Users manual

Ht60M

- meter / alarm unit
- two state controller
- PID controller

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Ht60M, 11/06, soft 6.11/rev. 1

1 Important

Ht60M is a meter / controller intended for the built-in to the panel.

At the first power-up, you can choose one of the following configurations at its initialization:
- meter / alarm unit … `tYPE` = `MEAS`,
- two state controller … `tYPE` = `onoF`,
- PID controller … `tYPE` = `PId`.

The device can be equipped with 1 input:
- temperature (thermocouples + rtd sensor -Pt100),
- process (0-20mA, 4-20mA, 0-5V, 1-5V, 0-10V),

2 outputs:
- 1. output (alarm, signal, heating control or cooling control),
- 2. output (alarm or signalling of temperature exceeding)

and communication lines:
- RS-232, protocol MODBUS RTU,
- EIA-485, protocol MODBUS RTU.

The device is easy to run and operate. The set parameters can be locked and thus preventing from deleting by a user.

User manual for the device Ht60M is divided into the particular chapters. When you install and put it into operation, we recommend proceeding in the following way:

If you are a final user, the device is in the default setting by the suplier

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 with 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….
- ***Operation of device***, in this chapter you will find the information on the parameters accessible for a user and the information on the basic features of the device.

If you are carring out the complete installation and setting of the device

- In this case you proceed in accordance with the following chapters:
- ***Installation***, in this chapter it is described how to build in the device into the panel.
- ***Principals of installation***, we recommend you to observe the guidelines described in this chapter.
- ***Wiring***, the description for wiring of the device.
- ***Putting into operation***, at first power-up you enter the initial menu in which you can configure and set the most important parameters of the device.

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 device and its operation in the following chapters.

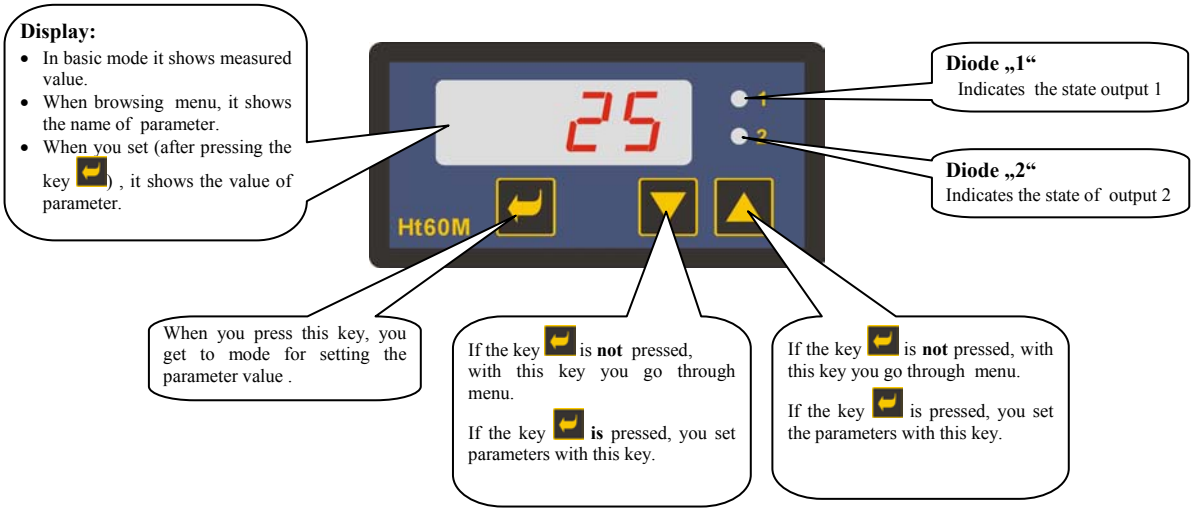
For the users who have prepared the complete setting of the device, we recommend to perform the setting of all the parameters in ***service level***, menu `ConF`. **Initial password** for the entry to service level is set to **995**.

2 Basic terms

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

Functions of indicators

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



2.1 Information and error messages

Information and error messages are only indicated in ***basic mode***, see page 5.

Information messages

- `----` … the error of input sensor or input is not set.
- `rAMP` … indication of ramp function.
- `Aut1` … starting autotunning of PID parameters for heating, `Pb1` ,`It1` ,`dE1` .
- `Aut2` … starting autotunning of PID parameters for cooling, `Pb1` ,`It1` ,`dE1` .
- `LAt1` … alarm 1 is active (function of the permanent alarm is turned ON … `LAt1` = `on`).
- `LAt2` … alarm 2 is active (function of the permanent alarm is turned ON … `LAt2` = `on`).

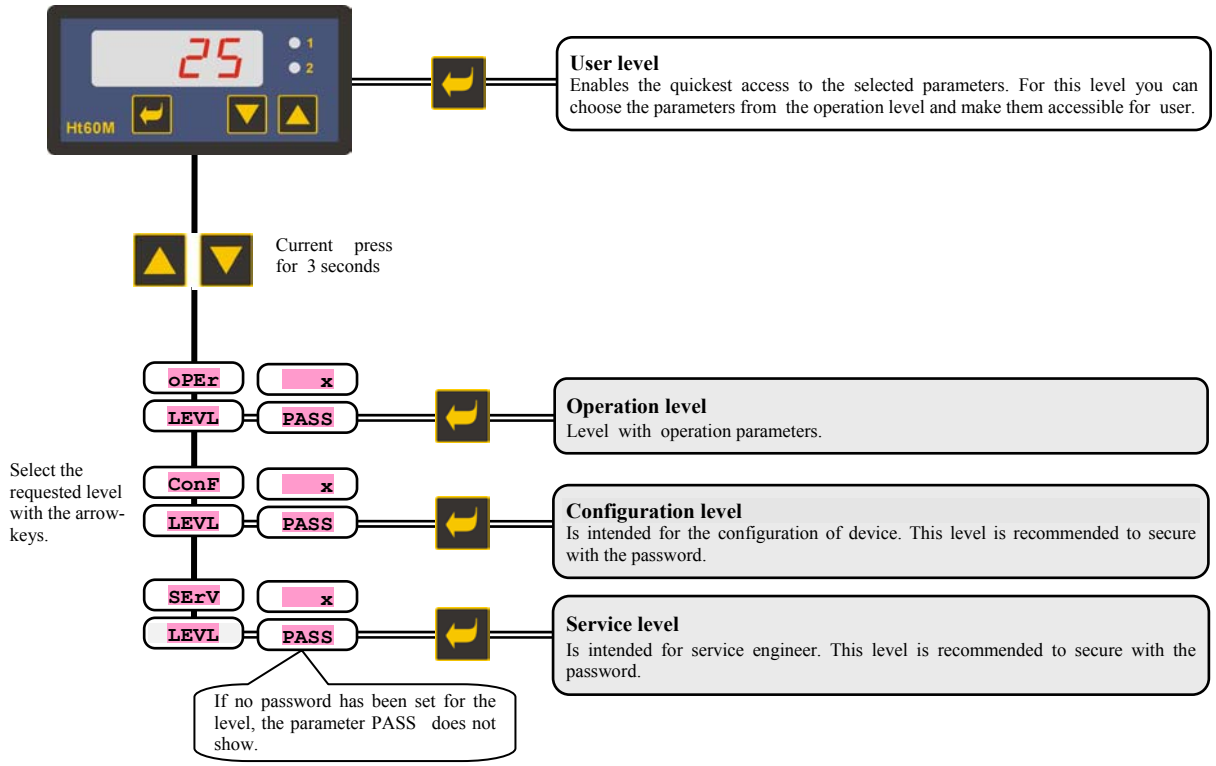
Error messages

If there is an error message indicated then the control outputs are switched OFF, the signal output is switched OFF, the alarm output is activated. The error messages blink on the lower display.

