# Users manual


# Ht40P

## programmable controller

# 1 Introduction

Ht40P is a temperature controller intended for the built-up to panel, format of device is ¼ DIN (96 x 48 mm). Enables programmable controlling with accordance to the requested curve or controlling to stp value.
The controller is equipped with 1 input for measurement and 3 outputs. It can be enhanced with communication lines.

Users manual for controller Ht40P is divided into particular chapters. When it is installed and put into operation we recommend proceed as follows:

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

If you are a final user, you will get the device in the customized operation 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.

## You are carrying out the complete installation and setting of the controller

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

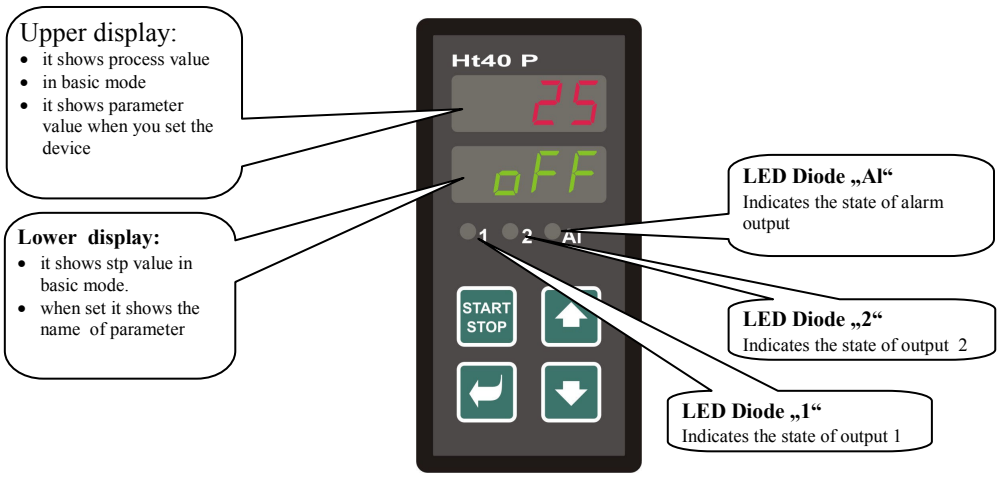
- ***Installation***, in this chapter it is described how to build in a controller into panel.
- , we recommend you to observe the guidelines described in this chapter.
- ***Wiring***, the description for wiring of the controller.
- ***Putting into operation***, at first power-up you enter the initial 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.

## 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. By long-term pressing (3 seconds) you enter the menu for editing a program.
- , 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 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-clock.
- , 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).

## 2.1 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

- `ProG` … the progrum is running.
- `PCLK` … starting a program by the clock, see page *15*.
- `Aut1` … automatic setting / autotunning of PID parameters the set 1 for heating, Pb1A , It1A , dE1A , see page *8*.
- `Aut2` …automatic setting / autotunning of PID parameters the set 2 for heating, Pb1b , It1b , dE1b , see page *8*.
- `Aut3` … automatic setting / autotunning of PID parameters for cooling Pb2A , It2A , dE2A , see page *8*.
- `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

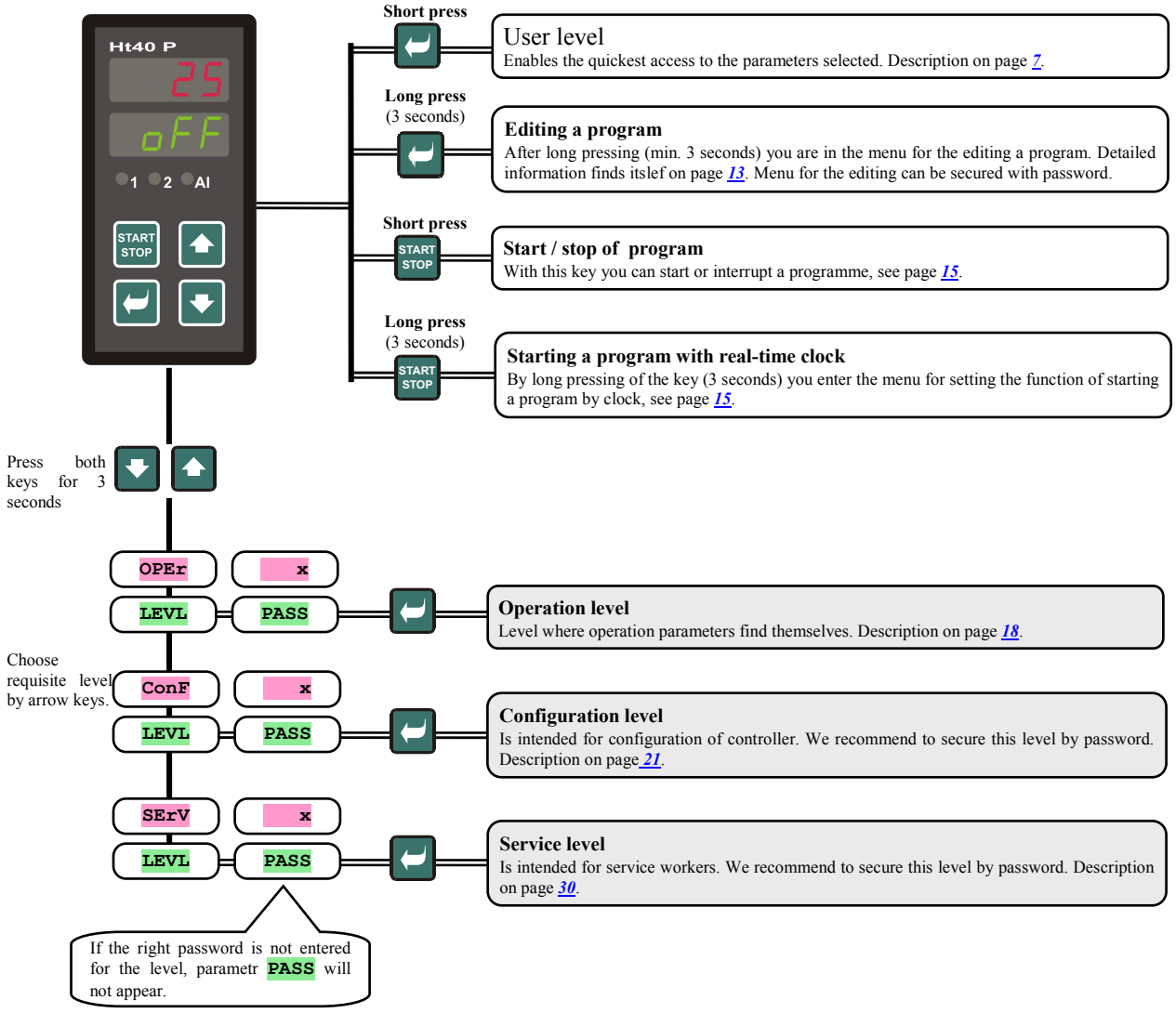
If there is a error message indicated the control outputs are switched OFF, the signal output is switched OFF, the alarm output is activated.

- `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.

## 2.2 Overview of levels, menus

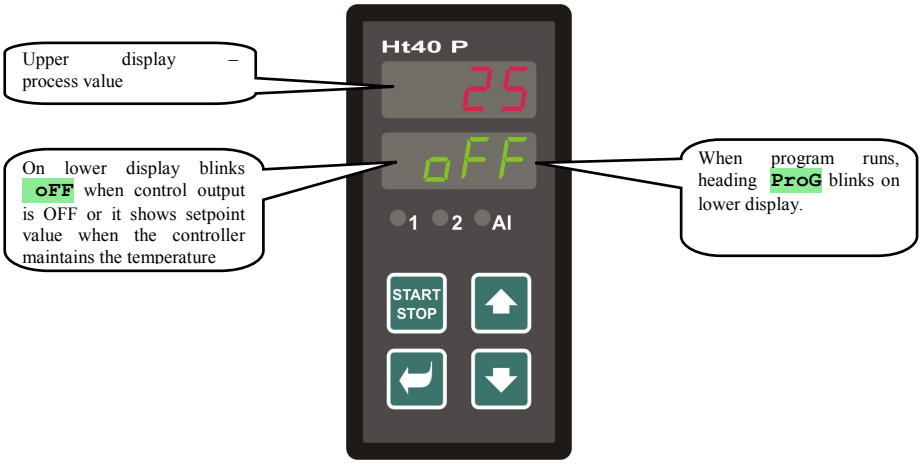
For the right function of the controller it is necessary to set up its parameters properly. For better understanding the parameters are sorted out to groups (levels and menus). Level is superior to menu, menu is a part of level (menu **out1**).

The structure of sorting shows the following picture.



# 3 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 setpoint 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 SLEP :

- SLEP = oFF, the control output is switched OFF, heading oFF is lit on lower display.
- SLEP = 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 SLEP can be found in ***configuration level***, menu SYS .

# 4 User level

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

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

To return from user level you must go trough 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 event output).

