MEASURING / CONTROL EQUIPMENT AND DRYING KILNS
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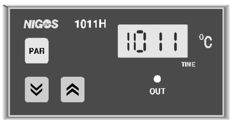
NIGOS ELEKTRONIK - NIŠ

User's manual for 1011 (P, H, V) and 1012 (P, H, V) microprocessor controllers

1011

- **Temperature controller**
- **Type of control: P, PI, ON / OFF**
- **Timer function**
- **Inputs: 1**
- **Outputs: 1**

1011P



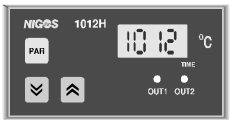
1011H

1011V

1012

- **Temperature controller**
- **Type of control: P, PI, ON / OFF**
- **Timer function**
- **Alarm**
- **Inputs: 1**
- **Outputs: 2**

1012P



1012H

1012V

SPECIFICATIONS

General				
	Power supply	220VAC, 110VAC, 48VAC, 24VAC; 50 / 60Hz; 4VA max		
	Number of inputs	1		
	Number of outputs	1 (1011); 2 (1012)		
	Display	Single, 4 digit, 7 - segment LED		
	Operating conditions	T: 0 ÷ 50 ^{0}C; RH: 5 ÷ 90%		
	Storage	T: - 40 ÷ 85 ^{0}C; RH: 5 ÷ 90%		
	Dimensions (P, H, V type)	96mm(W)x96mm(H)x145mm(L)	96mm(W)x48mm(H)x145mm(L)	48mm(W)x96mm(H)x145mm(L)
	Mounting hole	91mm(W)x91mm(H)	91mm(W)x46mm(H)	46mm(W)x91mm(H)
	Weight	400g	350g	350g

Input		
Thermocouple	Type	J, K, L, R, S, B
	Cold Junction Compensation (CJC)	Internal or 0
Resist sensor	Type	Pt100, 3-wire; Pt1000, 3-wire
Linear Input	Type	Linear current or voltage
	Range	0 ÷ 20mA or 4 ÷ 20mA DC; 0 ÷ 1V or 0 ÷ 10V DC
Input filter		1 ÷ 128

Output		
Relay	Specifications	3 - pin; 8A / 250VAC, resistive load 250V AC, 3A max
	Usage	Heating, cooling or alarm (1012)

Measurement (accuracy)		
	Sample rate	5Hz (200mS)
	Resolution	2µV at range -10 ÷ 60mV; 50µV at range 0 ÷ 1V; 500µV at range 0 ÷ 10V; 0.8µA at range 0 ÷ 20mA
Accuracy	Linearisation accuracy	≤ 0.5%
	Reference junction compensation accuracy	≤ 2 ^{0}C at range 0 ÷ 50 ^{0}C
	Total	≤ 0.5% ± 1 digit

Control function		
Control	Type of control	ON / OFF, P, PI
Alarm	Type	Full scale high or low; Deviation high or low
	Operation	Latching or non-latching
Option	Timer function	Keeping the temperature at defined value for a desired time period (1 ÷ 9999 mins)

1011 and **1012** series controllers represent the new generation of controllers based on microprocessor unit. With improved accuracy and control, these controllers replace all analogue controllers (DTR - 931, DTR - 941, DTR - 951). Their main advantage is universal usage since user can easily change parameters himself. Controllers are equiped by two-level parameter protection from accidental change.

1. Instalation

Dimensions of the controllers and mounting holes are given in the specification table for each type of controller 1011 (P, H, V) and 1012 (P, H, V). Controller is joined to the front panel of the mounting locker with the appropriate Π profile.

1.1. Electrical instalation

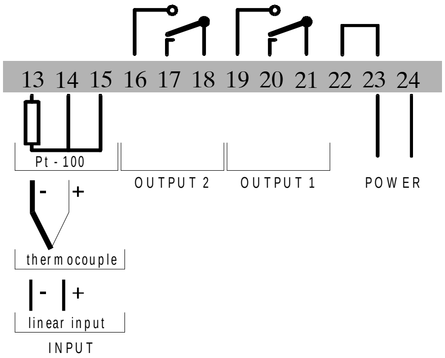


Figure 1.1 **Rear connection**

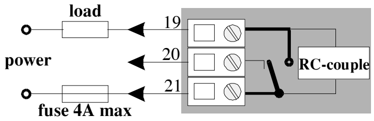
Note: *1011 controller has only one relay output, while 1012 controller has two ones.*

1.1.1. Power suply

Connectors 23 and 24 are used for power supply. Connectors 22 and 23 are shortened internally.