- `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 ***service 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, menu

For the right function of the device it is necessary to set up its parameters properly. For better understanding the parameters are sorted out to groups (levels and menus). The structure of sorting shows the following picture.



2.3 Basic mode of device

The device is in ***Basic mode*** when powered up (the initial set-up must be performed, see page 9).
On the display there is a measured temperature shown.

- Information and error messages are indicated only in ***basic mode***.

Return to basic mode

- To return to ***basic mode*** press shortly the keys
- If there is no key pressed for 60 seconds, the device itself returns to ***basic mode***.

3 Operation of device

The device has only 1 display. The orientation in menu and setting of parameters is then more difficult, than for the device with 2 displays.
How to set the device is shown on the following pictures:

Setting of stp value

Setting of stp value is permitted only in case when the device works as PID or two-state controller.
Procedure is as follows:

- Device is in basic mode, on display there is a measured value indicated
- For setting of stp value, press the key 

- Press the key  all the time
- With keys  or  set the requested stp value

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- After the setting release the key 
- **New set stp value is automaticly written after 2 seconds from the releasing the key** 

Setting of the other parameters of device

Setting is carried out in the same way as the setting of stp value

- with keys ▲ or ▼ choose the requested parameter

- press permanently the key ↵
- with the keys ▲ or ▼ set the requested value of the parameter

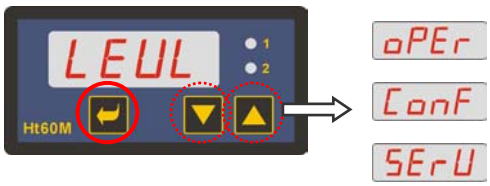
- after the finishing of the setting, release the key ↵

- press the key ▲ or ▼ … the change-over to the following menu
- **only after the pressing this key, the new value is written to the memory of device**

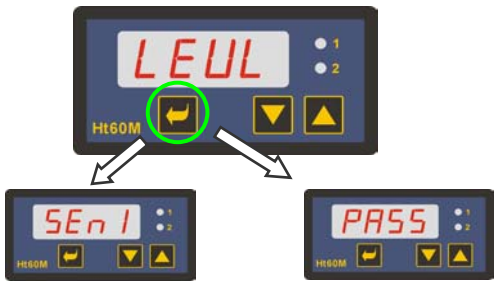
Change-over from one level to another level of menu

Change-over to operation (**oPEr**), configuration (**ConF**) or service (**SErV**) level is described in the following way:

- device is in basic mode, on display there is a measured value indicated
- press the both keys ▼ ▲ together for 3 seconds, until the heading „LEVL“ appears on the display



- press the key ↵ all the time
- with the key ▲ or ▼ choose the requested level:
  „**oPEr**“ … operation level
  „**ConF**“ … configuration level
  „**SErV**“ … service level



- after the finishing of the setting , release the key ↵
- if there is no password set, you will enter 1st. menu of selected level (for example „**SEn1**“)
- if there i a password, you will enter the menu after editing the right password

- press the key ↵ permanently
- with the key ▲ or ▼ set the right password for the access to the requested level

- after the releasing the key ↵ the heading „PASS“ appears again on display

- press the key ▲
- If the right password was set, you will get to 1. menu of the chosen level (for example „SEn1“)
- If the right heading was not properly set, the device returns to basic mode

4 Putting device into operation

The initial configuration can be made only by the authorized and entitled person for that. The improper setting can cause serious damage.

Procedure

Suppose that the device is installed into the panel, properly wired and you have turned it ON for the first time.Parameters for the initial configuration are as follows:

Configuration of the type for the device:

- **MEAS** … meter / alarm unit.
- **onoF** … two state controller.
- **PId** … PID controller.

Setting of input sensor … thermal input:

- **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** … rtd sensor Pt100, range -200 to 800°C.

Setting of input sensor … process input:

- **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.

Only for process input

Setting of decimal point for showing on display:

- **0** … no decimal point.
- **0.0** … one decimal point.
- **0.00** … two decimal points.
- **0.000** … three decimal points

Only for process input

Together with parameter **rh 1** you choose **the scale for showing values on display** for the process ranges.

Range: -499 to 2499.

Only for process input

Together with parameter **rL 1** you choose **the scale for showing values on display** for the process ranges.

Range: -499 to 2499.

Setting of 1st. output … meter (`tYPE` = `MEAS`):

- `oFF` …output is turned OFF.
- `ALPr` … alarm output.
- `SGPr` … signal output.

Setting of 1st. output … 2-state controller (`tYPE` = `onoF`):

- `oFF` … output is turned OFF.
- `ht2` … heat control, ON-OFF control.
- `CL2` … cool control, ON-OFF control.

Setting of 1st. output … PID controller (`tYPE` = `PId`):

- `oFF` … output is turned OFF.
- `ht` … heat control, PID controlling.
- `CL` … cool control, PID controlling.

Setting of 2nd. output:

- `oFF` … output is turned OFF.
- `ALPr` … alarm output.
- `SGPr` … signal output.

Only for two-state and PID controller

The limit of low operational range of stp value:

Range: -499 to `SP1h`.

Only for two-state and PID controller

The limit of high operational range of stp value:

Range: `SP1L` to 2499.

Important:

All the parameters that were set at initial configuration are possible to change later in ***configuration level***.

4.1 Configuartion of other type of device

The configuration of other type of device can be performed after the re-start of all the parameters at new setting of the whole device.

Procedure

- Enter to ***service level***, see page 8. Initial password for the access to ***service level*** is set to 995.
- Find the menu `rSt?` … restart of parameters.
- Menu `rSt` (`rSt?`, `rSt1`, `rSt2`, `rSt3`, `rSt4`, `rSt5`) must be set for 6 times `YES` and confirm.
- After the restart of parameters, switch OFF the device and then switch it ON again, set the new initial configuration of the device.

5 User level

User level is intended for the quick access of the user to the most common parameters. Menu of this level is freely set by the user (in ***configuration level***, parameters `StP1` to `StP4`).

	• Device is in basic mode, there is a measured value indicated on display • By pressing the key ▲ you will enter to user level
	**The first parameter of user level** (set by the parameter `StP1`) • By pressing the key ▲ you will enter to another parameter of user level
	**The second parameter of user level** (set by the parameter `StP2`) • By pressing the key ▲ you will enter to another parameter of user level
• • •	Another parameters of user level

In the device Ht60M you can select as many as 4 parameters of user level.