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

| Display | Procedure |
|---|---|
| ProG | When in program it indicates the number of the program that runs currently. Set StPx = run. |
| StEP | When in program it indicates the actual step of the program. To see these parameters, set StPx = run. |
| EnSP | When in program it indicates set point value. To see these parameters, set StPx = run. |
| trEM | When in program it indicates the time to end of the step. To see these parameters, set StPx = run. |
| PCn1 | **Indicates the power in % of the control output 1**. It is displayed only then if the output 1 is set as the control output. |
| PCn2 | **Indicates the power in % of the control output**. It is displayed only then if the output 2 is set as the control output. |
| PPrG | **The consumed energy in kWh for the last firing**. When program is started the counter is reset and the counting begins from 0. |
| Ptot | **The total consumption of energy in kWh**. After the value 9999 is reached the counter is reset and the counting begins from 0. |
| AoFF | **Menu for switching OFF of permanent alarm**. Set YES and confirm to switch OFF the permanent alarm. |
| Ent1 | **Indicates the state of event output 1** ( oFF … turned OFF, on … turned ON). The output can be set by arrow-keys only if program does not run. |
| Aut | **Starting / ending of autotunning / automatic setting of PID parameters:**<br>• oFF, autotunning / automatic setting of PID parameters is turned OFF.<br>• ht, starting of autotunning / automatic setting of PID parameters for heating<br>• CL, starting of autotunning / automatic setting of PID parameters for cooling. |
| dPEr | **Period of data storing for datalogger in minutes.**<br>Range: 1 to 120 minutes. |
| dSto | **Condition for data storing of the measured values in datalogger**.<br>• oFF, storing is turned OFF<br>• ProG, storing is executed only if program runs<br>• ALMr, storing is executed only at alarm.<br>• Cont, storing is executed constantly. |
| ALLo | **Low limit for alarm.**<br>Range:<br>• -499 up to ALhI °C for ot3 = ALPr.<br>• -999 up to 0 °C for ot3 = ALdE. |
| ALhI | **High limit for alarm.**<br>Range:<br>• ALLo up to 2499 °C for ot3 = ALPr.<br>• 0 up to 999 °C for ot3 = ALdE. |
| dLoG | **The entry to menu of datalogger**. To enter the menu set YES at upper display and confirming. In menu of datalogger you can view the course of firing. |
| CLK | **The entry to menu for setting of the real time clock**. To enter this menu set YES on upper display and confirming. Menu is described on page *20* |

## 4.2 Datalogger

The controller is equipped with the function for datastoring of measured values, it can store as many as 500 logs. If the memory is full, the oldest data are written over with the newer ones.
Each stored record consists of the following items:

- measured value
- stp value (reading only through communication line)
- the number of running program (reading only through communication line)
- month, day, hour and minute of the log

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

- On displays of the controller in menu **dLoG**. 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.
- 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 **dPER** you can set and configure the period for storing in minutes.
By the parameter **dSto** you can set the condition for datastoring:

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

The both parameters are located in ***operation level*** or in ***user level***.

| DATE | TIME | C1 | SP1 | PROG |
|---|---|---|---|---|
| 20.4.2009 | 13:21 | 890 | 890 | 2 |
| 20.4.2009 | 13:22 | 896 | 895 | 2 |
| 20.4.2009 | 13:23 | 900 | 900 | 2 |
| 20.4.2009 | 13:24 | 905 | 905 | 2 |

The device is equipped with datalogger for 500 logs

## 4.3 Autotunning – automatic setting of PID parameters

The controller is fitted with the function that sets automatically PID parameters.
Autotunning can be started both in program and in controlling to stp value. However, the control output must not be turned OFF.

### Procedure of starting autotunning:

- 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 optimalization 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 autotunning 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 are set Pb1A, It1A, De1A, only when the actual set point value is lower than parameter **SPId** when both sets of PID parameters are used (**ALGo** = **2PId**).
- Parameters are set Pb1B, It1B, De1B, only when the actual set point value is higher than parameter **SPId**.

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

## 4.4 Setting of parameters and menus of user level

The user menu provides user with the simplest access for viewing and configuring of parameters. The list of the parameters which are accessible in user level and their sequence are freely configured.
You can create user level in ***configuration level***, menu **uSEr**.

**Example how to create user menu:**

If you want to place parameter **Ent** to the position 1 in ***user level*** parameter for starting a autotunning **Aut** to the position 2. Proceed as follows:

- Set parameter **StP1** = **Ent1**.
- Set parameter **StP2** = **Aut** .
- 3 to 12 positions are not used, parameters **StP3** to **StP8** set **no**.

The outcome can be viewed in ***user level.***

## 4.5 Monitoring of energy consumption

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

- **Total**, reading in kWh is indicated by parameter **Ptot**, that can be found in ***operation level*** or in ***user level***.
- **For single firing**, the reading in kWh is indicated with parameter **PPrG** 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 **PoW** . Parameter finds itself in ***configuration level***, menu **SYS** , see page *24*.
- The counters of consumed energy **Ptot** and **PPrG** have the maximum range 9999. After reaching this value they are reset and the counting continues.
- The counter of consumed energy **PPrG** is automatically reset each time when a new program starts.
- The counter **Ptot** can be reset in ***service level***, menu **SYS** , parameter **CLrP**.

# 5 Program

The term „**program**“ can be understood like the requested course of the temperature (or other value, pressure etc.) 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.

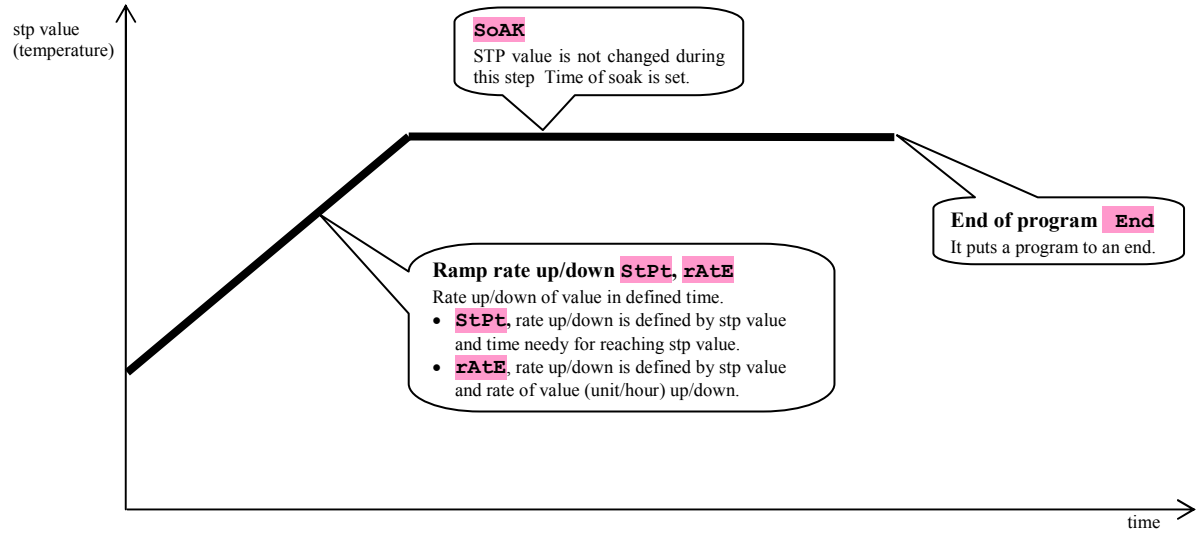
## 5.1 Principals of programing

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 10 programs numbered with 1 to 10 and each program can consist of maximum 15 steps.

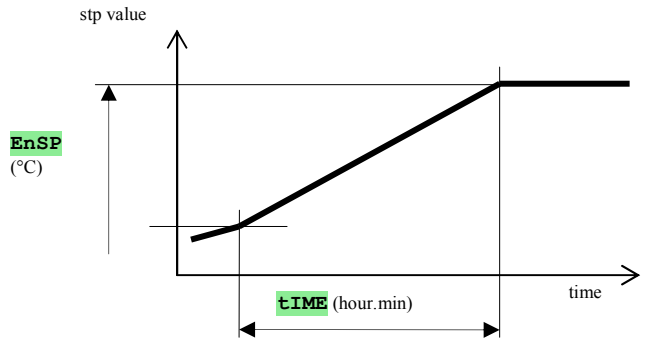
### Types of steps

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**,
- end of a program, **End**.



## StPt, ramp rate up or down of set point value

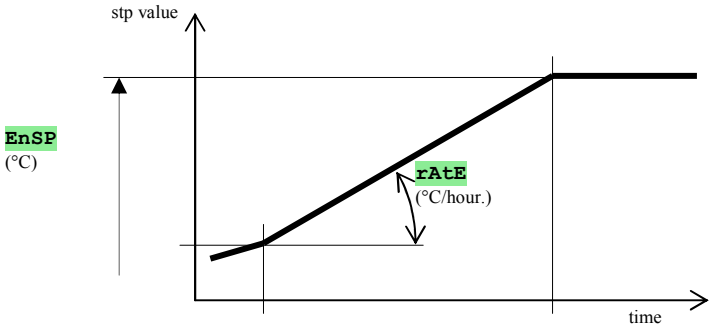



The summary of parameters of step **StPt**

| Display | Meaning |
|---|---|
| **EnSP** | Final set point value. |
| **tIME** | Time needy for reaching set point value, is stated in format hours.minutes. |
| **Ent** | State of the event output 1. Parameter is displayed only when the output 2 is set as the event. |

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.

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

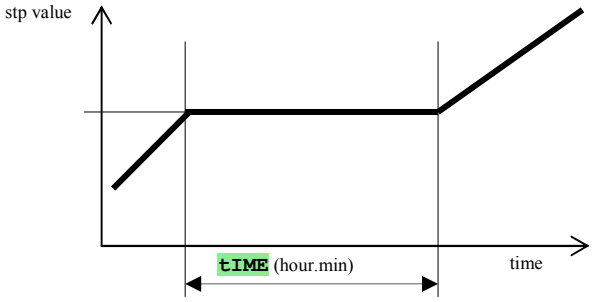



The summary of parameters of step **rAtE**

| Display | Meaning |
|---|---|
| **EnSP** | Final set point value. |
| **rAtE** | Rate of time to stp value, is stated in format °C/hour. |
| **Ent** | State of the event output 1. Parameter is displayed only when the output 2 is set as the event. |

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.

## SoAK, soak on set point value




The summary of parameters for step **SoAK**

| Display | Meaning |
|---|---|
| **tIME** | Time of soak is stated in format hours.minutes. |
| **Ent** | State of the event output 1. Parameter is displayed only when the output 2 is set as the event. |

STP 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.

