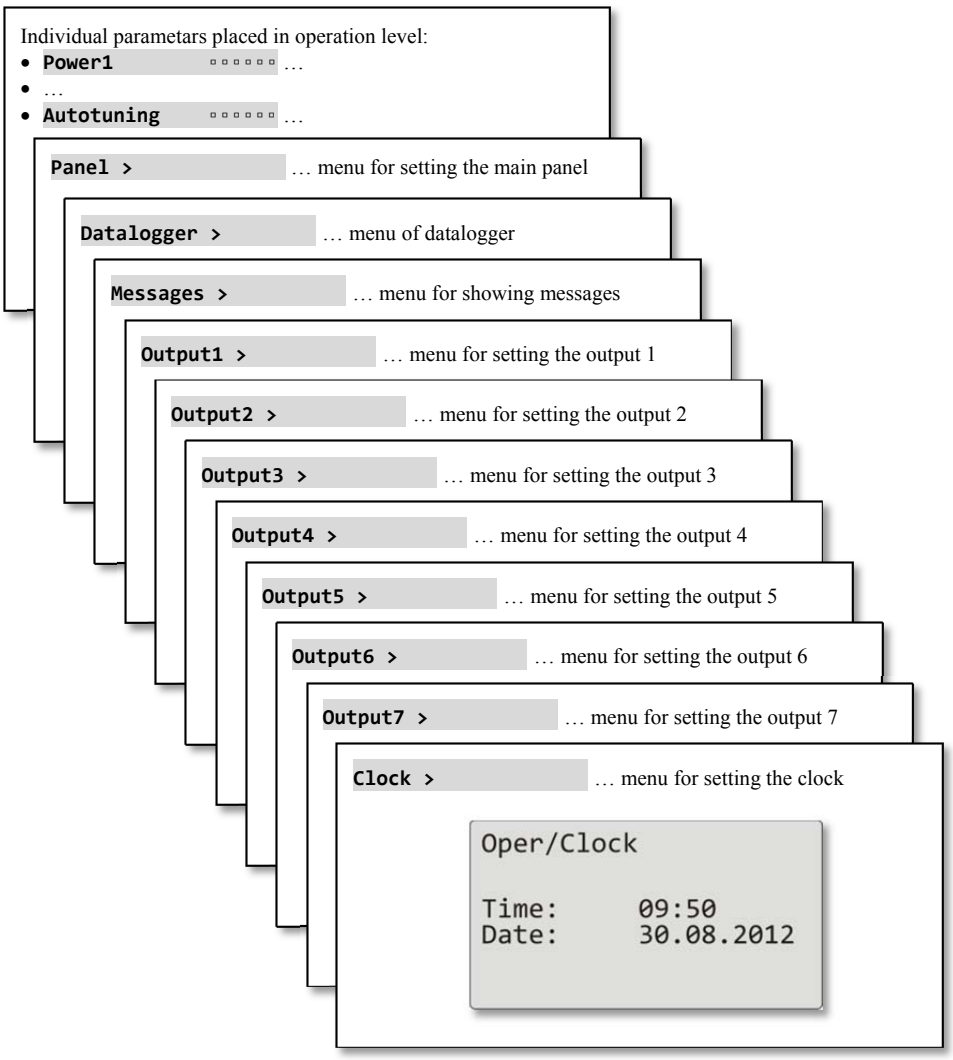
- set **Operation level >** and confirm.

If the password is set to secure entering *operation level*, it will appear the following screen:



- with help of arrow keys you will set the correct password and confirm.

Operation level – overview of menu



Individual parameters placed in operation level

Power1 ▫▫▫▫▫▫	**Shows the actual power of the output 1 in %.**
Power2 ▫▫▫▫▫▫	**Shows the actual power of the output 2 in %.**
Power prog ▫▫▫▫▫▫	**Energy consumption for the last firing in kWh**. Value is read from external energy meter (EM24).
Power total ▫▫▫▫▫▫	**Total consumption in kWh**. Value is read from external energy meter (EM24).
Alarm Off ▫▫▫▫▫▫	**Switching OFF of permanent alarm** by setting **Yes** and confirming.
Event1 ▫▫▫▫▫▫	**It shows the state of the event output 1**. If the program does not run, you can set up the output.
Event2 ▫▫▫▫▫▫	**It shows the state of the event output 2**. If the program does not run, you can set up the output.
Event3 ▫▫▫▫▫▫	**It shows the state of the event output 3**. If the program does not run, you can set up the output.
Event4 ▫▫▫▫▫▫	**It shows the state of the event output 4**. If the program does not run, you can set up the output.
Autotuning ▫▫▫▫▫▫	**Starting / turning OFF of autotuning of PID parameters:** • **Off** … turning OFF of autotuning of PID parameters, • **Ht** … starting of autotuning of PID parameters, heating, • **Cl** … starting of autotuning of PID parameters, cooling.

Panel … setting of parameters for basic screen

Panel ▫▫▫▫▫▫	**Setting of basic screen of the controller**: • **Num** … numerical screen, • **Graph** … graphic screen.
Graph-Per ▫▫▫▫▫▫	**Period of writing into the graph**. Range: 1 to 300 seconds Total number of lines of the graph is 80. Length of the graph depends on the period of writing: • period = 1 second … length of the graph is 80 seconds, • period = 45 seconds … length of the graph is 1 hour, • period = 90 seconds … length of the graph is 2 hours, • period = 225 seconds … length of the graph is 5 hours.
Graph-Min ▫▫▫▫▫▫	**Range of the graph, low limit**. Range: -999 to **Graph-Max**.
Graph-Max ▫▫▫▫▫▫	**Range of the graph, high limit**. Range: **Graph-Min** to 2999.

Datalogger … how to operate datalogger of data

View data >	Menu for showing process and set point value on display of the the device.
Datalogger 30.08.2012 Time Sp C 10:53:18 Vyp 849 10:52:18 Vyp 850 10:51:18 850 851 10:50:18 850 850	**Datalogger stores:** • set point value of the controller, • process value of the controller, • process values read through the communication line Comm1 or Comm2 out of max. 7 Slave controllers in control systm „enhnaced Master – Slave“, • value of total energy consumption read through communication line Comm1 from energy meter EM24. **On screen you can view:** • date of measurement … next to heading „Datalogger“, • 1. column … time of measurement, • 2. column … set point value of Ht205, • 3. column … process value of Ht205. You can browse data in datalogger with arrow keys.
Set datalogger >	Menu for setting of the period of logging and conditions for logging.
Dlog period ▫▫▫▫▫▫	Period of logging. Range: 10 to 600 seconds.
Dlog record ▫▫▫▫▫▫	Condition for logging: • **Off** …datalogger is turned OFF, • **Prog** … logging runs only when the program goes, • **Alarm** … logging only at alarm, • **Perm** … logging runs permanently.

Messages ... how to handle with messages

	On display it is shown date, time and message. Detailed information about the shown messages you can find on page ***16***.

Output1 ... menu for output 1

Prop1-A ▫▫▫▫▫▫	**Proportional band,** the first set of PID parameters for heating**.** **Range: 1 to 2499 °C.**
Int1-A ▫▫▫▫▫▫	**Integral value,** the first set of PID parameters for heating**.** Range: **Off**, 0,1 to 99,9 minutes.
Der1-A ▫▫▫▫▫▫	**Derivative value,** the first set of PID parameters for heating. Range: **Off**, 0,01 to 9,99 minutes.
Prop1-B ▫▫▫▫▫▫	**Proportional band,** the second set of PID parameters for heating. **Range: 1 to 2499 °C**
Int1-B ▫▫▫▫▫▫	**Integral value,** the second set of PID parameters for heating. Range: **Off**, 0,1 to 99,9 minutes.
Der1-B ▫▫▫▫▫▫	**Derivative value,** the second set of PID parameters for heating. Range: **Off**, 0,01 to 9,99 minutes.
Hys1 ▫▫▫▫▫▫	**Hysteresis,** this single parameter is set only for ON/OFF control. Range: 1 to 249 ºC.

Output2 ... menu for output 2

Prop2-A ▫▫▫▫▫▫	**Proportional band,** the PID parameters for cooling. **Range: 1 to 2499 °C.**
Int2-A ▫▫▫▫▫▫	**Integral value,** the PID parameters for cooling**.** Range: **Off**, 0,1 to 99,9 minutes.
Der2-A ▫▫▫▫▫▫	**Derivative value,** the PID parameters for cooling. Range: **Off**, 0,01 to 9,99 minutes.
Hys2 ▫▫▫▫▫▫	**Hysteresis,** this single parameter is set only for ON/OFF control. Range: 1 to 249 ºC.

Output3 ... menu for output 3

Alarm-Pr-Lo ▫▫▫▫▫▫	**Low limit of alarm, absolute value**. Range: -999 to **Alarm-Pr-Hi** ºC.
Alarm-Pr-Hi ▫▫▫▫▫▫	**High limit of alarm, absolute value**. Range: **Alarm-Pr-Lo** to 2999 ºC.
Alarm-De-Lo ▫▫▫▫▫▫	**Low limit of alarm, deviation from set point value**. Range: -999 to 0 ºC.
Alarm-De-Hi ▫▫▫▫▫▫	**High limit of alarm, deviation from set point value.** Range: 0 to 999 ºC.

Output4 ... menu for output 4

Sg4-Pr-Lo ▫▫▫▫▫▫	**Low limit of signalling, absolute value**. Range: -999 to **Sg4-Pr-Hi** ºC.
Sg4-Pr-Hi ▫▫▫▫▫▫	**High limit of signalling, absolute value**. Range: **Sg4-Pr-Lo** to 2999 ºC.
Sg4-De-Lo ▫▫▫▫▫▫	**Low limit of signalling, deviation from set point value**. Range: -999 to 0 ºC.
Sg4-De-Hi ▫▫▫▫▫▫	**High limit of signalling, deviation from set point value**. Range: 0 to 999 ºC.

Output5 ... menu for output 5

Sg5-Pr-Lo ▫▫▫▫▫▫	**Low limit of signalling, absolute value**. Range: -999 to **Sg5-Pr-Hi** ºC.
Sg5-Pr-Hi ▫▫▫▫▫▫	**High limit of signalling, absolute value**. Range: **Sg5-Pr-Lo** to 2999 ºC.
Sg5-De-Lo ▫▫▫▫▫▫	**Low limit of signalling, deviation from set point value**. Range: -999 to 0 ºC.
Sg5-De-Hi ▫▫▫▫▫▫	**High limit of signalling, deviation from set point value**. Range: 0 to 999 ºC.

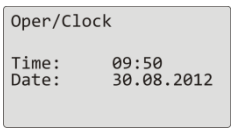
Output6 ... menu for output 6

Sg6-Pr-Lo ▫▫▫▫▫▫	**Low limit of signalling, absolute value**. Range: -999 to **Sg6-Pr-Hi** ºC.
Sg6-Pr-Hi ▫▫▫▫▫▫	**High limit of signalling, absolute value**. Range: **Sg6-Pr-Lo** to 2999 ºC.
Sg6-De-Lo ▫▫▫▫▫▫	**Low limit of signalling, deviation from set point value**. Range: -999 to 0 ºC.
Sg6-De-Hi ▫▫▫▫▫▫	**High limit of signalling, deviation from set point value**. Range: 0 to 999 ºC.

Output7 ... menu for output 7

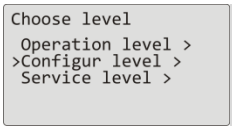
Sg7-Pr-Lo ▫▫▫▫▫▫	**Low limit of signalling, absolute value**. Range: -999 to **Sg7-Pr-Hi** ºC.
Sg7-Pr-Hi ▫▫▫▫▫▫	**High limit of signalling, absolute value**. Range: **Sg7-Pr-Lo** to 2999 ºC.
Sg7-De-Lo ▫▫▫▫▫▫	**Low limit of signalling, deviation from set point value**. Range: -999 to 0 ºC.
Sg7-De-Hi ▫▫▫▫▫▫	**High limit of signalling, deviation from set point value**. Range: 0 to 999 ºC.

Clock ... setting of the real time clock

Clock >	Setting of the real time clock
	With help of the key „**ENTER**“ you go through the particular time data. With help of the arrow keys you set the correct time data.

6 Configuration level

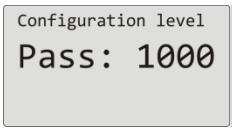
To enter configuration level press the both arrow keys for 3 seconds.



After 3 seconds it will appear the screen for choosing a level:

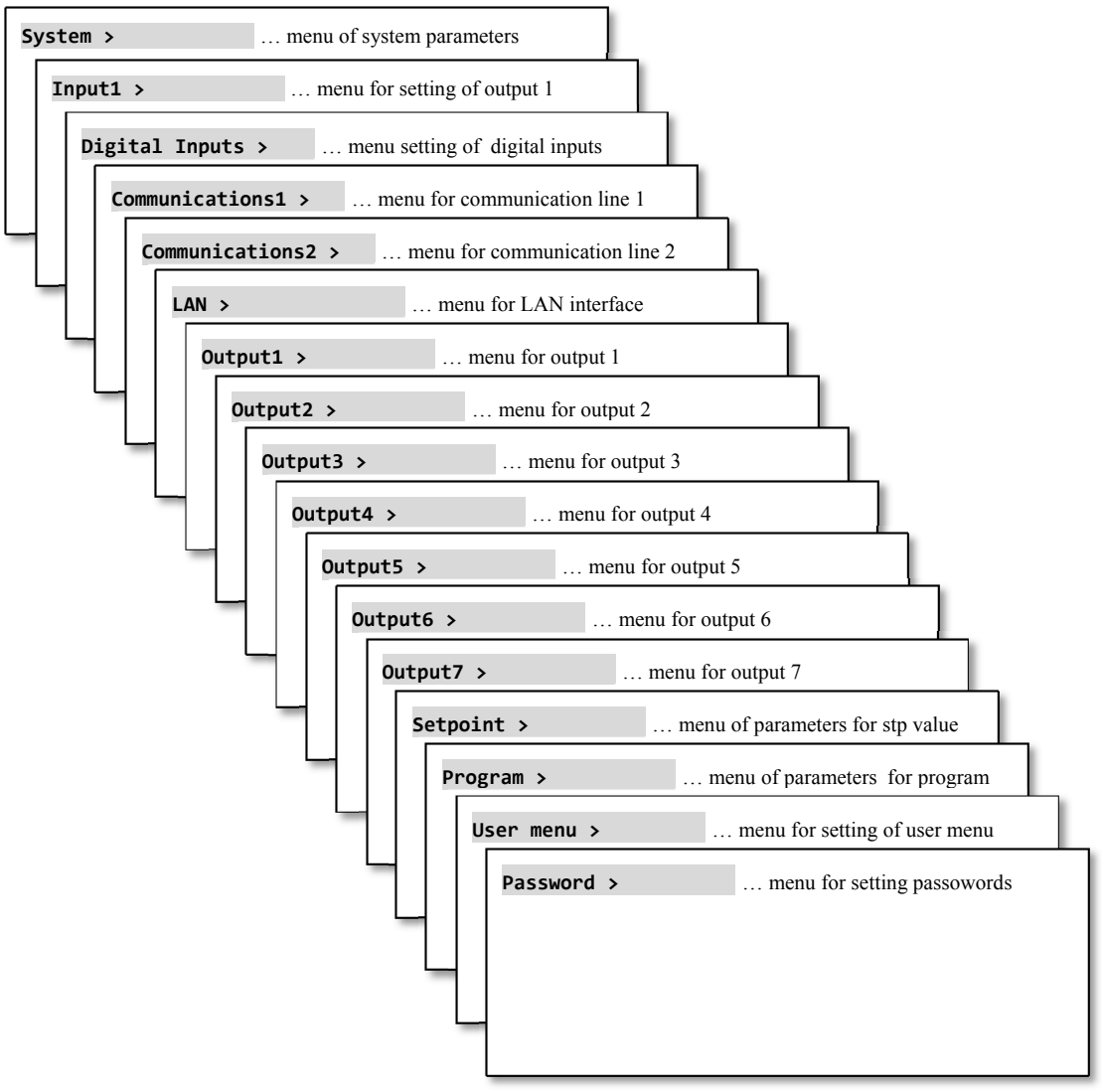
- set **Configur level >** and confirm.