Overview of all the parameters and menu of user level

Display	Procedure	How to reach particular parameters is described in ***operation level***
`PCn1`	**Indication of power in % of the control output I**.	
`Aut`	**Starting / ending of autotunning/automatic setting of PID parameters:** • `oFF`, autotunning /automatic setting of PID parameters is turned OFF. • `on`, starting of autotunning/automatic setting of PID parameters for heating or cooling (acc to the setting of the control output).	
`Pb1`	**Proportional band of the control output** Range: 1 to 2499 °C.	
`It1`	**Integral value of the control output**. Range: `oFF`, 0.1 to 99.9 minutes.	
`dE1`	**Derivative value of the control output**. Range: `oFF`, 0.01 to 9.99 minutes.	
`hYS1`	**Hysteresis of the control output** , this single parameter is set only for ON/OFF control. Range: 1 to 249 °C.	
`o1Lo`	**Low al/sg limit of output 1**. Output is activated, if measured value is ***lower***, than the set limit. • Range: -499 to `o1hI` °C.	
`o1hI`	**High al/sg limit of output 1**. Output is activated , if measured value is ***higher***, than the set limit. • Range: `o1Lo` to 2499 °C.	
`o2Lo`	**Low al/sg limit of output 2**. Output is activated, if the measured value is ***lower***, than the set limit. • Range: -499 to `o2hI` °C.	
`o2hI`	**High al/sg limit of output 2**. Output is activated, if the measured value is ***higher***, than the set limit. • Range: `o2Lo` to 2499 °C.	

Setting of parameters of user level

You can create your own user level in ***configuration level***, parameters `StP1`, `StP2`, `StP3`, `StP4` .

Example how to create user level:

You want to place on the 1st position in ***user level*** the parameter for starting autotunning `Aut` , on the 2nd high limit of alarm `o2hI`. Proceed as follows:

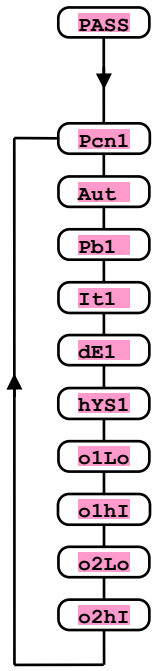
- Set the parameter `StP1` = `Aut`.
- Set the parameter `StP2` = `o2hI`.
- 3rd to 4th positions are not used, for parameters `StP3` and `StP4` set `no`.

You can view the result in ***user level***

6 Operation level

In operation level the parameters are set which are accessible for the user of the device.

How to reach the operation level you will find on page 8.



	Meaning of parameter	The condition for showing the parameter
Output 1	indicates the power output 1 in %	PID controller has been configured
	automatic setting of PID parameters	
	proportional band	
	integral value	
	derivative value	
	hysteresis of two-state controller	two-state controller was configured
	low alarm / signal limit of output 1	meter / alarm unit configured
	high alarm / signal limit of output 1	
Output 2	low alarm / signal limit of output 2	alarm / signal for output 2 set
	high alarm / signal limit of output 2	

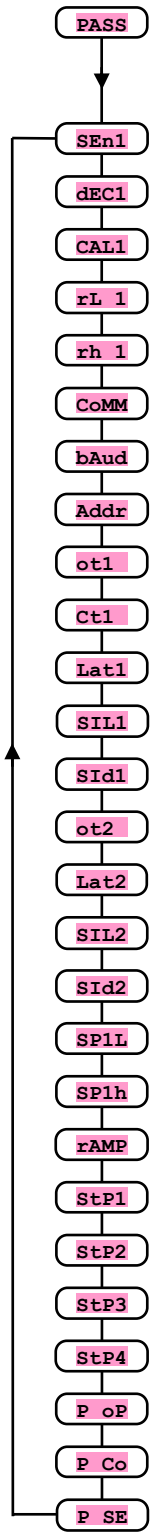
Menu of operation level

Display	Meaning
PCn1	**Shows the actual power of the output 1 in %.**
Aut	**Starting / ending of autotunning/automatic setting of PID parameters:** • oFF, autotunning /automatic setting of PID parameters are turned OFF. • on, starting of autotunning/automatic setting of PID parameters for heating or cooling (acc to the setting of the control output).
Pb1	**Proportional band of the control output** Range: 1 to 2499 °C.
It1	**Integral value of output 1**. Range: oFF, 0.1 to 99.9 minutes.
dE1	**Derivative value of output 1**. Range: oFF, 0.01 to 9.99 minutes.
hYS1	**Hysteresis of the control output** , this single parameter is set only for ON/OFF control. Range: 1 to 249 °C.
o1Lo	**Low al/sg limit of output 1**. Output is activated, if the measured value is ***lower***, than the set limit. • Range: -499 to o1hI °C.
o1hI	**High al/sg limit of output 1**. Output is activated, if the measured value is ***higher***, than the set limit. • Range: o1Lo to 2499 °C.
o2Lo	**Low al/sg limit of output 2**. Output is activated, if the measured value is ***lower***, than the set limit. • Range: -499 to o2hI °C.
o2hI	**High al/sg limit of output 2**. Output is activated, if the measured value is ***higher***, than the set limit. • Range: o2Lo to 2499 °C.

7 Configuration level

Configuration level is intended for the basic setting of device. In this level **the control output is turned OFF** and **deactivated alarm and signal output**.

How to reach the configuration level you will find on page 8.



	Meaning of parameter	The condition for showing the parameter
Input	setting of input sensor	always
	setting of decimal point	always
	calibration of sensor	always
	scale for showing the values on display, low limit	process input
	scale for showign the values on display, high limit	process input
Comm. line	protocol of communication line	equipped with communication line
	baudrate	
	address of device	
Output 1	function of output 1	always
	time of cycle of output 1	PID controller configured
	latching of alarm / signal	meter / limit unit configured
	silencing of alarm / signal at the start-up of device	
	choice of active sides of alarm / signal	
Output 2	function of output 2	always
	latching of alarm / signal	alarm or signalling set on output 2
	silencing of alarm / signal at the start-up of device	
	choice of active sides of alarm / signal	
System menu	limitation of low working range of stp value	two-state or PID controller configured
	limitation of high working range of stp value	two-state or PID controller configured
	ramp function	two-state or PID controller configured
User menu	parameter that is placed on 1. position of user menu	always
	parameter that is placed on 2. position of user menu	always
	parameter that is placed on 3. position of user menu	always
	parameter that is placed on 4. position of user menu	always
Locks for menu	password for entering the operation level	always
	password for entering the configuration level	always
	password for entering the service level	always

setting of input

Display	Meaning
SEn1	**Setting of input sensor … thermal input:** • no … no input 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 … rtd sensor (Pt100), range -200 to 800°C. **Setting of input sensor … process input:** • no … no input 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.
dEC1	**Setting of decimal point for showing on display … thermal input:** • 0 … no decimal point. • 0.0 … one decimal point. **Setting of decimal point for showing on display … process input:** • 0 … no decimal point. • 0.0 … one decimal point. • 0.00 … two decimal points. • 0.000 … three decimal points
CAL1	**Calibration of sensor**. The set figure is added to measured value as a correction. Range: -999 to 999 °C.
rL 1	Together with parameter rh 1 you set **the scale for showing the values on display** for the process range. Range: -499 to 2499.
rh 1	Together with parameter rL 1 you set **the scale for showing the values on display** for the process range. Range: 499 to 2499.

