

# Users manual



## HtIndustry programmable controller

INDUSTRY 01/03 soft 2.01/rev. 1, english version

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# 1 Introduction

INDUSTRY is a controller intended for controlling of complex technology equipment (controlling of electrical and gas furnaces, technology lines, ...). Enables the programmable controlling and with freely configured outputs you can as well as control the auxiliary equipment. The controller can be enhanced with 2 communication lines. One can be used for the link with PC / Master, the other for the communication with another controllers (Master-Slave, cascade controlling ...). The controller can be set up via keys or via PC

Users manual for controller INDUSTRY is divided into particular chapters. When it is installed and put into operation we recommend proceed as follows:

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

If you are a final user, 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:

- [Basic terms](#), here it is explained the key functions, displays, and so on....
- [Basic mode](#), the description of basic mode of controller.
- [User level](#), the description of parameters and menus of user level.
- [Program](#), all you need to know about editing a program.

## **If you are carrying out the complete installation and setting of the controller**

In this case you proceed in accordance with the following chapters:

- [Installation](#), in this chapter it is described how to build in a controller into panel.
- [Principals of installation](#), we recommend you to observe the guidelines described in this chapter.
- [Wiring](#), the description for wiring of the controller.
- [Putting into operation](#), at first power-up you enter the initial menu in which you can configure and set the most important parameters of controller.

According to the procedure you will perform installation, wiring and basic setting of controller. You can find out more details on the scope of the controller and its operation in the following chapters.

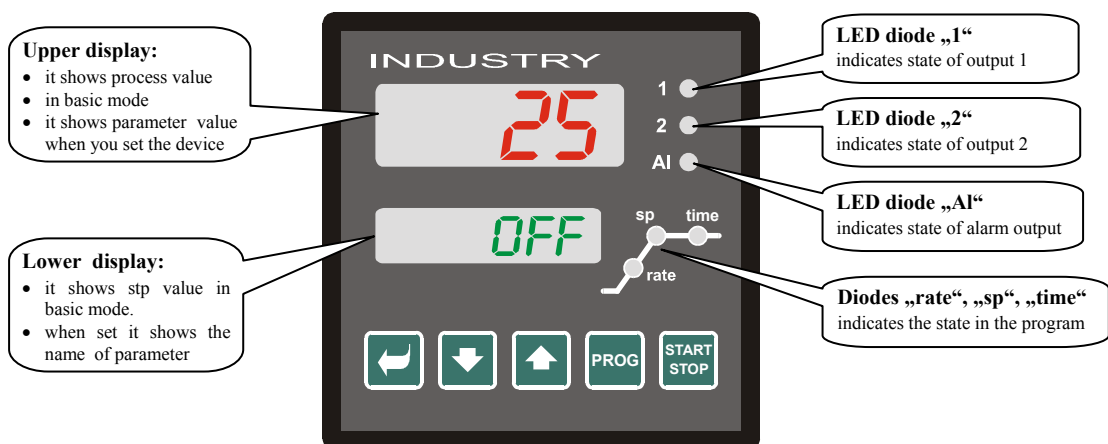
## 2 Basic terms

To avoid problems in operation of device the user should be able to manage its operation, setting parameters,...

### 2.1 Operation and description of controller








On the front panel board you can see 2 displays, 3 control lights (LED diodes) for indicating a status of outputs, 3 control lights (LED diodes) for indicating how a program runs. The device is set and configured via key-buttons.

#### Function of indicators



#### Function of key-buttons

The setting of parameters of the controller is performed via key-board. The function of each key-button is as follows:

-  key for setting and viewing of parameters of user, operation, configuration and user level. By pressing this key **you confirm the change in configured parameter** and the controller comes to another parameter.
-  key for decreasing a value of parameter. The value of parameter is either the figure or abbreviation composed of maximum 4 letters.
-  key for increasing a value of parameter.
-  key intended for editing a program. By pressing this key **you edit the actual parameter of the program** and the controller comes to another parameter.
-  key intended for starting and interrupting a program. By short pressing you enter to menu for starting a program. By long pressing (3 seconds) you enter to menu for starting a program by real time.
-  , by pressing both keys for short time the controller returns to basic mode, see page 6. After long pressing (3 seconds) you enter to higher levels of menu (operation, configuration, service).

## 2.2 Information and error messages

Information and error messages are indicated only in *basic mode*, see page [6](#).

### Information messages, upper display

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

### Information messages, lower display

- **PCLK** ... starting a program by the clock, see page 15.
- **Aut1** ... automatic setting/autotuning of PID parameters – the set 1 for heating, **Pb1A**, **It1A**, **dE1A**, see page [9](#).
- **Aut2** ... automatic setting/autotuning of PID parameters - the set 2 for heating, **Pb1b**, **It1b**, **dE1b**, see page [9](#).
- **Aut3** ... automatic setting/autotuning of PID parameters for cooling **Pb2A**, **It2A**, **dE2A**, see page [9](#).
- **GSD** ... GSD, process value is outside the soak band, program is held and as soon as process value returns to the defined soak band and the program starts again, see page [17](#).

### Error messages, lower display

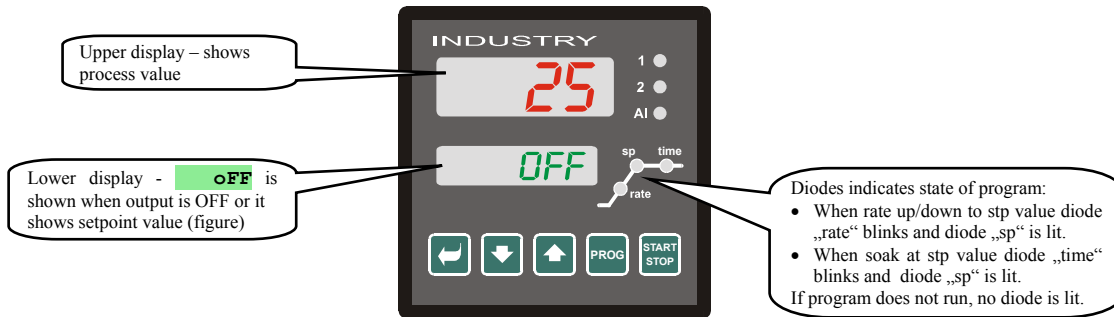
If there is a error message indicated then the control outputs are switched OFF, the signal output is switched OFF, the alarm output is activated.

- **Err0** ... error in FLASH memory of program. Switch the controller OFF and ON again. If the problem persists, contact your supplier.
- **Err1** ... error in EEPROM memory for configuration and operation parameters. The troubleshooting error can be made by restarting of all parameters in user level. After restart it is necessary to set up all parameters again. This can be done only by an experienced user. If the trouble persists, contact your supplier.
- **Err3** ... error in A/D converter. It can be caused by electrical impulse at input, too low temperature and excessive humidity, ... . Switch the controller OFF and ON again. If the problem persists, contact your supplier.





## 2.4 Basic mode

The controller is in **Basic mode** when powered up (the initial set-up must be performed, see page 38). Upper display shows process value, Lower display shows **OFF** when the output is switched OFF or it shows set point value.



- If there is different reading from **OFF** or set point value (figure) on lower display **controller is not in Basic mode** (parameters are being set).
- In **Basic mode** information and error messages appear on lower display, see page 4.

### Return to basic mode

- To return to **Basic mode** press shortly the keys  .
- The controller returns to basic mode automatically if no key is pressed for 60 seconds.

### The state of the controller when no program runs


If no program runs the controller can be set that the control output is switched OFF (it indicates **OFF** on lower display) or the controller can maintain the process value at the set point value (figure appears on lower display). The state of the controller beyond the program is configured via the parameter **SLEEP**:



- **SLEEP** = **OFF**, the control output is switched OFF, heading **OFF** is lit on lower display
- **SLEEP** = **SP1**, the controller maintains the process value at the set point value. On lower display appears setpoint value that can be modified through key-arrows.

Parameter **SLEEP** can be found in **configuration level**, menu **SYS**.

## 3 User level

User level is intended for the quick access to the most common parameters for a user.

To enter user level and to go through this level press the key .

To return from user level you must go through all the parameters or by pressing shortly the keys  .

**You can configure freely the structure of user level:**

- you can define which parameters and menus will be in user level,
- you can define on which position these parameters(menus) will be placed,
- the parameters and menus are displayed only in case that their showing has the meaning (e.g. the state of event output is shown only in case that output 2 is set as the event output).

### Overview of all the parameters and menus of user level

Display	Procedure
(run)	<p>The parameters that indicate the run of the program are accessible</p> <ul style="list-style-type: none"> <li>• <b>ProG</b>, When in program it indicates the number of the program that runs currently.</li> <li>• <b>StEP</b>, When in program it indicates the actual step of the program.</li> <li>• <b>EnSP</b>, When in program it indicates set point value of the actual step.</li> <li>• <b>trEM</b>, When in program it indicates the time to end of the step.</li> </ul> <p>Parameters are shown when in program.</p>
(ErUN)	<p>The parameters that indicate the run of the program are accessible. The parameters of the actual step being running can be changed:</p> <ul style="list-style-type: none"> <li>• <b>ProG</b>, When in program it indicates the number of the program that runs currently.</li> <li>• <b>StEP</b>, When in program it indicates the actual step of the program.</li> <li>• <b>tYPE</b>, indicates the type of step(<b>StPt</b>, <b>rAtE</b>, <b>SoAK</b>) of the program that is just running.</li> <li>• <b>rAtE</b>, you can edit the rate up of the step that is just running. This value can be changed.</li> <li>• <b>EnSP</b>, you can edit the final set point value of the step that is just running. This value can be changed.</li> <li>• <b>trEM</b>, you can edit the time to the end of the step. This value can be changed.</li> </ul> <p>Parameters are shown when in program.</p>
<b>PCnt 1</b>	Indicates the power in % of the control output 1. It is displayed only then if the output 1 is set as the control output.
<b>PCnt 2</b>	Indicates the power in % of the control output 2. It is displayed only then if the output 2 is set as the control output.
<b>P ProG</b>	The consumed energy in kWh for the last firing. When program is started the counter is reset and the counting begins from 0.
<b>P tot</b>	The total consumption of energy in kWh. After the value 9999 is reached the counter is reset and the counting begins from 0.
<b>AL OFF</b>	Menu for switching OFF of permanent alarm. Set <b>YES</b> and confirm to switch OFF the permanent alarm
<b>Aut</b>	<p>Starting / ending of autotuning/automatic setting of PID parameters:</p> <ul style="list-style-type: none"> <li>• <b>OFF</b>, autotuning /automatic setting of PID parameters is turned OFF.</li> <li>• <b>ht</b>, starting of autotuning/automatic setting of PID parameters for heating</li> <li>• <b>CL</b>, starting of autotuning/automatic setting of PID parameters for cooling .</li> </ul>
<b>dt PER</b>	<p>Period of data storing for datalogger in minutes.</p> <p>Range: 1 to 120 minutes.</p>
<b>dt Sto</b>	<p>Condition for data storing of the measured values in datalogger.</p> <ul style="list-style-type: none"> <li>• <b>OFF</b>, storing is turned OFF</li> <li>• <b>ProG</b>, storing is executed only if program runs</li> <li>• <b>ALMr</b>, storing is executed only at alarm.</li> <li>• <b>Cont</b>, storing is executed constantly.</li> </ul>
<b>Ent1</b>	Indicates the state of event output 1 ( <b>OFF</b> ... switched OFF, <b>on</b> ... switched ON). The output can be set by arrow-keys only if program does not run.
<b>Ent2</b>	Indicates the state of event output 2 ( <b>OFF</b> ... switched OFF, <b>on</b> ... switched ON). The output can be set by arrow-keys only if program does not run.
<b>Ent3</b>	Indicates the state of event output 3 ( <b>OFF</b> ... switched OFF, <b>on</b> ... switched ON). The output can be set by arrow-keys only if program does not run.
<b>Ent4</b>	Indicates the state of event output 4 ( <b>OFF</b> ... switched OFF, <b>on</b> ... switched ON). The output can be set by arrow-keys only if program does not run.
<b>dtLoG?</b>	The entry to menu of datalogger. To enter the menu set <b>YES</b> at upper display and confirming. In menu of datalogger you can view the course of firing.
<b>CLK ?</b>	The entry to menu for setting of the real time clock. To enter this menu set <b>YES</b> on upper display and confirming. Menu is described on page <a href="#">21</a> .

## Setting of parameters and menus in user level

User level provides a user with the quickest access for viewing and setting of parameters. The list of the parameters that will be present and accessible for a user in user level, as well as their sequence can be freely configured.

You will carry out the formation of user level in *configuration level*, menu **uSEr**.

### Example how to create user menu:

You want to place the parameter **Ent1** on the 1st position of user level and starting autotuning **Aut** on the 2nd position of user level:

- Set the parameter **StEP 1** = **Ent1**.
- Set the parameter **StEP 2** = **Aut**.
- 3rd to 12th positions are not used, for parameters **StEP 3** to **StEP12** set **no**.

You can view the result in *user level*

## 3.1 Datalogger

The controller is equipped with the function for datastoring of measured values, it can store 40 logs for standard memory and with extended memory as many as 4000 logs. If the memory is full, the oldest data are written over with the newer.

Each stored record consists of the following items:

- month, day, hour and minute of the log
- measured value

date	time	measured value
17.10.2002	08.45	850
17.10.2002	08.50	852
17.10.2002	08.55	855
17.10.2002	09.00	857
	...	
17.10.2002	17.40	194

### Stored logs can be read by 2 ways :

- On displays of the controller in menu **dtLoG?**. When the menu is opened on lower display time in format hour and minute is shown and on upper display measured value is shown. You can scroll through single measured values with the arrow-keys. Menu **dtLoG?** Must be placed in *user level*.
- Data transferring via communication lines. All necessary information is in the manual devoted to communication lines.

### Parameters for the configuration of datalogger

By the parameter **dt PER** you can set and configure the period for storing in minutes.

By the parameter **dt Sto** you can set the condition for datastoring:

- **dt Sto** = **Cont**, data will be stored constantly,
- **dt Sto** = **ALMr**, data will be stored at alarm,
- **dt Sto** = **ProG**, data will be stored when program runs,
- **dt Sto** = **oFF**, data are not stored.

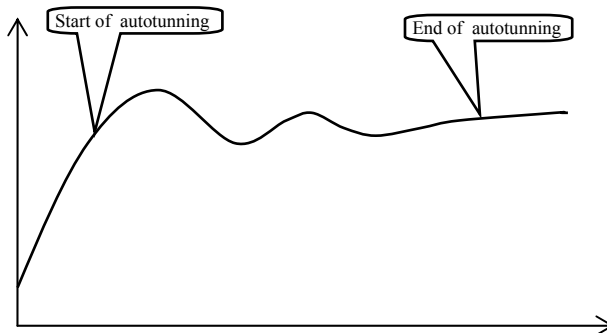
The both parameters are located in *operation level* or in *user level*. You can make them accessible in *user level*.