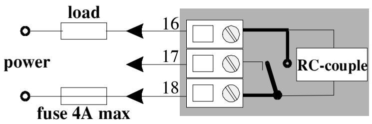
1.1.2. Output 1 connection

Table 1.1. **Output 1 connection**

Relay output Contact 19 is connected with contact 21, when the output is active. Maximum of resistive load is 250V AC, 3A. The fuse must be fitted.	

1.1.3. Output 2 connection

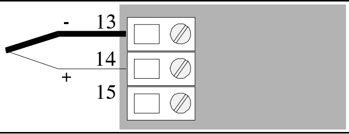
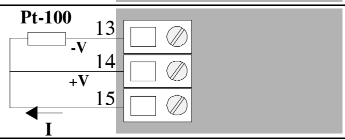
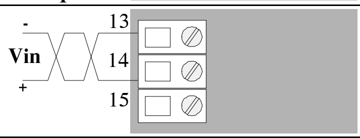
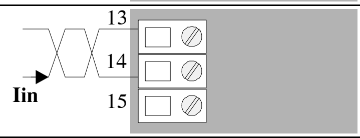
Table 1.2. **Output 1 connection**

Relay output Contact 16 is connected with contact 18, when the output is active. Maximum of resistive load is 250V AC, 3A. The fuse must be fitted.	

1.1.4. Input

Different types of sensors could be connected at input: thermocouple as well as resistivity sensors (Pt100 or Pt1000) or standard current (0 ÷ 20mA or 4 ÷ 20mA) or voltage signals (0 ÷ 1V or 0 ÷ 10V) (see table 1.3). Selection of the probe is made by adjusting of DIP SWITCH at the main board of the unit (see figure 1.2 and table 1.4) as well as selection of a adequate probe in the parametar list.
In the case of the thermocouple, if the probe is not long enough, adequate compensational cable should be used. Pay attention to the proper connectivity of the probe and the inputs of the unit.

Table 1.3. **Probe connection**

Sensor	**Description of connection**
Thermocouple	
Pt100 or Pt1000	
Voltage input: 0 ÷ 1V or 0 ÷ 10V Input resistance cca. 13KΩ	
Current input: 0 ÷ 20mA or 4 ÷ 20mA Input resistance 50Ω	

1.2. DIP SWITCH configuration

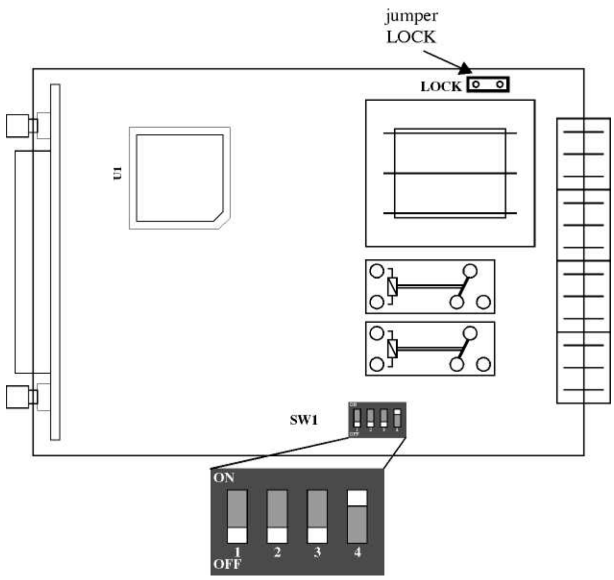
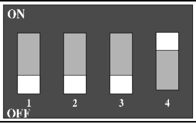
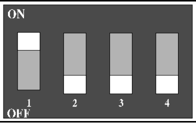
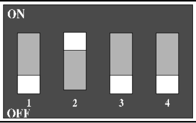
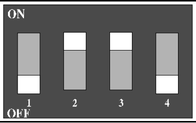


Figure 1.2 **DIP SWITCH location**

Table 1.4. **DIP SWITCH settings**

Thermocouples and Pt100 probes		Voltage input: 0 ÷ 10V DC	
Voltage input: 0 ÷ 1V DC and Pt1000		Current input: 0 ÷ 20mA or 4 ÷ 20mA DC	

2. How to use the controller

1011 (P, H, V) and 1012 (P, H, V) controllers are universal temperature controllers with ON/OFF, proportional (P) and PI type of control. 1011 controller has one output, while 1012 has two ones. User can define function, type of control and additional parameters for each of the outputs. 1012's output 2 can be used either for control or alarm. Controllers can hold temperature at so-called "Setpoint" (SP) for a given time. That is so-caled "Timer function" or "Timer".