If the password is set for entering *configuration level*, it appears the following screen:

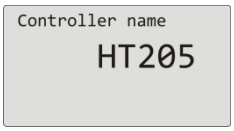


- with arrow keys you should enter the right password and confirm.

Configuration level – overview of menu



System ... setting of system parameters

Contr.name ▫▫▫▫▫▫	**Name of the device.**
	With the key „**ENTER**“ you go through single figures. With the arrow keys you set up the requested figure. Name of the device is shown in „INFO“ panel.
Language ▫▫▫▫▫▫	**Setting of language in the controller:** • **Engl** … English, • **German** … German, • **Czech** … Czech.
Disp-bright ▫▫▫▫▫▫	**Setting of display brightness:** Range: 0 to 10.
Dlog ▫▫▫▫▫▫	**Limiting of number of logs in datalogger of process values:** Range: • 10, 20, 50, 100, 200, 500 logs.
Dlog Msg ▫▫▫▫▫▫	**Limiting of number of messages in datalogger for messages:** Range: • 10, 20, 50, 100, 200 logs.
Dlog Amb ▫▫▫▫▫▫	**Limiting of number of logs in datalogger for ambient temperature:** Range: • 10, 20, 50, 100, 200, 500 logs.

Input1 ... setting of measuring input

Input1 ▫▫▫▫▫▫	**Setting of input sensor … thermal input:** • **No** … input is not set, • **J** … thermocouple „J“, range -200 to 900ºC, • **K** … thermocouple „K“, range -200 to 1360ºC, • **T** … thermocouple „T“, range -200 to 400ºC, • **N** … thermocouple „N“, range -200 to 1300ºC, • **E** … thermocouple „E“, range -200 to 700ºC, • **R** … thermocouple „R“, range 0 to 1760ºC, • **S** … thermocouple „S“, range 0 to 1760ºC, • **B** … thermocouple „B“, range 300 to 1820ºC, • **C** … thermocouple „C“, range 0 to 2320ºC, • **D** … thermocouple „D“, range 0 to 2320ºC, • **RTD** … rtd sensor Pt100, range -200 to 800ºC. **Setting of input sensor … process input:** • **No** … input is not set, • **0-20mA** … current signal 0 - 20mA, • **4-20mA** … current signal 4 – 20mA, • **0-5V** … voltage signal 0 – 5V, • **1-5V** … voltage signal 1 – 5V, • **0-10V** … voltage signal 0 – 10V.
Dec1 ▫▫▫▫▫▫	**Setting of decimal point … thermal input:** • **0** … no decimal point, • **0.0** … 1 decimal point. **Setting of decimal point … process input:** • **0** … no decimal point, • **0.0** … 1 decimal point, • **0.00** … 2 decimal points, • **0.000** … 3 decimal points.
Cal1 ▫▫▫▫▫▫	**Correction of sensor**. The set value is added to process value. Range: -999 to 999 ºC.
Range1-Lo ▫▫▫▫▫▫	Together with parameter **Range1-Hi** you also set **the scale of displaying process values** for process inputs. Rozsah: -999 to 2999.
Range1-Hi ▫▫▫▫▫▫	Together with parameter **Range1-Lo** you also set **the scale of displaying process values** for process inputs. Range: -999 to 2999.
Filter1 ▫▫▫▫▫▫	You set filter coefficient for input signal. The more the filter coefficient is the more the filter smoothes the input signal. Range: **Off**, 0.1 to 60.0 seconds.

Digital inputs … how to set digital inputs

Dig. input1 ▫▫▫▫▫▫	**Function of digital input 1:** • Off … no function, • Start … ***rising edge signálu*** … start of program which is defined by the parameter Start prog1, • End … ***rising edge of signal*** … ending of program, • Wait … ***rising edge of signal*** … waiting of program for the confirmation by digital input, • Stop … ***rising edge of signal*** … stopping of program, ***falling edge of signal*** … continue of program, • OutOff … ***high level of signal*** ….. switching OFF of output, deleting of memory for integral and derivate of the controller, • OutFrz … ***high level of signal*** … switching OFF of the output, memory for integral and derivate remain unchanged, • Lock … ***high level of signal*** … lock of the key board.
Start prog1 ▫▫▫▫▫▫	**Number of the program that will be started by the digital input 1 when there is setting Dig. input1 = Start.** Range: 1 to 30.
Dig. input2 ▫▫▫▫▫▫	**Function of the digital input 2:** • Off … no function, • Start … ***rising edge of signal*** … start of program which is defined by the parameter Start prog2, • End … ***rising edge of signal*** … ending of program, • Wait … ***rising edge of signal*** … waiting of program for the confirmation by digital input, • Stop … ***rising edge of signal*** … stopping of program, ***falling edge of signal*** … continue of program, • OutOff … ***high level of signal***… … switching OFF of output, deleting of memory for integral and derivate of the controller, • OutFrz … ***high level of signal*** … switching OFF of the output, memory for integral and derivate remain unchanged, • Lock … ***high level of signal*** … lock of the key board.
Start prog2 ▫▫▫▫▫▫	**Number of the program that will be started by digital input 2 when there is setting Dig. input2 = Start.** Range: 1 to 30.

Communications1 … setting of first comunication line

Comm1 ▫▫▫▫▫▫	**Setting of first communication line:** • Modbus … comunication with PC, protocol MODBUS, • M-S … Ht205 is device MASTER in system „Master – Slave“, cascade control, … , it transmits set point value, procees value and the measured value of the power at the output 1, it reads process values from max. 10 SLAVE controllers (*). • EMeter … monitoring of energy meter for energy consumption (meter EM24). The address for the communication with energy meter is in default setting 1.
Baud1 ▫▫▫▫▫▫	**Communication baudrate of first communication line:** • 9600 … 9600Bd, • 57600 … 57600Bd, • 115200 … 115200Bd. New baudrate is set after the restart of device.
Addr1 ▫▫▫▫▫▫	**Address of device** at the communication via protocol Modbus. Range: 1 to 250.

Communications2 … setting of the second communication line

Comm2 ▫▫▫▫▫▫	**Setting of the second communication line:** • Modbus … communication with PC, protocol MODBUS, • M-S … Ht205 is MASTER controller in system „Master – Slave“, cascade control, … , it transmitts set point value, process values and the measured value of the power at the output 1, reads measured values from max. 10 SLAVE controllers (*).
Baud2 ▫▫▫▫▫▫	**Baudrate of the second communication line:** • 9600 … 9600Bd, • 57600 … 57600Bd, • 115200 … 115200Bd. New baudrate is set after the restart of the device.
Addr2 ▫▫▫▫▫▫	**Address of the device** at the communication via protocol Modbus. Range: 1 to 250.

(*) … If the both communication lines are set for system „Master – Slave“, process values of the SLAVE controllers are read only from the first communication line 1.

LAN ... setting for LAN interface

IP ▫▫▫.▫▫▫.▫▫▫.▫▫▫	**IP address of LAN interface.**
IP adress 192.168.0.1	• With the key „**ENTER**“ you browse the particulars of IP address. • With help of arrow keys you set the requested value of IP address.
SNET ▫▫▫.▫▫▫.▫▫▫.▫▫▫	**SNET, network mask of LAN interface.**
SNET adress 255.255.255.0	• With arrow keys you set the requested value of network mask.
IPG ▫▫▫.▫▫▫.▫▫▫.▫▫▫	**IPG address of LAN interface.**
IPG adress 192.168.0.20	• With the key „**ENTER**“ you browse the particulars of IPG address. • With help of the arrow keys you set the requested value of IPG address.
Port ▫▫▫▫▫	**Number of port for LAN interface.**
Port 10000	• With help of the arrow keys you choose the requested number of port.
LAN restrict ▫▫▫▫▫▫	**Limitation for LAN interface:** • **Read** … through LAN interface you can read only the values of parameters, • **Rd/Wr** … through LAN interface you can read and write the values of parameters.
LAN password >	Password for the communication through **LAN interface**.
LAN password _ _ _ _ _ _ _	With the key „**ENTER**“ you browse the particular figuers of the password. With help of arrow keys you set the requested figures. New password is valid at new connection via LAN interface. Password is not turned OFF, if spaces are set … shown as _____.

Important:

- Configuration is written into LAN module after 30 seconds when you leave the menu for LAN interface.

Output1 ... setting of the output 1

Output1 ▫▫▫▫▫▫	**Function of the first (control) output:** • Off … output is switched OFF, • Ht … heating control, PID controlling, • Ht2 … heating control, ON/OFF controlling • Ht3A … heating control, 3-way switching step controlling.
Signal1 ▫▫▫▫▫▫	**Setting of the first process output, voltage signal:** • 0-10V … output 0-10VDC, galvanicly isolated, • 0-5V … output 0-5VDC, galvanicly isolated. **Setting of the first process output, current signal:** • 0-20mA … output 0-20 mA, galvanicly isolated, • 4-20mA … output 4-20mA, galvanicly isolated.
Ct1 ▫▫▫▫▫▫	**Time cycle of the output 1 for SSD and relay output.** Range: 1 to 200 seconds.
Valve hyst. ▫▫▫▫▫▫	**Hysteresis for switching of valve at 3-way step controlling**. The higher the parameter is, the less frequently the valve is controlled. Range: 1 to 50%.
Time overrun ▫▫▫▫▫▫	**Time of transition of valve from minimum to maximum position for 3-way switching step control**. The correct setting of this value is necessary for precise control. Range: 1 to 999 seconds.
Algo PID ▫▫▫▫▫▫	**Algorithm of PID controlling**: • PID … one set of PID parameters, • 2xPID … two sets of PID parameters.
Switch PID ▫▫▫▫▫▫	**Temperature at which the sets of PID parameters are switched over.** Range: -999 to 2999 ºC.
PowLimit-Lo ▫▫▫▫▫▫	**Power limit for the output power at lowe temperatures than set in the parameter Switch-PL**. Range: 0 to 100%.
Switch-PL ▫▫▫▫▫▫	**Temperatur efor switching over of the power limit.** Range: -999 to 2999 ºC.
PowLimit-Hi ▫▫▫▫▫▫	**Power limit for the output power at lowe temperatures than set in the parameter Switch-PL**. Range: 0 to 100%.
Der time1 ▫▫▫▫▫▫	**It makes more accurate the delay of derivate for the output 1 of PID controller**. The more value is set, the more derivative value is damped down. Range: 1.0 to 100.0 seconds.

Output2 ... setting of the output 2

Output2 ▫▫▫▫▫▫	**Function of the second (control) output:** • Off … output is turned OFF, • Cl … cooling control, PID controlling, • Cl2 … cooling control, ON/OFF controlling, • AHeat … auxiliary heating.
Signal2 ▫▫▫▫▫▫	**Setting of the second process output, voltage signal:** • 0-10V … output 0-10VDC, galvanicly isolated, • 0-5V … output 0-5VDC, galvanicly isolated. **Setting of the first process output, current signal:** • 0-20mA … output 0-20 mA, galvanicly isolated, • 4-20mA … output 4-20mA, galvanicly isolated.
DeSp2 ▫▫▫▫▫▫	**Set point value for output 2** – deviation from set point of output 1. Range: 0 to 1000 ºC.
Ct2 ▫▫▫▫▫▫	**Time cycle of the output 2 for SSD and relay output.** Range: 1 to 200 seconds.
% Power1 ▫▫▫▫▫▫	**Limiting of power for auxiliary heating.** Range: 0 to 100%.
Der time2 ▫▫▫▫▫▫	**It makes more accurate the delay of derivate for the output 2 of PID controller**. The more value is set, the more derivative value is damped down. Range: 1.0 to 100.0 seconds.

Output3 ... alarm output

Output3 ▫▫▫▫▫▫	**Function of the third (alarm) output:** • Off … output is turned OFF, • AlProc … alarm and its limits are defined by absolute value, • AlDev … alarm and its limits are defined by deviation from stp value.
Latch3 ▫▫▫▫▫▫	**Setting of permanent alarm:** • Off … permanent alarm is turned OFF, • On … permanent alarm is turned ON (alarm should be deactivated by the operator).
Silenc3 ▫▫▫▫▫▫	**Silencing of alarm at the power - up:** • Off … At the power up the alarm is not silenced, • On … At the power up the alarm is silenced.
Side3 ▫▫▫▫▫▫	**Selection of active limits for alarm:** • Both … low and high limit is active, • Hi … high limit is active, • Lo … low limit is active.
Hysteresis3 ▫▫▫▫▫▫	**Hysteresis for switching for the alarm output.** Range: 1 to 249 °C.

Output4 ... setting of the output 4

Unlike the standard functions of outputs 4 – 7 (event defined by the program, signalling of exceeding the temperature, indications if the program runs or is ended up), it is possible to set for the output 4 the customized function SgF, used for example for control of fan in the furnace.

Output4 ▫▫▫▫▫▫	**Function of the output 4:** • Off … output is turned OFF, • Event1 … event. output 1 controlled by the program, • SgProc … signalling when process value is beyond the defined limits, absolute value, • SgDev … signalling when process value is beyond the defined limits, deviation from stp value, • Prog … signalling when the program runs, • PrEnd … signalling when the program has ended, • SgF … control of the fan, function is described in another application sheet.
IEvent1 ▫▫▫▫▫▫	**State of the event output 1 when the program is interrupted:** • Hold … event output 1 remains unchanged, • Off …event output 1 is turned OFF, • On … event output 1 is turned ON. Parameter is shown at setting Output4 = Event1.
Side4 ▫▫▫▫▫▫	**Selection of the active limits for signalling that process value is beyond these defined limits:** • Both … low and high limit is active, • Hi … high limit is active, • Lo … low limit is active. Parameter is shown at the setting Output4 = SgProc or Output4 = SgDev.
Hysteresis4 ▫▫▫▫▫▫	**Hysteresis for switching for the signalling output.** Range: 1 to 249 ºC. Parameter is shown at the setting Output4 = SgProc or Output4 = SgDev.
SgTime4 ▫▫▫▫▫▫	**Setting of the duration of signalling at the end of a program.** Range: 1 to 999 seconds. Parameter is shown at the setting Output4 = PrEnd.
Sp SgF ▫▫▫▫▫▫	**Setting of value for the function SgF.** Range: -999 to 2999 ºC. Parameter is shown at the setting Output4 = SgF.
Time SgF ▫▫▫▫▫▫	**Duration of the running of the fan SgF.** Range: 1 to 99 minutes. Parameter is shwon at the setting Output4 = SgF.