## End, ending a program

The summary of parameters for step **End**

| Display | Meaning |
|---|---|
| **Ent** | State of the event output 1. Parameter is displayed only when the output 2 is set as the event. |

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

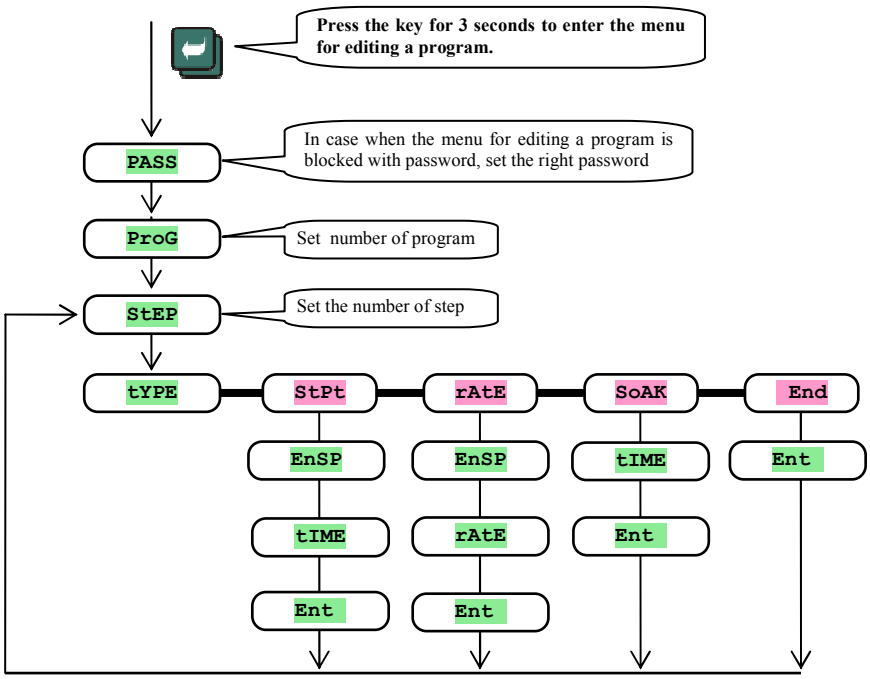
## 5.2 Editing a program

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 for editing a program from basic mode, hold the pressed key** for 3 seconds .

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.




- Parameter `Ent` is shown only when the output 2 is set as the event output (`ot2` = `Ent`).
- Type of step `StPt` is shown only in case if it is allowed (`rAMP` = `StPt` or `rAMP` = `both`).
- Type of step `rAtE` is shown only in case if it is allowed (`rAMP` = `rAtE` or `rAMP` = `both`).
- The description for setting parameters `ot2` and `rAMP` you will find in ***configuration level***.

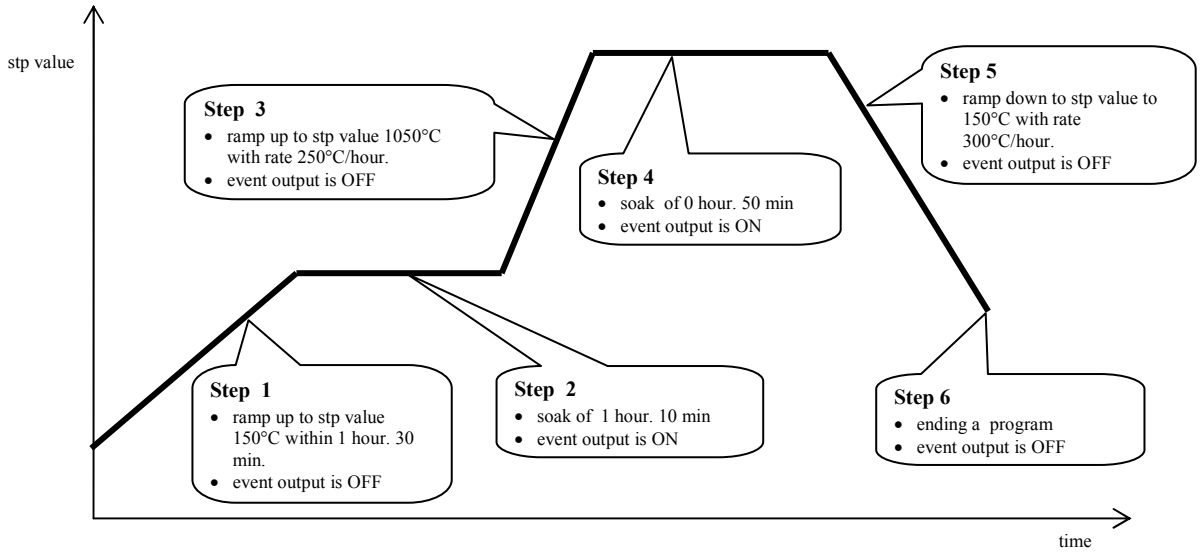
**Important:**

- At each change of the parameter `rAMP` 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 (**ot2** = **Ent** ) and both types of steps are allowed for rate up/down (**rAMP** = **both**).




| StEP | tYPE | EnSP | tIME | rAtE | Ent |
|---|---|---|---|---|---|
| 1 | StPt | 150 | 1.30 | | oFF |
| 2 | SoAK | | 1.10 | | on |
| 3 | rAtE | 1050 | | 250 | oFF |
| 4 | SoAK | | 0.50 | | on |
| 5 | rAtE | 150 | | 300 | oFF |
| 6 | End | | | | oFF |
| 7 | | | | | |
| 8 | | | | | |

Now you can write the program to the controller:

- Controller is in ***basic mode***, see page *6*.
- Press the key ↵ for more than 3 seconds. On lower display it appears **ProG**. The procedure for editing a program is in the following table.

| Displej | Postup |
|---|---|
| Prog | Number of a program, set 2, confirm with the key „↵“. |
| Step | Number of step, set 1, confirm with the key „↵“. |
| tYPE | Type of step 1, set StPt, confirm with the key „↵“. |
| EnSP | Set point value of step 1, set 150, confirm with the key „↵“. |
| tIME | Time needy for reaching value EnSP of step 1, set 1.30, confirm with the key „↵“. |
| Ent | State of the event output of step 1, set oFF, confirm with the key „↵“. |
| StEP | Number of step, set 2, confirm with the key „↵“. |
| tYPE | Type of step 2, set SoAK, confirm with the key „↵“. |
| tIME | Time of soak of step 2, set 1.10, confirm with the key „↵“. |
| Ent | State of the event output of step 2, set on, confirm with the key „↵“. |

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

| | |
|---|---|
| StEP | Number of step, set 6, confirm with the key „↵“. |
| tYPE | Type of step 6, set End, confirm with the key „↵“. |
| Ent | State of the event output of step 6, set oFF, confirm with the key „↵“. |

## 5.3 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 programme 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 tlačítko START STOP .
- The requested program starts.
- Running a program is indicated with blinking heading **Prog** on lower display.

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

### To 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**.

## 5.4 When the program runs

When in basic mode on lower display stp value is shown, on upper display process/measured value is shown.

***The run of the program*** is indicated with blinking heading **ProG** on lower display.

### State of the program is indicated with these parameters

- **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.

These parameters can be made accessible in ***user level***, (setting parameter **StPx** = **run**).

### Options for setting and reading of parameters, or state of the controller

- Setting and reading of parameters is allowed in user level.
- Setting and reading of parameters is allowed in operation level.
- Editing and reading programs is allowed. If you change parameters of the program that is just running, the current running step is not changed. The new parameters are accepted only in the following step.
- Setting of automatic start-up of a program by the clock is allowed.
- The interruption and ending a program is allowed.
- Autotunning of PID parameters is allowed.
- Setting the parameters in configuration level **is inhibited**.

## 5.5 Event output Ent

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 (**Ent** = **on**) or switched OFF (**Ent** = **oFF**).

### Options for configuration of event output

The second output can be configured as the event. Set it in ***configuration level,*** menu **out2** parameter **ot2** = **Ent**.

### State of event output at the interruption of the program

At the interruption of the program, see chapter *5.3*, the state of the event output is defined with the parameter **IEnt** this way:

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

### Configuration of event output when program runs

In ***operation level*** with the parameter **Ent** (this parameter can be located also in **user level**) you can configure the state of the event output.
When the program runs you can only view the state of the event output.

## 5.6 Signalling via output 2 when program runs

The second output can be configured and set for **signaling for the run of the program**.
When the program runs, the output is switched ON. When the program does not run the output is switched OFF.
Carry out the setting in ***configuration level***, menu `out2` parameter `out2` = `SGP`.

## 5.7 Signalling via output 2 when program is ended up

The second output can be configured and set for **signaling when the program is ended up**.
The output is switched ON for 10 seconds after ending or interrupting a program.
Carry out the setting in ***configuration level***, menu `out2` parameter `out2` = `SGPE`.

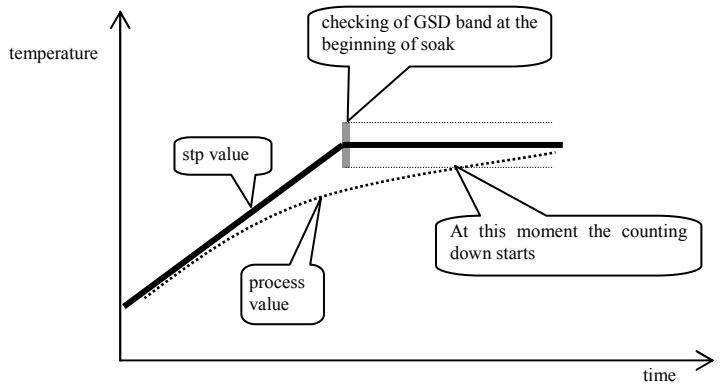
## 5.8 Guaranteed Soak Deviation - GSD

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.**

Type of the defined GSD can be configured in ***configuration level***, menu `SYS` , parameter `GSD`:

- `GSD` = `SoAK`, GSD is active only at the beginning of each soak. It means that counting down starts only at the moment when the temperature in the furnace almost reaches the set point value (the deviation of process value from stp value will be smaller than the configured guaranteed soak band ( `GSdE`).
- `GSD` = `trAK`, GSD is active during the whole program. It means that the counting down is paused if the process value leaves the defined soak band `GSdE`.
- `GSD` = `oFF`, GSD is turned OFF. It means that the counting down will not be paused.