2.1. Front pannel description

2.1.1. Display and LED

Display shows measured temperature. In case of a probe-related error (sensor break, irregular input connection etc.), instead of measured value, symbols **Snbr** are displayed. When the controller is in the parameter-changing mode, symbol of the parameter and his value are displayed alternately on the display.
In case of controller functioning error, some of symbols **CS.Er** or **E2.Er** and other messages are displayed alternately, deppending on the type of error. In that case, user should turn the controller off and conntact the producer.

The LED point in the lower right corner of the display marked with **TIME** indicates timer status (see chapter 4. of this manual).

OUT 1 and **OUT 2** indicators (1012 controller), and **OUT** indicator (1011 controller) are lit whenever the addequate outputs are on (relay is active).

2.1.2. Buttons

Buttons on the front panell of the controller are used to handle the controller. Push / release of the buttons evoke some changes on the display. Some of them consider possible changes in the later controller's operating. In some cases, longer pressure on the addequate button can be used, for fast changing of the shown parameter value.
Here are some of the basic functions for specific buttons.

- **PAR -** used for choosing control parameters. Parameter symbol and his value are displayed alternately.
Also used for resetting of the alarm when it is active.

- **UP** - used for increasing selected parameter's value.

- **DOWN** - used for decreasing selected parameter's value.

2.2. Parameter protection

Parameters are settings, within the controller, that determine how the controller will operate. To make parameter access easier, the parameters are arranged in lists. According to their nature, they are protected from changing in appropriate way. Each controller (1011 and 1012) has two levels of parameter protection. First level is password (code) protection, and second one is parameter access protection.

2.2.1. Parameter access protection

For protection of accidental change by user, to each parameter can be assigned one of three access levels:
- **HidE** - access denied (access to the parameter is denied - it is invisible - removed from the list of parameters)
- **rEAd** - partial access allowed (parameter exists in the parameter list, but it's value is locked and can not be changed)
- **Altr** - full access allowed (parameter exists in the list of parameters and it's value can be freely changed)

On user's request, manufacturer can set access level to the certain parameters. If necessary, user can make adjustments in following way:

a) turn controller off, disconnect power supply, open the case, disconnect jumper **JP1** (see figure 1.2)
b) close the case (if it remains open, make sure not to touch any parts that are under high voltage)
c) connect it to power supply (connecting inputs and outputs is not necessary)
d) use button **PAR** to choose parameter **ACCS**

e) use button **UP** to choose a parameter, and then use button **DOWN** to assign level of access (**HidE**, **rEAd**, or **Altr)**
f) turn controller off, return jumper **JP1** back in position, close the case and connect power supply

Note: **All critical parameters should be removed from the parameter list (deny access) to prevent accidental change of parameter's value by user and also to make parameter access easier.**

2.2.2. Password (code) parameter protection

Additional protection for parameters is trough the password protection. Parameter **CodE** is stored in memory, and its value represents the password (code) that enables access to the specific parameter list. When the controller is connected to power supply, parameter **CodE** appears in initial list. If correct code (earlier defined) is entered (using buttons **UP** and **DOWN**) after this parameter is shown, list of parameters that are assigned **Altr** or **rEAd** level of protection, will become visible. After correct code is entered, parameter **CodE** disappears from the list until the controller is unplugged from the power supply. If the wrong code is entered, list of parameters remains hidden from user. Initially, value of the **CodE** parameter is set to **1011** for 1011 controller, apropos of **1012** for 1012 controller. This value can be changed in following way:
a) turn controller off, disconnect power supply, open the case, disconnect jumper **JP1** (see figure 1.2)
b) close the case (if it remains open, make sure not to touch any parts that are under high voltage)
c) connect it to power supply (connecting inputs and outputs is not necessary)
d) use button **PAR** to choose parameter **CodE**
e) use buttons **UP** and **DOWN to** set a new code
f) turn controller off, return jumper **JP1** back in position, close the case and connect power supply

2.3. Parameter tables

These tables show all parameters that can appear on display. Pushing the button **PAR** lists the parameters, and parameter's name and value are alternately displayed. If needed, parameter's value can be changed using buttons UP and DOWN (only available if access to the parameter is granted).