Output5 ... setting of the output 5

Output 5 has the feature for control of start/stop of burner unlike the standard functions of outputs 4 - 7

Output5 ▫▫▫▫▫▫	**Function of the output 5:** • Off … output is turned OFF, • Event2 … event. output 2 controlled by the program, • SgProc … signalling when process value is beyond the defined limits, absolute value, • SgDev … signalling when process value is beyond the defined limits, deviation from stp value, • Prog … signalling when the program runs, • PrEnd … signalling when the program has ended, • Burner … control of the burner, function is described in another application sheet.
IEvent2 ▫▫▫▫▫▫	**State of the event output 2 when the program is interrupted:** • Hold … event output 2 remains unchanged, • Off …event output 2 is turned OFF, • On … event output 2 is turned ON. Parameter is shown at setting Output5 = Event2**.**
Side5 ▫▫▫▫▫▫	**Selection of the active limits for signalling that process value is beyond these defined limits:** • Both … low and high limit is active, • Hi … high limit is active, • Lo … low limit is active. Parameter is shown at the setting Output5 = SgProc **or** Output5 = SgDev**.**
Hysteresis5 ▫▫▫▫▫▫	**Hysteresis for switching for the signalling output.** Range: 1 to 249 ºC. Parameter is shown at the setting **Output5** = **SgProc** or **Output5** = **SgDev**.
SgTime5 ▫▫▫▫▫▫	**Setting of the duration of signalling at the end of a program.** Range: 1 to 999 seconds. Parameter is shown at the setting **Output5** = **PrEnd**.
Time on ▫▫▫▫▫▫	**Time during which the deviation from set point value must be exceeded Dev on, so that the output should be switched ON.** Range: 1 to 999 seconds. Parameter is shown at the settting **Output5** = **Burner**.
Dev on ▫▫▫▫▫▫	**The deviation from set point value.** If this deviation is exceeded (process valu eis lower) for the time **Time on**, when the output is switched ON. Range: -999 to 0 ºC. Parameter is shown at the setting **Output5** = **Burner**.
Time off ▫▫▫▫▫▫	**Time during which the deviation from set point must be exceeded Dev off, so that the output should be switched OFF.** Range: 1 to 999 seconds. Parameter is shown at the setting **Output5** = **Burner**.
Dev off ▫▫▫▫▫▫	**Deviation from set point value.** If this deviation is exceeded (process value is higher) for the time **Time off**, the output is switched OFF. Range: 0 to 999 ºC. Parameter is shown at the setting **Output5** = **Burner**.
Time start ▫▫▫▫▫▫	Time for starting of the burner. Minimum time during which the output for starting a burner is switched ON. The output can be switched OFF at the time **Time start** only in case, when set point value is turned OFF (for example by turning OFF of the program). Parameter is shown at the setting **Output5** = **Burner**.

Output6 ... setting of the output 6

Output6 ▫▫▫▫▫▫	**Function of the output 6:** • Off … output is turned OFF, • Event3 … event. output 3 controlled by the program, • SgProc … signalling when process value is beyond the defined limits, absolute value, • SgDev … signalling when process value is beyond the defined limits, deviation from stp value SP1, • Prog … signalling when the program runs, • PrEnd … signalling when the program has ended.
IEvent3 ▫▫▫▫▫▫	**State of the event output 3 when the program is interrupted:** • Hold … event output 3 remains unchanged, • Off …event output 3 is turned OFF, • On … event output 3 is turned ON. Parameter is shown at setting Output6 = Event3**.**
Side6 ▫▫▫▫▫▫	**Selection of the active limits for signalling that process value is beyond these defined limits:** • Both … low and high limit is active, • Hi … high limit is active, • Lo … low limit is active. Parameter is shown at the setting Output6 = SgProc **or** Output6 = SgDev**.**

Hysteresis6 ▫▫▫▫▫▫	**Hysteresis for switching for the signalling output.** Range: 1 to 249 ºC. Parameter is shown at the setting **Output6** = **SgProc** or **Output6** = **SgDev**.
SgTime6 ▫▫▫▫▫▫	**Setting of the duration of signalling at the end of a program.** Range: 1 to 999 seconds. Parameter is shown at the setting **Output6** = **PrEnd**.

Output7 … setting of the output 7

Output7 ▫▫▫▫▫▫	**Function of the output 7:** • **Off** … output is turned OFF, • **Event4** … event. output 4 controlled by the program, • **SgProc** … signalling when process value is beyond the defined limits, absolute value, • **SgDev** … signalling when process value is beyond the defined limits, deviation from stp value SP1, • **Prog** … signalling when the program runs, • **PrEnd** … signalling when the program has ended.
IEvent4 ▫▫▫▫▫▫	**State of the event output 4 when the program is interrupted:** • **Hold** … event output 4 remains unchanged, • **Off** …event output 4 is turned OFF, • **On** … event output 4 is turned ON. Parameter is shown at setting **Output7** = **Event4.**
Side7 ▫▫▫▫▫▫	**Selection of the active limits for signalling that process value is beyond these defined limits:** • **Both** … low and high limit is active, • **Hi** … high limit is active, • **Lo** … low limit is active. Parameter is shown at the setting **Output7** = **SgProc** **or** **Output7** = **SgDev.**
Hysteresis7 ▫▫▫▫▫▫	**Hysteresis for switching for the signalling output.** Range: 1 to 249 ºC. Parameter is shown at the setting **Output7** = **SgProc** or **Output7** = **SgDev**.
SgTime7 ▫▫▫▫▫▫	**Setting of the duration of signalling at the end of a program.** Range: 1 to 999 seconds. Parameter is shown at the setting **Output7** = **PrEnd**.

Setpoint … parameters of set point value

Sp1-Lo ▫▫▫▫▫▫	**Limit of low range for stp value.** Range: -999 to **Sp1-Hi**.
Sp1-Hi ▫▫▫▫▫▫	**Limit of high range for stp value.** Range: **Spi1-Lo** to 2999.
Outside prog. ▫▫▫▫▫▫	**State of the controller if a program does not run:** • **Off** … set point value is turned OFF, • **Sp1** … the controller maintains the process value to stp value (**Sp1**).

Program … setting of parameters for program

Ramp type ▫▫▫▫▫▫	**Type of ramp function that is allowed in the program:** • **Stpt** … step is defined by the final set point value and by the time necessary for reaching it, • **Rate** … step is defined by the final set point value and ramp rate for stp point, • **Both** … the both types of steps are allowed.
GSDe ▫▫▫▫▫▫	**Setting of band for GSD about stp value when the program runs.** Range: 1 to 999 ºC.
P-Out Action ▫▫▫▫▫▫	**Response to the power cut. It takes effect after the duration** **P-Out Time** has elapsed. • **Cont** … after the power cut the program continues, • **Stop** … if the power cut is longer than **P-Out Time** program is paused, • **End** … if the power cut is longer than **P-Out Time** program is ended up,
P-Out Time ▫▫▫▫▫▫	**Maximum duration of the power cut in minutes when the controller continues in a program without decision.** If the power cut is longer than chosen maximum duration, then the controller decides what to do, the decision is made according to the parameter **P-Out Action** (program is paused … **Stop** program is ended up … **End**). Range: 0 to 999 minutes. Parameter is not shown if it is set **P-Out Action** = **Cont**.

Start prog ▫▫▫▫▫▫	**Setting of the program starting:** • Prog … you only set the program that starts with the first step, • PrSt … you set the prorgram as well as the step.
Stop prog ▫▫▫▫▫▫	**You can choose to allow the stop of the program with the key „PROG“** … state Stop: • No … stopping of the program is not allowed, • Yes … stopping of the program is allowed.

User menu … list of parameters in use menu

Parameter1 ▫▫▫▫▫▫	**Parameter placed on the first position in user menu**: • No … parameter is not set, • PrView … menu that indicates the state of the program, • PrEdit … menu for editing of the current running step of the program, • %Pow1 … indicates the power of the output 1 in %, • %Pow2 … indicates the power of the output 2 in %, • PowPr … indicates the consumed energy kWh for the last firing (value read from energy meter … EM24), • PowTot … indicates the total consumed energy in kWh (value read from energy meter … EM24), • AlOff … the function for turning the alarm OFF, • Aut … starting / stopping of automatic optimalization of PID parameters/autotuning, • Event1 … showing (when in program) / controlling (when not in program) of the event output 1, • Event2 … showing (when in program) / controlling (when not in program) of the event output 2, • Event3 … showing (when in program) / controlling (when not in program) of the event output 3, • Event4 … showing (when in program) / controlling (when not in program) of the event output 4, • Panel … menu for setting of basic screen, • Dlog … menu for showing / setting of datalogger, • Msg … menu for showing messages, • Clock … menu for setting of the real time clock.
Parameter2 ▫▫▫▫▫▫	**Parameter that is placed on 2nd position of user menu. The list is the same as in Parameter1.**
Parameter3 ▫▫▫▫▫▫	**Parameter that is placed on 3rd position of user menu. The list is the same as in Parameter1.**
Parameter4 ▫▫▫▫▫▫	**Parameter that is placed on 4th position of user menu. The list is the same as in Parameter1.**
Parameter5 ▫▫▫▫▫▫	**Parameter that is placed on 5th position of user menu. The list is the same as in Parameter1.**
Parameter6 ▫▫▫▫▫▫	**Parameter that is placed on 6th position of user menu. The list is the same as in Parameter1.**
Parameter7 ▫▫▫▫▫▫	**Parameter that is placed on 7th position of user menu. The list is the same as in Parameter1.**
Parameter8 ▫▫▫▫▫▫	**Parameter that is placed on 8th position of user menu. The list is the same as in Parameter1.**
Parameter9 ▫▫▫▫▫▫	**Parameter that is placed on 9th position of user menu. The list is the same as in Parameter1.**
Parameter10 ▫▫▫▫▫▫	**Parameter that is placed on 10th position of user menu. The list is the same as in Parameter1.**
Parameter11 ▫▫▫▫▫▫	**Parameter that is placed on 11th position of user menu. The list is the same as in Parameter1.**
Parameter12 ▫▫▫▫▫▫	**Parameter that is placed on 12th position of user menu. The list is the same as in Parameter1.**

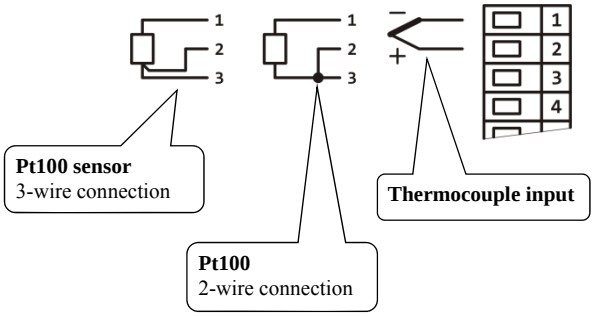
Password … setting of password for the entry to menu

Pass Sp1 ▫▫▫▫▫▫	**Password for the change of the set point value.** Range: Off, 1 to 9999.
Pass Prog ▫▫▫▫▫▫	**Password for the entry to program editing.** Range: Off, 1 to 9999.
Pass Oper ▫▫▫▫▫▫	**Password for the entry to operation level.** Range: Off, 1 to 9999.
Pass Conf ▫▫▫▫▫▫	**Password for the entry to configuaration level.** Range: Off, 1 to 9999.
Pass Serv ▫▫▫▫▫▫	**Password for the entry to service level.** Range: Off, 1 to 9999.

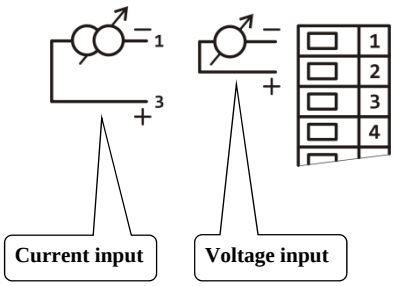
6.1 Measuring input

The right selection, the installation, the wiring, the location of sensor in the equipment and the corresponding setting of parameters of the controller has the essential importance for the correct function.

Thermal input



Process input



Setting of measuring input

You set the input in ***configuration level***, menu **`Input1 >`** with the following parameters:

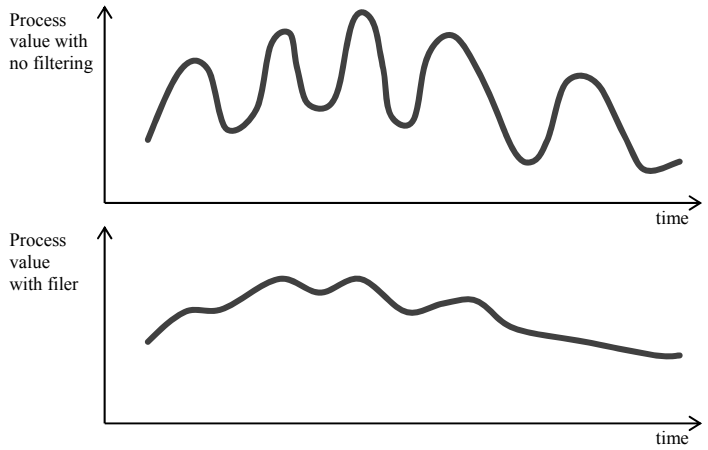
Parameter	Description	Thermal input	Process input
`Input1`	Type of input sensor	• **`J`** … thermocouple „J“ • **`K`** … thermocouple „K“ • **`T`** … thermocouple „T“ • **`N`** … thermocouple „N“ • **`E`** … thermocouple „E“ • **`R`** … thermocouple „R“ • **`S`** … thermocouple „S“ • **`B`** … thermocouple „B“ • **`C`** … thermocouple „C“ • **`D`** … thermocouple „D“ • **`RTD`** … RTD sensor Pt100	• **`0-20mA`** … current input 0 to 20mA • **`4-20mA`** … current input 4 to 20mA • **`0-5V`** … voltage input 0 to 5V • **`1-5V`** … voltage input 1 to 5V • **`0-10V`** … voltage input 0 to 10V
`Dec1`	Setting of number of decimal points	• **`0`** … no decimal point • **`0.0`** … 1 decimal point	• **`0`** … no decimal point • **`0.0`** … 1 decimal point • **`0.00`** … 2 decimal point • **`0.000`** … 3 decimal point
`Cal1`	Setting of sensor calibration (value is added to process value)	-999 to 999	
`Range1-Lo`	Range of process input	**`x`**	-999 to 2999
`Range1-Hi`			-999 to 2999
`Filter1`	Input filter	**`Off`**, 0.1 to 60.0 seconds	

Important:

- Inputs ***are not galvanically isolated*** from the ground of the device.
- Thermocouple and RTD inputs have the detection of improperly wired sensor. When the sensor is open or broken, the
- control output is turned OFF, the alarm output is activated, the signal output is deactivated.
- Process input 4 to 20mA has the detection of broken sensor, it is defined when the current is lower than 3mA, other process inputs have no detection.

Input filter

If the process value is distorted by interference, you can use the digital filter. The more the filter coefficient **Filter1** is, the more the filter smoothes the input signal. When in setting **Filter1** = **Off** the filter is turned OFF.