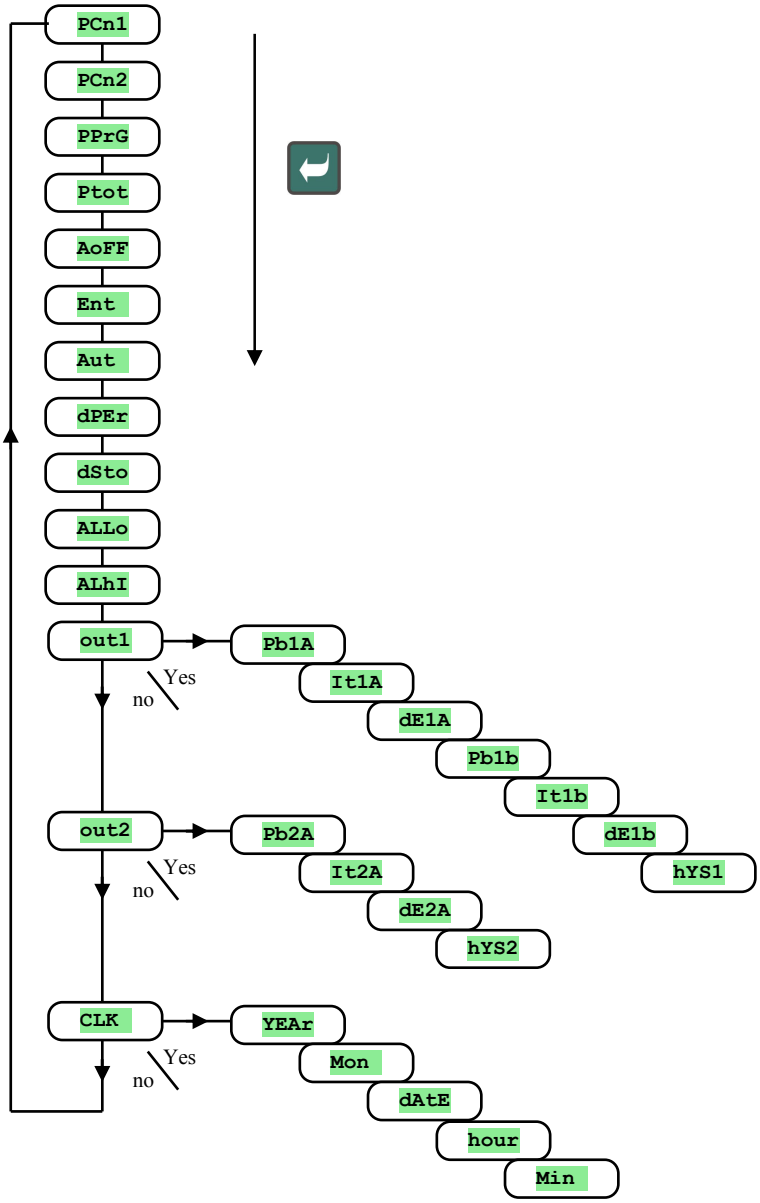
The soak band `GSdE` can be configured in ***configuration level***, menu `SYS` , parameter `GSdE`



# 6 Operation level

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

From basic mode to operation level you will get by pressing the keys for approx. 3 seconds. On lower display it appears **LEVL**, 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-keys and confirm with the key .



## Menu of operational level

| Display | Meaning |
|---|---|
| PCn1 | **Shows the actual power of the output 1 in %.** |
| PCn2 | **Shows the actual power of the output 2 in %.** The output 2 must be set as the control output. |
| PPrG | **Energy consumption in kWh for the last firing.** When in program the counter is set to 0 and counting of consumption starts from 0. |
| Ptot | **Total consumption in kWh**. After reaching value 9999 the counter is reset and starts counting from 0. |
| AoFF | **You can switch OFF permanent alarm** by setting YES and confirm. |
| Ent | Appears **the state of the event output 1** ( oFF … switched OFF, on … switched ON). The output can be configured via the arrow-keys if a program does not run. |
| Aut | **Starting / turning OFF of autotunning of PID parameters:**<br>• oFF, turning OFF of autotunning of PID parameters.<br>• ht, starting of autotunning of PID parameters, heating.<br>• CL, starting of autotunning of PID parameters, cooling. |
| dPEr | **The period of data storing of measured process values in datalogger in minutes.**<br>Range: 1 to 120 minutes. |
| dSto | **Condition for data storing of measured process values(data history) in datalogger**:<br>• oFF, data storing is turned OFF.<br>• ProG, storing is executed only if program runs.<br>• ALMr, storing is executed only at alarm.<br>• Cont, storing is executed constantly. |
| ALLo | **Low limit of alarm.**<br>Range:<br>• -499 to ALhI °C for ot3 = ALPr.<br>• -999 to 0 °C for ot3 = ALdE. |
| ALhI | **High limit of alarm**.<br>Range:<br>• ALLo to 2499 °C for ot3 = ALPr.<br>• 0 to 999 °C for ot3 = ALdE. |
| out1 | **The entry to menu for setting of parameters of the output 1.** |
| out2 | **The entry to menu for setting of parameters of the output 2.** |
| CLK | **The entry to menu for setting the real-time clock**. |

## out1, menu of parameters of the output 1

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

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

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

## CLK , menu for setting the real time clock

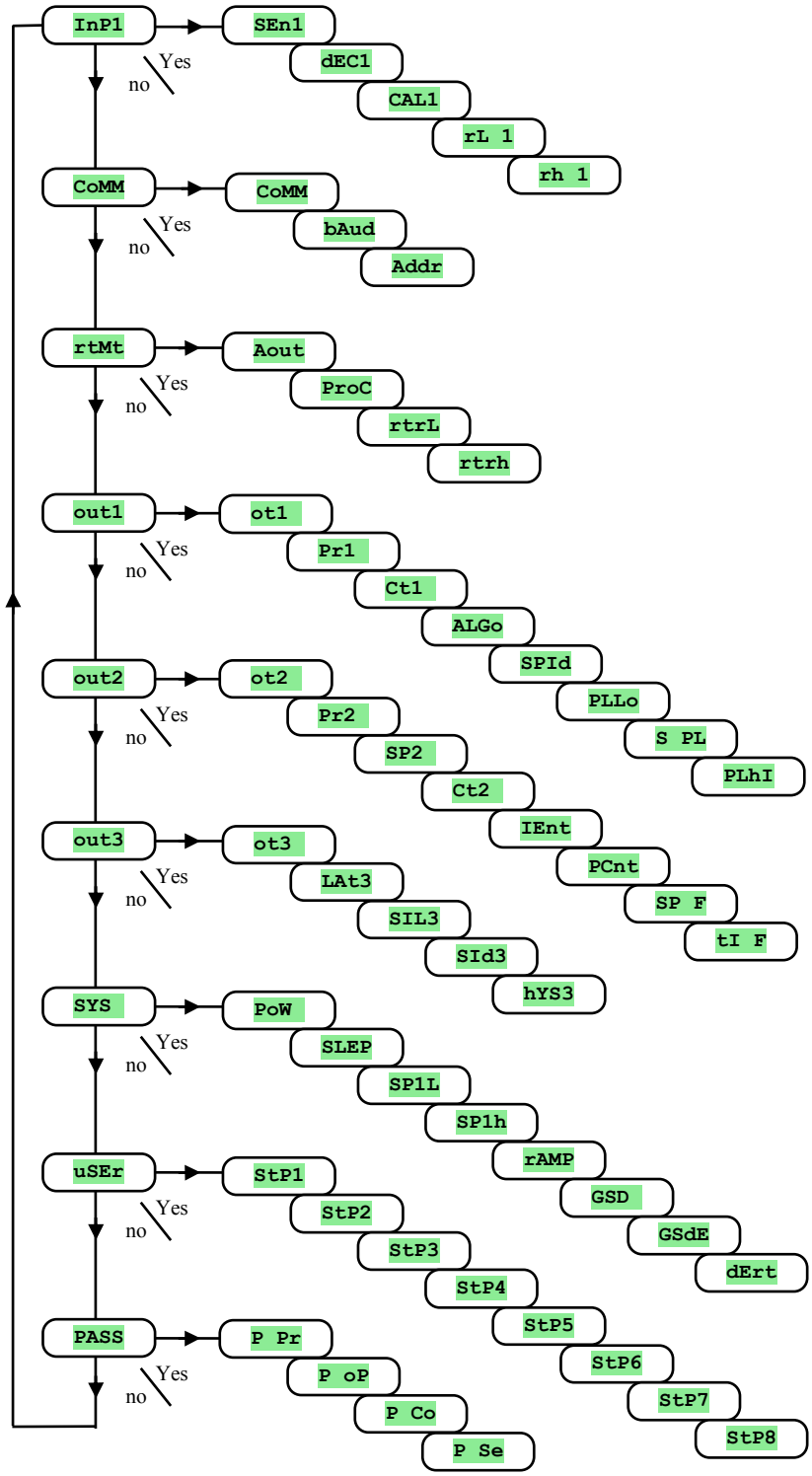
In this menu you can set the real time clock. The clock is not equipped with automatic changeover from standard time to daylight saving time and back in turn.

| Display | Meaning |
|---|---|
| YEAr | Set the actual year. |
| Mon | Set the actual month. |
| dAtE | Set the actual day. |
| hour | Set current hour. |
| MIn | Set current minute. |

# 7 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 **LEVL**, 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 and confirm it again.