## 3.2 Autotuning –automatic setting of PID parameters

The controller is fitted with the function that sets automatically PID parameters.

Autotuning can be started both in program and in controlling to stp value. However, the control output must not be turned OFF.



### Procedure of starting autotuning :

- The controller must switch the control output it means the control output must not be turned OFF (in **basic MODE** there must not be on lower display **oFF**).
- Automatic optimization you can start with parameter **Aut** = **ht** for heating or **Aut** = **CL** for cooling. You will find parameter **Aut** in **operation level** or **user level**. Starting of autotuning is possible only when the particular output is set for PID controlling.
- The controller explores the characteristics of system from switching ON/OFF on the output and determines optimal PID parameters. It can cause an overshoot.
- On lower display blinks **Aut1** (configuration of parameters for heating **Pb1A**, **It1A**, **dE1A**), **Aut2** (configuration of parameters for heating **Pb1b**, **It1b**, **dE1b**) or **Aut3** (configuration of parameters for cooling **Pb2A**, **It2A**, **dE2A**).

### Important:

- Parameters **Pb1A**, **It1A**, **dE1A**, are set when 1 set of PID parameters is used (**ALGo** = **PId**) or the both sets of PID parameters are used (**ALGo** = **2PId**) and the actual set point value is lower than parameter **SWPId**.
- Parameters **Pb1b**, **It1b**, **dE1b**, are set if the actual set point value is higher than parameter **SWPId** when the both sets of PID parameters are used (**ALGo** = **2PId**).

Parameters **ALGo** and **SWPId** are found in **configuration level**, menu **out1**.

## 3.3 Monitoring of energy consumption

The controller is equipped with the function for monitoring of approximate consumed energy:

- **Total**, reading in kWh is indicated with parameter **P tot**, that is found in **operation level** or in **user level**.
- **For single firing**, reading in kWh is indicated with parameter **P ProG**, that is found in **operation level** or in **user level**.

### Important:

- For the correct counting of consumed energy you must set the input power of furnace (the equipment) with parameter **PoWEr**. Parameter finds itself in **configuration level**, menu **SYS**, see page [26](#).
- The counters of consumed energy **P tot** and **P ProG** have maximum range 9999. After reaching this value they are reset and the counting continues.
- The counter of consumed energy **P ProG** is automatically reset each time when a program starts.
- The counter **P tot** can be reset in **service level**, menu **SYS**, parameter **CLrP** ?.

# 4 Program

The term „program“ can be understood like the requested course of the temperature that user wants to attain.

This chapter is to clarify:

- principals of programming,
- editing a program,
- starting and interrupting a program,
- running a program,
- setting of parameters connected with the program.

## 4.1 Principals of programming

Program (**Prog**) consists of single steps (**Step**) that goes one after other (program starts with step 1, continues with step 2, ...).

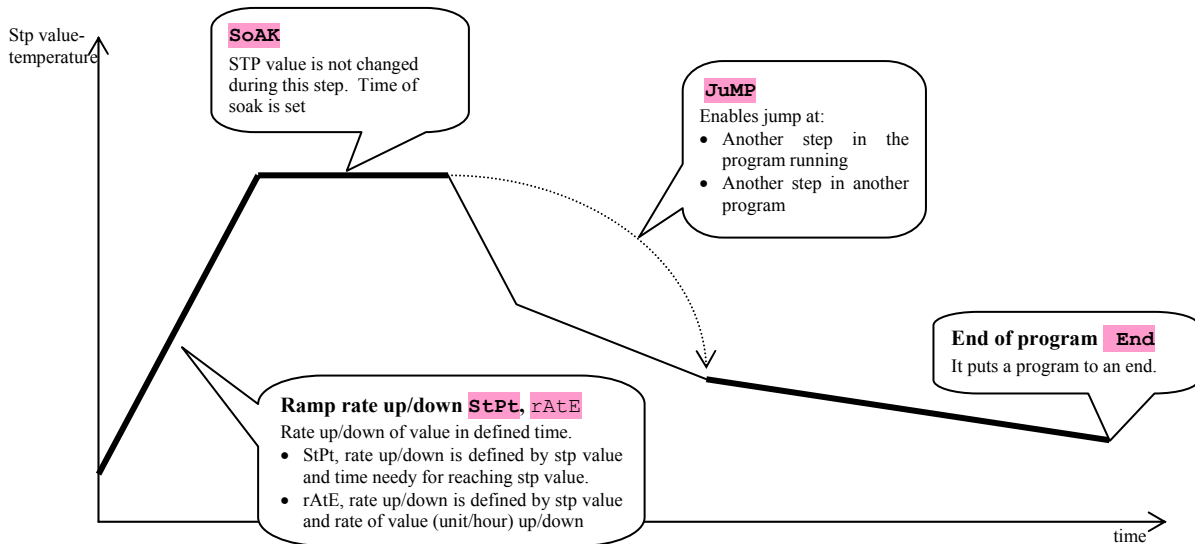
Program is ended up with step **End** (ending a program).

You can edit as many as 30 programs numbered with 1 to 30 and each program can consist of maximum 15 steps.

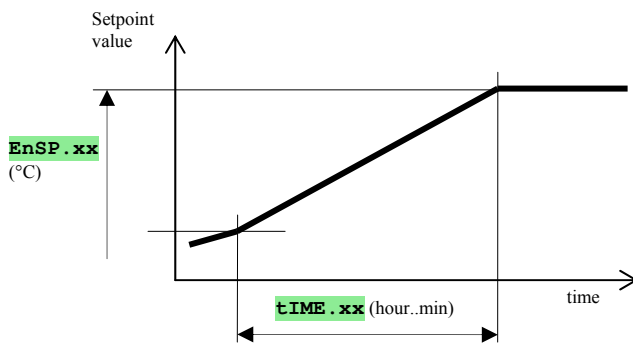
### Types of steps

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

- ramp up (down) to the temperature (setpoint value - stp) **StPt**, **rAtE**,
- soak at the temperature (stp), **SoAK**,
- jump at another program, step **JuMP**,
- end of a program, **End**.



## StPt, rate up and down of stp value

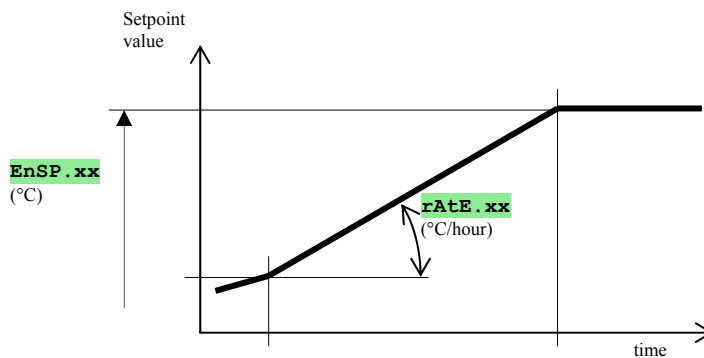


Initial set point value in step **StPt** is the same as the final set point value of preceding (former) step. In case of starting a program the initial set point value is equal to the process value. Time for step is maximum 99 hours 59 minutes.

The summary of parameters of step **StPt**:

display	Meaning
<b>EnSP.xx</b>	Final set point value.
<b>tIME.xx</b>	Time needy for reaching set point value, is stated in format hours .minutes .
<b>Ent1.xx</b>	State of the event output 1. Parameter is displayed only when the output 4 is set as the event.
<b>Ent2.xx</b>	State of the event output 2. Parameter is displayed only when the output 5 is set as the event.
<b>Ent3.xx</b>	State of the event output 3. Parameter is displayed only when the output 6 is set as the event.
<b>Ent4.xx</b>	State of the event output 4. Parameter is displayed only when the output 7 is set as the event.
<b>Gsd.xx</b>	Function GSD, see page <a href="#">17</a> .

## rAtE, rate up and down of set point value

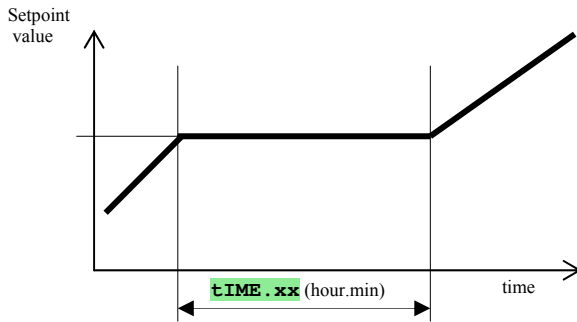


Initial set point value of step **rAtE** is the same as the final set point value of preceding (former) step. In case of starting a program the initial set point value is equal to the process value. Duration of step is not limited.

The summary of parameters of step **rAtE**:

Display	Meaning
<b>EnSP.xx</b>	Final set point value.
<b>rAtE.xx</b>	Rate of time , is stated in format °C/hour.
<b>Ent1.xx</b>	State of the event output 1. Parameter is displayed only when the output 4 is set as the event.
<b>Ent2.xx</b>	State of the event output 2. Parameter is displayed only when the output 5 is set as the event.
<b>Ent3.xx</b>	State of the event output 3. Parameter is displayed only when the output 6 is set as the event.
<b>Ent4.xx</b>	State of the event output 4. Parameter is displayed only when the output 7 is set as the event.
<b>Gsd.xx</b>	The function GSD, see page <a href="#">17</a> .

## **SoAK, soak on set point value**

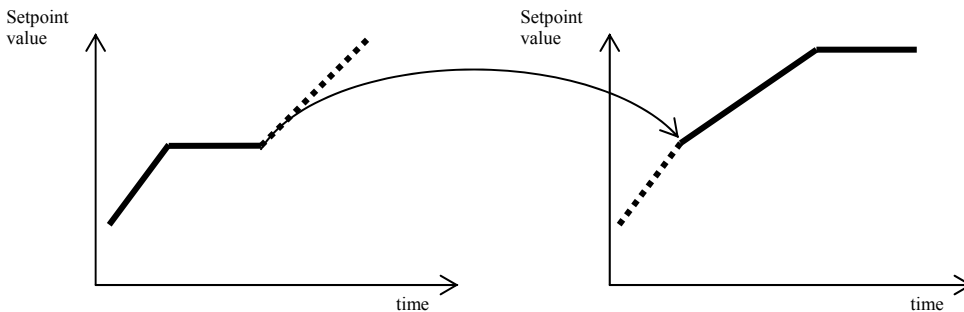


STP value of step **SoAK** is the same as the final STP of previous step. In case of starting a program the set point value is equal to the process value. Time duration of step is maximum 99 hours 59 minutes.

The summary of parameters for step **SoAK**:

Display	Meaning
<b>tIME .xx</b>	Time of soak is stated in format hours minutes.
<b>Ent1 .xx</b>	State of the event output 1. Parameter is displayed only when the output 4 is set as the event.
<b>Ent2 .xx</b>	State of the event output 2. Parameter is displayed only when the output 5 is set as the event.
<b>Ent3 .xx</b>	State of the event output 3. Parameter is displayed only when the output 6 is set as the event.
<b>Ent4 .xx</b>	State of the event output 4. Parameter is displayed only when the output 7 is set as the event.
<b>GSd .xx</b>	The function GSD, see page <a href="#">17</a> .

## **JuMP, jump in program**



You can not jump-loop to the step that you are on.

The summary of parameters for step **JuMP**:

Display	Meaning
<b>J Pr .xx</b>	The number of the program where you want to jump-loop to.
<b>J St .xx</b>	The number of the step that you want to jump-loop to.

## **End, ending a program**

The summary of parameters for step **End**:

Display	Meaning
<b>Ent1 .xx</b>	State of the event output 1. Parameter is displayed only when the output 4 is set as the event.
<b>Ent2 .xx</b>	State of the event output 2. Parameter is displayed only when the output 5 is set as the event.
<b>Ent3 .xx</b>	State of the event output 3. Parameter is displayed only when the output 6 is set as the event.
<b>Ent4 .xx</b>	State of the event output 4. Parameter is displayed only when the output 7 is set as the event.



The step **End** puts a program to an end and adjusts the event outputs.

## 4.2 Editing a program

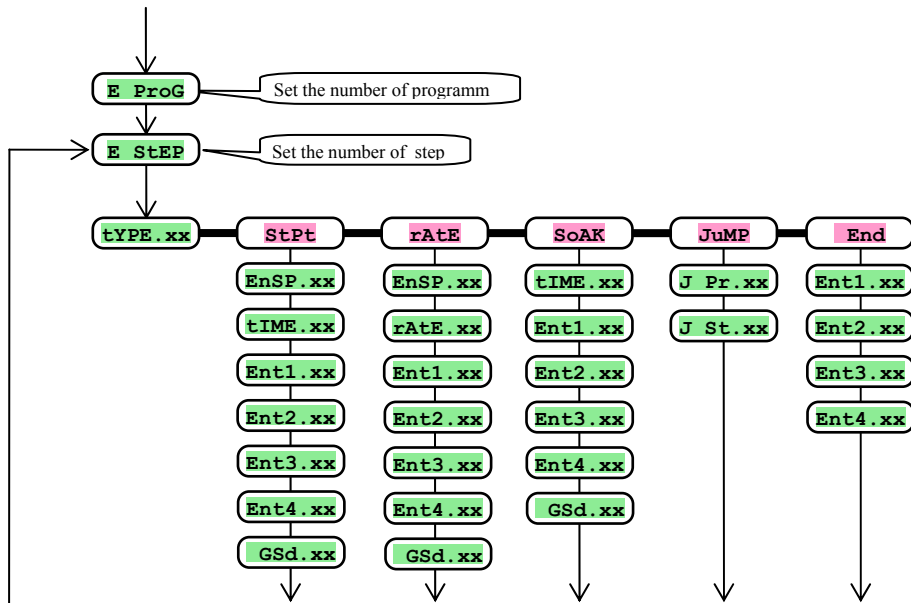
Menu for **editing a program** is intended for:

- editing a new program,
- viewing a program that has been edited,
- change of some parameters in the program already edited

To enter the menu **editing a program** from *basic mode* press the key .

To return from menu **editing a program** to *basic mode* press the both keys  .

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



- Parameters **Ent1.xx** to **Ent4.xx** are shown only when the outputs are set as the event outputs (in configuration level output 4 to 7).
- Type of step **StPt** is shown only in case if it is allowed (**rA tYP** = **StPt** or **rA tYP** = **both**).
- Type of step **rAtE** is shown only in case if it is allowed (**rA tYP** = **rAtE** or **rA tYP** = **both**).