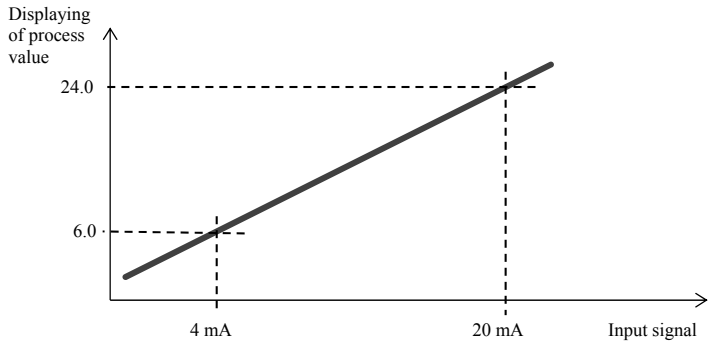
Setting of range of process inputs

You can define the range by the parameters **Range1-Lo** , **Range1-Hi** and **Dec1**.

Example of setting for the process inputp:
You want the input signal 4 to 20 mA to be displayed in the range 6.0 to 24.0. Make this setting:

- **Input1** = **4-20mA**,
- **Dec1** = **0.0**,
- **Range1-Lo** = **6.0**,
- **Range1-Hi** = **24.0**.

The distribution between the values 6.0 and 24.0 will be linear.



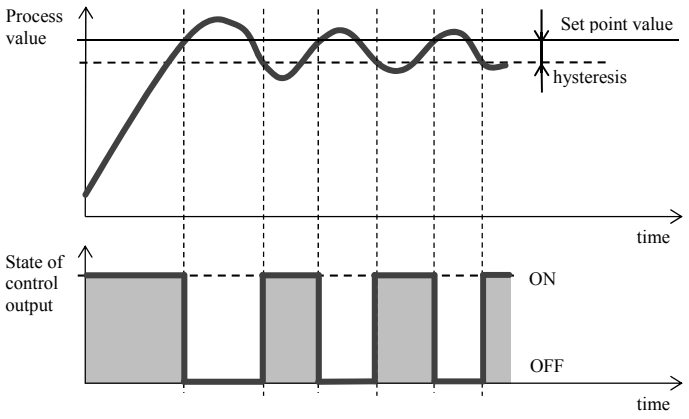
6.2 Controlling, the control outputs

The controller enables to control the system by PID controlling, ON/OFF switching, 3-way switching control. You can choose heating as well as cooling. For controlling the outputs 1 and 2 are used.

Function of control outputs	Output 1	Output 2	Description
Heating	✓	×	Controller uses always the output 1 for heating. It can be chosen PID controlling or ON/OFF switching.
Cooling	×	✓	Controller uses always the output 2 for cooling. It can be chosen PID controlling or ON/OFF switching.
Heating + auxiliary heating	✓	✓	Output 1 is used for heating, output 2 is used of auxiliary heating. Power of the output 2 is calculated in this way: Power2 = Power1 x `% Power1`. Parameter `% Power1` can be found in ***configuration level***, menu `Output2 >`.
Heating + cooling	✓	✓	Output 1 is used for heating, output 2 is used for cooling. Both outputs can be set for PID control or ON/OFF switching.
3-way control	✓	✓	System or furnace is control by outputs 1 and 2. The position of the valve is counted from the time of transition of the valve. 3-way switching is allowed only for relay outputs or SSD outputs.

ON/OFF switching

ON/OFF control is selected by setting `Output1` = `Ht2` (heating control) or `Output2` = `Cl2` (cooling control). It is used for less exacting application. It is not possible to achieve zero hysteresis value on principle. The process value rises and drops about set point value in the characteristic way.



Summary of parameters for setting of ON/OFF switching, heating

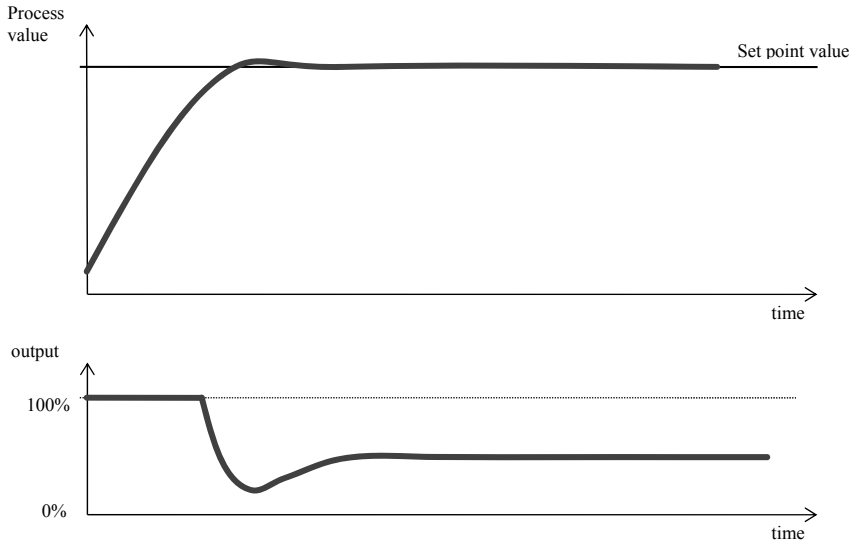
Parameter	Description	Placing
`Output1` = `Ht2`	Setting of the output 1 for ON/OFF switching, heating.	***Configuration level***, menu `Output1 >`
`Hys1` = `xxx`	Setting of hysteresis for the output 1.	***Operation level***, menu `Output1 >`

Summary of parameters for setting of ON/OFF switching, cooling

Parameter	Description	Placing
`Output2` = `Chl2`	Setting of the output 2 for ON/OFF switching, cooling.	***Configuration level***, menu `Output2 >`
`DeSp2` = `xxx`	Deviation of set point value for cooling from set point for heating.	
`Hys2` = `xxx`	Setting of hysteresis for the output 2.	***Operation level***, menu `Output2 >`

PID controlling

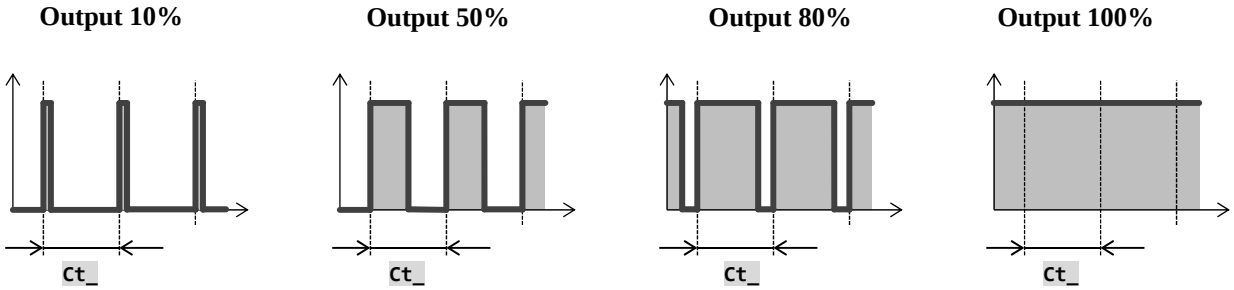
PID control is selected by setting **Output1** = **Ht** (heating) or **Output2** = **Cl** (cooling). It provides the precise control. For the correct function of the controller, however, it is necessary to set properly PID parameters. The controller has the autotuning for setting of PID parameters that is described further.



PID parameters have the following meaning:

- **Prop** … proportional band, is set in measured units. It is the band about the set point value in which the controller keeps the temperature.
- **Int** … integral, in minutes. Integral compensates the loss of system. A low integral value causes a fast
- integrating action.
- **Der** … derivative, in minutes. Derivative responses to fast changes and tries to react against them. The morevalue
- is, the more derivative factor reacts.

If the control output is 2 state (ON/OFF) (relay or SSR), the power is (given in %) transferred to the output with so called **pulse width modulation**. In each time cycle (parameter **Ct_**) the control output is switched ON once and once OFF. The more the power is necessary, the wider the width of switching is.
The output responses are illustrated inthe third part of the drawing:



Important:

The duration of time cycle has the influence on quality of control. The longer the cycle is, the less the quality of control is. If the electromechanical unit (relay, switching contactor) is used for the control output, the duration of time cycle must be set longer with regard to lifetime of switch.

Summary of parameters for setting of PID control, heating:

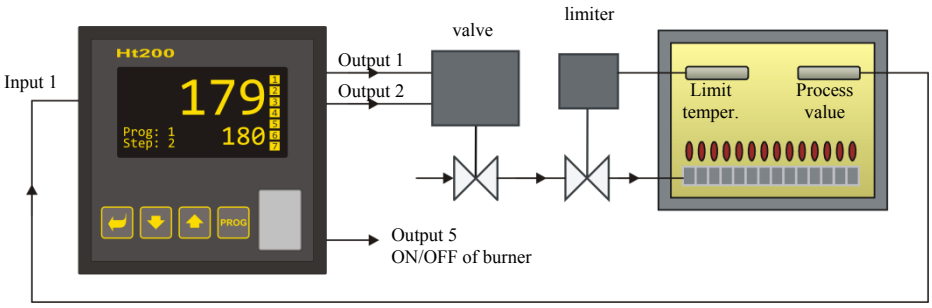
Parameter	Description	Placing
Output1 = Ht	Setting of the output 1 for PID control, heating.	***Configuration level***, menu **Output1 >**
Signal1 = xxx	Setting of process input (0 to 20mA, 4 to 20mA, …).	
Ct1 = xxx	Setting of time cycle for relay output or SSD.	
Algo PID = xxx	1 set or 2 sets of PID parameters.	
Switch PID = xxx	Temperature for switching between 2 sets PID parameters.	
PowLimit-Lo = xxx	Power limit function, low values.	
Switch-PL = xxx	Setting of limit between low and high values of power limit function.	
PowLimit-Hi = xxx	Power limit function, high values.	
Der time1 = xxx	Character (delay) of derivate.	
Autotuning = xxx	Starting of automatic setting of PID parameters.	***Operation level*** or ***User level***
Prop1-A = xxx	Proportional band, 1. set of PID parameters.	***Operation level***, menu **Output1 >**
Int1-A = xxx	Integral, 1. set of PID parameters.	
Der1-A = xxx	Derivate, 1. set of PID parameters.	
Prop1-B = xxx	Proportional band, 2. set of PID parameters.	
Int1-B = xxx	Integral, 2. set of PID parameters.	
Der1-B = xxx	Derivate, 2. set of PID parameters.	

Summary of parameters for setting of PID control, cooling

Parameter	Description	Placing
Output2 = Chl	Setting of the output 2 for PID control, cooling.	***Configuration level***, menu **Output2 >**
Signal2 = xxx	Setting of process output (0 to 20mA, 4 to 20mA, …).	
DeSp2 = xxx	Deviation of set point value of the output 2 from set point for the output 1.	
Ct2 = xxx	Setting of time cycle for relay output or SSD.	
Autotuning = xxx	Starting of automatic setting of PID parameters.	***Operation level*** or ***User level***
Prop2-A = xxx	Proportional band.	***Operation level***, menu **Output2 >**
Int2-A = xxx	Integral.	
Der2-A = xxx	Derivate.	

3 – way switching step control

The controller in 3-way switching mode is intended for the control of valve and uses the PID algorithmus for the determination of the requested power. This power is transmitted through the outputs 1 and 2 of the controller. The position of the valve is controlled by the time (the time necessary for the whole transition of the valve from minimum position to maximum position must be defined).
3-way switching step control is allowed only in case when the outputs 1 and 2 are equipped with SSD or relay.



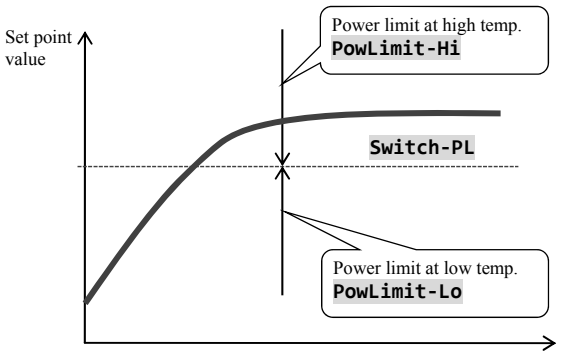
Description how the controller works

- Controller uses PID control.
- The position of the valve is controlled by the time. The time necessary for the whole transition of the valve from minimum position to maximum position must be defined by the operator. The parameter **`Time overrun`**.
- Output 1 opens the valve up. If the power of 100% is requested, the output 1 is permanently turned ON, the output 2 is permanently turned OFF.
- Output 2 closes the valve down. If the power of 0% is requested, the output 2 is permanently turned ON, output1 is permanently turned OFF.
- Hysteresis of the output, parameter **`Valve hyst.`**, this sets sensitivity of the output to change for the requested power. The higher the parameter is set, the less frequently the valve is controlled.
- When 3-way switching control is chosen, we recommend to set the parameter **`Der time1`** to the value about 25,0.

Summary of parameters for setting of PID control, heating:

Parameter	Description	Placing
`Output1 = Ht3A`	Setting of the output 1 and 2 for 3-way switching control.	***Configuration level***, menu **`Output1 >`**
`Valve hyst. = xxx`	Setting of hysteresis for switching of the valve.	
`Time overrun = xxx`	Time of transition of the valve from minimum to max. position.	
`Algo PID = xxx`	1 or 2 sets of PID parameters.	
`Switch PID = xxx`	Temperature of switching between 2 sets of PID parameters.	
`PowLimit-Lo = xxx`	Power limit function, low values.	
`Switch-PL = xxx`	Setting of limit between low and high values of power limit function.	
`PowLimit-Hi = xxx`	Power limit function, high values.	
`Der time1 = xxx`	Character (delay) of derivate.	
`Autotuning = xxx`	Starting of autotuning.	***Operation level*** or ***User level***
`Prop1-A = xxx`	Proportional band, 1. set of PID parameters.	***Operation level***, menu **`Output1 >`**
`Int1-A = xxx`	Integral, 1. set of PID parameters.	
`Der1-A = xxx`	Derivate, 1. set of PID parameters.	
`Prop1-B = xxx`	Proportional band, 2. set of PID parameters.	
`Int1-B = xxx`	Integral, 2. set of PID parameters.	
`Der1-B = xxx`	Derivate, 2. set of PID parameters.	

Power limit function for the control output



You can improve the quality of control by limiting of the output power. Power limit function can be used only for heating.

Example how to set the power limit function:

When rising at set point value the big overshoot occurs. One of possible solution is the power limit in the vicinity of set point value. The procedure is the following:

- Find out the power supplied to the stable system.
- Set the switcher **Switch-PL** on the value by several ^{0}C less than set point value.
- Power limit function **PowLimit-Lo** set it to 100%.
- Power limit function **PowLimit-Hi** set it the level that is approx. By 10 to 20% higher than the power supplied to the stable system.

6.3 Alarm output

The third output (output 3) is alarm.

Alarm is active (**the control light of the output is lit, relay is opened**) in the following cases:
- Error of sensor is indicated (for thermal inputs and current loop 4-20mA at the currents smaller than 3mA),
- Error in memory with parameters of controllers is indicated … it is indicated by message **Error1**,
- Error of input convertor is indicated … indicated by the message **Error3**,
- Chosen alarm limits are exceeded.