## InP1, input setting

| Display | Meaning |
|---|---|
| SEn1 | **Setting of input sensor.**<br>• no … input is not set.<br>• J … thermocouple J, range -200 to 900°C.<br>• K … thermocouple K, range -200 to 1360°C.<br>• t … thermocouple T, range -200 to 400°C.<br>• n … thermocouple N, range -200 to 1300°C.<br>• E … thermocouple E, range -200 to 700°C.<br>• r … thermocouple R, range 0 to 1760°C.<br>• S … thermocouple S, range 0 to 1760°C.<br>• b … thermocouple B, range 300 to 1820°C.<br>• C … thermocouple C, range 0 to 2320°C.<br>• d … thermocouple D, range 0 to 2320°C.<br>• rtd … rtd sensor ( Pt100), range -200 to 800°C.<br>**Setting of input sensor … process input:**<br>• no … input is not set.<br>• 0-20 … 0 – 20 mA, range -499 to 2499 units.<br>• 4-20 … 4 – 20 mA, range -499 to 2499 units.<br>• 0-5 … 0 – 5 V, range -499 to 2499 units.<br>• 1-5 … 1 – 5 V, range -499 to 2499 units.<br>• 0-10 … 0 – 10 V, range -499 to 2499 units. |
| dEC1 | **Setting of decimal point for displaying.**<br>• 0 … no decimal point.<br>• 0.0 … 1 decimal point.<br>**Setting of decimal point for displaying – process input:**<br>• 0 … no decimal point.<br>• 0.0 … 1 decimal point.<br>• 0.00 … 2 decimal points.<br>• 0.000 … 3 decimal points |
| CAL1 | Correction of sensor. The set value is added to process value.<br>Range: -999 to 999 °C. |
| rL1 | Together with parameter rh1 it is necessary to set **the scale for showing the values on display** for process inputs.<br>Range: -499 to rh1 . |
| rh1 | Together with parameter rL1 it is necessary to set **the scale for showing the values on display** for process inputs.<br>Range: rL1 to 2499. |

## CoMM, communication line

| Display | Meaning |
|---|---|
| CoMM | Setting of communication line.<br>• Mod … the controller is set for communication with PC or for system “Master-Slave” as a slave controller.<br>• SGnL … Master, the controller transmits information for the controlling of SLAVE units. |
| bAud | **Communication line:**<br>• 9.6 … 9600Bd.<br>• 19.2 … 19200Bd.<br>• 38.4 … 38400Bd.<br>• 57.6 … 57600Bd. |
| Addr | Address of the equipment, it is shown when CoMM = Mod. |

## rtMt, retransmit output

| Display | Meaning |
|---|---|
| Aout | **Value is transmitted through analog output:**<br>• PrC … measured value (upper display).<br>• StPt … stp value (lower display).<br>• Pcnt … power of the output 1 |

| | |
|---|---|
| **ProC** | **Output analog signal**.<br>• **0-20** … 0 to 20mA.<br>• **4-20** … 4 to 20mA. |
| **rtrL** | **Together with parameter rtrh you set the scale of transmitted measured or stp value:**<br>Range: -499 to **rtrh**.<br><br>When **Aout** = **Pcnt** this parameter is not shown. |
| **rtrh** | **Together with parameter rtrL you set the scale of transmitted measured or stp value:**<br>Range: **rtrL** to 2499.<br><br>When **Aout** = **Pcnt** this parameter is not shown. |

## out1, output 1

| Display | Meaning |
|---|---|
| **ot1** | **Function of the output 1:**<br>• **oFF** … the output 1 is turned OFF.<br>• **ht** … the heating control, PID controlling.<br>• **ht2** … the heating control, ON/OFF controlling. |
| **Pr1** | **Setting of first process output, voltage output:**<br>• **0-10** … 0 to 10V.<br>• **0-5** … 0 to 5V.<br>**Setting of first process output, current output:**<br>• **0-20** … 0 to 20mA.<br>• **4-20** … 4 to 20mA. |
| **Ct1** | **Time cycle for switching of the output 1.**<br>Range: 1 to 200 seconds. |
| **ALGo** | **Alghoritmus of PID controlling:**<br>• **PId** … one set of PID parameters is used.<br>• **2PId** … both sets of PID parameters are used. |
| **SPId** | **Limit between PID1 and PID2.**<br>Range: -499 to 2499 °C. |
| **PLLo** | **Power limit function for the limiting of output power at low measured values**, in %.<br>Range: 0 to 100 %. |
| **S PL** | **Setting of limit between low and high values of power limit function**.<br>Range: -499 to 2499 °C. |
| **PLhI** | **Power limit function for the limiting of output power at high measured values**, in %.<br>Range: 0 to 100 %. |

## out2, output 2

| Display | Meaning |
|---|---|
| **out2** | Function of the output 2:<br>• **oFF** … the output 2 is turned OFF.<br>• **CL** … the cooling control, PID controlling.<br>• **CL2** … the cooling control, ON/OFF controlling.<br>• **Ent1** … the event Nr.1, controlled by program.<br>• **SGP** … signalling of the state that program runs.<br>• **SGPE** … signalling for ending up of program, duration of signalling is 10 seconds.<br>• **A ht** … auxiliary heating.<br>• **SGF** … users function F1 |
| **Pr2** | **Setting of second process output, voltage output:**<br>• **0-10** … 0 to 10V.<br>• **0-5** … 0 to 5V.<br>**Setting of second process output, current output:**<br>• **0-20** … 0 to 20mA.<br>• **4-20** … 4 to 20mA. |
| **SP2** | **Stp value of the output 2** (the deviation from stp value of the output 1).<br>Range: 0 to 1000 °C. |

| | |
|---|---|
| Ct2 | **Time cycle for switching of the output 2.**<br>Range: 1 to 200 seconds. |
| IEnt | State of the event output 1 when **program is interrupted**:<br>• hold … the event output 1 remains unchanged.<br>• oFF … the event output 1 is turned OFF.<br>• on … the event output 1 is turned ON.<br>Parameter is shown only when the output is set as the event. |
| PCnt | **Limiting of power of auxiliary heating.**<br>Range: 0 to 100 %. |
| SP F | **Setting of the temperature for the function SgF.**<br>Range: -499 to 2499 °C. |
| tI F | **Setting of the time for the function SgF.**<br>Range: 1 to 99 minutes. |

## out3, alarm output

| Display | Meaning |
|---|---|
| ot3 | **Function of the alarm output:**<br>• oFF … alarm output is turned OFF.<br>• ALPr… alarm defined by the absolute value.<br>• ALdE … alarm defined by the deviation from stp value SP1. |
| Lat3 | **Setting for alarm latching:**<br>• oFF … temporary alarm.<br>• on … permanent alarm . |
| SIL3 | **Setting for alarm silencing at power-up:**<br>• oFF … alarm function is active.<br>• on … alarm function is deactivated. |
| Sid3 | **The selection of active limits for alarm:**<br>• both … low and high limit is active.<br>• hI … high limit is active.<br>• Lo … low limit is active. |
| hYS3 | **Hysteresis for switching for the alarm output**.<br>Range: 1 to 99 °C. |

## SYS , system parameters

| Display | Meaning |
|---|---|
| PoW | **Power of system under control in kW**. This parameter is used for the calculation of consumed energy.<br>Range: 0.0 to 999.0 kW. |
| SLEP | **State of the controller if a program does not run:**<br>• oFF … the controller does not maintain the process value to stp value.<br>• SP1 … the controller maintains the process value to stp value SP1. |
| SP1L | **The limit of low range for stp value.**<br>Range: -499 to SP1h °C. |
| SP1h | **The limit of high range for stp value.**<br>Range: SP1L to 2499 °C. |
| rAMP | **Type of step for ramp up/down allowed in program:**<br>• StPt … step is defined by stp value and time needy for reaching it.<br>• rAtE … step is defined by stp value and by ramp rate up/down.<br>• both … both steps are accessible/available. |
| GSd | **Type of GSD:**<br>• SoAK … GSD is active only at the beginning of soak.<br>• trAK … GSD is active during the whole program.<br>• oFF … GSD is turned OFF. |
| GSdE | **Setting of band for GSD about stp value when the program runs.**<br>Range: 1 to 999 °C. |
| dErt | **It makes the character of derivative value more accurate.** The more value is set, the more derivative value is damped down.<br>Range: 1.0 to 100.0 seconds. |

## uSEr, how to set user menu

| Display | Meaning |
|---|---|
| StP1 | Parameter, that is placed on first position in user menu. In brackets it is suggested the displaying of the parameter in user level (on lower display):<br>• no … there is no parameter<br>• run … when in program it indicates the current state of the program ProG, StEP, EnSP, trEM<br>• PCn1 … indicates the power in % of the control output 1.<br>• PCn2 … indicates the power in % of the control output 2.<br>• PPrG … indicates energy in kWh consumed for the last firing.<br>• Ptot … indicates total consumed energy in kWh.<br>• AoFF … function for swithing the alarm OFF .<br>• Ent ….. displaying / controlling of the event output 1.<br>• Aut … starting / ending of autotunning of PID parameters.<br>• dPEr … datalogger, setting of the period for data storing of measured values.<br>• dSto … datalogger, setting the condition for data storing.<br>• ALLo … setting of low limit for alarm.<br>• ALhI … setting of high limit for alarm.<br>• dLoG … the access to menu of datalogger.<br>• CLK … the entry to menu for setting of the real-time clock. |
| StEP 2 | Parameter that is placed on 2nd position of user menu. The list is the same as in StEP 1. |
| StEP 3 | Parameter that is placed on 3rd position of user menu. The list is the same as in StEP 1. |
| StEP 4 | Parameter that is placed on 4th position of user menu. The list is the same as in StEP 1. |
| StEP 5 | Parameter that is placed on 5th position of user menu. The list is the same as in StEP 1. |
| StEP 6 | Parameter that is placed on 6th position of user menu. The list is the same as in StEP 1. |
| StEP 7 | Parameter that is placed on 7th position of user menu. The list is the same as in StEP 1. |
| StEP 8 | Parameter that is placed on 8th position of user menu. The list is the same as in StEP 1. |

## PASS, password for entering higher levels of menu

| Display | Meaning |
|---|---|
| P Pr | **Password for the entry to menu for editing a program**. If it is set oFF, the entry is not secured with password.<br>Range: oFF, 1 to 9999. |
| P oP | **Password for the entry to operation level.** If it is set oFF, the entry is not secured with password.<br>Range: oFF, 1 to 9999. |
| P Co | **Password for the entry to configuration level**. If it is set oFF, the entry is not secured with password.<br>Range: oFF, 1 to 9999. |
| P SE | **Password for the entry to service level.** If it is set oFF, the entry is not secured with password.<br>Range: oFF, 1 to 9999. |

## 7.1 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 **InP1**.

### 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 **SP1L** a **SP1h**.

### Important:

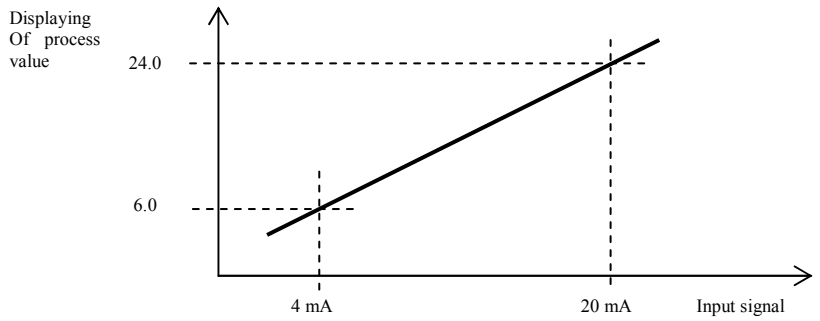
Thermocouple and RTD inputs have the detection of improperly wired sensor. When the sensor is open or broken, the control output is turned OFF, the alarm output is activated, the signal output is deactivated.