communication line

Display	Meaning
CoMM	**Setting of communication line**: • Mod … device is set for the communication with PC, protocol MODBUS RTU.
bAud	**Baudrate:** • 9.6 … 9600 Bd. • 19.2 … 19200 Bd. • 38.4 … 38400 Bd. • 57.6 … 57600 Bd.
Addr	**Address of device.** Range: 1 to 250.

output 1

Display	Meaning
ot1	**Function of output 1, meter / alarm unit (tYPE = MEAS):** • oFF … output is turned OFF. • ALPr … alarm output. • SGPr … signal output. **Function of output 1, two-state controller (tYPE = onoF):** • oFF … output is turned OFF. • ht2 … two-state controller - heating. • CL2 … two-state controller - cooling. **Function of output 1, PID controller (tYPE = PId):** • oFF … output is turned OFF. • ht … PID controller - heating. • CL … PID controller – cooling.
Ct1	**Time of cycle for the output 1**. Range: 1 to 200 seconds.
LAt1	**Setting of permanent alarm / signal for the output 1:** • oFF … temporary alarm. • on … permanent alarm.
SIL1	**Silencing of alarm / signal at the first turning ON:** • oFF … function is turned OFF. • on … function is turned ON.
SId1	**Choice of active sides of alarm / signal** • both … both sides are active. • hI … high side is active. • Lo … low side is active.

output 2

Display	Meaning
ot2	**Function of output 2:** • oFF … output 2 is turned OFF. • ALPr … alarm output. • SGPr … signal output.
LAt2	**Setting of permanent alarm / signal for the output 2:** • oFF … temporary alarm. • on … permanent alarm.
SIL2	**Silencing of alarm / signal at the first turning ON:** • oFF … function is turned OFF. • on … function is turned ON.
SId2	**Choice of active sides for alarm, signal** • both … both sides are active. • hI … high side is active. • Lo … low side is active.

system parameters

Display	Meaning
SP1L	**Limitation of low operational range for stp value.** Range: -499 to SP1h °C.
SP1h	**Limitation of high operational range for stp value.** Range: SP1L to 2499 °C.
rAMP	**Ramp function … rate up to stp value SP1 when in controlling to stp value**. If it is set oFF , ramp function is turned OFF. Range: oFF, 1 to 999 °C/hour.

setting of user menu

Display	Meaning
StP1	Parameter that is placed on 1. position of user menu: • no … no parameter • PCn1 … indicates the power in % of the control output 1. • Aut … starting / ending of automatic optimalization of PID control parameters. • Pb1 … proportional band of output 1. • It1 … integral value of the output 1. • dE1 … derivative value of the output 1. • hYS1 … hysteresis of output 1 when ON/OFF switching is set. • o1Lo … low alarm / signal limit of output 1. • o1hI … high alarm / signal limit of output 1. • o2Lo … low alarm / signal limit of output 2. • o2hI … high alarm / signal limit of output 2.
StP2 … StP4	Parameter that is placed on 2. , 3. or 4. position of user menu. The list is the same as in StP1.

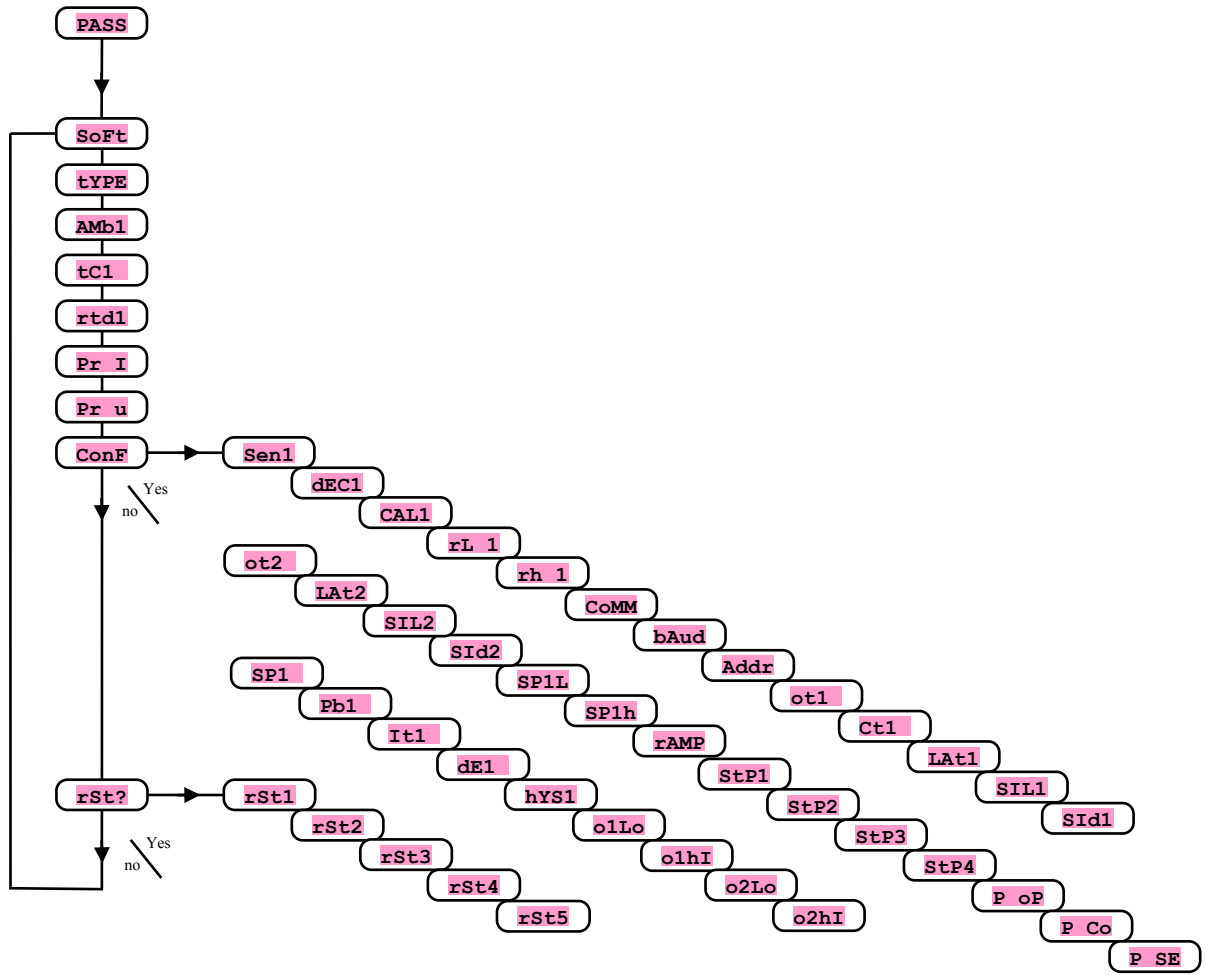
passwords for entering higher levels of menu

Display	Meaning
P oP	**Password for entering the operation level**. If it is set oFF, the access is not secured with the password. • Range: oFF, 1 to 9999.
P Co	**Password for entering the configuration level**. If it is set oFF, the access is not secured with the password. • Range: oFF, 1 to 9999.
P SE	**Password for entering the service level**. If it is set oFF, the access is not secured with the password. • Range: oFF, 1 to 9999.