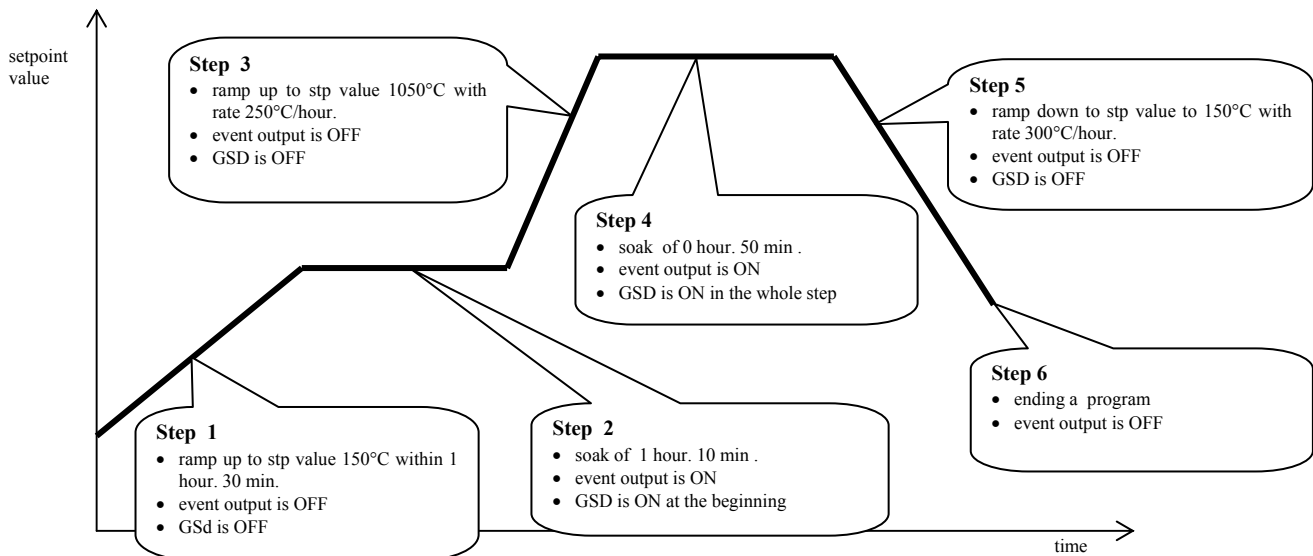
### **Important:**

- At each change of the parameter **rA tYP** it is recommended to check up all edited programs.

How to edit a program – it will be detailed in the following example

Example for editing a program:

- Edit the program to the controller – program is illustrated below and stated in the table .
- Edit the program to the position 2 (program - number 2).
- In configuration level the output 2 is set as the event (**out4** = **Ent1**) and both types of steps are allowed for rate up/down (**rA tYP** = **both**).



E StEP	tYPE .xx	EnSP .xx	tIME .xx	rAtE .xx	Ent1 .xx	Ent2 .xx	Ent3 .xx	Ent4 .xx	Gsd .xx
1	StPt	150	1.30		oFF				oFF
2	SoAK		1.10		on				Strt
3	rAtE	1050		250	oFF				oFF
4	SoAK		0.50		on				on
5	rAtE	150		300	oFF				oFF
6	End				oFF				
7									
8									

Now you can edit the program to the controller:

- Controller is in **basic mode**, see page 6.
- Press the key „PROG“. On lower display it appears **E ProG**. Procedure for editing is in the following table.

Display	Procedure
<b>E ProG</b>	The number of the program, set <b>2</b> , confirm with the key „PROG“.
<b>E Step</b>	The number of the step, leave <b>1</b> , confirm with the key „PROG“.
<b>tYPE . 1</b>	Type of the step 1, set <b>StPt</b> , confirm with the key „PROG“.
<b>EnSP . 1</b>	Set point value of the step 1, set <b>150</b> , confirm with the key „PROG“.
<b>tIME . 1</b>	Time needy for reaching the value <b>EnSP 1</b> of the step 1, set <b>1.30</b> , and confirm with the key „PROG“.
<b>Ent1 . 1</b>	State of the event output for the step 1, set <b>oFF</b> , and confirm with the key „PROG“.
<b>Gsd . 1</b>	The function GSD, set <b>oFF</b> .
<b>E StEP</b>	The number of the step, leave <b>2</b> , and confirm with the key „PROG“.
<b>tYPE 2</b>	Type of the step 2, set <b>SoAK</b> , and confirm with the key „PROG“.
<b>tIME . 2</b>	Time of soak of the step 2, set <b>1.10</b> , and confirm with the key „PROG“.
<b>Ent1 . 2</b>	The state of the event output 2, set <b>on</b> , and confirm with the key „PROG“.
<b>Gsd . 2</b>	The function GSD, set <b>Strt</b> .

Proceed in the same way for editing other parameters up to the step 6

<b>E StEP</b>	The number of the step, leave <b>6</b> , confirm with the key „PROG“.
<b>tYPE . 6</b>	Type of the step 6, set <b>End</b> , confirm with the key „PROG“.
<b>Ent1 . 6</b>	State of the event output of the step 6, set <b>oFF</b> , confirm with the key „PROG“.

## 4.3 Starting and ending a program

The program can be started up by the command of operator with keyboard or can be automatically started up by the internal real time clock.

### Starting a program with keyboard

- Controller is in *basic mode*, see page 6.
- Press shortly the key „START / STOP“. On lower display it appears **ProG**, on upper display you set via key-arrows the number of the program you wish to start and you confirm with the key „START / STOP“.
- The requested program starts.
- Running a program is indicated with diodes „rate“, „sp“ a „time“.

### Starting a program by the internal clock

You can select the program that will be started up by the clock after the time setting.

- Controller is in *basic mode*, see page 6.
- Press the key „START / STOP“ for approx. 3 seconds. On lower display it appears **PCLK**, further you will proceed acc. to the table:

Display	Procedure
<b>PCLK</b>	Set the number of program you wish to start up by clock. If you set <b>oFF</b> , automatic start is not allowed. Confirm with the key „START / STOP“.
<b>Mon</b>	Set month of start of program. If you don't like to set month and day of starting, set <b>oFF</b> . In that case parameter <b>dAY</b> is not displayed and program starts every day. Confirm with the key „START / STOP“.
<b>dAtE</b>	Set day of starting. It is not displayed, if setting is <b>Mon</b> = <b>oFF</b> . Confirm with the key „START / STOP“.
<b>hour</b>	Set hour of starting a program. Confirm with the key „START / STOP“.
<b>Min</b>	Set minute of starting a program. Confirm with the key „START / STOP“.

### Important:

- If you set the automatic starting a program by the clock, on lower display blinks **PCLK**.
- You can not set the automatic starting of the program if another program runs.
- If the program started up by the clock is shorter than 10 minutes, it can be started several times successively one after another.

### Interruption of a program

You can end up a program in this way:

The controller is in *basic mode*, the program is running.

- Press shortly the key „START / STOP“, on lower display it appears **ProG**.
- If you set „Cont“ on upper display and confirm with the key „START / STOP“, program will continue.
- If you set „End“ on upper display and confirm with the key „START / STOP“, **program will be ended up**.

## 4.4 The course of the program running

*The run of the program* is indicated with diode lights „rate“, „sp“ and „time“:

- „rate“ blinks, „sp“ is lit, it means that the ramp rate up/down to stp value is running.
- „time“ blinks, „sp“ is lit, it means that the soak on the stp value is running.

### To read the state of the program

To read the state of the program that is just running you need to set the parameter **StePxx** = **run**, see page 27.

In user level the following parameters will be available for you (only when the program is running):

- **ProG** ... shows the number of the program that is just running,
- **StEP** ... shows the number of the actual step,
- **EnSP** ... shows the final set point value of the actual step,
- **TrEM** ... shows the time to the end of the step.

### To read the state of the program, the change of actual step

The parameters for reading the state of the program and for the change of setting for the step that is just running can be available by setting **StePxx** = **ErUN**, see page 27.

In user level the following parameters will be shown when the program runs:

- **ProG** ... shows the number of the program that is just running,

- **StEP** ... shows the number of the actual step,
- **tYPE** ... shows the type of actual step,
- **EnSP** ... shows the final set point value of the actual step, *this parameter can be changed*,
- **rAtE** ... shows rate up of the actual step, *this parameter can be changed*,
- **trEM** ... shows the time to the end of the step, *this parameter can be changed*.

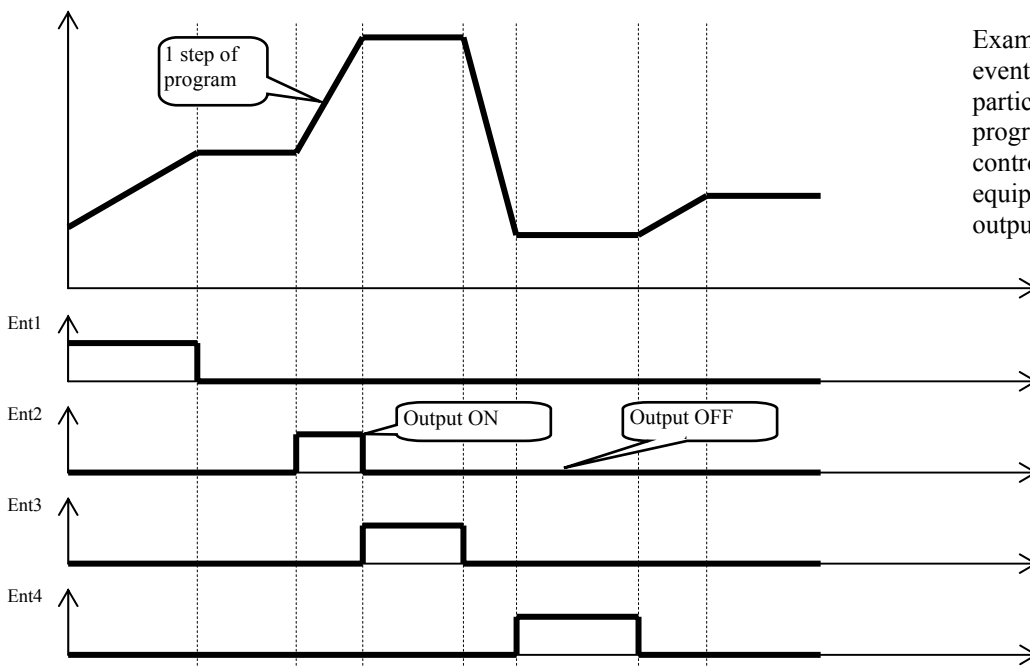
The parameters changed/configured in this way have influence only on the course of actual step, they are not edited permanently.

### **Scope of setting and reading parameters, event. state of controller in a program**

- Setting and reading of parameters is allowed in user level.
- Setting and reading of parameters is allowed in operation level.
- Setting of automatic start-up of a program by the clock is allowed.
- The interruption and ending a program is allowed.
- Autotuning of PID parameters is allowed.
- Setting the parameters in configuration level **is inhibited**

## **4.5 Event outputs Ent1 to Ent4**

The event output is intended for controlling of external events (cooling flaps of furnace, fan, ...) by the program. In particular steps of the program the event output can be switched ON (**Ent1** = **on**) or switched OFF (**Ent1** = **oFF**).



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

### **Options for configurations of event output**

Output 4 to 7 can be configured as the event one (Ent1 to Ent4). You can carry out this setting in *configuration level*, menu **out4** ... parameter **out4** = **Ent1** ....

### **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 **out4** to **out7**, parameters **I Ent1** to **I Ent4** as follows:

- **I Ent1** = **hoLd**, state of the event output remains unchanged.
- **I Ent1** = **oFF**, the event output is switched OFF at the interruption of the program.
- **I Ent1** = **on**, the event output is switched ON at the interruption of the program



## Controlling of event output when not in program

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

## 4.6 Guaranteed Soak Deviation - GSD

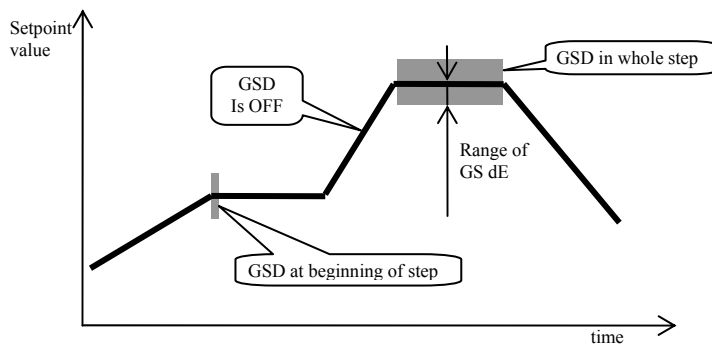
The function of GSD helps to maintain the requested course of the program. If the process value leaves the defined Soak Band, **counting down is paused**.

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:

- **oFF**, at that step GSD is turned OFF (counting down is not paused in that step).
- **strt**, GSD is turned ON only at the beginning of the step (the step starts at the moment when process value gets into soak band **GS dE** in the surroundings of stp value, (further the counting down is not paused).
- **on**, GSD is turned ON in the whole step (the counting down is paused each time when process value leaves soak band **GS dE**).

Width of soak band GSD can be set in *configuration level*, menu **SYS ?**, parameter **GS dE**.



## 4.7 Signalling for the run of a program, the end of a program

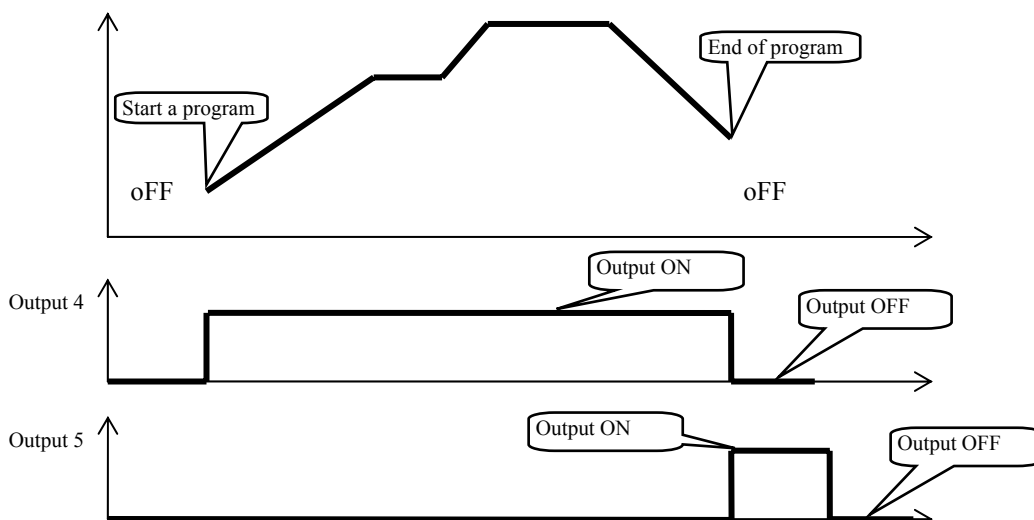
The auxiliary outputs (out4 to out7) can indicate the run of a program as well as ending a program.

### Example:

Output 4 will indicate the run of a program, output 5 will indicate ending a program (the duration for the switching ON of relay will be adjusted to 15 seconds).