### Measuring range of process inputs

In ***configuration level***, menu **InP1**, you can define the measuring range of the process inputs with **rL 1**, **rh 1** 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 **rh 1** = 24.0. The distribution between the values 6.0 and 24.0 will be linear.

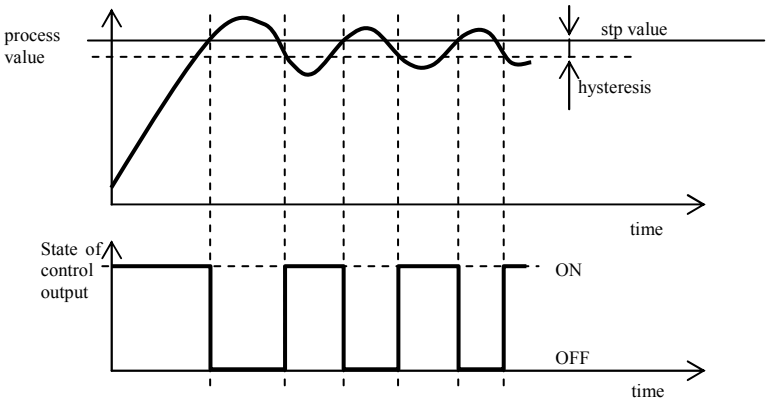


## 7.2 Controlling, control output

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 8 and the power limit function, see below. Parameters for configuration of the control output 1 are in ***configuration level***, menu **out1**.

### ON/OFF controlling

ON/OFF control is selected by setting **out1** = **ht2** heating 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**. It provides the precise control. For the correct function of the controller, however, it is necessary to set properly PID parameters. Autotunning for setting of PID parameters is described on page 8. 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.
- **dE** **derivative factor**, in minutes. Derivative responses 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** , that is 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.

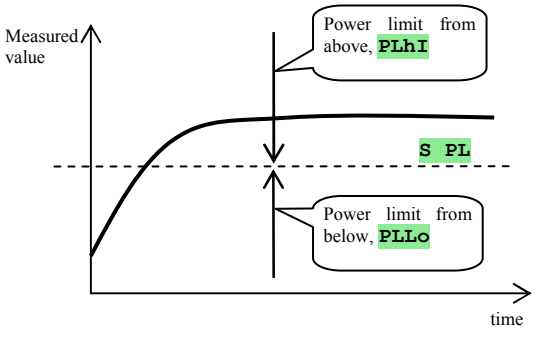
### Power limit function

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

#### Example of 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 **S PL** on the value by several °C less than set point value.
- Set power limit **PLLo** to 100%.
- Set power limit **PlhI** approx. by 10 to 20% higher than the power supplied to the stable system.



## 7.3 Alarm

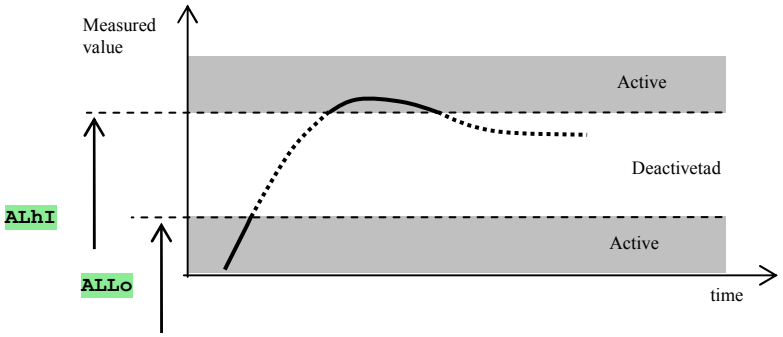
The third output (output 3) is alarm.
The configuration parameters of the output you will find in ***configuration level***, menu **out3**, setting of alarm limits **ALLo** and **ALhI** you will find in ***user level or operation level***.

### Setting of alarm output

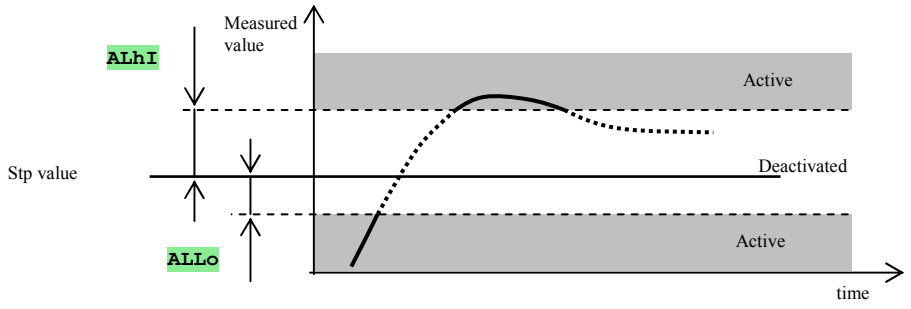
You can set this function with parameter **out3**:

- **out3** = **oFF**, alarm output is turned OFF.
- **out3** = **ALPr**, alarm defined by the absolute value.
- **out3** = **ALdE**, alarm limits are set as the deviation from stp value.

### Alarm defined by absolute value of temperature **out3** = **ALPr**.




### Alarm defined by deviation from stp value **out3** = **ALdE**.



## Temporary, permanent (latched) alarm

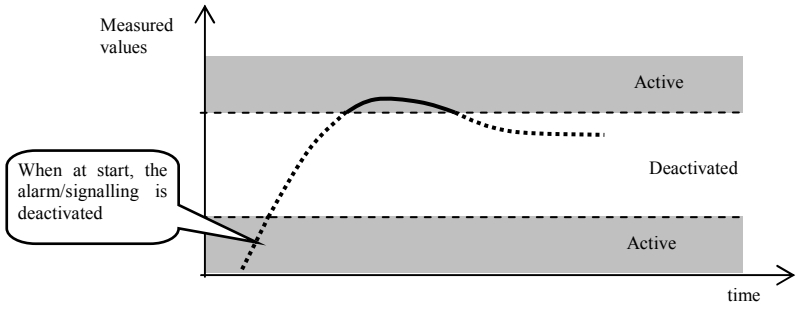
Alarm can be temporary (**Lat3** = **oFF**) or permanent (**Lat3** = **on**).

- 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 **AoFF**, 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 **SIL3**:

- **SIL3** = **oFF**, function is not active.
- **SIL3** = **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

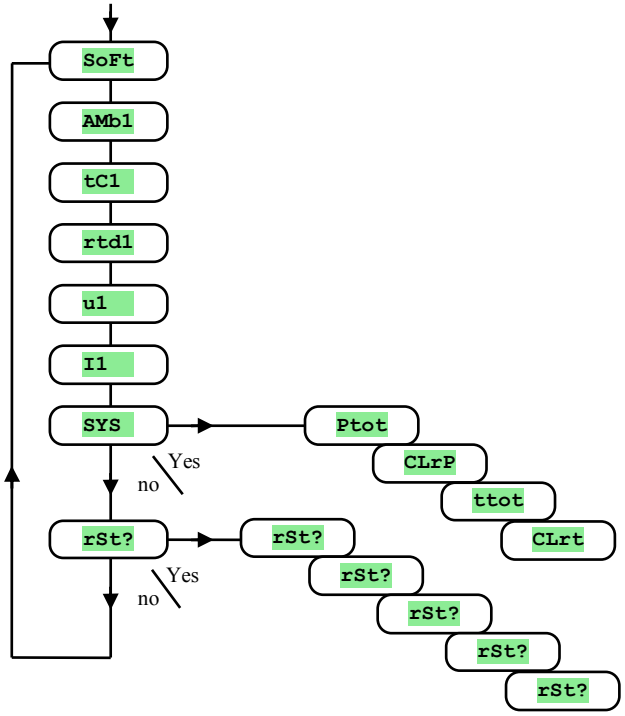
With parameter **SId3** you can choose the active side of the alarm:

- **SId3** = **both**, both sides (limits) are active.
- **SId3** = **hI**, only high alarm side (limit) is active.
- **SId3** = **Lo**, only low alarm side (limit) is active.

# 8 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 **LEVL**, on upper display set **SErV** 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.




Initial password for the enter to service level is set to **995**

## Menu of service level

| Display | Meaning |
|---|---|
| **SoFt** | The number of software version. |
| **Amb1** | Actual ambient temperature. |
| **tC1** | Measured voltage, thermocouple input 1. Range 60mV. |
| **rtd1** | Measured resistance, resistance input 1. Range 350 Ω. |
| **I1** | Measured current, current input 1. Range 20mA. |
| **u1** | Measured voltage, voltage input 1. Range 10V. |

## SYS , system menu

| Display | Meaning |
|---|---|
| **Ptot** | Total consumption in kWh. After reaching 9999 the counter is reset and the counting starts from 0. |
| **CLrP** | To reset the counter **Ptot**. By setting **YES** and with confirmation the counter is reset **Ptot**. |
| **ttot** | 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 the counter **ttot**. By setting **YES** and with confirmation the counter is reset **ttot**. |

## rSt?, writing of initial parameters

| Display | Meaning |
|---|---|
| **rSt?**<br>**rSt?**<br>**rSt?**<br>**rSt?** | Editing of initial parameters is the significant action to controller`s setting. First it must be confirmed by 5x setting **YES**, and then the selection of initiation follows. |
| **rSt?** | The selection of initiation:<br>• **no** … no initiation.<br>• **ConF** … initial configuration (operation, configuration and service level).<br>• **ProG** … initiation of programs.<br>• **dLoG** … deleting measured values in datalogger.<br>• **All** … initiation of configuration, datalogger and programs. After this step the restart of the controller happens |

# 9 Table of parameters

In this table the parameters are sorted out to groups, in the same sequence as the survey of the parameters in ***service level.*** Write down your own complete setting of controller to the table below.