8 Service level

Service level is intended for using of service engineers. In this level **the control output is turned OFF and alarm and signal output is deactivated**.

How to reach the service level you will find on page 8.



Display	Meaning
SoFt	**Number of software version.**
TYPE	**Type of the selected device.** MEAS … meter, onoF … two-state controller, PId … PID controller
AMb1	**Actual ambient temperature.**
tC1	**Measured voltage, thermocouple input 1.** Range 60mV.
rtd1	**Measured resistance, resistance input 1**. Range 350 ohm.
Pr I	**Measured current, current input 1.** Range 20mA.
Pr u	**Measured voltage, voltage input 1**. Range 10V.
ConF	By setting YES and confirming, you enter the menu for setting all the parameters. This menu can be used for example at the first configuration of the device.
rSt?	Writing of initial parameters is a substantial intervention to device setting. It must be confirmed 6 times by setting YES.

9 Measurement – description of input

The right selection, the installation, the wiring, the location of sensor in the equipment and the corresponding setting of parameters of the controller has the essential importance for the correct function. Parameters for the configuration of the measurement input are in ***configuration level***.

Setting of input sensor

Set the corresponding input sensor in parameter **SEn1**. The overview of input sensors finds itself in the chapter ***Technical parameters***, see page *28*.
With the parameter **dEC1** you can set the position of decimal point. For thermocouples it is possible to set no or 1 decimal point.
With the parameter **CAL1** you set the calibration of sensor. The set value is added to process/measured value.
You can set the limit for set point value in ***configuration level,*** parameters **SP1L** and **SP1h**.

Important:

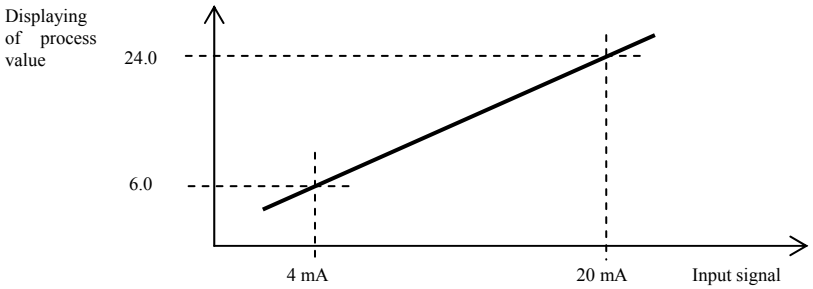
- Thermocouple and RTD inputs have the detection of improperly wired sensor. When the sensor is open or broken, the control output is turned OFF, the alarm output is active.

Measuring range of process inputs

In ***configuration level*** it is possible with the parameters **rL 1**, **rh 1** and **dEC1** to define the measuring range of process inputs.

Example of setting 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**, **rL 1** = 6.0 and **rh 1** = 24.0. The distribution between the values 6.0 and 24.0 will be linear.



10 Controlling, control output

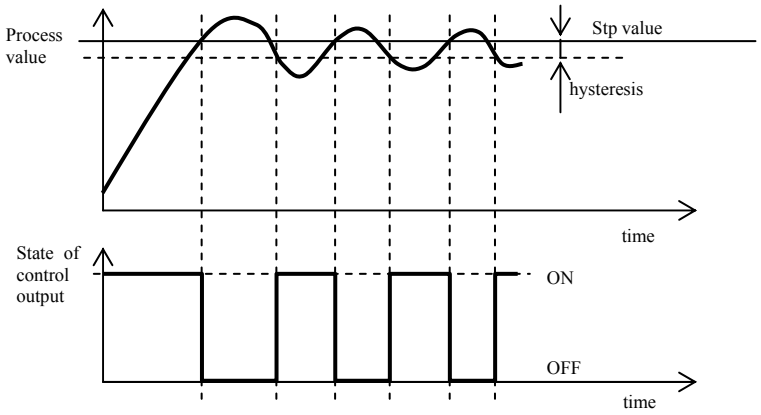
Control output is always on the position „**output 1**“.
The device makes possible these control at setting:

- tYPE = onoF, ON/OFF control of heating or cooling.
- tYPE = PId, PID control of heating or cooling.

10.1 ON/OFF control

The device is configured as ON/OFF (two-state) controller, if you choose at the initial configuration tYPE = onoF.

ON/OFF control is chosen in ***configuration level*** by setting ot1 = ht2 (for heating) or ot1 = CL2 (for cooling).
It is mainly used for less demanding applications. 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.



10.2 PID control

The device is configured as PID controller, if you choose at the initial configuration tYPE = PId.

PID control is chosen in ***configuration level*** with the parameter ot1 = ht (for heating) or ot1 = CL (for cooling).
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 *20*.
PID parameters have the following meaning:

- Pb1 **proportional band** is set in measured units. It is the band about the set point value in which the controller keeps the temperature.
- It1 **integral factor**, in minutes. Integral factor compensates the loss of system. A **low** integral value causes a **fast** integrating action.
- dE1 **derivative factor**, in minutes. Derivative responses to fast changes and tries to react against them. The **more** value is, the **more** derivative factor reacts.

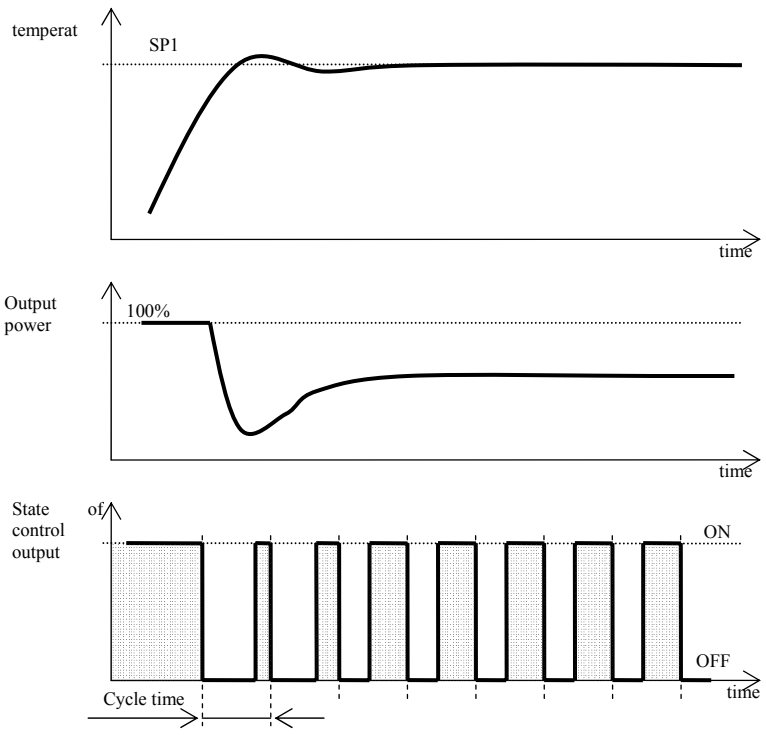
The required power is (given in %) transferred to the output with so called pulse width modulation. In each time cycle (parameter Ct1, that you will find in ***configuration level***) the control output is switched ON once and once OFF. The more the power is necessary, the wider the width of switching 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.