Setting of alarm output

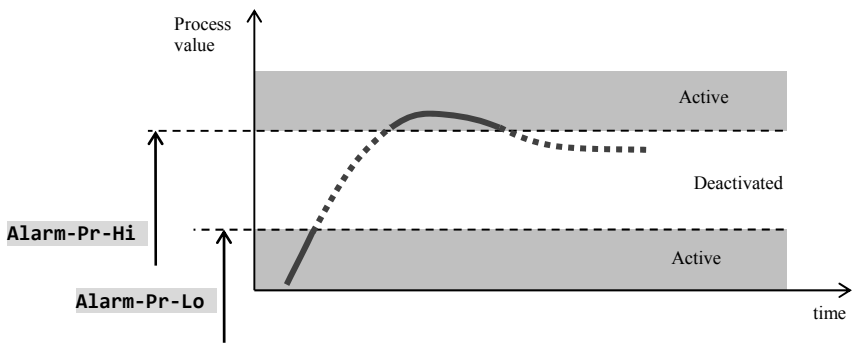
You can set the alarm output in ***configuration level***, alarm limits in ***operation level***, by the following parameters:

Parameter	Description	Placing
Output3 = **xxx**	Setting of the alarm type.	***Configuration level,*** menu **Output3 >**
Latch3 = **xxx**	Setting for permanent alarm.	
Silenc3 = **xxx**	Silencing of the alarm at power up.	
Side3 = **xxx**	Choosing of alarm limits.	
Hysteresis3 = **xxx**	Switching hysteresis of the alarm output.	
Alarm-Pr-Lo = **xxx**	Alarm limits, absolute value, low and high limit.	***Operation level***, menu **Output3 >**
Alarm-Pr-Hi = **xxx**		
Alarm-De-Lo = **xxx**	Alarm limits, deviation from set point value, low and high limit.	
Alarm-De-Hi = **xxx**		
Alarm Off = **xxx**	Turning OFF for permanent alarm after the alarm condition is over.	***Operation level*** or ***User level***

Setting of alarm output

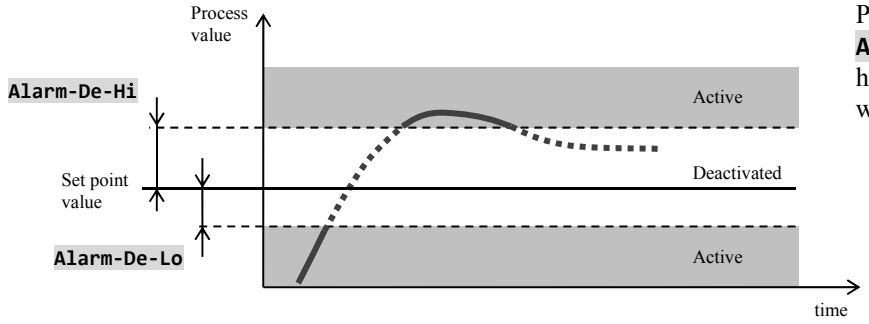
Type of alarm can be set by the parameter **Output3**, which is found in ***configuration level***, menu **Output3 >**.
- **Output3** = **Off**, alarm output is turned OFF,
- **Output3** = **AlProc**, alarm limits defined by the absolute value,
- **Output3** = **AlDev**, alarm limits are set as the deviation from stp value.

Alarm defined by the absolute value of temperature … **Output3** = **AlProc**



Alarm limits are defined from absolute values.

Alarm defined by the deviation from stp value … **Output3** = **AlDev**



Parameters **Alarm-De-Lo** and **Alarm-De-Hi** can define low and high deviation from set point at which the alarm is active.

Temporary, permanent (latched) alarm

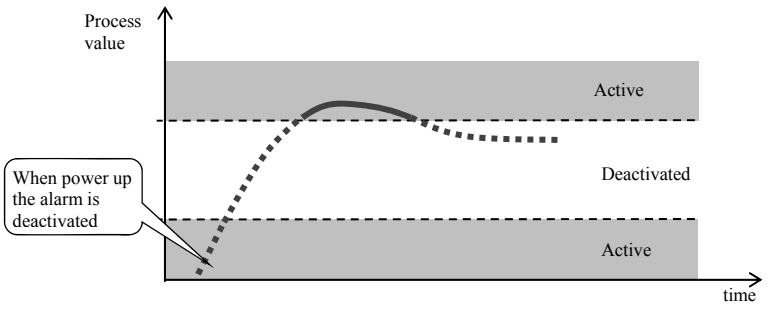
Alarm can be temporary (**Latch3** = **Off**) or permanent (latched) (**Latch3** = **On**).

- **Temporary alarm** will turn automatically off when the alarm condition is over.
- **Permanent alarm** is turned ON even when the alarm condition is over. Turn OFF permanent (latched) alarm when the
- alarm condition is over by the function **Alarm Off**, that is found in *user leve*l or *operation level*. Permanent alarm is also turned off after the supply voltage interruption.

Silencing of alarm

Silencing of alarm can be used to disable alarm at startup rising to set point value. This state should not be evaluated as error because the system is not yet stable.
This function is set with the parameter :

- **Silenc3** = **Off**, function is not active,
- **Silenc3** = **On**, alarm can be activated after the process value at the startup rising reaches the allowed range for the first time (between alarm limits).



Active sides of alarm

With parameter **Side3** you can choose the active sides of the alarm:

- **Side3** = **Both**, both sides (limits) are active,
- **Side3** = **Hi**, only high alarm side (limit) is active,
- **Side3** = **Lo**, only low alarm side (limit) is active.

7 Service level

If the entry to the service level is blocked by the password, you will get to service level by setting the right password.

Diagnostics >	Menu of **Diagnostics of controller**.
AmbTemp ▫▫▫▫▫▫▫	It shows the actual ambient temperature measured at the terminal.
Tc1 ▫▫▫▫▫▫▫	Measured voltage, thermocouple input 1. Range 60mV.
Rtd1 ▫▫▫▫▫▫▫	Measured resistance, resistance input 1. Range 350 Ω.
PrI1 ▫▫▫▫▫▫▫	Measured current, current input 1.Range 20mA
PrU1 ▫▫▫▫▫▫▫	Measured voltage, voltage input 1. Range 10V.
AmbTemp > 50 ▫▫▫▫▫▫▫	Time in hours, when the ambient temeprature was higher than 50 ºC.
AmbTemp > 60 ▫▫▫▫▫▫▫	Time in hours, when the ambient temeprature was higher than 60 ºC.
AmbTemp > 70 ▫▫▫▫▫▫▫	Time in hours, when the ambient temeprature was higher than 70 ºC.
AmbTemp > 80 ▫▫▫▫▫▫▫	Time in hours, when the ambient temeprature was higher than 80 ºC.
Datalogger Amb >	Menu for showing the ambient temperatures stored in datalogger.
Datalogger 30.08.2012 Time Amb 10:40 21.9 10:30 21.8 10:20 21.6 10:10 21.6	In datalogger the ambient temperatures of the controller are stored, the temperatures measured by the thermal sensor place dat the input 1. Interval for writing of ambient temperature is 10 minutes.
System >	**System menu.**
Dlog Data ▫▫▫▫▫▫▫	Total number of logs in datalogger (process value, set point value, …).
Dlog Msg ▫▫▫▫▫▫▫	Total numebr of logs in the message datalogger.
Dlog AmbTemp ▫▫▫▫▫▫▫	Total number of logs in datalogger for the ambient temperature.
Rst Supply ▫▫▫▫▫▫▫	Number of switching ON of the device.
Rst WD ▫▫▫▫▫▫▫	Number of the restarts caused by the function Watch Dog.
Rst Osc ▫▫▫▫▫▫▫	Number of the restarts caused by the error in oscillator.
ConvertErr ▫▫▫▫▫▫▫	Number of wrong readings from the convertor.
RdBlokErr ▫▫▫▫▫▫▫	Number of the wrong readings of the configuration parameters from memory EEPROM.
WrBlokErr ▫▫▫▫▫▫▫	Number of the wrong writings of the configuration parameters from memory EEPROM
Reset >	**Reset of menu.** Reset mut be confirmed by 5 times.
Reset no	• **Conf** … reset of configuration parameters of the device (operation, configuration menu). • **Program** … reset of programs. • **Status** … reset of the status information of the controller (information about the course of the program, stored errors, dataloggers). • **Datalogger** … reset of dataloggers. • **All** … reset of all the parameters in the controller.

8 Communication line

With the device you can communiacte through the interface:
- 1. communication line (EIA485), protocol MODBUS ^{RTU},
- 2. communication line (EIA485), protocol MODBUS ^{RTU},
- LAN interface, protocol MODBUS^{RTU}.

In the following chapters there will be the description of the registers of the controller Ht205.
The description of protocol MODBUS ^{RTU} will be detailed in the single manual.

8.1 Summary of registers of communication line

Table contains the overall summary of registers accessible for communication line. Meaning of particular items stated below is the following:
- **Display** … text that is shown on the display of the device.
- **Address** … address of the register. After the address there is a stated access to register, r … only reading, r/w … reading and writing.
- **Range** … Range of register values.
- **Initiation** … initial value at the first power up or restart.
- **Dec. point** … it determines the number of decimal points shown on the display. Conversion is shown in the following table.
- **Note** … it is mostly given the meaning of the register.

	Decimal point	Value that is set by communication line	Value on dispaly	Note
Default setting of decimal point	0	2300	2300	No decimal point.
	1		230.0	1 decimal point.
	2		23.00	2 decimal points.
Thermal input	**Dec1** = 0	2300	230	Acc. to par. **Dec1** (no dec. point).
	Dec1 = 1		230.0	Acc. to par. **Dec1** (1 dec. point).
Process input	**Dec1** = 0	2300	230	Acc. to par. **Dec1** (no dec. point).
	Dec1 = 1		23.0	Acc. to par. **Dec1** (1 dec. point).
	Dec1 = 2		2.30	Acc. to par. **Dec1** (2 dec. points).
	Dec1 = 3		0.230	Acc. to par. **Dec1** (3 dec. points).

HW configuration of the device

Display	Address	Range	Initiation	Dec.point	Note
	0 r				Class of Firmware.
	1 r	0 … thermocouple + Pt100 1 … process input			Measuring input.
	2 r	0 … none 1 … komunikační line 2 … digital inputs			1. universal input / output.
	3 r	0 … none 1 … communication line			2. universal input / output.
	4 r	0 … none 1 … LAN modul			LAN modul.
	5 r	1 … SSD 2 … relay 3 … process voltage 4 … process current			1. output.
	6 r	0 … none 1 … SSD 2 … relay 3 … process voltage 4 … process current			2. output.
	7 r	0 … none 1 … relay			3. output, alarm.
	8 r	0 … none 1 … 1 relay (4 output) 2 … 2 relay (4, 5 output) 3 … 3 relay (4 to 6 output) 4 … 4 relay (4 to 7 output)			4. to 7. output.
	10 r	0 … no system error 1 … system errror of the device (EEPROM, convertor)			Internal error of the device.

Reading of the state of the device

Display	Address	Range	Initiation	Dec.point	Note
	20 r	Process value		Dec1	If the sensor is not set, this value is given back -22000. If the sensor error, this valu eis given back -22001.
	21 r	Actual set point value on lower display		Dec1	If the set point value is turned OFF (Off), this value is given back -22000.
	22 r	Ambient temperature		1	
	23 r	0 to 100		0	Output 1, power in percentage.
	24 r	0 to -100 0 to 100		0	Output 2: • Power in percentage for cooling control. • Power in percentage for auxiliary heating control.
	25 r	0 … no alarm 1 … alarm is active			Output 3, alarm.
	26 r	0 … OFF 1 … ON			Output 4.
	27 r	0 … OFF 1 … ON			Output 5.
	28 r	0 … OFF 1 … ON			Output 6.
	29 r	0 … OFF 1 … ON			Output 7.
	30 r	0 … not active 1 … active			1. digital input. Register copies the state of the digital input.
	31 r	0 … not active 1 … active			1. digital input. Register is set by the change of log. value (rising edge) of digital input, it is deleted after reading.
	32 r	0 … not active 1 … active			2. digital input. Register copies the state of the digital input.
	33 r	0 … not active 1 … active			2. digital input. Register is set by the change of log. value (rising edge) of digital input, it is deleted after reading.

Display	Address	Range	Initiation	Dec.point	Note
	40 r	0 … out of program 1 … course of program 2 … state „STOP“			State of the controller.
Program	41 r	1 to 30			Actual running program.
Step	42 r	1 to 15			Actual running step.
End SP	43 r			Dec1	Final set point.
Time rem	44 r				Time to the end of the step, hours.
	45 r				Time to the end of the step, minutes.
Power total	50 r	**Low value** Range 0 to 65535			Total energy consumption, state of the energy meter.
	51 r	**High value** Range 0 to 65535			***Total consumption =*** ***((65536 * high value) + low value) / 10***
Power prog	52 r	**Low value** Range 0 to 65535			Energy consumption for the last firing, state of the energy meter.
	53 r	**High value** Range 0 to 65535			***Total consumption =*** ***((65536 * high value) + low value) / 10***

Starting, ending of a program

Display	Address	Range	Initiation	Dec.point	Note
	60 w	1 to 30	1	0	By writing to this address you start the appropriate program (1 to 30).
	61 w	0 … no action 1 … ending of program	0	0	By writing „1“ to this address you end up the running program.

Starting a program by the real time clock

Display	Address	Range	Initiation	Dec.point	Note
Program	70 r/w	0 to 30 0 … Off	0	0	Requested program.
Month	71 r/w	0 to 12 0 … Off	0	0	Month.
Date	72 r/w	1 to 31	1	0	Day.
Hour	73 r/w	0 to 23	0	0	Hour.
Minute	74 r/w	0 to 59	0	0	Minute.

Other commands

Display	Address	Range	Initiation	Dec.point	Note
Alarm Off	80 w	0 … no action 1 … cancelling of permanent alarm		0	By setting „1“ you cancel the permanet alarm.