In *configuration level* you will set:

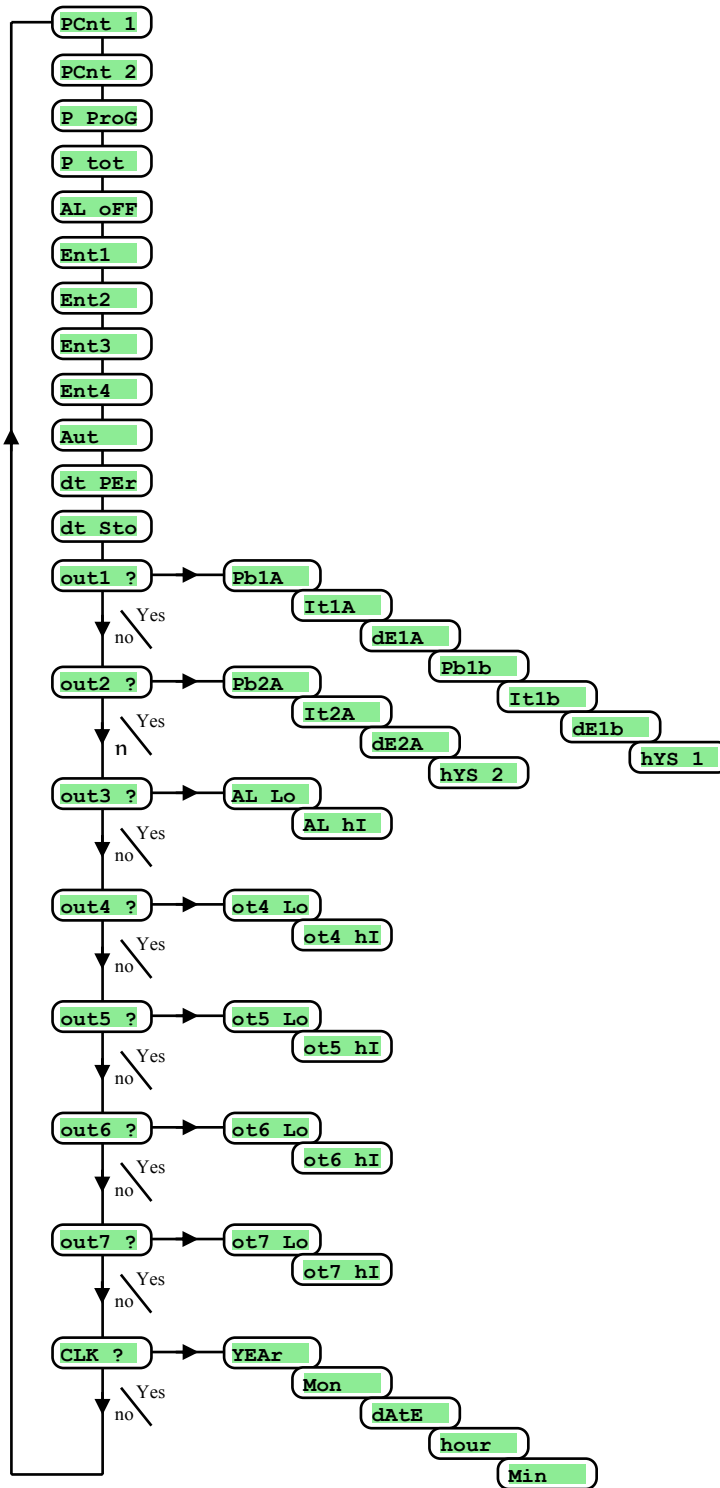
- Output 4 ... **out 4** = **ProG**.
- Output 5 ... **out 5** = **PEnd**, parameter **tIME 5** = 15.



# 5 Operation level

In operation level you can set parameters which are available to a user.

From basic mode to operation level you will get by pressing the keys   for approx. 3 seconds. . On lower display it appears **LEVEL**, on upper display set **oPEr** and confirm with the key . If **PASS** appears on lower display the level is secured with the password. In this case set the right password with the arrow-key .



## Menu of operation level

Display	Meaning
<b>PCnt 1</b>	Shows the actual power of the output 1 in %.
<b>PCnt 2</b>	Shows the actual power of the output 2 in %.
<b>P ProG</b>	Energy consumption in kWh for the last firing. When in program the counter is set to 0 and counting of consumption starts from 0.
<b>P tot</b>	Total consumption in kWh. After reaching value 9999 the counter is reset and starts counting from 0.
<b>AL oFF</b>	You can <b>switch OFF permanent alarm</b> by setting <b>YES</b> and confirming.
<b>Ent1</b>	Appears <b>the state of the event output 1</b> ( <b>oFF</b> ... switched OFF, <b>on</b> ... switched ON). The output can be configured via the arrow-keys if a program does not run.
<b>Ent2</b>	Appears <b>the state of the event output 2</b> ( <b>oFF</b> ... switched OFF, <b>on</b> ... switched ON). The output can be configured via the arrow-keys if a program does not run.
<b>Ent3</b>	Appears <b>the state of the event output 3</b> ( <b>oFF</b> ... switched OFF, <b>on</b> ... switched ON). The output can be configured via the arrow-keys if a program does not run.
<b>Ent4</b>	Appears <b>the state of the event output 4</b> ( <b>oFF</b> ... switched OFF, <b>on</b> ... switched ON). The output can be configured via the arrow-keys if a program does not run.
<b>Aut</b>	Starting / turning OFF of autotuning of PID parameters: <ul style="list-style-type: none"> <li><b>oFF</b>, turning OFF of autotuning of PID parameters.</li> <li><b>ht</b>, starting of autotuning of PID parameters, heating.</li> <li><b>CL</b>, starting of autotuning of PID parameters, cooling.</li> </ul>
<b>dt PEr</b>	<b>The period of data storing</b> of measured process values in datalogger in minutes. Range: 1 to 120 minutes.
<b>dt Sto</b>	Condition for data storing of measured process values(data history) in datalogger: <ul style="list-style-type: none"> <li><b>oFF</b>, data storing is turned OFF</li> <li><b>ProG</b>, storing is executed only if program runs.</li> <li><b>ALMr</b>, storing is executed only at alarm.</li> <li><b>Cont</b>, storing is executed constantly.</li> </ul>
<b>out1 ?</b>	<b>The entry to menu for setting of parameters of the output 1</b> (PID parameters or hysteresis of the control output).
<b>out2 ?</b>	<b>The entry to menu for setting of parameters of the output 2</b> (PID parameters or hysteresis of the control output).
<b>out3 ?</b>	<b>The entry to menu for setting of parameters of the output 3</b> (alarm limits).
<b>out4 ?</b>	<b>The entry to menu for setting of parameters of the output 4</b> (signal limits).
<b>out5 ?</b>	<b>The entry to menu for setting of parameters of the output 5</b> (signal limits).
<b>out6 ?</b>	<b>The entry to menu for setting of parameters of the output 6</b> (signal limits).
<b>out7 ?</b>	<b>The entry to menu for setting of parameters of the output 7</b> (signal limits).
<b>CLoCK?</b>	<b>The entry to menu for setting of real time clock.</b>

### **out1** , menu for parameters of the output 1

Menu is intended for manual setting of PID parameters or for fine tuning of parameters when the controlling is not enough precise.

Display	Meaning
<b>Pb1A</b>	<b>Proportional band</b> , the first set of PID parameters. Range: 1 to 2499 °C.
<b>It1A</b>	<b>Integral value</b> , the first set of PID parameters. Range: <b>oFF</b> , 0.1 to 99.9 minutes.
<b>dE1A</b>	<b>Derivative value</b> , the first set of PID parameters. Range: <b>oFF</b> , 0.01 to 9.99 minutes.
<b>Pb1b</b>	<b>Proportional band</b> , the second set of PID parameters. Range: 1 to 2499 °C.
<b>It1b</b>	<b>Integral value</b> , the second set of PID parameters. Range: <b>oFF</b> , 0.1 to 99.9 minutes.
<b>dE1b</b>	<b>Derivative value</b> , the second set of PID parameters. Range: <b>oFF</b> , 0.01 to 9.99 minutes.
<b>hYS1</b>	<b>Hysteresis</b> , this single parameter is set only for ON/OFF control. Range: 1 to 249 °C.

Parameters **Pb1A** , **It1A** , **dE1A** / **Pb2A** , **It2A** , **dE2A** are switched over with accordance to stp value.

The temperature for switching over is set in *configuration level*, menu **out1** parameter **SWPId**. If stp value is lower than **SWPId**, parameters **Pb1A**, **It1A**, **dE1A** are used, if it is higher, the parameters **Pb2A**, **It2A**, **dE2A** are used.

### **out2**, menu for parameters of the output 2

Menu is intended for manual setting of PID parameters of the output 2 or for the correction of PID parameters after autotuning.

Display	Meaning
<b>Pb2A</b>	Proportional band. Range: 1 to 2499 °C.
<b>It2A</b>	Integral value. Range: <b>oFF</b> , 0.1 to 99.9 minutes.
<b>dE2A</b>	Derivative value. Range: <b>oFF</b> , 0.01 to 9.99 minutes.
<b>hYS2</b>	Hysteresis, this single parameter is set only for ON/OFF control. Range: 1 to 249 °C.

### **out3**, menu for setting of alarm limits

The menu is shown when the output 3 is set as the alarm one (**out 3** = **ALPr** or **out 3** = **ALdE**).

Display	Meaning
<b>AL Lo</b>	<b>Low limit of alarm.</b> Alarm is activated when process value is <b>lower</b> than the set alarm limit. Range: <ul style="list-style-type: none"> <li>-499 to <b>AL hI</b> °C for <b>out 3</b> = <b>ALPr</b>.</li> <li>-999 to 0 °C for <b>out 3</b> = <b>ALdE</b>.</li> </ul>
<b>AL hI</b>	<b>High limit of alarm.</b> Alarm is activated when process value is <b>higher</b> than the set alarm limit. Range: <ul style="list-style-type: none"> <li><b>AL Lo</b> to 2499 °C for <b>out 3</b> = <b>ALPr</b>.</li> <li>0 to 999 °C for <b>out 3</b> = <b>ALdE</b>.</li> </ul>

### **out4**, menu for setting of signal limits of output 4

The menu is shown when the output 4 is set as the signal one (**out 4** = **SGPr** or **out 4** = **SGdE**).

Display	Meaning
<b>ot4 Lo</b>	<b>Low limit of signalling.</b> Output is activated when process value is <b>lower</b> than the set signalling limit. Range: <ul style="list-style-type: none"> <li>-499 to <b>ot4 hI</b> °C for <b>out 4</b> = <b>SGPr</b>.</li> <li>-999 to 0 °C for <b>out 4</b> = <b>SGdE</b>.</li> </ul>
<b>ot4 hI</b>	<b>High limit of signalling.</b> Output is activated when process value is <b>higher</b> than the set signalling limit. Range: <ul style="list-style-type: none"> <li><b>ot4 Lo</b> to 2499 °C for <b>out 4</b> = <b>SGPr</b>.</li> <li>0 to 999 °C for <b>out 4</b> = <b>SGdE</b>.</li> </ul>

### **out5**, menu for setting of signal limits of output 5

The menu is shown when the output 5 is set as the signal one (**out 5** = **SGPr** or **out 5** = **SGdE**).

Display	Meaning
<b>ot5 Lo</b>	<b>Low limit of signalling.</b> Output is activated when process value is <b>lower</b> than the set signalling limit. Range: <ul style="list-style-type: none"> <li>-499 to <b>ot5 hI</b> °C for <b>out 5</b> = <b>SGPr</b>.</li> <li>-999 to 0 °C for <b>out 5</b> = <b>SGdE</b>.</li> </ul>
<b>ot5 hI</b>	<b>High limit of signalling.</b> Output is activated when process value is <b>higher</b> than the set signalling limit. Range: <ul style="list-style-type: none"> <li><b>ot5 Lo</b> to 2499 °C for <b>out 5</b> = <b>SGPr</b>.</li> <li>0 to 999 °C for <b>out 5</b> = <b>SGdE</b>.</li> </ul>

## **out6** , menu for setting of signal limits of output 6

The menu is shown when the output 6 is set as the signal one (**out 6** = **SGPr** or **out 6** = **SGdE**).

Display	Meaning
<b>ot6 Lo</b>	<b>Low limit of signalling.</b> Output is activated when process value is <b>lower</b> than the set signalling limit. Range: <ul style="list-style-type: none"><li>• -499 to <b>ot6 hI</b> °C for <b>out 6</b> = <b>SGPr</b>.</li><li>• -999 to 0 °C for <b>out 6</b> = <b>SGdE</b>.</li></ul>
<b>ot6 hI</b>	<b>High limit of signalling.</b> Output is activated when process value is <b>higher</b> than the set signalling limit. Range: <ul style="list-style-type: none"><li>• <b>ot6 Lo</b> to 2499 °C for <b>out 6</b> = <b>SGPr</b>.</li><li>• 0 to 999 °C for <b>out 6</b> = <b>SGdE</b>.</li></ul>

## **out7** , menu for setting of signal limits of output 7

The menu is shown when the output 7 is set as the signal one (**out 7** = **SGPr** or **out 7** = **SGdE**).