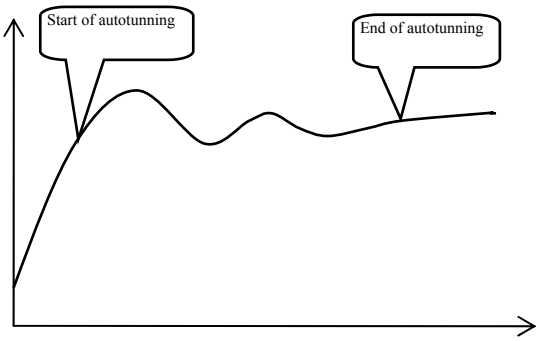
Important:

- 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.



Autotunning - automatic setting of PID parameters

The controller is equipped with the function how to find optimal PID parameters for heating as well as for cooling.



When in autotunning the following headings blink on display:

- **Aut1** … parameters **Pb1** , **It1** , **dE1** are being set for heating.
- **Aut2** …parameters **Pb1** , **It1** , **dE1** are being set for cooling.

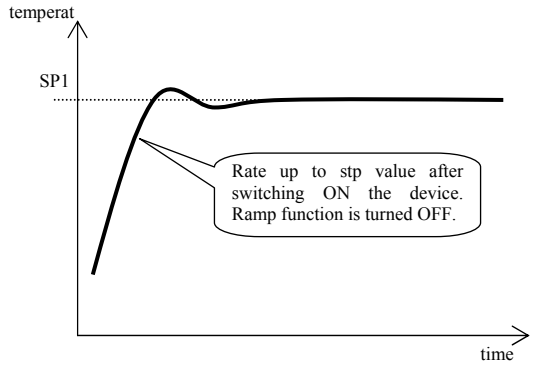
Procedure how to start autotunning:

- Automatic optimalization or autotunning you will start with the parameter **Aut** = **on**. Parameter **Aut** finds itself in ***operation level.*** The control output has to be set for PID control.
- The controller explores the characteristics of system from switching ON/OFF on the output and determines optimal PID parameters. It can cause an overshoot.
- During the autotunning on display blinks the information message (**Aut1**, **Aut2**).
- After the autotunning is finished the parameters are edited and the information messages stop blinking.

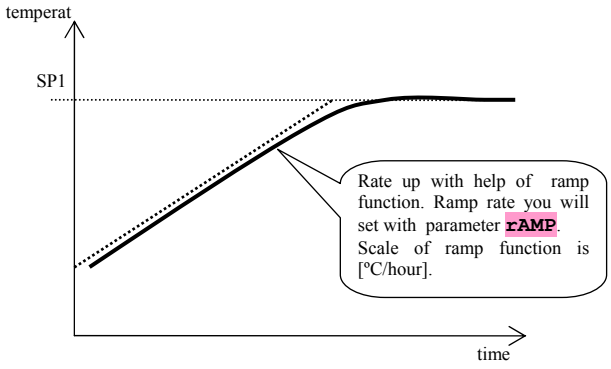
10.3 Ramp function

When the controller is powered up, rapid temperature changes appear. If this rapid increase in temperature is not wanted, you can control the ramp rate to stp value with the ramp function.

Ramp function is turned OFF



Ramp function is turned ON



- Ramp function ensures the reaching stp value SP1 in the linear way.
- Ramp function is active only after the controller is turned on and it is ended by reaching stp value SP1.
- When the ramp function is activated, on display blinks the heading **rAMP**.
- Ramp function is set in ***configuration level***, parameter **rAMP** [ºC/hour].
- If it is the parameter **rAMP** = **oFF**, the ramp function is turned OFF.

11 Alarm / signal output

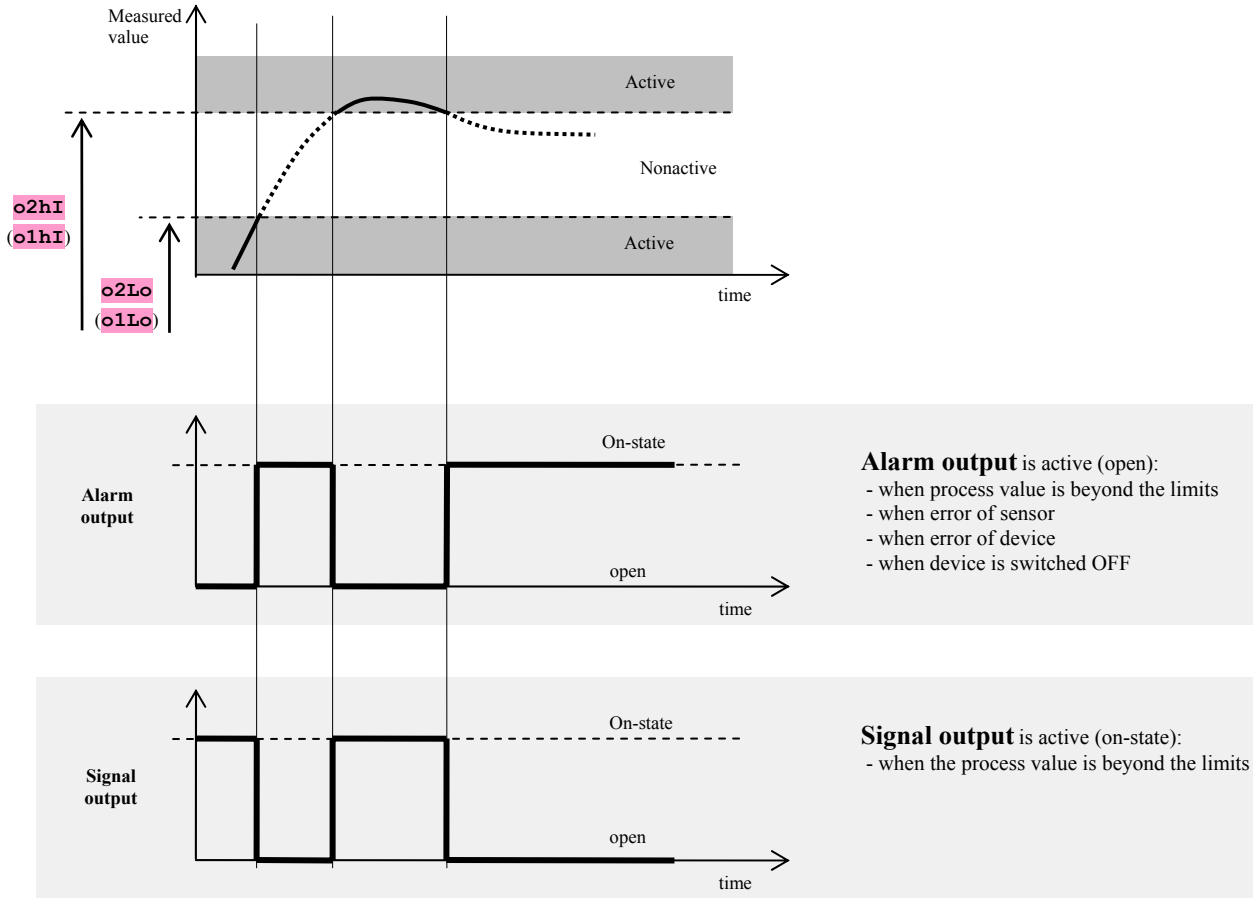
Alarm / signal output is always on the position „**output 2“**.
If you choose at the initial configuration „meter, alarm unit“ … `tYPE` = `MEAS`, alarm / signal output is also placed on the position „**output 1“**.