Operation level

Display	Address	Range	Initiation	Dec.point	Note
	100 r/w	Sp1-Lo to Sp1-Hi		Dec1	Set point, valu eis shown on lower display.
Prop1-A	110 r/w	10 to 24990	200	Dec1	Proportional band, 1. set of parameters for heating.
Int1-A	111 r/w	0 to 999 0 … Off	100	1	Integral, 1. set of parameters for heating.
Der1-A	112 r/w	0 to 999 0 … Off	24	2	Derivative, 1. set of parameters for heating.
Prop1-B	113 r/w	10 to 24990	200	Dec1	Proportional band, 2. set of parameters for heating.
Int1-B	114 r/w	0 to 999 0 … Off	100	1	Integral, 2. set of parameters for heating.
Der1-B	115 r/w	0 to 999 0 … Off	24	2	Derivative, 2. set of parameters for heating.
Hys1	116 r/w	10 to 2490	20	Dec1	Switching hysteresis of the output 1 for ON/OFF control.
Prop2-A	120 r/w	10 to 24990	200	Dec1	Proportional band, set of parameters for cooling.
Int2-A	121 r/w	0 to 999 0 … Off	100	1	Integral, set of parameters for cooling.
Der2-A	122 r/w	0 to 999 0 … Off	24	2	Derivative, set of parameters for cooling.
Hys2	123 r/w	10 to 2490	20	Dec1	Switching hysteresis of the output 2 for ON/OFF control.
Alarm-Pr-Lo	130 r/w	-9990 to Alarm-Pr-Hi	0	Dec1	Low limit for alarm – absolute value.
Alarm-Pr-Hi	131 r/w	Alarm-Pr-Lo to 29990	29990	Dec1	High limit for alarm – absolute value.
Alarm-De-Lo	132 r/w	-9990 to 0	-990	Dec1	Low limit for alarm – deviation from stp value.
Alarm-De-Hi	133 r/w	0 to 9990	990	Dec1	High limit for alarm – deviation from stp value.
Sg4-Pr-Lo	140 r/w	-9990 to Sg4-Pr-Hi	0	Dec1	Low limit for signalling – absolute value.
Sg4-Pr-Hi	141 r/w	Sg4-Pr-Lo to 29990	29990	Dec1	High limit for signalling – absolute value.
Sg4-De-Lo	142 r/w	-9990 to 0	-990	Dec1	Low limit for signalling – deviation from stp value.
Sg4-De-Hi	143 r/w	0 to 9990	990	Dec1	High limit for signalling – deviation from stp value.
Sg5-Pr-Lo	150 r/w	-9990 to Sg5-Pr-Hi	0	Dec1	Low limit for signalling – absolute value.
Sg5-Pr-Hi	151 r/w	Sg5-Pr-Lo to 29990	29990	Dec1	High limit for signalling – absolute value.
Sg5-De-Lo	152 r/w	-9990 to 0	-990	Dec1	Low limit for signalling – deviation from stp value.
Sg5-De-Hi	153 r/w	0 to 9990	990	Dec1	High limit for signalling – deviation from stp value.
Sg6-Pr-Lo	160 r/w	-9990 to Sg6-Pr-Hi	0	Dec1	Low limit for signalling – absolute value.
Sg6-Pr-Hi	161 r/w	Sg6-Pr-Lo to 29990	29990	Dec1	High limit for signalling – absolute value.
Sg6-De-Lo	162 r/w	-9990 to 0	-990	Dec1	Low limit for signalling – deviation from stp value.
Sg6-De-Hi	163 r/w	0 to 9990	990	Dec1	High limit for signalling – deviation from stp value.
Sg7-Pr-Spo	170 r/w	-9990 to Sg7-Pr-Hi	0	Dec1	Low limit for signalling – absolute value.
Sg7-Pr-Hor	171 r/w	Sg7-Pr-Lo to 29990	29990	Dec1	High limit for signalling – absolute value.
Sg7-De-Lo	172 r/w	-9990 to 0	-990	Dec1	Low limit for signalling – deviation from stp value.
Sg7-De-Hi	173 r/w	0 to 9990	990	Dec1	High limit for signalling – deviation from stp value.
Dlog period	180 r/w	10 to 600	60	0	Period for archiving for datalogger in seconds.
Dlog record	181 r/w	0 … Off 1 … Prog 2 … Alarm 3 … Perm	3		Condition for archiving.
Panel	190 r/w	0 … Num 1 … Graph	0		Setting of the main panel of the device.
Graph-Per	191 r/w	1 to 300	2		Period for writing to graph in seconds.
Graph-Lo	192 r/w	-9990 to Graph-Hi	0		Range of the graph, low limit.
Graph-Hi	193 r/w	Graph-Lo to 29990	1000		Range of the graph, high limit.

Configuration level

Display	Address	Range	Initiation	Dec.point	Note
Language	200 r/w	0 … Engl 1 … German 2 … Czech	0		Setting of the language for the controller.
Disp-bright	201 r/w	0 to 10	6		Setting of brightness of the display.
Dlog	202 r/w	0 to 5	5		Limiting of number of logs for datalogger of process values: • 0 … 10 logs, • 1 … 20 logs, • 2 … 50 logs, • 3 … 100 logs, • 4 … 200 logs, • 5 … 500 logs.
Dlog Msg	203 r/w	0 to 4	4		Limiting of the number of logs for message datalogger: • 0 … 10 logs, • 1 … 20 logs, • 2 … 50 logs, • 3 … 100 logs, • 4 … 200 logs.
Dlog Amb	204 r/w	0 to 5	5		Limiting of the number of logs for datalogger of ambient temperatures: • 0 … 10 logs, • 1 … 20 logs, • 2 … 50 logs, • 3 … 100 logs, • 4 … 200 logs, • 5 … 500 logs.
Input1	210 r/w	**Thermal input:** 0 … No 1 … J 2 … K 3 … T 4 … N 5 … E 6 … R 7 … S 8 … B 9 … C 10 … D 11 … RTD **Process input:** 0 … No 1 … 0-20mA 2 … 4-20mA 3 … 0-5V 4 … 1-5V 5 … 0-10V	0		Setting of measuring input.
Dec1	211 r/w	**Thermal input:** 0 … 0 1 … 0.0 **Process input:** 0 … 0 1 … 0.0 2 … 0.00 3 … 0.000	0		Setting of decimal point.
Cal1	212 r/w	-9990 to 9990	0	Dec1	Calibration of measuring input.
Range1-Lo	213 r/w	-9990 to 29990	0	Dec1	Range of process input, low limit.
Range1-Hi	214 r/w	-9990 to 29990	1000	Dec1	Range of process input, high limit.
Filter1	215 r/w	0 to 1000 0 … Off	10	1	Input filter.

Display	Address	Range	Initiation	Dec.point	Note
Dig. input1	230 r/w	0 … Off 1 … Start 2 … End 3 … Wait 4 … Stop 5 … OutOff 6 … OutFrz 7 … Lock	0		Function of 1. digital input.
Start prog1	231 r/w	1 to 30	30		Number of the program that will be started by the digital input at setting Dig. input1 = Start.
Dig. input2	232 r/w	0 … Off 1 … Start 2 … End 3 … Wait 4 … Stop 5 … OutOff 6 … OutFrz 7 … Lock	0		Function of 2. digital input.
Start prog2	233 r/w	1 to 30	30	0	Number of the program that will be started by the digital input at setting Dig. input2 = Start.
Comm1	240 r/w	0 … Modbus 1 … M-S 2 … EMeter	0		
Baud1	241 r/w	0 … 9600 1 … 57600 2 … 115200	0		
Addr1	242 r/w	1 to 250	1	0	
Comm2	250 r/w	0 … Modbus 1 … M-S	0		
Baud2	251 r/w	0 … 9600 1 … 57600 2 … 115200	0		
Addr2	252 r/w	1 to 250	1	0	
IP adress	270 r/w	0 to 255	192	0	IP address of the device, 1. figure.
	271 r/w	0 to 255	168	0	IP address of the device, 2. figure.
	272 r/w	0 to 255	0	0	IP address of the device, 3. figure.
	273 r/w	0 to 255	100	0	IP address of the device, 4. figure.
SNET adress	274 r/w	0 to 31	8	0	Net mask SNET.
IPG adress	275 r/w	0 to 255	192	0	IPG address of the device, 1. figure.
	276 r/w	0 to 255	168	0	IPG address of the device, 2. figure.
	277 r/w	0 to 255	0	0	IPG address of the device, 3. figure.
	278 r/w	0 to 255	0	0	IPG address of the device, 4. figure.
Port	279 r/w	1 to 65535	10000	0	Port of LAN interface.
LAN restrict	280 r/w	0 … Read 1 … Rd/Wr	0		Limit for LAN interface.
Output1	290 r/w	0 … Off 1 … Ht 2 … Ht2 3 … Ht3A	1		Function of the output 1.
Signal1	291 r/w	0 … 0-10V 1 … 0-5V 2 … 0-20mA 3 … 4-20mA	0 … voltage 2 … current		Type of process output.
Ct1	292 r/w	1 to 200	1 … SSD 15 … relay	0	Time cycle of the output 1.
Valve hyst.	293 r/w	1 to 50	5	0	Hysteresis for valve of 3-way switching step control.
Time overrun	294 r/w	1 to 999	60	0	Time of transition of valve from minimum position to maximum position.

Display	Address	Range	Initiation	Dec.point	Note
Algo PID	295 r/w	0 … PID 1 … 2xPID	0		Algorithm for PID control.
Switch PID	296 r/w	-9990 to 29990	250	Dec1	Limit between PID1 and PID2.
PowLimit-Lo	297 r/w	0 to 100	100	0	Power limit under the limit Switch-PL .
Switch-PL	298 r/w	-9990 to 29990	250	Dec1	Temperatrue for switching over of power limit.
PowLimit-Hi	299 r/w	0 to 100	100	0	Power limit over the limit Switch-PL .
Der time1	300 r/w	10 to 1000	25	1	Delay of derivative of PID controller on the output 1.
Output2	310 r/w	0 … Off 1 … Cl 2 … Cl2 3 … AHeat	0		Function of the output 2.
Signal2	311 r/w	0 … 0-10V 1 … 0-5V 2 … 0-20mA 3 … 4-20mA	0 … voltage 2 … current		Type of the process output.
DeSp2	312 r/w	0 to 10000	10	Dec1	Set point of the output 2 (deviation from 1. set point).
Ct2	313 r/w	1 to 200	1 … SSD 15 … relé	0	Time cycle of the output 2.
% Power1	314 r/w	0 to 100	100	0	Power limit for auxiliary heating.
Der time2	315 r/w	10 to 1000	25	1	Delay of derivative of PID controller on the output 2.
Output3	320 r/w	0 … Off 1 … AlProc 2 … AlDev	0		Function of the output 3.
Latch3	321 r/w	0 … Off 1 … On	0		Setting of permanent alarm.
Silenc3	322 r/w	0 … Off 1 … On	0		Silencing of alarm at power up.
Side3	323 r/w	0 … Both 1 … Hi 2 … Lo	0		Selection of active sides of alarm.
Hysteresis3	324 r/w	10 to 2490	20	Dec1	Switching hysteresis of alarm output.
Output4	330 r/w	0 … Off 1 … Event1 2 … SgProc 3 … SgDev 4 … Prog 5 … PrEnd 6 … SgF	0		Function of the output 4.
IEvent1	331 r/w	0 … Hold 1 … Off 2 … On	0		State of event. output Event1 when the program is interrupted.
Side4	332 r/w	0 … Both 1 … Hi 2 … Lo	0		Selection of active sides for signalling.
Hysteresis4	333 r/w	10 to 2490	20	Dec1	Switching hysteresis of signalling output.
SgTime4	334 r/w	1 to 999	10	0	Duration of signalling at the ending up of a program in seconds.
Sp SgF	335 r/w	-9990 to 29990	500	Dec1	Set point, function SgF.
Time SgF	336 r/w	1 to 99	5	0	Time in minutes for the operation of the fan, function SgF.
Output5	340 r/w	0 … Off 1 … Event2 2 … SgProc 3 … SgDev 4 … Prog 5 … PrEnd 6 … Burner	0		Function of the output 5.
IEvent 2	341 r/w	0 … Hold 1 … Off 2 … On	0		State of event. output Event2 when the program is interrupted.

Display	Address	Range	Initiation	Dec.point	Note
Side5	342 r/w	0 … Both 1 … Hi 2 … Lo	0		Selection of active sides for signalling.
Hysteresis5	343 r/w	10 to 2490	20	Dec1	Switching hysteresis of signalling output.
SgTime5	344 r/w	1 to 999	10	0	Duration of signalling at the ending up of a program in seconds.
Time on	345 r/w	1 to 999	10	0	Duration during which the deviation from set point must be exceeded Dev on, so that the output should be turned ON.
Dev on	346 r/w	-9990 to 0	-20	Dec1	Deviation from set point for turning the output ON.
Time off	347 r/w	1 to 999	10	0	Duration during which the deviation from set point must be exceeded Dev off, so that the output should be turned OFF.
Dev off	348 r/w	0 to 9990	20	Dec1	Deviation from set point for turning the output OFF.
Time start	349 r/w	1 to 999	40	0	Time of start for burner in seconds.
Output6	350 r/w	0 … Off 1 … Event3 2 … SgProc 3 … SgDev 4 … Prog 5 … PrEnd	0		Function of the output 6.
IEvent3	351 r/w	0 … Hold 1 … Off 2 … On	0		State of the event. output Event3 when the program is interrupted.
Side6	352 r/w	0 … Both 1 … Hi 2 … Lo	0		Selection of active sides for signalling.
Hysteresis6	353 r/w	10 to 2490	20	Dec1	Switching hysteresis of signalling output.
SgTime6	354 r/w	1 to 999	10	0	Duration of signalling at the ending up of a program in seconds.
Output7	360 r/w	0 … Off 1 … Event4 2 … SgProc 3 … SgDev 4 … Prog 5 … PrEnd	0		Functuion of the output 7.
IEvent4	361 r/w	0 … Hold 1 … Off 2 … On	0		State of event. output Event4 when the program is interrupted.
Side7	362 r/w	0 … Both 1 … Hi 2 … Lo	0		Selection of active sides for signalling.
Hysteresis7	363 r/w	10 to 2490	20	Dec1	Switching hysteresis of signalling output.
SgTime7	364 r/w	1 to 999	10	0	Duration of signalling at the ending up of a program in seconds.
Sp1-Lo	370 r/w	-9990 to Sp1-Hi	0	Dec1	Low working range for set point.
Sp1-Hi	371 r/w	Sp1-Lo to 29990	1000	Dec1	High working range for set point.
Outside prog.	372 r/w	0 … Off 1 … Sp1	0		State of set point, if the program does not run.
Ramp type	380 r/w	0 … Stpt 1 … Rate 2 … Both	2		Type of step „ramp up/down of set point“ allowed by editing a program.
GSDe	381 r/w	10 to 9990	100	Dec1	GSD function, deviation from set point.
P-Out Action	382 r/w	0 … Cont 1 … Stop 2 … End	0		Response to the power cut when the allowed time for the power cut is exceeded P-Out Time.
P-Out Time	383 r/w	0 to 999	0	0	Allowed time of power cut within which the controller can continue in program. If the power cut is longer than the allowed time, the controller continues in action according to setting of parameter P-Out Action.
Start prog	384 r/w	0 … Prog 1 … PrSt	0		Setting options for starting a program.

Display	Address	Range	Initiation	Dec.point	Note
Stop prog	385 r/w	0 … No 1 … Yes	0		The stopping a program is allowed - state Stop.
Parameter1	390 r/w	0 … No 1 … PrView 2 … PrEdit 3 … %Pow1 4 … %Pow2 5 … PowPr 6 … PowTot 7 … AlOff 8 … Aut 9 … Event1 10 … Event2 11 … Event3 12 … Event4 13 … Panel 14 … Dlog 15 … Msg 16 … Clock	1		1. position of user menu.
Parameter2	391 r/w	Like Parameter1	14		2. position of user menu.
Paremeter3	392 r/w	Like Parameter1	0		3. position of user menu.
Parameter4	393 r/w	Like Parameter1	0		4. position of user menu.
Parameter5	394 r/w	Like Parameter1	0		5. position of user menu.
Parameter6	395 r/w	Like Parameter1	0		6. position of user menu.
Paremeter7	396 r/w	Like Parameter1	0		7. position of user menu.
Parameter8	397 r/w	Like Parameter1	0		8. position of user menu.
Paremeter9	398 r/w	Like Parameter1	0		9. position of user menu.
Parameter10	399 r/w	Like Parameter1	0		10. position of user menu.
Paremeter11	400 r/w	Like Parameter1	0		11. position of user menu.
Parameter12	401 r/w	Like Parameter1	0		12. position of user menu.
Pass Sp1	410 r/w	0 to 9999 0 … Off	0	0	Password for the change of set point.
Pass Prog	411 r/w	0 to 9999 0 … Off	0	0	Password for entry to editing a program.
Pass Oper	412 r/w	0 to 9999 0 … Off	0	0	Password for entry to operation level.
Pass Conf	413 r/w	0 to 9999 0 … Off	0	0	Password for entry to configuration level.
Pass Serv	414 r/w	0 to 9999 0 … Off	0	0	Password for entry to service level.