Display	Meaning
<b>ot7 Lo</b>	<b>Low limit of signalling.</b> Output is activated when process value is <b>lower</b> than the set signalling limit. Range: <ul style="list-style-type: none"><li>• -499 to <b>ot7 hI</b> °C for <b>out 7</b> = <b>SGPr</b>.</li><li>• -999 to 0 °C for <b>out 7</b> = <b>SGdE</b>.</li></ul>
<b>ot7 hI</b>	<b>High limit of signalling.</b> Output is activated when process value is <b>higher</b> than the set signalling limit. Range: <ul style="list-style-type: none"><li>• <b>ot7 Lo</b> to 2499 °C for <b>out 7</b> = <b>SGPr</b>.</li><li>• 0 to 999 °C for <b>out 7</b> = <b>SGdE</b>.</li></ul>



## **CLK** , menu for setting the real time clock

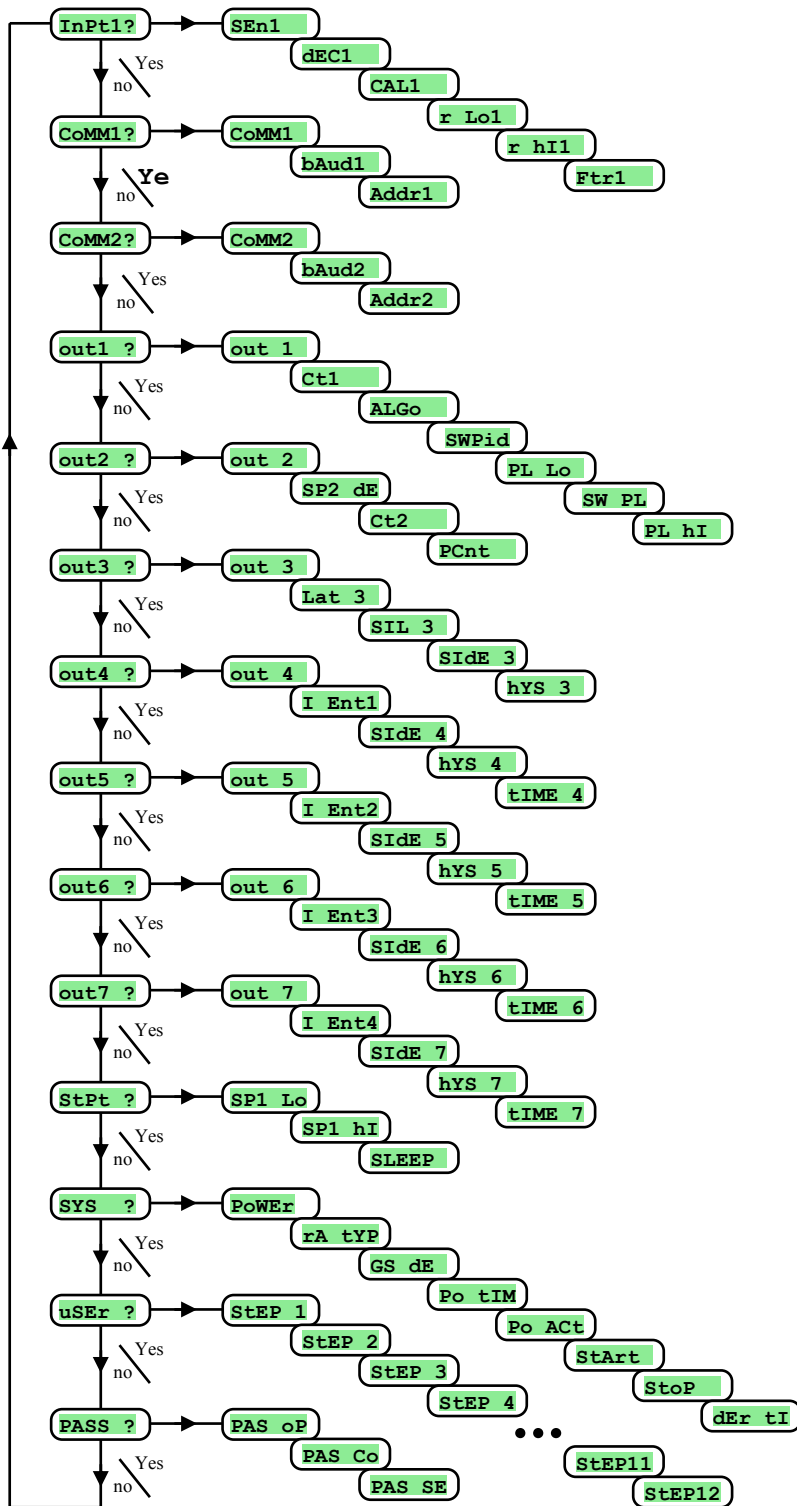
In this menu you can set the real time clock. The clock is not equipped with automatic changeover from standard time to daylight saving time and back in turn.

Display	Meaning
<b>YEAr</b>	Set the actual year.
<b>Mon</b>	Set the actual month.
<b>dAtE</b>	Set the actual day.
<b>hour</b>	Set current hour.
<b>MIn</b>	Set current minute.

# 6 Configuration level

Configuration level is intended for the basic setting of the controller. In this level **the control output is turned OFF** and **alarm, signal and event outputs are deactivated**.

To enter configuration level from basic mode press both the keys   for 3 seconds. On lower display it appears **LEVEL**, on upper display set via the arrow-keys **ConF** and confirm. If **PASS** appears on lower display, configuration level is secured with the password. In this case set the password via the arrow-keys and confirm again.



## InPt1 , input setting

Display	Meaning
<b>SEn1</b>	<p><b>Setting of input sensor – thermal input.</b></p> <ul style="list-style-type: none"> <li><b>no</b> ... input is not set.</li> <li><b>J</b> ... thermocouple J, range -200 to 900°C.</li> <li><b>K</b> ... thermocouple K, range -200 to 1360°C.</li> <li><b>t</b> ... thermocouple T, range -200 to 400°C.</li> <li><b>n</b> ... thermocouple N, range -200 to 1300°C.</li> <li><b>E</b> ... thermocouple E, range -200 to 700°C.</li> <li><b>r</b> ... thermocouple R, range 0 to 1760°C.</li> <li><b>S</b> ... thermocouple S, range 0 to 1760°C.</li> <li><b>b</b> ... thermocouple B, range 300 to 1820°C.</li> <li><b>C</b> ... thermocouple C, range 0 to 2320°C.</li> <li><b>d</b> ... thermocouple D, range 0 to 2320°C.</li> <li><b>rtd</b> ... rtd sensor (Pt100), range -200 to 800°C.</li> </ul> <p><b>Setting of input sensor ... process input:</b></p> <ul style="list-style-type: none"> <li><b>no</b> ... input is not set.</li> <li><b>0-20</b> ... 0 – 20 mA, range -499 to 2499 units.</li> <li><b>4-20</b> ... 4 – 20 mA, range -499 to 2499 units.</li> <li><b>0-5</b> ... 0 – 5 V, range -499 to 2499 units.</li> <li><b>1-5</b> ... 1 – 5 V, range -499 to 2499 units.</li> <li><b>0-10</b> ... 0 – 10 V, range -499 to 2499 units.</li> </ul>
<b>dEC1</b>	<p><b>Setting of decimal point for displaying – thermal input.</b></p> <ul style="list-style-type: none"> <li><b>0</b> ... no decimal point.</li> <li><b>0.0</b> ... 1 decimal point.</li> </ul> <p><b>Setting of decimal point for displaying – process input:</b></p> <ul style="list-style-type: none"> <li><b>0</b> ... no decimal point.</li> <li><b>0.0</b> ... 1 decimal point.</li> <li><b>0.00</b> ... 2 decimal points.</li> <li><b>0.000</b> ... 3 decimal points</li> </ul>
<b>CAL1</b>	<p><b>Correction of sensor.</b> The set value is added to process value. Range: -999 to 999 °C.</p>
<b>r Lo1</b>	<p>Together with parameter <b>r hI1</b> you also set <b>the scale of displaying measured values for process input ranges.</b> Range: -499 to <b>r hI1</b>.</p>
<b>r hI1</b>	<p>Together with parameter <b>r Lo1</b> you also set <b>the scale of displaying measured values for process input ranges.</b> Range: <b>r Lo1</b> to 2499.</p>
<b>Ftr1</b>	<p>You set <b>filter coefficient for input signal.</b> The more the filter coefficient is the more the filter smoothes the input signal. Range: <b>oFF</b>, 0.1 to 60.0 seconds.</p>

## CoMM1 , first communication line

Display	Meaning
<b>CoMM1</b>	<p><b>Setting of communication line:</b></p> <ul style="list-style-type: none"> <li><b>Mod</b> ... the controller is set for communication with PC.</li> <li><b>SGnL</b> ... the controller transmits information for controlling of SLAVE units (process and stp values, output power)..</li> </ul>
<b>bAud1</b>	<p><b>Baudrate of communication,</b> is in default setting - 9600Bd.</p>
<b>Addr1</b>	<p><b>Address of the equipment,</b> it is shown when <b>CoMM1 = Mod.</b></p>

## CoMM2 , second communication line

Display	Meaning
<b>CoMM2</b>	<p><b>Setting of communication line:</b></p> <ul style="list-style-type: none"> <li><b>Mod</b> ... the controller is set for the communication with PC.</li> <li><b>SGnL</b> ... the controller transmits information for controlling of SLAVE units (process and stp values, output power).</li> <li><b>SG 1</b> ... enhanced system Master-Slave. The controller transmits set point value and reads process value from the address 1 of the controller Slave.</li> <li><b>SG 2</b> ... enhanced system Master-Slave. The controller transmits set point value and reads process value from the addresses 1 and 2 of the controllers Slave.</li> <li><b>SG 3</b> ... enhanced system Master-Slave. The controller transmits set point value and reads process value from the addresses 1 to 3 of the controllers Slave.</li> <li><b>SG 4</b> ... enhanced system Master-Slave. The controller transmits set point value and reads process value from the addresses 1 to 4 of the controllers Slave.</li> <li><b>SG 5</b> ... enhanced system Master-Slave. The controller transmits set point value and reads process value from the addresses 1 to 5 of the controllers Slave.</li> <li><b>SG 6</b> ... enhanced system Master-Slave. The controller transmits set point value and reads process value from the addresses 1 to 6 of the controllers Slave.</li> <li><b>SG 7</b> ... enhanced system Master-Slave. The controller transmits set point value and reads process value from the addresses 1 to 7 of the controllers Slave.</li> <li><b>SG 8</b> ... enhanced system Master-Slave. The controller transmits set point value and reads process value from the addresses 1 to 8 of the controllers Slave.</li> <li><b>SG 9</b> ... enhanced system Master-Slave. The controller transmits set point value and reads process value from the addresses 1 to 9 of the controllers Slave.</li> <li><b>SG10</b> ... enhanced system Master-Slave. The controller transmits set point value and reads process value from the addresses 1 to 10 of the controllers Slave.</li> </ul>

<b>bAud2</b>	Baudrate of communication, is in default setting - 9600Bd.
<b>Addr2</b>	Address of the equipment, it is shown when <b>CoMM2</b> = <b>Mod</b> .

### out1 , output 1

Display	Meaning
<b>out 1</b>	<b>Function of the output 1:</b> <ul style="list-style-type: none"> <li>• <b>oFF</b> ... the output 1 is turned OFF.</li> <li>• <b>ht</b> ... the heating control, PID controlling.</li> <li>• <b>ht2</b> ... the heating control, ON/OFF controlling</li> </ul>
<b>Ct1</b>	<b>Time cycle for switching of the output 1.</b> Range: 1 to 200 seconds.
<b>ALGo</b>	<b>Algorithms of PID controlling:</b> <ul style="list-style-type: none"> <li>• <b>PId</b> ... one set of PID parameters is used.</li> <li>• <b>2PId</b> ... both sets of PID parameters are used.</li> </ul>
<b>SWPId</b>	<b>Limit between PID set 1 and PID set 2.</b> Range: -499 to 2499 °C.
<b>PL Lo</b>	<b>Power limit function for the limiting of output power at low measured values, in %.</b> Range: 0 to 100 %.
<b>SW PL</b>	<b>Setting of limit between low and high values of power limit function.</b> Range: -499 to 2499 °C.
<b>PL hI</b>	<b>Power limit function for the limiting of output power at high measured values, in %.</b> Range: 0 to 100 %.

### out2 , output 2

Display	Meaning
<b>out2</b>	<b>Function of the output 2:</b> <ul style="list-style-type: none"> <li>• <b>oFF</b> ... the output 2 is turned OFF.</li> <li>• <b>CL</b> ... the cooling control, PID controlling.</li> <li>• <b>CL2</b> ... the cooling control, ON/OFF controlling.</li> <li>• <b>A ht</b> ... auxiliary heating.</li> </ul>
<b>SP2 dE</b>	<b>Stp value for the output 2 (deviation from stp value of the output 1).</b> Range: 0 to 1000 °C.
<b>Ct2</b>	<b>Time cycle for switching of the output 2.</b> Range: 1 to 200 seconds.
<b>PCnt</b>	<b>Limiting of power of auxiliary heating.</b> Range: 0 to 100 %.

### out3 , alarm output

Display	Meaning
<b>out 3</b>	<b>Function of the alarm output:</b> <ul style="list-style-type: none"> <li>• <b>oFF</b> ... alarm output is turned OFF.</li> <li>• <b>ALPr</b> ... alarm defined by the absolute value.</li> <li>• <b>ALdE</b> ... alarm defined by the deviation from stp value SP1.</li> </ul>
<b>Lat 3</b>	<b>Setting for alarm latching:</b> <ul style="list-style-type: none"> <li>• <b>oFF</b> ... temporary alarm / signalling.</li> <li>• <b>on</b> ... permanent alarm / signalling.</li> </ul>
<b>SIL 3</b>	<b>Setting for alarm silencing at the power-up:</b> <ul style="list-style-type: none"> <li>• <b>oFF</b> ... alarm function is active.</li> <li>• <b>on</b> ... alarm function is deactivated.</li> </ul>
<b>SIDE 3</b>	<b>The selection of active limits for alarm:</b> <ul style="list-style-type: none"> <li>• <b>both</b> ... low and high limit is active.</li> <li>• <b>hI</b> ... high limit is active.</li> <li>• <b>Lo</b> ... low limit is active.</li> </ul>
<b>hYS 3</b>	<b>Hysteresis for switching for the alarm output.</b> Range: 1 to 249 °C.



## out4 , auxiliary output

Display	Meaning
out 4	<b>Function of auxiliary output:</b> <ul style="list-style-type: none"> <li>oFF ... auxiliary output is turned OFF.</li> <li>Ent1 ... event 1 controlled by the program.</li> <li>SGPr ... signalling when process value is beyond the defined limits, absolute value.</li> <li>SGdE ... signalling when process value is beyond the defined limits, deviation from stp value SP1.</li> <li>ProG ... signalling when the program runs.</li> <li>PEnd ... signalling when the program has ended.</li> </ul>
I Ent1	<b>State of the event output 1 when the program is interrupted:</b> <ul style="list-style-type: none"> <li>hold ... event output 1 remains unchanged.</li> <li>oFF ... event output 1 is turned OFF.</li> <li>on ... event output 1 is turned ON.</li> </ul> Parameter is shown only when out 4 = Ent1 .
SIde 4	<b>Selection of the active limits for signalling that process value is beyond these defined limits:</b> <ul style="list-style-type: none"> <li>both ... low and high limit is active.</li> <li>hI ... high limit is active.</li> <li>Lo ... low limit is active.</li> </ul> Parameter is shown only when out 4 = SGPr or SGdE.
hYS 4	<b>Hysteresis for switching for the signalling output.</b> <ul style="list-style-type: none"> <li>Range: 1 to 249 °C.</li> </ul> Parameter is shown only when out 4 = SGPr or SGdE.
tIME 4	<b>Setting of the duration of signalling at the end of a program.</b> <ul style="list-style-type: none"> <li>Range: 1 to 999 seconds.</li> </ul> Parameter is shown only when out 4 = PEnd.

## out5 , auxiliary output

Display	Meaning
out 5	<b>Function of auxiliary output:</b> <ul style="list-style-type: none"> <li>oFF ... auxiliary output is turned OFF.</li> <li>Ent2 ... event 2 controlled by the program.</li> <li>SGPr ... signalling when process value is beyond the defined limits, absolute value.</li> <li>SGdE ... signalling when process value is beyond the defined limits, deviation from stp value SP1.</li> <li>ProG ... signalling when the program runs.</li> <li>Pend ... signalling when the program has ended.</li> </ul>
I Ent2	<b>State of the event output 2 when the program is interrupted:</b> <ul style="list-style-type: none"> <li>hold ... event output 2 remains unchanged.</li> <li>oFF ... event output 2 is turned OFF.</li> <li>on ... event output 2 is turned ON.</li> </ul> Parameter is shown only when out 5 = Ent2 .
SIde 5	<b>Selection of the active limits for signalling that process value is beyond these defined limits:</b> <ul style="list-style-type: none"> <li>both ... low and high limit is active.</li> <li>hI ... high limit is active.</li> <li>Lo ... low limit is active.</li> </ul> Parameter is shown only when out 5 = SGPr or SGdE.
hYS 5	<b>Hysteresis for switching for the signalling output.</b> <ul style="list-style-type: none"> <li>Range: 1 to 249 °C.</li> </ul> Parameter is shown only when out 5 = SGPr or SGdE.
tIME 5	<b>Setting of the duration of signalling at the end of a program.</b> <ul style="list-style-type: none"> <li>Range: 1 to 999 seconds.</li> </ul> Parameter is shown only when out 5 = PEnd.