**Table of parameters in configuration level:**

| | |
|---|---|
| Sen1 | |
| dEC1 | |
| CAL1 | |
| rL 1 | |
| rh 1 | |
| CoMM | |
| bAud | |
| Addr | |
| ot1 | |
| Pr1 | |
| Ct1 | |
| ALGo | |
| SPId | |
| PLLo | |
| S PL | |
| PLhI | |

| | |
|---|---|
| ot2 | |
| Pr2 | |
| SP2 | |
| Ct2 | |
| IEnt | |
| PCnt | |
| SP F | |
| tI F | |
| out3 | |
| Lat3 | |
| SIL3 | |
| SId3 | |
| hYS3 | |

| | |
|---|---|
| PoW | |
| SLEP | |
| SP1L | |
| SP1h | |
| rAMP | |
| GSD | |
| GSdE | |
| dErt | |
| StP1 | |
| StP2 | |
| StP3 | |
| StP4 | |
| StP5 | |
| StP6 | |
| StP7 | |
| StP8 | |
| P Pr | |
| P oP | |
| P Co | |
| P SE | |

**Table of parameters in operation level:**

| | |
|---|---|
| SP1 | |
| dPEr | |
| dSto | |
| ALLo | |
| ALhI | |

| | |
|---|---|
| Pb1A | |
| It1A | |
| dE1A | |
| Pb1b | |
| It1b | |
| dE1b | |
| hYS1 | |

| | |
|---|---|
| Pb2A | |
| It2A | |
| dE2A | |
| hYS2 | |

# 10 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 dimmensions

- Width x height x overall length: 48 x 96 x 121 mm (including terminalboard).
- behind panel length: 114 mm (including terminalboard).
- Cutout in the panel: 44 x 91 mm.
- The thickness of panel: 1,5 to 10 mm.

### Mounting

- Make the panel cutout 44 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 on *32*.

Wiring of the controller begins on page *33*.

## 10.1 Principles for installation

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 ligths

## 10.2 Reduction of influence of intereference

Making a design try to observe these guidelines:

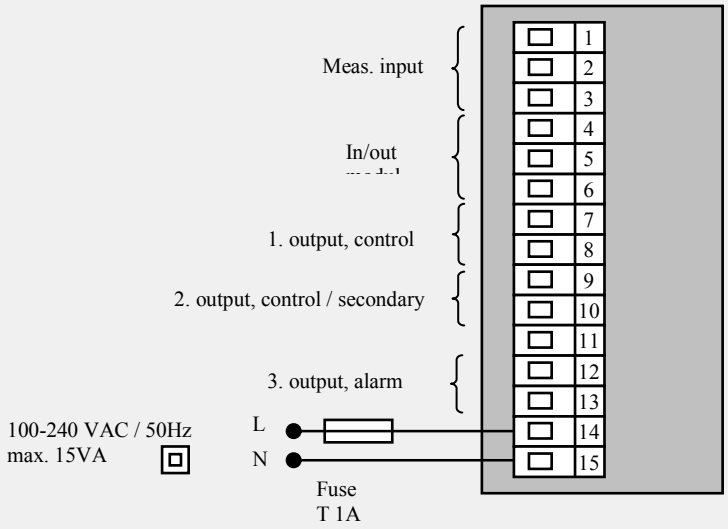
- All wires of power supply voltage and power wires carrying high currents must be lead separately from signal leads (e.g. thermocouple lead wire, communication lines). Minimum distance between these types of wires should not be smaller than 30 cm.
- If signal and power wires cross each other it is suitable 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.

# 11 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 or temperature limiter).**

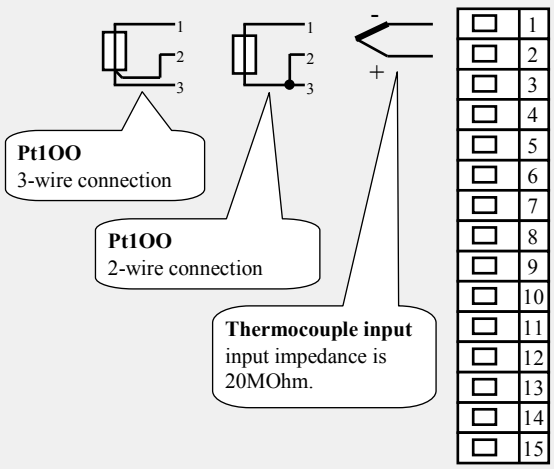
## Supply voltage

**Before you connect the device to supply, check the supply voltage if it correspond with rated voltage.**
**The controller is intended for use in industrial or in laboratory equipment**, **overvoltage category II**, degree **2**.

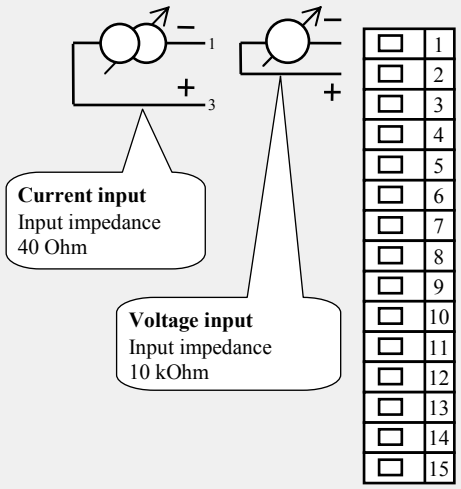



## Thermal input 1 (In1)

**Thermal inputs**

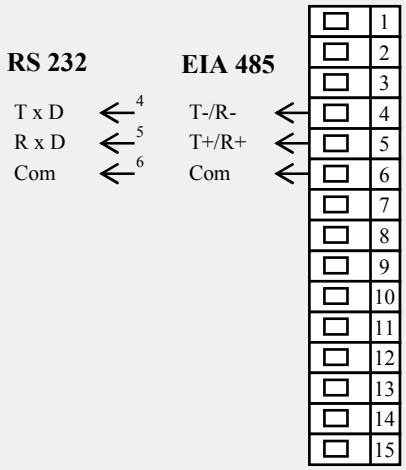



**Process inputs**

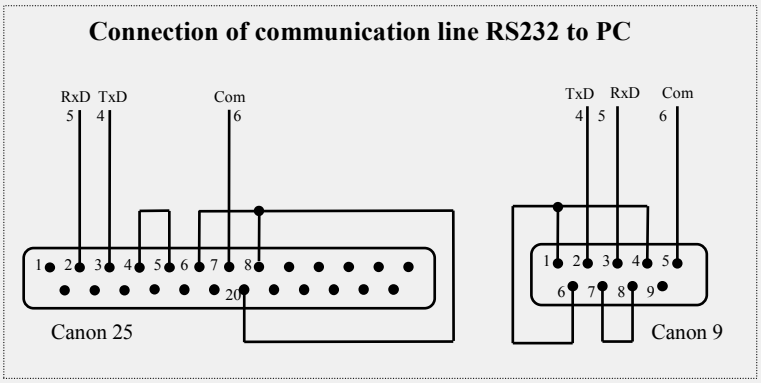



**Measuring input *is not galvanicly isolated* from the ground of controller**

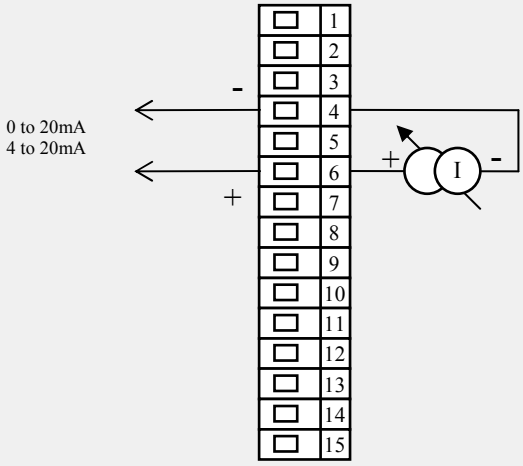
## Communication line (Comm)




**Communication line *is galvanicly isolated* from the device´s ground**



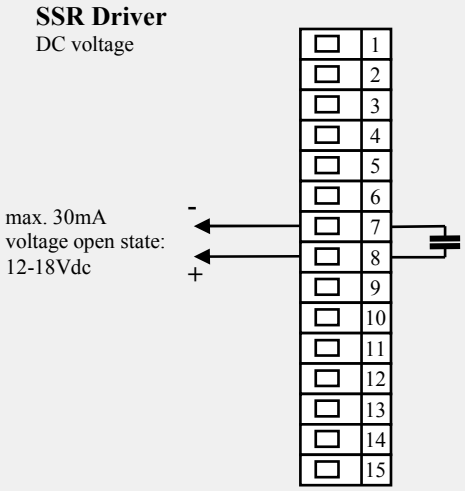

## Retransmit output (rtmt)




**Retransmit output *is galvanicly isolated* from the device´s ground**

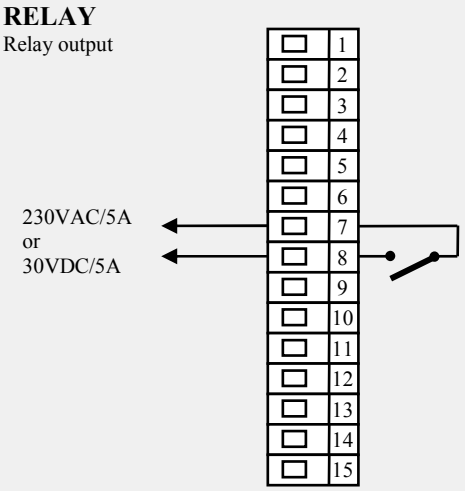
## 1. output (out1)