The abbreviations in parentheses hold true for the output 1 (it must be set as alarm or signal).

Setting of alarm / signal output

You set this function with the parameter `ot2` , (`ot1`):

- `ot2` (`ot1`) = `oFF`, output is turned OFF,
- `ot2` (`ot1`) = `ALPr`, alarm output, the limits are set in the absolute values,
- `ot2` (`ot1`) = `SGPr`, signal output, the limits are set in the absolute values.



Temporary, permanent alarm – function LAT

Alarm can be temporary - LAt2 (LAt1) = oFF or permanent(latched) - LAt2 (LAt1)= on.

- Temporary alarm will turn OFF after the alarm conditions elapse.
- Permanent latched alarm is turned ON even after the alarm conditions elapse.

Important:

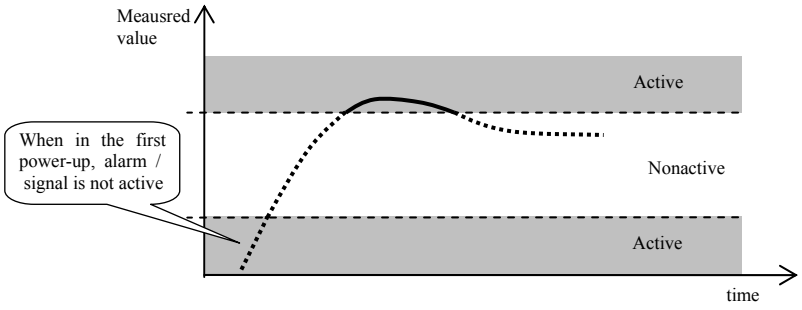
Permanent latched alarm will turn OFF after the alarm conditions elapse by short pressing the keys  .
Permanent alarm is also turned OFF after the power cut.

Silencing of alarm / signal – function SIL

Silencing of alarm / signal can be used for putting down alarm / signal at the first rate up to stp value. Usaully it is not the state that should be assessed as error, because the thermal system is not yet stabilized.

Function is configured with the parameter:

- SIL2 (SIL1) = oFF, function not active
- SIL2 (SIL1) = on, alarm / signal can be activated then when measured value reach the allowed range for the first time after the power-up (between alarm / signal limits).



Active sides of alarm / signal – function SId

With the parameter SId2 (SId1) you can choose which side of alarm will be active:

- SId2 (SId1) = both, both limit sides are active.
- SId2 (SId1) = hI, active is only the high alarm / signal limit side.
- SId2 (SId1) = Lo, active is only the low alarm / signal limit side.

12 Table of parameters

Table of parameters of configuration level:

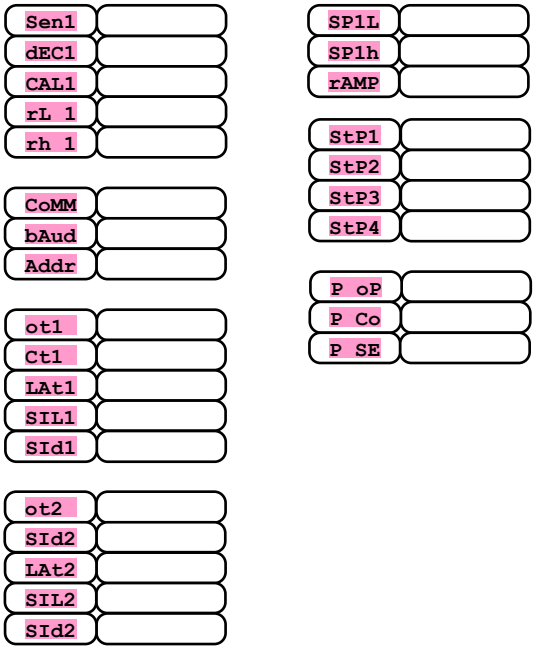
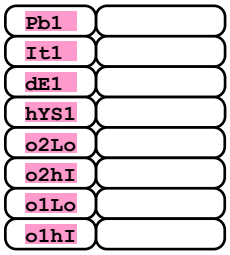


Table of parameters of operation level:



13 Installation

The device is designed to be mounted to the panel cut-out. Slide the device into the cut-out and fix it with 2 flanges that are supplied with the device. The installation requires the access to the back of the panel.

Mounting dimensions

- Width x height x overall length: 96 x 48 x 107 mm (including terminal board).
- Behind panel length: 101 mm ((including terminal board).
- Cut-out in the panel: 90 x 45 mm.
- The thickness of panel: 1,5 to 5 mm.

Mounting

- Make the panel cutout 90 x 45 mm.
- Slide the controller into the panel cut-out.
- Insert the flanges for holding into the holes upward and downward or on both sides of the device.
- 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 device begins on page *26*.

13.1 Principals on installation, the source of interference

There are many possible sources of interference in environment of the device. 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.

13.2 Reduction of interference

Making a design of system, 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 device.
- Do not use supply voltage for the device 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.

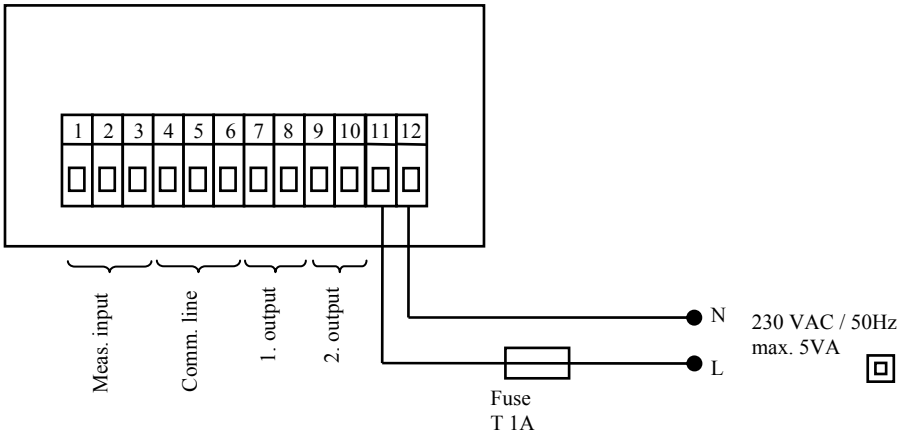
When necessary the uninterruptible power sources (UPS) could be used.