## out6 , auxiliary output

Display	Meaning
out 6	<b>Function of auxiliary output:</b> <ul style="list-style-type: none"> <li>oFF ... auxiliary output is turned OFF.</li> <li>Ent1 ... event 3 controlled by the program.</li> <li>SGPr ... signalling when process value is beyond the defined limits, absolute value.</li> <li>SGdE ... signalling when process value is beyond the defined limits, deviation from stp value SP1.</li> <li>ProG ... signalling when the program runs.</li> <li>PEnd ... signalling when the program has ended.</li> </ul>

<b>I Ent3</b>	<p><b>State of the event output 3 when the program is interrupted:</b></p> <ul style="list-style-type: none"> <li>• <b>hold</b> ... event output 3 remains unchanged.</li> <li>• <b>oFF</b> ... event output 3 is turned OFF.</li> <li>• <b>on</b> ... event output 3 is turned ON.</li> </ul> <p>Parameter is shown only when <b>out 6 = Ent3</b> .</p>
<b>SIde 6</b>	<p><b>Selection of the active limits for signalling that process value is beyond these defined limits:</b></p> <ul style="list-style-type: none"> <li>• <b>both</b> ... low and high limit is active.</li> <li>• <b>hI</b> ... high limit is active.</li> <li>• <b>Lo</b> ... low limit is active.</li> </ul> <p>Parameter is shown only when <b>out 6 = SGPr</b> or <b>SGdE</b>.</p>
<b>hYS 6</b>	<p><b>Hysteresis for switching for the signalling output.</b></p> <ul style="list-style-type: none"> <li>• Range: 1 to 249 °C.</li> </ul> <p>Parameter is shown only when <b>out 6 = SGPr</b> or <b>SGdE</b>.</p>
<b>tIME 6</b>	<p><b>Setting of the duration of signalling at the end of a program.</b></p> <p>Range: 1 to 999 seconds.</p> <p>Parameter is shown only when <b>out 6 = PEnd</b>.</p>

## **out7** , auxiliary output

Display	Meaning
<b>out 7</b>	<p><b>Function of auxiliary output:</b></p> <ul style="list-style-type: none"> <li>• <b>oFF</b> ... auxiliary output is turned OFF.</li> <li>• <b>Ent1</b> ... event 4 controlled by the program.</li> <li>• <b>SGPr</b> ... signalling when process value is beyond the defined limits, absolute value.</li> <li>• <b>SGdE</b> ... signalling when process value is beyond the defined limits, deviation from stp value SP1.</li> <li>• <b>ProG</b> ... signalling when the program runs.</li> <li>• <b>PEnd</b> ... signalling when the program has ended.</li> </ul>
<b>I Ent4</b>	<p><b>State of the event output 4 when the program is interrupted:</b></p> <ul style="list-style-type: none"> <li>• <b>hold</b> ... event output 4 remains unchanged.</li> <li>• <b>oFF</b> ... event output 4 is turned OFF.</li> <li>• <b>on</b> ... event output 4 is turned ON.</li> </ul> <p>Parameter is shown only when <b>out 7 = Ent4</b> .</p>
<b>SIde 7</b>	<p><b>Selection of the active limits for signalling that process value is beyond these defined limits:</b></p> <ul style="list-style-type: none"> <li>• <b>both</b> ... low and high limit is active.</li> <li>• <b>hI</b> ... high limit is active.</li> <li>• <b>Lo</b> ... low limit is active.</li> </ul> <p>Parameter is shown only when <b>out 7 = SGPr</b> or <b>SGdE</b>.</p>
<b>hYS 7</b>	<p><b>Hysteresis for switching for the signalling output.</b></p> <ul style="list-style-type: none"> <li>• Range: 1 to 249 °C.</li> </ul> <p>Parameter is shown only when <b>out 7 = SGPr</b> or <b>SGdE</b>.</p>
<b>tIME 7</b>	<p><b>Setting of the duration of signalling at the end of a program.</b></p> <p>Range: 1 to 999 seconds.</p> <p>Parameter is shown only when <b>out 7 = PEnd</b>.</p>

## **StPt** , features of set point value (stp value)

Display	Meaning
<b>SP1 Lo</b>	<p><b>The limit of low range for stp value.</b></p> <p>Range: -499 to <b>SP1 hI</b> °C.</p>
<b>SP1 hI</b>	<p><b>The limit of high range for stp value.</b></p> <p>Range: <b>SP1 Lo</b> to 2499 °C.</p>
<b>SLEEP</b>	<p><b>State of the controller if a program does not run:</b></p> <ul style="list-style-type: none"> <li>• <b>oFF</b> ... the controller does not maintain the process value to stp value.</li> <li>• <b>SP1</b> ... the controller maintains the process value to stp value SP1.</li> </ul>

## **SYS** , system parameters

Display	Meaning
<b>POWEr</b>	<p><b>Power of system under control in kW.</b> This parameter is used for the calculation of consumed energy.</p> <p>Range: 0.0 to 999.0 kW.</p>
<b>rA tYP</b>	<p><b>Type of step for ramp up/down allowed in program:</b></p> <ul style="list-style-type: none"> <li>• <b>StPt</b> ... step is defined by stp value and time needy for reaching it.</li> <li>• <b>rAtE</b> ... step is defined by stp value and by ramp rate up/down.</li> <li>• <b>both</b> ... both steps are accessible/available.</li> </ul>

<b>GS dE</b>	<b>Setting of band for GSD about stp value when the program runs.</b> Range: 1 to 999 °C.
<b>Po tIM</b>	<b>Maximum duration of power cut in minutes.</b> If the duration is shorter than <b>Po tIM</b> , the program continues on, If it is longer, the response to the power cut is defined by setting of the parameter <b>Po Act</b> . When you set <b>oFF</b> this function is not active. Range: <b>oFF</b> , 1 to 999 minutes.
<b>Po Act</b>	<b>The response to the power cut.</b> It takes effect after the duration <b>Po tIM</b> has elapsed. <ul style="list-style-type: none"> <li><b>Cont</b> ... program continues.</li> <li><b>hoLd</b> ... program is held and the cotroller maintains the last stp value.</li> <li><b>Abrt</b> ... program is held and the control output is turned OFF.</li> </ul>
<b>StArt</b>	<b>Setting of the program start :</b> <ul style="list-style-type: none"> <li><b>ProG</b> ... you only set the program that starts with the first step.</li> <li><b>PrSt</b> ... you set the program as well as the step.</li> </ul>
<b>StoP</b>	<b>Setting of the ending or interrupting a program:</b> <ul style="list-style-type: none"> <li><b>C E</b> ... Continue (continues in running the program), End (ending the program).</li> <li><b>Ch E</b> ... Continue (continues in running the program), Hold (soak at the temperature), End (ending the program).</li> <li><b>C AE</b> ... Continue (continues in running the program), Abort (turning OFF the control output), End (ending the program).</li> <li><b>ChAE</b> ... Continue (continues), Hold (soak), Abort (turning OFF the control output), End (ending the program).</li> </ul>
<b>dEr tI</b>	<b>It makes the character of derivative value more accurate.</b> The more value is set, the more derivative value is damped down. Range: 1.0 to 100.0 seconds.

## **uSEr** , **setting of user menu**

Display	Meaning
<b>StEP 1</b>	<b>Parameter, that is placed on first position in user menu.</b> In brackets it is suggested the displaying of the parameter in user level (on lower 6-figure display): <ul style="list-style-type: none"> <li><b>no</b> ... no parameter</li> <li><b>run</b> ... makes accessible parameters <b>ProG</b> , <b>StEP</b> , <b>EnSP</b> , <b>trEM</b> , that indicate the program status.</li> <li><b>ErUn</b> ... makes accessible <b>ProG</b> , <b>StEP</b> , <b>tYPE</b> , <b>EnSP</b> , <b>rAtE</b> , <b>trEM</b> . Setting can be changed.</li> <li><b>PCn1 (PCnt 1)</b> ... indicates the power in % for the control output 1.</li> <li><b>PCn2 (PCnt 2)</b> ... indicates the power in % for the control output 2.</li> <li><b>PPrG (P ProG)</b> ... indicates the consumed energy kWh for the last firing.</li> <li><b>Ptot (P tot)</b> ... indicates the total consumed energy in kWh.</li> <li><b>AoFF (AL oFF)</b> ... the function for turning the alarm OFF .</li> <li><b>Aut (Aut)</b> ... starting / stopping of automatic optimalization of PID parameters/autotuning.</li> <li><b>dPER (dt PEr)</b> ... datalogger, setting of the period for data storing of measured values.</li> <li><b>dSto (dt Sto)</b> ... datalogger, setting the condition for data storing.</li> <li><b>Ent1 (Ent1)</b> ... displaying and controlling of the event output 1.</li> <li><b>Ent2 (Ent2)</b> ... displaying and controlling of the event output 2.</li> <li><b>Ent3 (Ent3)</b> ... displaying and controlling of the event output 3.</li> <li><b>Ent4 (Ent4)</b> ... displaying and controlling of the event output 4.</li> <li><b>dLoG (dtLoG?)</b> ... the access to menu of datalogger.</li> <li><b>CLK (CLK ?)</b> ... the access to menu for setting of the real time clock.</li> </ul>
<b>StEP 2</b>	Parameter that is placed on 2nd position of user menu. The list is the same as in <b>StEP 1</b> .
<b>StEP 3</b>	Parameter that is placed on 3rd position of user menu. The list is the same as in <b>StEP 1</b> .
<b>StEP 4</b>	Parameter that is placed on 4th position of user menu. The list is the same as in <b>StEP 1</b> .
<b>StEP 5</b>	Parameter that is placed on 5 <sup>th</sup> position of user menu. The list is the same as in <b>StEP 1</b> .
<b>StEP 6</b>	Parameter that is placed on 6 <sup>th</sup> position of user menu. The list is the same as in <b>StEP 1</b> .
<b>StEP 7</b>	Parameter that is placed on 7th position of user menu. The list is the same as in <b>StEP 1</b> .
<b>StEP 8</b>	Parameter that is placed on 8 <sup>th</sup> position of user menu. The list is the same as in <b>StEP 1</b> .
<b>StEP 9</b>	Parameter that is placed on 9 <sup>th</sup> position of user menu. The list is the same as in <b>StEP 1</b> .
<b>StEP10</b>	Parameter that is placed on 10th position of user menu. The list is the same as in <b>StEP 1</b> .
<b>StEP11</b>	Parameter that is placed on 11th position of user menu. The list is the same as in <b>StEP 1</b> .
<b>StEP12</b>	Parameter that is placed on 12th position of user menu. The list is the same as in <b>StEP 1</b> .

## **PASS** , **passwords for the entry to higher levels of menu**

Display	Meaning
<b>PAS oP</b>	<b>Password for the entry to operation level.</b> If it is set <b>oFF</b> , the entry is not secured with password. <ul style="list-style-type: none"> <li>Range: <b>oFF</b>, 1 to 9999.</li> </ul>
<b>PAS Co</b>	<b>Password for the entry to configuration level.</b> If it is set <b>oFF</b> , the entry is not secured with password. <ul style="list-style-type: none"> <li>Range: <b>oFF</b>, 1 to 9999.</li> </ul>
<b>PAS SE</b>	<b>Password for the entry to service level.</b> If it is set <b>oFF</b> , the entry is not secured with password. <ul style="list-style-type: none"> <li>Range: <b>oFF</b>, 1 to 9999.</li> </ul>

## 6.1 Measurement

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. Parameters for the configuration of the measurement input are in *configuration level*, menu **InPt1**.

### Setting of input sensor

Set the corresponding input sensor in parameter **SEn1**. You will find the survey of input sensors in the chapter **Technical parameters**, see page 39.

You can set the position of decimal point by parameter **dEC1**. For thermal sensors it is possible to display without decimal point or with 1 decimal point.

Set the calibration of sensor with the parameter **CAL1**. The set value is added to process/measured value.

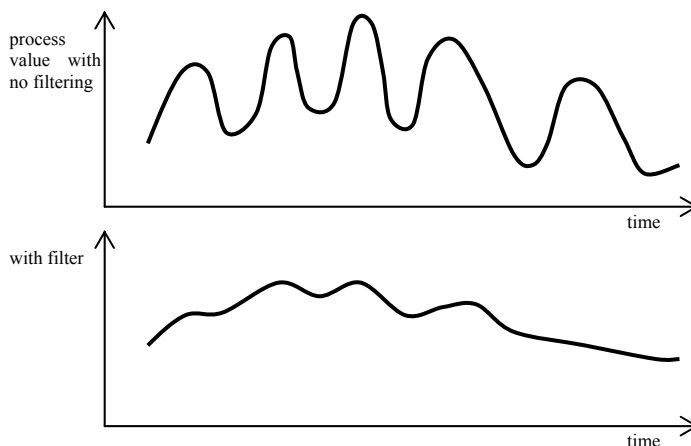
You can set the limit for set point value in *configuration level*, menu **SYS**, parameters **SP1 Lo** a **SP1 hI**.

### Important:

- 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..

### Input filter

If the process value is distorted by interference, you can use the digital filter. The more the filter coefficient is **Ftr1**, the more the filter smoothes the input signal. When **Ftr1** = **OFF** the filter is turned OFF.



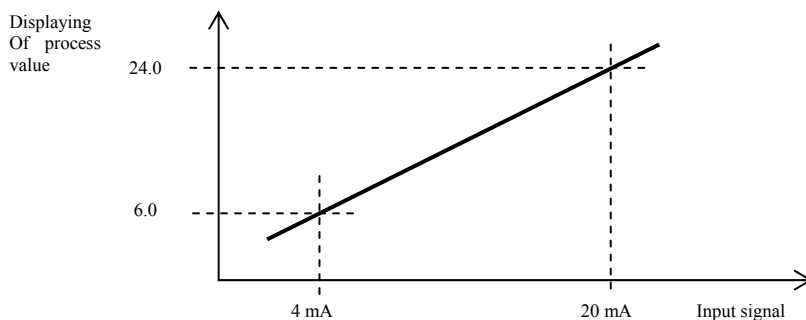
### Measuring range of process inputs

In *configuration level*, menu **InPt1**, you can define the measuring range of the process inputs with **r Lo1**, **r hI1** and **dEC1**.