**SSR Driver**
DC voltage



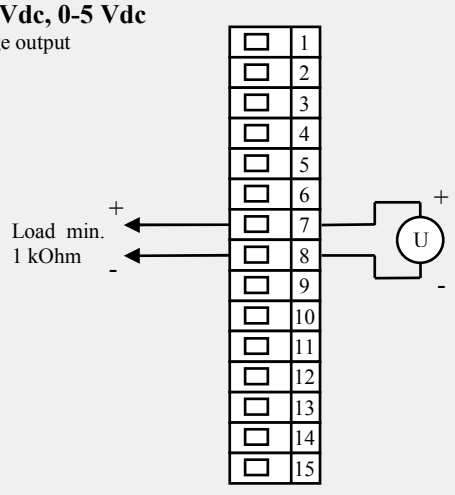

**Output for ssr *is not isolated* from the ground of device**

**RELAY**
Relay output



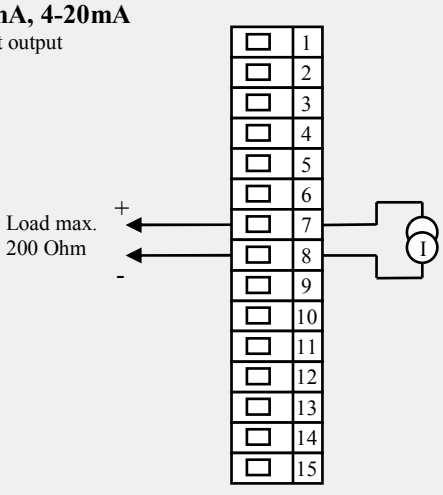

**RELAY output is *galvanicly isolated* from the ground of the controller. For this output it is necessary to fix the wires in the way that in case of loosening the wire from the terminal the insulation would not be reduced between supply voltage and safety voltage.**

**0-10 Vdc, 0-5 Vdc**
Voltage output




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

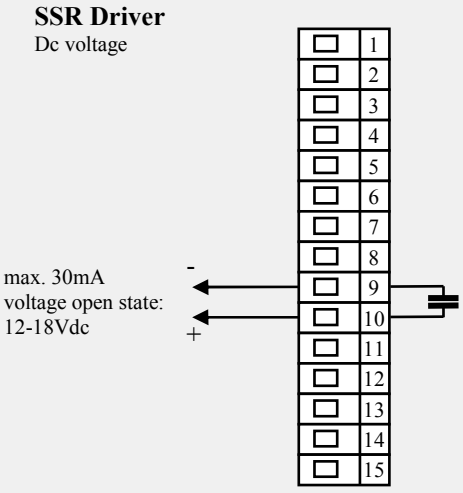
**0-20mA, 4-20mA**
Current output




**Current output *is galvanicly isolated* from the device´s ground**

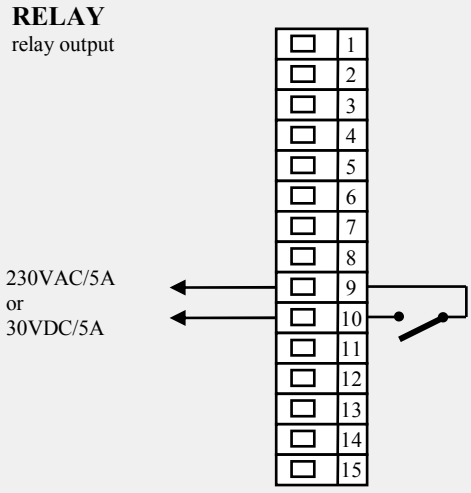
## 2. output (out2)

**SSR Driver**
Dc voltage



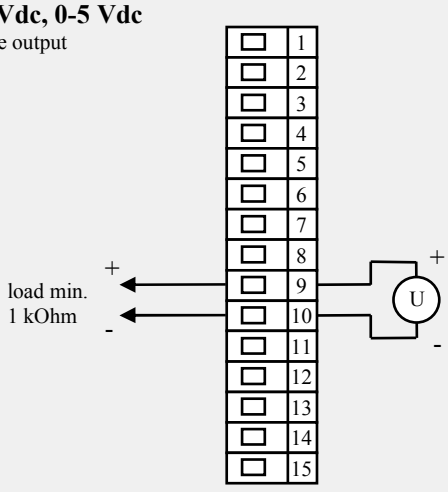

**Output for ssr *is not isolated* from the ground of device.**

**RELAY**
relay output



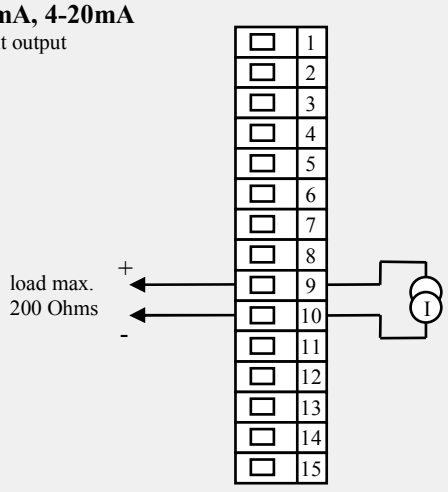

**RELAY output is *galvanicly isolated* from the ground of the controller. For this output it is necessary to fix the wires in the way that in case of loosening the wire from the terminal the insulation would not be reduced between supply voltage and safety voltage.**

**0-10 Vdc, 0-5 Vdc**
Voltage output




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

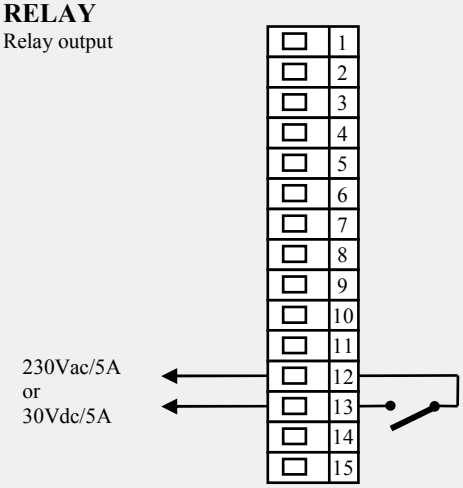
**0-20mA, 4-20mA**
Current output




**Current output *is isolated* from the device´s ground**

## Alarm output (out3)

**RELAY**
Relay output




**RELAY output is *galvanicly isolated* from the ground of the controller. For this output it is necessary to fix the wires in the way that in case of loosening the wire from the terminal the insulation would not be reduced between supply voltage and safety voltage.**

# 12 Putting into operation

**The initial set-up can be done only by the qualified and authorised 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.

## 12.1 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 *22*.
- **ot1** , setting of the control output. The description of this parameter see on page *22*.
- **SP1L**, set low limit of range of stp value. We recommend to leave 0.
- **SP1h**, set high limit of range of stp value. We recommend to set maximum working temperature of equipment. he operator can not set higher stp value than this value of parameter.
- **rL 1**, **rh 1**, parameters for setting the scale of process inputs. Fro the thermal inputs these parameters are not shown. The description of parameters you will find on page *26* and *27*.

**Important:**

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

# 13 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, autotunning/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, 20 programs, 15 steps,
- control to the constant set point value,
- controlling in system Master / Slave.

## Indicators and keys

- two 4-figure LED displays with height 10 mm, 3 LED indicating diodes of outputs,
- 4 keys, setting is done via menu – pushing the buttons.

## 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 Ohms), voltage (10 kOhm), no 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.

- ±0,1% of span/range at 25ºC ±3ºC of ambient temperature and at ±10% rated supply voltage,
- temperature stability ±0,1ºC/ºC in ambient,
- voltage stability ±0,01%/% of change in supply voltage.

## Output 1, 2

- open collector / SSR driver, 12 – 18 VDC for switching ON, max. 30 mA.
- Electromechanical relay, 230Vac/5A or 30Vdc/5A, switching ON, without RC suppression unit.
- Dc output – current, 0-20 mA, 4-20 mA, galvanicly isolated, load max. 200 Ohms.
- DC output – voltage, 0-5 V, 0-10V, galv. isolated, load min. 1 kOhm.

### Alarm output

- electromechanical relay, 230Vac/5A or 30Vdc/5A, switching ON, no RC suppresion unit.

### Communication line

- RS 232, ***galvanicly isolated***, protocol Modbus RTU,
- EIA 485, ***galvanicly isolated***, protocol Modbus RTU.

### Retransmit output

- Output current 0 to 20mA or 4 to 20mA,
- max. impedance of load is 100 Ohms,
- accuracy 0,1% of range at 25°C ± 3°C ambient temperatury and ± 10% of rated suply voltage,
- retransmit output is ***galvanicly isolated*** from the ground of device.

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

### Shipping and storage

- -20 to 70 ºC

### Dimensions

- width x height x length, 48 x 96 x 121 mm,
- depth behind panel surface 114 mm,
- cutout into the panel 48 x 91 mm, the thickness of the panel, 1,5 to 10 mm.

## 13.1 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 overvoltage, electrical values and temperatures of inadmissible intensity, chemical materials, mechanical damage) electrical or mechanical overloading of inputs and outputs.

## 13.2 Description of model

**Ht40P - a b – c d e - f g h**

- **a: input**
  T = thermal input
  P = process input
- **b: secondary input / output**
  0 = none
  X = communication line RS 232
  A = communication line EIA 485
  E = retransmit output
- **c: output 1**
  K = ssr driver
  R = electromechanical relay
  P = current 0-20 mA, 4-20 mA
  N = voltage 0-5 V, 0-10 V
- **d: output 2**
  K = ssr driver
  R = electromechanical relay
  P = current 0-20 mA, 4-20 mA
  N = voltage 0-5 V, 0-10 V
- **e: alarm output**
  R = electromechanical relay
- **f , g, h: version of software**

# 14 Index