14 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 possible default of the device could cause damage, the equipment with the device must be fitted with the independent protection unit (thermal cut-out).

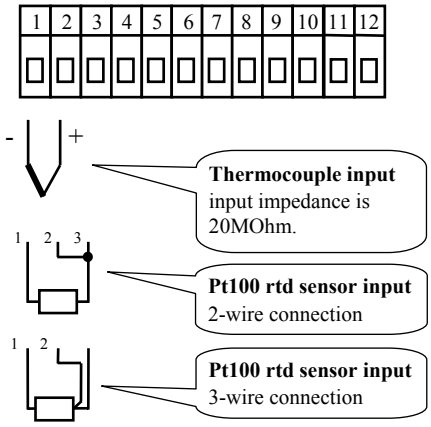
Supply voltage

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

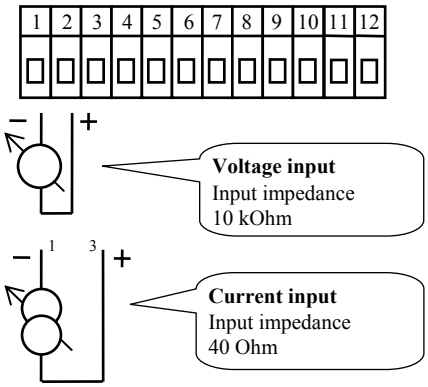


Measuring input (InP1)

Temperature inputs



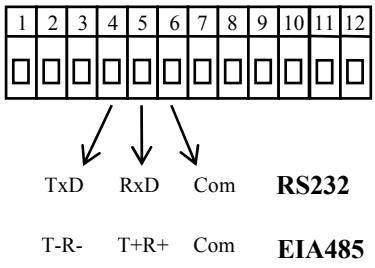
Process inputs

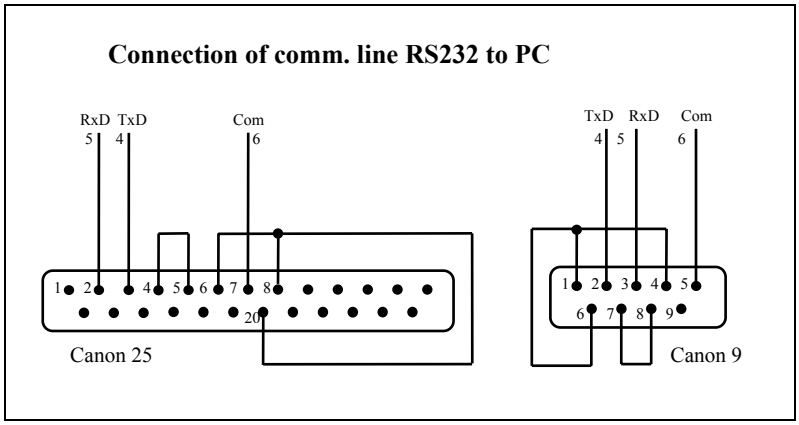


Measuring input *is not galvanic insulated* from the ground of the device

Communication line (CoMM)

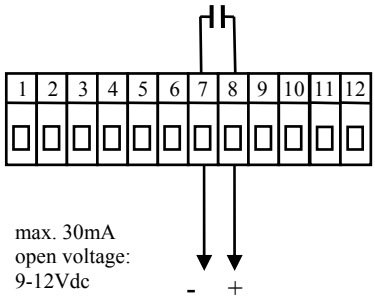
Communication line *is galvanic insulated* from the ground of the device



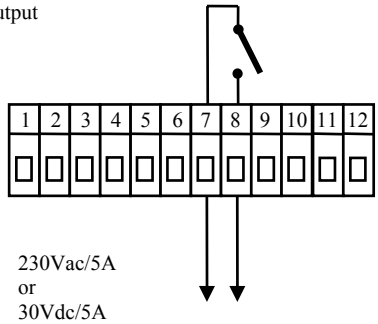


1. output (alarm / signal, control)

SSD
Dc voltage



RELAY
Relay output

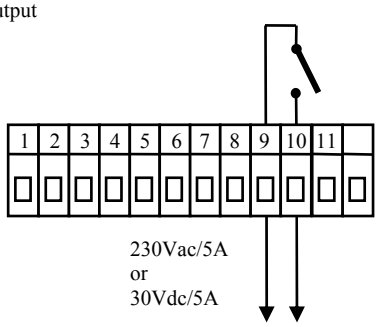


Output SSD *is not galvanic insulated* from the device ground

***Output RELAY is galvanic insulated from the ground of device.* 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.**

2. output (alarm / signal)

RELAY
Relay output



***Output RELAY is galvanic insulated from the ground of device.* 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.**

15 Technical parameters

The device is intended for use in the industrial or laboratory equipment, the category of pollution / over voltage II.

Controlling

- PID, PI, PD, P controlling, autotunning/automatic setting of PID parameters, controlling of heating or cooling.
- ON/OFF controlling, controlling of heating or cooling.

Controlling of stp value

- controlling to stp value, ramp function

Alarm, signalling

- absolute alarm, signalling, high and low limits.
- Permanent / temporary alarm / signalling
- Silencing of alarm / signaling at the power up

Indicators and keys

- 1 four-digit displays, height of segments is 14 mm,
- 2 LED diodes for outputs,
- 3 keys, setting through the particular menus.

Sensors, inputs

Thermal input – thermocouple or rtd Pt100, 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 Pt100, range -200 to 800°C, 2-wire or 3-wire connection, DIN curves.

Process input - current (input impedance 40 Ohms), voltage (10 kOhm), 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.

Output 1

- SS driver, voltage 9 – 12 Vdc in ON state, max. 30 mA,
- Electromechanical relay, 230Vac/5A or 30Vss/5A, switching, no RC suppression unit.

Output 2

- Electromechanical relay, 230Vac/5A or 30Vdc/5A, switching, no RC suppression unit.

Communication line

- RS 232, galvanic insulated, protocol Modbus RTU,
- EIA 485, galvanic insulated, protocol Modbus RTU.

Accuracy of inputs

- ±0,25% of range (min. 600ºC) , ±1 digit at 25ºC ±3ºC ambient temperature and at ±10% rated supply voltage
- temperature stability ±0,1ºC/ºC in ambient
- voltage stability ±0,01%/% of change in supply voltage.

Supply voltage

- 230 VAC + / - 10%, 50 Hz, internal slow fuse T2 A/250 V
- input power max. 5 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 96 x 48 x 107 mm,
- depth behind panel surface 101 mm,
- cutout into the panel 90 x 45 mm, , the thickness of the panel 1,5 to 5 mm.

15.1 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, and mechanical damage) electrical or mechanical overloading of inputs and outputs.

15.2 Description of model

Ht60M – a b – c d – e f g

- **a: input**
  T = thermal input
  P = process input
- **b: communication line**
  0 = none
  X = communication line RS 232
  A = communication line EIA 485
- **c: 1.output**
  K = ss driver
  R = electromechanical relay
- **d: 2.output**
  R = electromechanical relay
- **e, f, g: 0 0 0**
  customary version

16 Index