#### Example of setting for the process input:

You want the input signal 4 to 20 mA to be displayed in the range 6.0 to 24.0.

Set **dEC1** = **0.0**, **r Lo1** = 6.0 and **r hI1** = 24.0. The distribution between the values 6.0 and 24.0 will be linear.

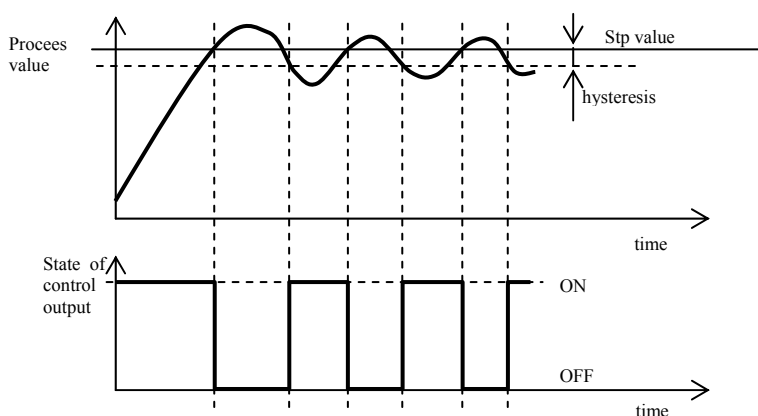


## 6.2 Controlling, the control output

You can select in the controller ON/OFF (2 state) or PID controlling for heating or cooling. If PID controlling is set, you can use the autotuning function for finding optimal PID parameters, see page 9 and the power limit function, see page 30. Parameters for configuration of the control output 1 are in *configuration level*, menu **out1**, of the control output 2 in menu **out2**.

### ON/OFF controlling

ON/OFF control is selected by setting **out1** = **ht2** (heating control) or **out2** = **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.



### PID controlling

PID control is selected by setting **out1** = **ht** (heating) or **out2** = **CL** (cooling). It provides the precise control. For the correct function of the controller, however, it is necessary to set properly PID parameters. Autotuning for setting of PID parameters is described on page 9.

PID parameters have the following meaning :

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

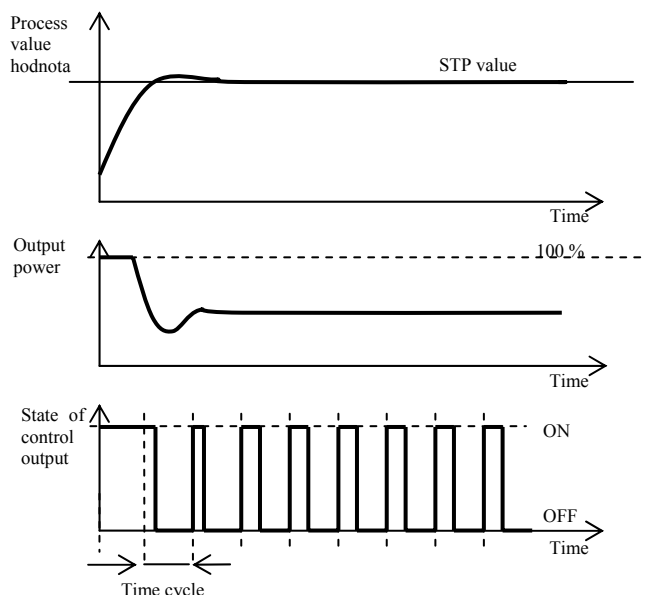
If the control output is 2 state (ON/OFF) (relay or SSR), the power is (given in %) transferred to the output with so called pulse width modulation. In each time cycle (parameter **ct1**, you will find it in *configuration level*, menu **out1**) the control output is switched ON once and once OFF. The more the power is necessary, the wider the width of switching is. The output responses are illustrated in the third part of the drawing.

### Example of pulse width modulation of the output:

- Time cycle is 10 seconds, the power requested is 30%. The output is ON for 3 seconds and OFF for 7 seconds.
- Time cycle is 10 seconds, the power requested is 5%. The output is ON for 0,5 second and OFF for 9,5 seconds.

### Important:

- (**ct1**, **ct2**) The duration of time cycle has the influence on the 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.



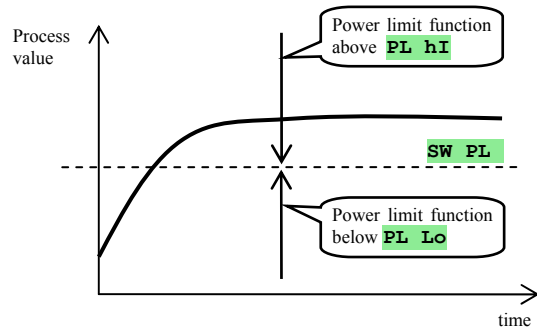
## Power limit function

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 use 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 **SW PL** on the value by several °C less than set point value.
- Set power limit **PL Lo** to 100%.
- Set power limit **PL hI** approx. by 10 to 20% higher than the power supplied to the stable system.



## 6.3 Alarm

The third output (output 3) is alarm.

The configuration parameters of the output you will find in *configuration level*, menu **out3**, setting of the alarm limits **AL Lo** and **AL hI** you will find in *operation level*.

### Setting of alarm output

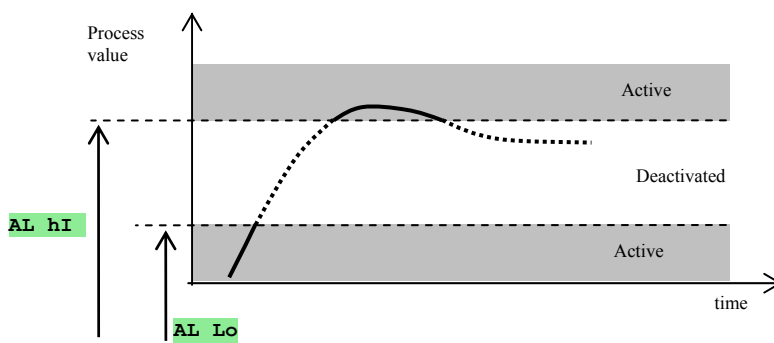
Set this function with parameter **out 3**:

- **out 3** = **oFF**, alarm output is turned OFF.
- **out 3** = **ALPr**, alarm limits defined by the absolute value.
- **out 3** = **ALdE**, alarm limits are set as the deviation from stp value.

### Important:

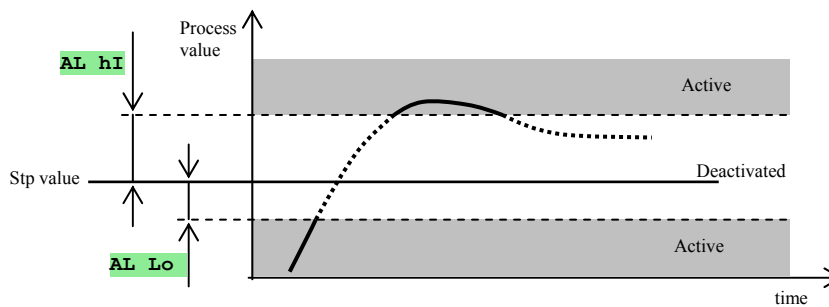
- Relay in standby MODE means **active alarm**.
- When controller is switched OFF, error of sensor, error of controller the alarm is active.

### Alarm defined by the deviation from stp value **out 3** = **ALPr**



Alarm limits are defined from absolute values.

## Alarm defined by the absolute value of temperature $out\ 3 = ALdE$



Parameters  $AL\ Lo$  and  $AL\ hI$  define low and high deviation from stp value at which alarm is active.

## Temporary, permanent(latched) alarm

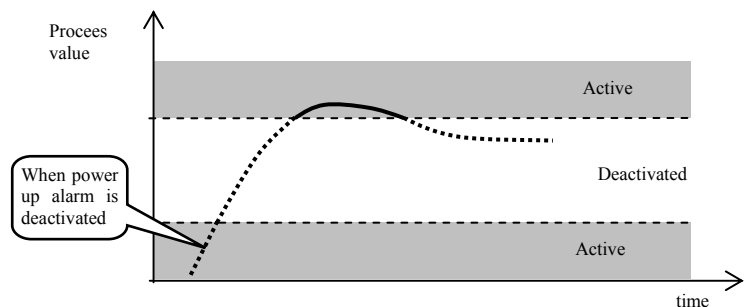
Alarm can be temporary ( $LA\ t\ 3 = OFF$ ) or permanent ( $LA\ t\ 3 = on$ ).

- 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  $AL\ OFF$ , that is found in *user level* 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 :

- $SIL\ 3 = OFF$ , function is not active
- $SIL\ 3 = on$ , alarm can be activated after the process value at startup rising reached the allowed range for the first time (between alarm limits).



## Active sides of alarm

With parameter  $SIdE\ 3$  you can choose the active side of alarm:

- $SIdE\ 3 = both$ , both sides (limits) are active.
- $SIdE\ 3 = hI$ , only high alarm side (limit) is active.
- $SIdE\ 3 = Lo$ , only low alarm side (limit) is active.



## 6.4 Auxiliary outputs out4 to out7

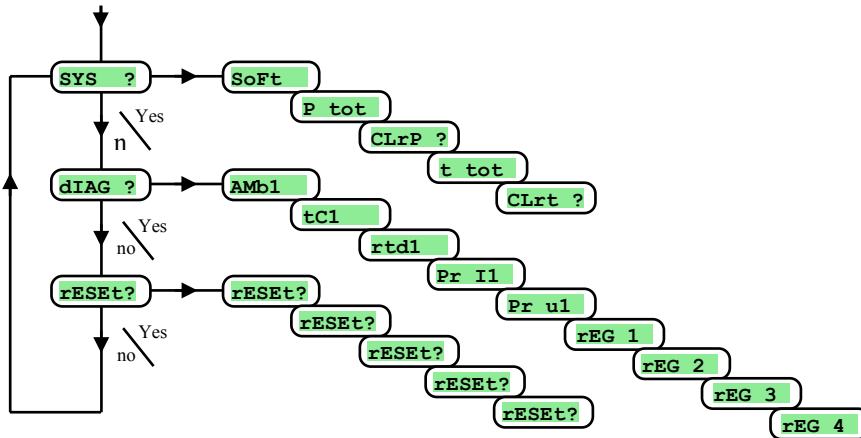
Auxiliary outputs can be configured for the following functions:

- $out\ x = Entx$ , event output. It is used for controlling of external equipment via program. When not in a program this event output can be set by an operator.
- $out\ x = SGPr$ , signalling when process value (temperature) exceeds or underpasses the defined limits. These defined limits are set with parameters  $otx\ Lo$  and  $otx\ hI$  in operation level. The absolute values are set. The output relay is switched ON if temperature is higher than  $otx\ hI$  or lower than  $otx\ Lo$ .
- $out\ x = SGdE$ , signalling when process value (temperature) exceeds or underpasses the defined limits. These defined limits are set with parameters  $otx\ Lo$  and  $otx\ hI$  in operation level. The deviation from stp value is set. The output relay is switched ON if temperature is higher than  $SP1 + otx\ hI$  or lower than  $SP1 - otx\ Lo$ .
- $out\ x = ProG$ , signalling when the program runs, see page 17.
- $out\ x = PEnd$ , signalling when the program has ended, see page 17.

# 7 Service level

Service level is intended for service workers. In this level the control output is switched OFF and alarm and event output is deactivated.

You can get to service level from basic mode by pressing the keys   for 3 seconds. On lower display it appears LEVEL, set SErV on upper one and confirm. If it appears PASS on lower display, level is secured with password. In this case set the right password with the arrow-keys and confirm again.



## SYS , system menu

Display	Meaning
SoFt	The number of software version.
P tot	Total consumption in kWh. After reaching 9999 the counter is reset and the counting starts from 0.
CLrP ?	To reset P tot. By setting YES and confirming the counter is reset P tot.
t tot	Total time of the control output in hours. Simply it can be said that it is the time of switching ON of the control output.
CLrt ?	To reset t tot. By setting YES and confirming the counter is reset t tot.

## DIAG , diagnostic menu

Display	Meaning
AMb1	Actual ambient temperature.
tC1	Measured voltage, thermocouple input 1. Range 60mV.
rtd1	Measured resistance, resistance input 1. Range 350 Ω.
Pr I1	Measured current, current input 1. Range 20mA.
Pr u1	Measured voltage, voltage input 1. Range 10V.
rEG 1	Parameters needy for manufacturer.
rEG 2	
rEG 3	
rEG 4	

## rESEt , editing of initial parameters

Display	Meaning
rESEt?	Editing of initial parameters is the significant action to controller's setting. First it must be confirmed by 4x setting YES, and then the selection of initiation follows.
rESEt?	
rESEt?	
rESEt?	
rESEt?	The selection of initiation: <ul style="list-style-type: none"> <li>no ...no setting of initiation.</li> <li>ConF ... initial configuration (operation, configuration and service level).</li> <li>ProG ... initiation of programs.</li> <li>dAtA ... initiation of data in back-up memory (state of controller, consumed energy, ...).</li> <li>dLoG ... deleting measured values in datalogger.</li> <li>All ... initiation of configuration and programs. After this step the restart of the controller happens,</li> </ul>



## 8 Table of parameters

The table of parameters for configuration level:

Sen1		out 2		out 6		StEP 1	
dEC1		SP2 dE		I Ent3		StEP 2	
CAL1		Ct2		SIde 6		StEP 3	
r Lo1		PCnt		hYS 6		StEP 4	
r hI1				tIME 6		StEP 5	
Ftrl		out 3				StEP 6	
		LAt 3		out 7		StEP 7	
CoMM1		SIL 3		I Ent4		StEP 8	
bAud1		SIde 3		SIde 7		StEP 9	
Addr1		hYS 3		hYS 7		StEP10	
				tIME 7		StEP11	
CoMM2		out 4				StEP12	
bAud2		I Ent1		SP1 Lo		PAS oP	
Addr2		SIde 4		SP1 hI		PAS Co	
		hYS 4		SLEEP		PAS SE	
out 1		tIME 4					
Ct1				PoWER			
ALGo		out 5		rA tYP			
SWPid		I Ent2		GS dE			
PL Lo		SIde 5		Po tIM			
SW PL		hYS 5		Po ACT			
PL hI		tIME 5		StArt			
				StoP			
				dEr tI			

The table of parameters for operation level:

dt PEr		Pb2A		ot5 Lo	
dt Sto		It2A		ot5 hI	
		dE2A			
Pb1A		hYS2		ot6 Lo	
It1A				ot6 hI	
dE1A		AL Lo			
Pb1b		AL hI		ot7 Lo	
It1b				ot7 hI	
dE1b		ot4 Lo			
hYS1		ot4 hI			

## 9 Installation

The controller is designed to be mounted to the panel cutout. Slide the controller into the cutout 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 [35](#).

## 9.1 Principals for installation, the sources of interference

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.