Setting of the real time clock

Display	Address	Range	Initiation	Dec.point	Note
Year	500 r/w	0 to 99		0	Year.
Month	501 r/w	1 to 12		0	Month.
Day	502 r/w	1 to 31		0	Day.
Hour	503 r/w	0 to 23		0	Hour.
Minute	504 r/w	0 to 59		0	Minute.

Writing, editing a program

The controller Ht205 has 30 programs with 15 steps.
Programs are written to addresses from 2000 to 8749 according to the following relation:

Address = 2000 + 225 x (Program – 1) + 15 x (Step – 1)

Example of addresses of a program:

Range of addresses	Program	Step
2000 to 2014	1	1
2015 to 2029	1	2
…	1	…
2210 to 2224	1	15
2225 to 2239	2	1
2240 to 2254	2	2
…	2	…
2435 to 2449	2	15
8525 to 8539	30	1
8540 to 8554	30	2
…	30	…
8735 to 8749	30	15

Parameters are placed in registers according to the following table (all the registers are intended for reading as well as writing):

Display	Shifting of address	Range	Initiation	Dec.point	Note
Step type	+0	0 … End 1 … Stpt 2 … Rate 3 … Soak 4 … Jump	0		Type of step.
Setpoint1	+1	Sp1-Lo to Sp1-Hi	250	Dec1	Set point.
Time	+2	0 to 5999	10	0	Time of step in minutes.
Rate	+3	10 to 30000	1000	Dec1	Ramp up/down in units/hour. .
GuarSoak	+4	0 … Start 1 … Off 2 … On	0		GSD function.
Wait	+5	0 … Off 1 … On	0		Waiting for the confirmation for continuing in program by digital input.
Jump Prog	+6	1 to 30	1	0	Jump at the program.
Jump Step	+7	1 to 15	1	0	Jump at the step.
Event1	+8	0 … Off 1 … On	0		State of event 1 in given step.
Event2	+9	0 … Off 1 … On	0		State of event 2 in given step.
Event3	+10	0 … Off 1 … On	0		State of event 3 in given step.
Event4	+11	0 … Off 1 … On	0		State of event 4 in given step.
	+12		0		
	+13		0		

If the parameters of the same program as well as the same step are edited currently from the keyboard and also from the communication line, the values transmitted through the communication line are not accepted.

Transmitting data from datalogger of process values

Reading data from datalogger is realized through the registers 800 and 801.

Structure of read data is as follows:

Register	Meaning	Description
Data1	Year	Date and time of log.
Data2	Month	
Data3	Date	
Data4	Hour	
Data5	Minute	
Data6	Second	
Data7	Set point of Ht205	Set point of the controller.
Data8	Process value of Ht205	Process value of the controller.
Data9	Process value of 1. Slave controller	Process value of „Slave“ controllers connected to Ht205.
Data10	Process value of 2. Slave controller	
Data11	Process value of 3. Slave controller	
Data12	Process value of 4. Slave controller	
Data13	Process value of 5. Slave controller	
Data14	Process value of 6. Slave controller	
Data15	Process value of 7. Slave controller	
Data16	Energy consumption, low value	Energy consumptipon = ((65536 * high value) + low value) / 10
Data17	Energy consumption, high value	
Data18	Number of the running program	

Procedure of reading data from datalogger:

- It reads 1. log from the address 800 (for gaining the complete logs you should read 18 registers, see table above),
- It reads 2. log from the address 801 (18 registers),
- It reads 3. log from the address 801 (18 registers),
- …
- It reads n^{th} log from the address 801 (18 registers).

The end of logs is indicated by giving back the value -32000 in all registers.

Transmitting data from the message datalogger

Reading datalogger is realized through the registers 810 and 811.

The structure of the reading data:

<table>
<tr><th>Register</th><th>Meaning</th><th>Description</th></tr>
<tr><td>Data1</td><td>Year</td><td rowspan="6">Date and time of log.</td></tr>
<tr><td>Data2</td><td>Month</td></tr>
<tr><td>Data3</td><td>Date</td></tr>
<tr><td>Data4</td><td>Hour</td></tr>
<tr><td>Data5</td><td>Minute</td></tr>
<tr><td>Data6</td><td>Second</td></tr>
<tr><td>Data7</td><td>Register 1</td><td rowspan="4">Meaning of registers:
<table><tr><th>Message</th><th>Register1</th><th>Register2</th><th>Register3</th><th>Register4</th></tr><tr><td>Switching ON of device</td><td>1</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Start of a program</td><td>2</td><td>program</td><td>-</td><td>-</td></tr><tr><td>Ending up of program</td><td>3</td><td>program</td><td>-</td><td>-</td></tr><tr><td>Interruption of program</td><td>4</td><td>program</td><td>-</td><td>-</td></tr><tr><td>Start of alarm</td><td>5</td><td>Process value</td><td>dec. point</td><td>-</td></tr><tr><td>End of alarm</td><td>6</td><td>Process value</td><td>dec. point</td><td>-</td></tr><tr><td>Change in setting</td><td>10</td><td>Address of register</td><td>Set value</td><td>dec. point</td></tr><tr><td>Reset of setting</td><td>50</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Reset of program</td><td>51</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Reset of status</td><td>52</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Reset of datalogger</td><td>53</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Reset of device</td><td>54</td><td>-</td><td>-</td><td>-</td></tr></table></td></tr>
<tr><td>Data8</td><td>Register 2</td></tr>
<tr><td>Data9</td><td>Register 3</td></tr>
<tr><td>Data10</td><td>Register 4</td></tr>
</table>

Procedure of reading data from datalogger:

- It reads 1. log from the address 810 (for gaining the complete logs you should read 10 registers, see table above),
- It reads 2. log from the address 811 (10 registers),
- It reads 3. log from the address 811 (10 registers),
- …
- It reads n^{th} log from the address 811 (10 registers).

The end of logs is indicated by giving back the value -32000 in all registers.

9 Installation of the controller

The controller is designed to be mounted to the panel cutout. After sliding the controller into the cut out and fix it with 2 flanges, that are supplied with the controller. The installation requires the access to the back of the panel.

Mounting dimensions

- Width x height x overall length: 96 x 96 x 121 mm (including terminalboard).
- behind panel length: 114 mm (including terminalboard).
- Cutout in the panel: 91 x 91 mm.
- The thickness of panel: 1,5 to 10 mm.

Mounting:
- Make the panel cutout 91 x 91 mm.
- Slide the controller into the panel cutout.
- Insert the flanges for holding into the holes upward and downward or on both sides of the controller.
- Tighten the screws firmly on the flanges.

The controller is now installed, before wiring we recommend to read thoroughly the chapter on the possible sources of interference and principals for installation.

Wiring of the controller begins on page ***69***.

Principals for installation, the sources of interferences

There are many possible sources of interference in environment of the controller. Among the most harmful sources of interference are the following:
- Equipment with inductive load, e.g. electromotors, winding of relays and breakers, … .
- Thyristors and other semiconductor equipment
- Welding devices.
- Wires carrying high currents.
- Fluorescent lightings and neon lights.
- ……

Reduction of influence of interference

Making a design try to observe these guidelines:
- All wires of power supply voltage and power wires carrying high currents must be lead separately from signal leads
- (e.g. thermocouple lead wire, communication lines). Minimum distance between these types of wires should not be
- smaller than 30 cm.
- If signal and power wires cross each other it is suitable for them to be crossed in right angle.
- From the beginning try to find the possible sources of interference and keep the wires away from them.
- Do not install relays and breakers very close to the controller.
- Do not use supply voltage for the controller also for supplying inductive and phase angle control equipment.
- Twisted and shielded wires should be used for signal leads. Shielding should be earthed several times.
- When necessary the uninterruptible power sources (UPS) could be used.

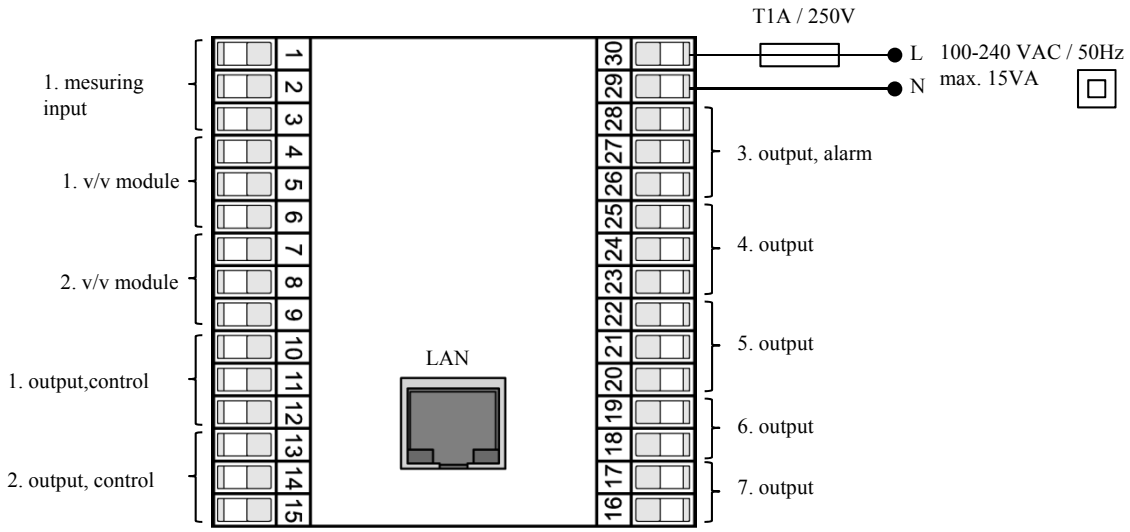
10 Wiring

To avoid potential electric shock, use safety practices laid down by national standards when wiring and connecting this unit to a power source. Failure to do so could result in such damage, and / or injury. The wiring must be done only by the authorized person.

If there is any default of the device that could cause a damage, the equipment with the controller must be fitted with the independent protection unit (thermal cut-out, limiter).

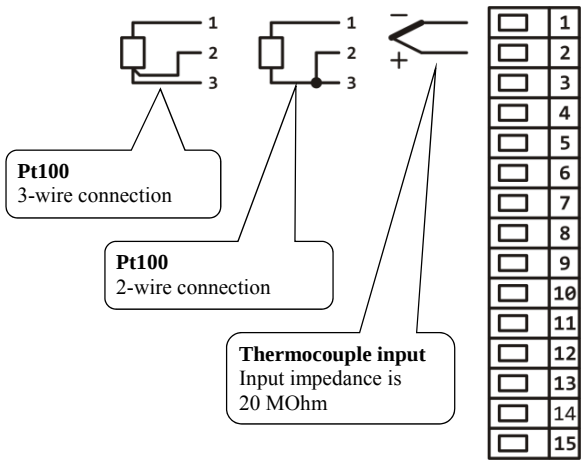
Supply voltage

Before you connect the unit to a supply power source, check the level of supply voltage.
The controller is intended for use in industrial or in laboratory equipment – overvoltage category II, polution degree 2.

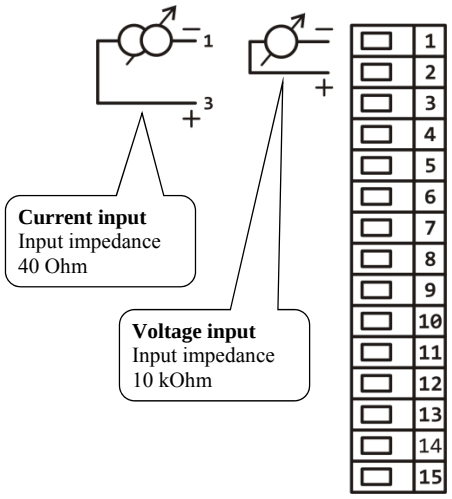


1. input, measuring

Thermal input

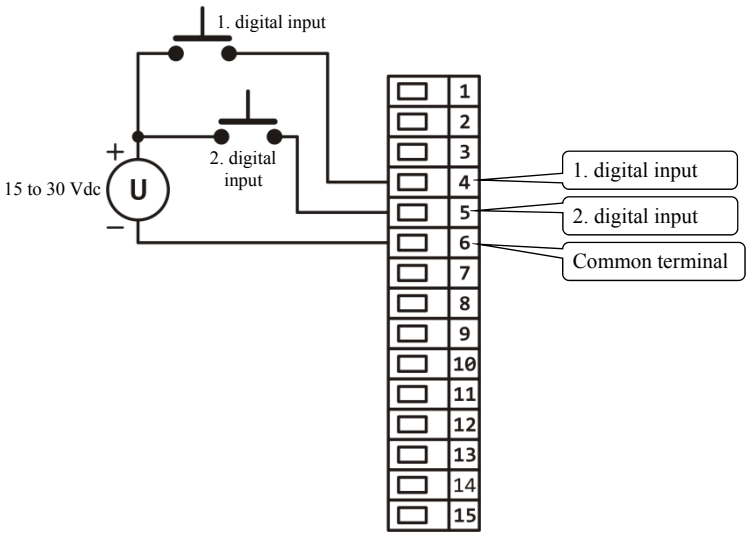


Process input



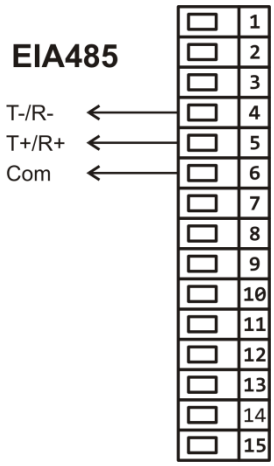
Measuring input *is not galvanicly isolated* from ground of controller

1. v/v module ... digital inputs



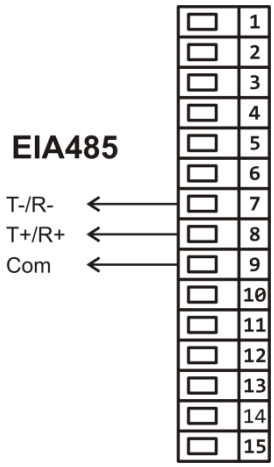
Digital inputs *are galvanically isolated* from ground of the device

1. v/v module ... communication line EIA485



Communication line *is galvanically isolated* from ground of the device

2. v/v module ... communication line EIA485



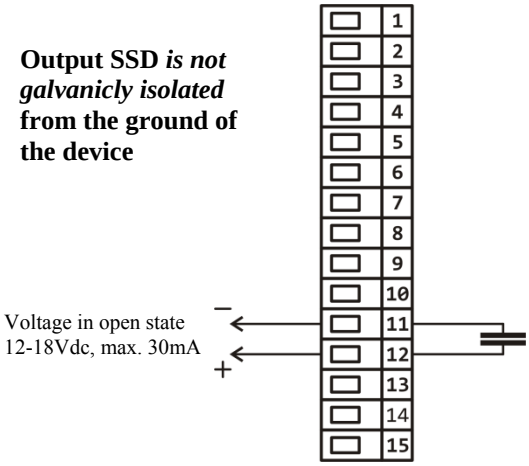
Communication line *is galvanically isolated* from ground of the device