## 9.2 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

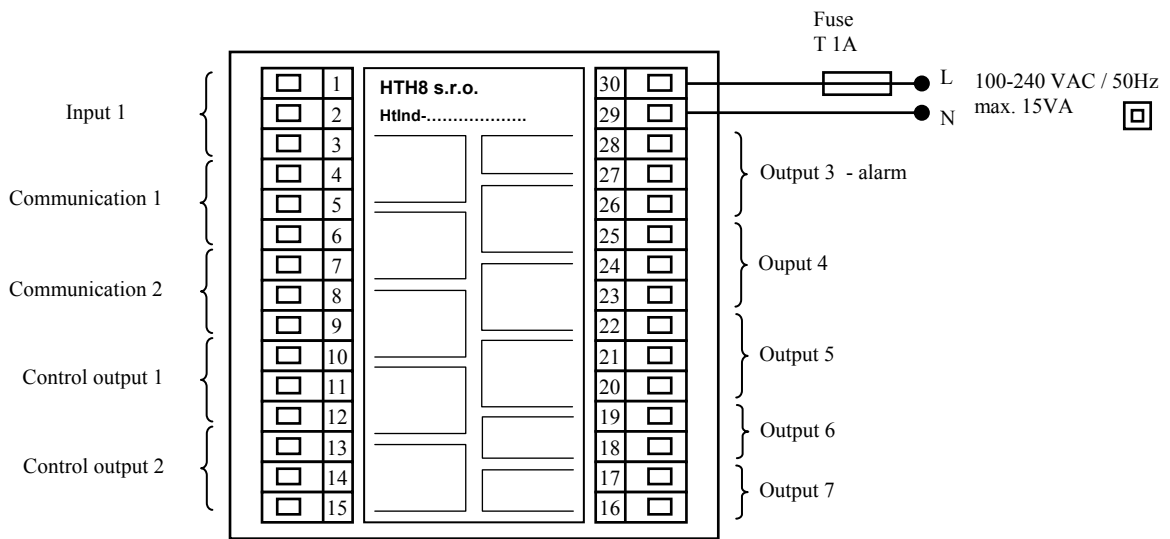
To avoid potential electric shock, use safety practices laid down by national standards when wiring and connecting this unit to a power source. Failure to do so could result in such damage, and / or injury. The wiring must be done only by the authorized person.

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

## Supply voltage

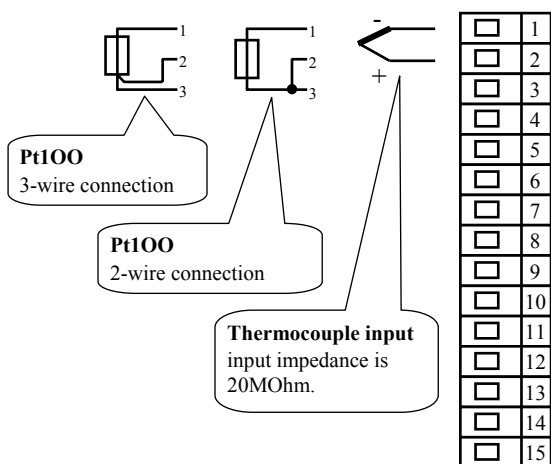
Before you connect the unit to a supply power source, check the level of supply voltage.

The controller is intended for use in industrial or in laboratory equipment.

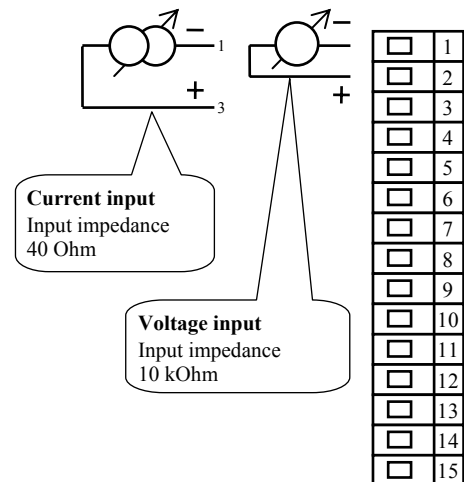


## 1. Measuring input (In1)

### Thermal inputs

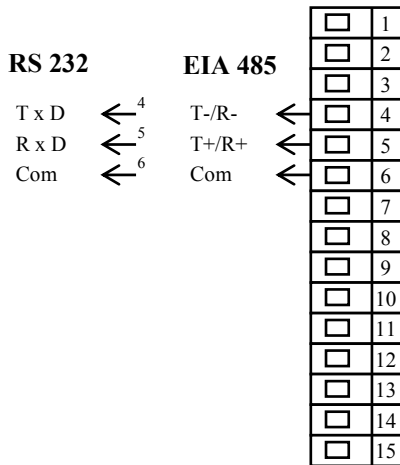


### Process inputs

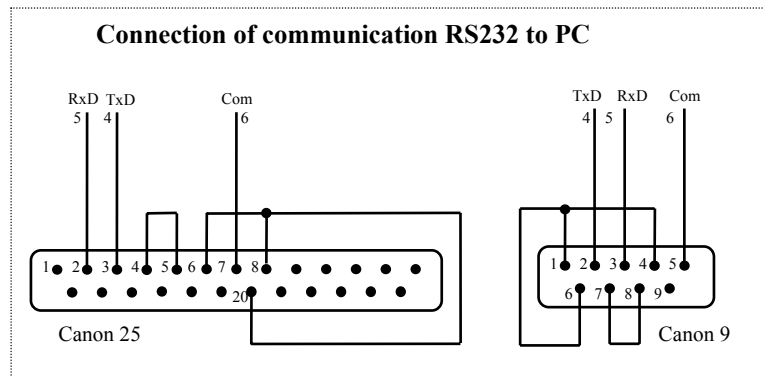


**Measuring input is not isolated from ground of the controller**

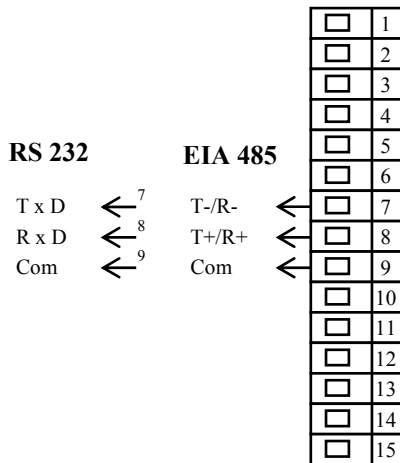
## Communication line 1 (CoMM1)



Communication is *galvanically isolated* from the ground of controller



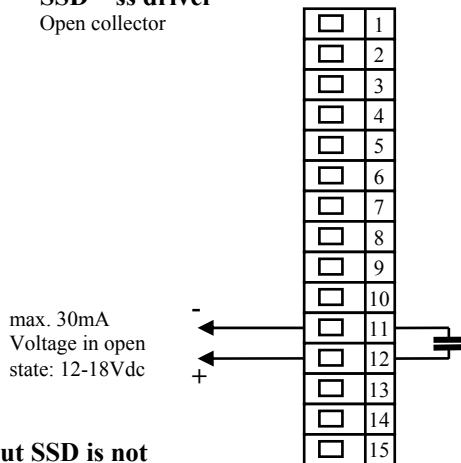
## Communication line 2 (CoMM2)



Communication is *galvanically isolated* from the ground of controller

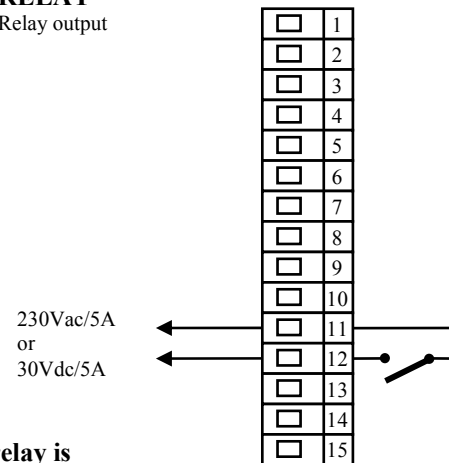
## Control output 1 (out 1)

**SSD – ss driver**  
Open collector



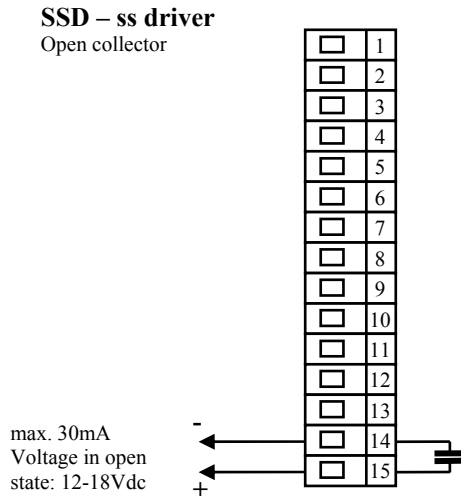
Output SSD is not galvanically isolated from the ground

**RELAY**  
Relay output

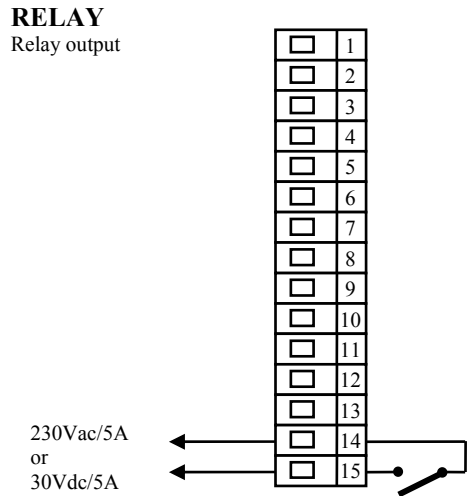


Output relay is galvanically isolated from the ground

**Control output 2 (out 2)**

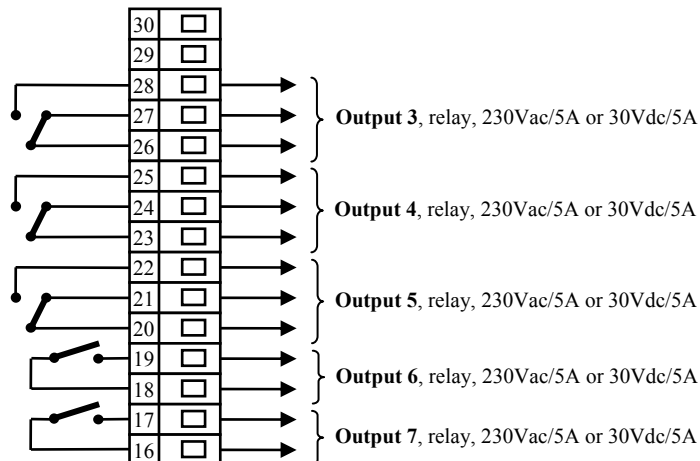


**Output SSD is not galvanically isolated from the ground**



**Output relay is galvanically isolated from the ground**

**Alarm output (out 3), event outputs (out 4 to out 7)**



**Relay outputs are galvanically isolated from ground of controller**

# 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 must enter the most necessary data to the controller for its problem-free operation:

- Type of sensor, position of decimal point
- Operational range of set point value
- Set-up for the control output

## 11.1 Guidelines

Let's suppose that the controller is installed in the panel and you have just power it up for the first time. Parameters of initial operation are the following:

- **SEn1**, set input sensor. The description of this parameter see on page [23](#).
- **dEC1**, set the position of decimal point. You will find the description of this parameter on page [28](#). This parameter is shown only for the process input.
- **r Lo1**, **r hI1**, parameters for setting of the scale of displaying values for process inputs. These are not displayed for thermal inputs. The description of parameters is on page [28](#).
- **out1**, setting of the control output. The description of this parameter see on page [23](#).
- **SP1 Lo**, set low limit of range of stp value. We recommend to leave 0.
- **SP1 hI**, set high limit of range of stp value. We recommend to set maximum working temperature of equipment. The operator can not set higher stp value than this value of parameter.
- Further information about input setting you will find on page [28](#), information about output setting on page [29](#).

### **Important:**

- All the parameters that were set in the initial operation can be later changed in *configuration level*.

# 12 Technical parameters

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

## **Controlling**

- PID, PI, PD, P controlling, autotuning/automatic setting of PID parameters,
- 2-state (ON/OFF) control
- control of heating or cooling .

## **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, low, high

## **Controlling / regulation to set point (stp) value**

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

## **Indicators and keys**

- one 4-figure LED display 14 mm, one 6-figure display 10 mm,
- 3 LED indicating diodes of outputs, 3 LED indicating diodes for program,
- 5 keys, setting is done via menu

## **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 input - current (input impedance 40 Ω), voltage (10 k Ω), without the detection of broken sensor:

- **no** ... no input is set,
- **0-20** ... 0 – 20 mA, range -499 to 2499 units,
- **4-20** ... 4 – 20 mA, range -499 to 2499 units,
- **0-5** ... 0 – 5 V, range -499 to 2499 units,
- **1-5** ... 1 – 5 V, range -499 to 2499 units,
- **0-10** ... 0 – 10 V, range -499 to 2499 units.

## **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.

## **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**

- RS 232, galvanically isolated, protocol Modbus RTU,
- EIA 485, galvanically isolated, protocol Modbus RTU.
- 

### **Accuracy of inputs**

- $\pm 0,1\%$  of span/range (min.  $540^{\circ}\text{C}$ ) ,  $\pm 1$  digit at  $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$  of ambient temperature and at  $\pm 10\%$  rated supply voltage
- temperature stability  $\pm 0,1^{\circ}\text{C}/^{\circ}\text{C}$  in ambient
- voltage stability  $\pm 0,01\%/%$  of change in supply voltage

### **Supply voltage**

- 100 to 240 VAC 50 Hz, internal slow fuse 2 A/250 V
- input power max. 6 VA
- data stored in memory upon power failure

### **Operating environment**

- 0 to  $50^{\circ}\text{C}$
- 0 to 90 % relative humidity, non-condensing

### **Shipping and storage**

- $-20$  to  $70^{\circ}\text{C}$

### **Dimensions**

- width x height x length, 96 x 96 x 121 mm
- depth behind panel surface 114 mm
- cutout 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, electrical values and temperatures of inadmissible intensity, chemical materials, mechanical damage) electrical or mechanical overloading of inputs and outputs.



## 12.2 Description of model

### HtIInd – S a b c – d e f g h – i j k

- **a: input**
  - T = thermal input
  - P = process input
- **b: first communication line**
  - 0 = none
  - X = communication line RS 232
  - A = communication line EIA 485
- **c: second communication line**
  - 0 = none
  - X = communication line RS 232
  - A = communication line EIA 485
- **d: 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
- **e: 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
- **f: alarm output**
  - 0 = none
  - R = electromechanical relay
- **g: auxiliary outputs**
  - 0 = none
  - 1 = 1 electromechanical relay
  - 2 = 2 electromechanical relay
  - 3 = 3 electromechanical relay
  - 4 = 4 electromechanical relay
- **h: memory of datalogger**
  - 0 = small memory (40 logs)
  - 1 = large memory (4000 logs)
- **i, j, k: version of SW**

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