1. output, control

SSD - ss driver

Open collector

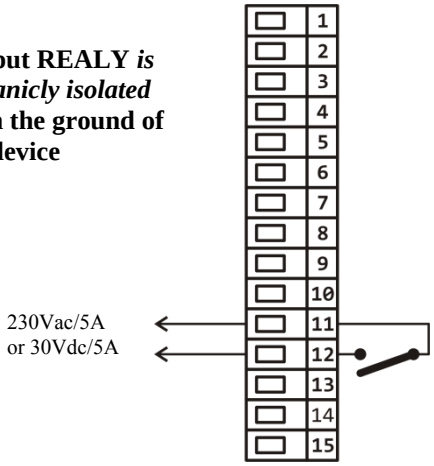
Output SSD *is not galvanicly isolated* from the ground of the device



RELAY

Relay output

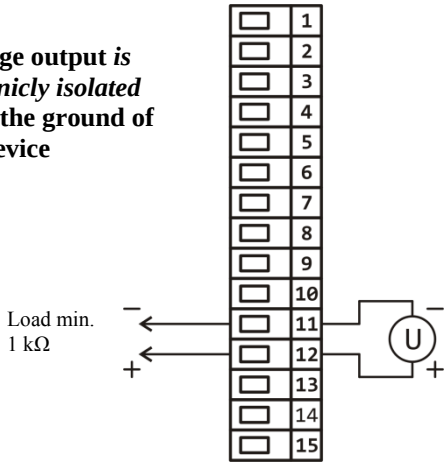
Output REALY *is galvanicly isolated* from the ground of the device



0-10 Vdc, 0-5 Vdc

Process voltage output

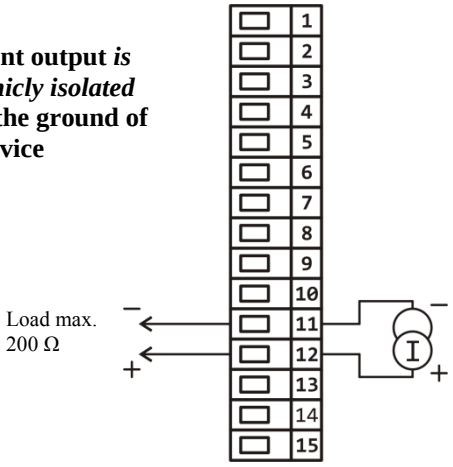
Voltage output *is galvanicly isolated* from the ground of the device



0-20mA, 4-20mA

Process current output

Current output *is galvanicly isolated* from the ground of the device

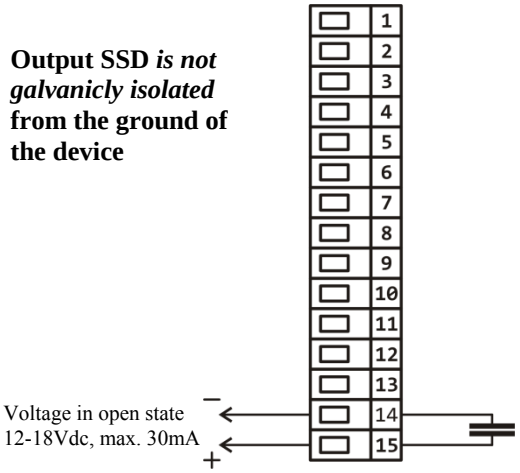


2. output, control

SSD – ss driver

Open collector

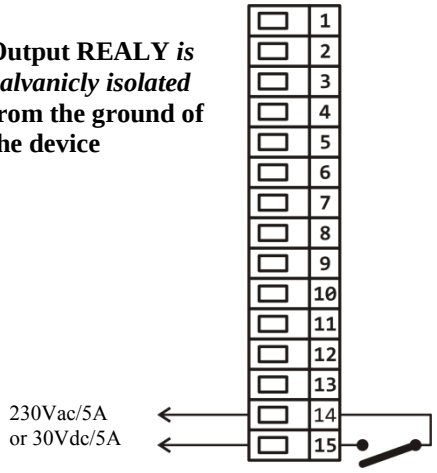
Output SSD *is not galvanicly isolated* from the ground of the device



RELAY

Relay output

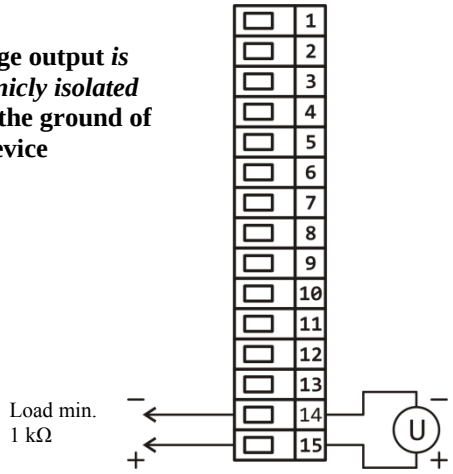
Output REALY *is galvanicly isolated* from the ground of the device



0-10 Vdc, 0-5 Vdc

Process voltage output

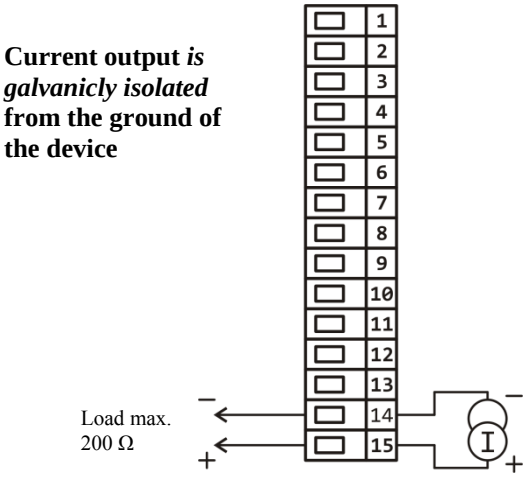
Voltage output *is galvanicly isolated* from the ground of the device



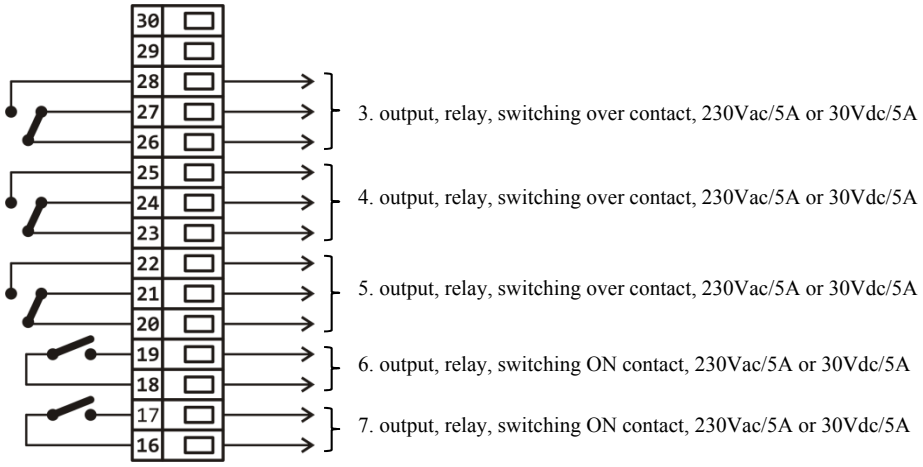
0-20mA, 4-20mA

Process current output

Current output *is galvanicly isolated* from the ground of the device



3. output, alarm, 4. to 7. outputs, auxiliary



RELAY output 4 - 7 *are galvanicly isolated* from the ground of the device

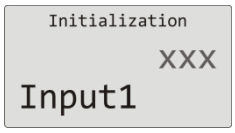
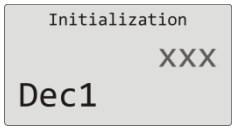
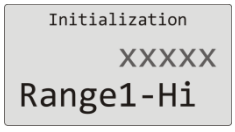
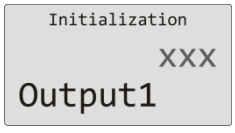
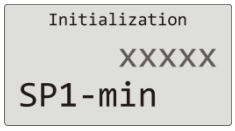
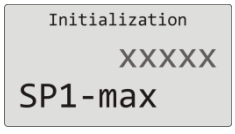
11 Putting into operation

The initial set-up can be done only by the qualified and authorized person.
The wrong set-up can cause serious damage.

When you power the controller up for the first time, you enter elementary initial menu:

Menu for elementary initiation

Menu for elementary initiation is released at the first power up of the device or if the input sensor is not set.
All the parameters of initial menu can be later changed in ***configuration level*** of the device.

	Selection of language: • **English** • **German** • **Czech**	
	**Setting of input for the controller:** • **Thermal input** … thermocouple J, K, T, N, E, R, S, B, C, D or RTD sensor Pt100. • **Process input** … signal 4-20mA, 0-20mA, 0-5V, 1-5V, 0-10V.	
	**Number of decimal points for thermal inputs:** • **0** … no decimal point • **0.0** … 1 decimal point	**Number of decimal points for process inputs:** • **0** … no decimal point • **0.0** … 1 decimal point • **0.00** … 2 decimal points • **0.000** … 3 decimal points
	Together with the parameter **Range1-Lo** you set **the scale of displaying values** for procees inputs. Range: -999 to 2999. For thernal input this parameter is not shown.	
	Together with the parameter **Range1-Hi** you set **the scale of displaying values** for procees inputs. Range: -999 to 2999. For thernal input this parameter is not shown.	
	**Setting of function for output 1:** • **Ht** … heating, PID control, • **Ht2** … heating, ON/OFF switching, • **Ht3A** … heating, 3-way switching step control (only in case that outputs 1 and 2 are equipped with relay or SSD).	
	**Low limit of working range of set point.** Range: -999 to **SP1-max** ºC.	
	**High limit of working range of set point.** Range: **SP1-min** to 2999 ºC.	

12 Technical parameters

The controller is intended for use in industrial or laboratory equipment, the category of pollution 2 / overvoltage II.

Controlling

- PID controlling of heating / cooling, autotuning/automatic setting of PID parameters,
- 2-state (ON/OFF) control /cooling
- 3-way switching step control

Alarm

- absolute or relative defined by the set point value
- temporary or permanent alarm
- silencing of alarm at startup of the controller
- selection of limits high/low, or only low,or only high.

Controlling to set point (stp) value

- program controlling, 30 programs, 15 steps,
- control to the constant set point value.

Indicators and keys

- graphic OLED display, 128 x 64 dots,
- 5 keys, setting is done via menu technique.

Sensors, inputs

Thermal input is thermocouple or rtd, the detection of bad-wired/broken sensor:

- **No** … no input is set,
- **J** … thermocouple J, Range -200 to 900°C,
- **K** … thermocouple K, Range -200 to 1360°C,
- **T** … thermocouple T, Range -200 to 400°C,
- **N** … thermocouple N, Range -200 to 1300°C,
- **E** … thermocouple E, Range -200 to 700°C,
- **R** … thermocouple R, Range 0 to 1760°C,
- **S** … thermocouple S, Range 0 to 1760°C,
- **B** … thermocouple B, Range 300 to 1820°C,
- **C** … thermocouple C, Range 0 to 2320°C,
- **D** … thermocouple D, Range 0 to 2320°C,
- **RTD** … sensor rtd Pt100, Range -200 to 800°C, 2 or 3-wire connection, DIN curves.

Process current input (input impedance 40 Ohmů), voltage input (10 kOhmů):

- **No** … no input is set,
- **0-20mA** … 0 – 20 mA, Range -999 to 2999 units, no detection of bad-wired/broken sensor,
- **4-20mA** … 4 – 20 mA, Range -999 to 2999 units, detection of bad-wired/broken sensor at the current < 3mA,
- **0-5V** … 0 – 5 V, Range -999 to 2999 units, no detection of bad-wired/broken sensor,
- **1-5V** … 1 – 5 V, Range -999 to 2999 units, no detection of bad-wired/broken sensor,
- **0-10V** … 0 – 10 V, Range -999 to 2999 units, no detection of bad-wired/broken sensor.

Accuracy of inputs

- ± (0,1% of span/range (min. 800ºC) , ±1 digit) at 25ºC ±3ºC of ambient temperature and at ±10% rated supply voltage
- temperature stability ±0,1ºC/ºC in ambient temperature,
- voltage stability ±0,01%/% of change in supply voltage
- Accuracy for measurement of matching end point ± (1ºC at 25ºC + 0,1ºC/ºC ambient temperature).

Digital inputs

- Logical levels 0-5 Vdc / 15-30 Vdc, galvanicly isolated.

Outputs 1, 2

- ss driver/open collector, 12 – 18 V dc in the state ON, max. 30 mA.
- electromechanical relay, 230Vac/5A or 30Vdc/5A, switching ON, without RC suppression unit.
- dc current output 0-20 mA, 4-20 mA, galvanicly isolated, load max. 200 Ohms,
- dc voltage output 0-5 V, 0-10V, galvanicly isolated, load min. 1 kOhm.

Outputs 3, 4, 5

- electromechanical relay, 230Vac/5A or 30Vdc/5A, switching OVER, without RC suppression unit.

Outputs 6, 7

- electromechanical relay, 230Vac/5A or 30Vdc/5A, switching ON, without RC suppression unit.

Communication line

- EIA 485, galvanicly isolated, protocol MODBUS^{RTU}.

LAN interface

- Galvanicly isolated, protocol MODBUS^{RTU}.

Datalogger

- datalogger of process values, max. 500 logs,
- datalogger of messages, max. 200 logs,
- datalogger of ambient temperature, max. 500 logs, period of archiving 10 min.

Supply voltage

- 100 to 240 VAC 50 Hz, internal slow fuse 2 A/250 V
- input power max. 15 VA
- we recommend to insert T1A / 250V before the device, this fuse is not included in the packing.

Operating environment

- 0 to 50 ºC,
- 0 to 90 % relative humidity, non-condensing.

Shipping and storage

- -20 to 70 ºC.

Dimensions

- width x height x length, 96 x 96 x 121 mm
- depth behind panel surface 114 mm
- cut-out into the panel 91 x 91 mm, the thickness of the panel 1,5 to 10 mm

12.1 Warranty

The supplier provides 36-month warranty on defects in material and workmanship on this controller with the exception on defects caused by mechanical or electrical wearing out of the outputs. This warranty does not also apply to damage resulting from inappropriate transportation and storage, misuse, wrong wiring, ambient influences (especially effects of electrical over voltage, electricalvalues and temperatures of in admissible intensity, chemical materials, mechanical damage) electrical or mechanical overloading of inputs and outputs.

12.2 Description of model

Ht205 – S a b c d – e f g h – j k l

a: input
- T = thermal input
- P = process input

b: first v/v modul
- 0 = none
- A = communication line EIA 485
- D = two digital inputs

c: second v/v modul
- 0 = none
- A = communication line EIA 485

d: LAN interface
- 0 = none
- L = yes *

e: control output 1
- K = ss driver
- R = electromechanical relay
- P = current 0-20 mA, 4-20 mA
- N = voltage 0-5 V, 0-10 V

f: control output 2
- 0 = none
- K = ss driver
- R = electromechanical relay
- P = current 0-20 mA, 4-20 mA
- N = voltage 0-5 V, 0-10 V

g: alarm output
- 0 = none
- R = electromechanical relay

h: auxiliary outputs
- 0 = none
- 1 = 1 electromechanical relay
- 2 = 2 electromechanical relays
- 3 = 3 electromechanical relays
- 4 = 4 electromechanical relays

* … when LAN interface is used, the second output type P or N can not be used

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