Table 2.1**. Mutual parameters for 1011 and 1012 controllers**

PARAMETER		**ADJUSTABLE RANGE**		**FACTORY SETTING**
UEr	Software version (displayed after controller is connected to power supply. Used for information in case of repairing)			
SP	Temperature setpoint	**LoSP** to **HiSP**		**25 ^{0}C**
Probe	Type of probe Controller is shipped adjusted for demanded probe. Operator can change the type of probe later, according to this manual.		max band	**according to user demand**
		FE J - type J (Iron-SAMA Constantan)	0 ÷ 1000 ^{0}C	
		ni.Cr - type K (NickelChrome-Nickel)	0 ÷ 1200 ^{0}C	
		FE L - type L (Iron-DIN Constantan)	0 ÷ 800 ^{0}C	
		r 13 - type R (Pt/13%Rh-Pt)	0 ÷ 1600 ^{0}C	
		S 10 - type S (Pt/10%Rh-Pt)	0 ÷ 1600 ^{0}C	
		b 30 - type B (Pt/30%Rh-Pt)	0 ÷ 1600 ^{0}C	
		P0.1 - Pt100 without tenth's precision	-199 ÷ 400 ^{0}C	
		.P0.1 - Pt100 with tenth's precision	-99.9 ÷ 199.9 ^{0}C	
		P1.0 – Pt1000 without tenth's precision	-50 ÷ 150 ^{0}C	
		.P1.0 –Pt1000 with tenth's precision	-50.0 ÷ 150.0 ^{0}C	
		Lin - linear input without tenth's precision	-999 ÷ 1999	
		.Lin - linear input with tenth's precision	-99.9 ÷ 199.9	
L.tiP	Defines type of linear input	**n0.1** - voltage input 0 ÷1V **n0.10** - voltage input 0 ÷10V **S0.20** - current input 0 ÷20mA or 4 ÷20mA		**according to type of probe and user demand**
CJC	Cold Junction Compensation	**0** - no compensation **int** - internal compensation		**int**
OFSt	Measuring offset	**-9.99 ^{0}C ÷ 99.99 ^{0}C**		**0.00 ^{0}C**
FiLt	Digital input filter	**1, 2, 4, 8, 16, 32, 64, 128** - reduces interferences		**4**
HiSP	Setpoint high limit	From **LoSP** to max temperature for a chosen probe		**according to type of probe and user demand**
LoSP	Setpoint low limit	From min temperature for a chosen probe to **HiSP**		**according to type of probe and user demand**
t.hld	Timer function (timer)	**OFF** - timer off **1 ÷ 9999** mins		**OFF**
Hb	Holdback value for setpoint rate limit	**1 ^{0}C ÷ 1999 ^{0}C** without tenth's precision **0.1 ^{0}C ÷ 199.9 ^{0}C** with tenth's precision		**100 ^{0}C**
ACCS	Access list header	**HidE** - access denied **rEAd** – partial access allowed **Altr** - full access allowed		

CodE	Additional password protection	Represents the password (code) that enables access to the specific parameter list	**1011** (for 1011 controller) **1012** (for 1012 controller)

Table 2.2. **Output 1 parameters**

PARAMETER		**ADJUSTABLE RANGE**	**FACTORY SETTING**
OUt.1	Output 1 function	**HEAt** - heating **COOL** - cooling	**according to user demand**
Ctr1	Type of control for output 1	**ProP** - proportional (P) or PI control (according to the value of the parameter **int.t**) **On.OF** - ON / OFF control	**Prop**
HiS.1	Hysteresis for output 1 when ON / OFF control is selected (**On.OF**)	**0 ^{0}C** ÷ **1000 ^{0}C** without tenth's precision **0.1 ^{0}C** ÷ **100.0 ^{0}C** with tenth's precision	**10 ^{0}C**
Pro.1	Proportional band for output 1 when either P or PI control is selected (**ProP**)	**0 ^{0}C** ÷ **1999 ^{0}C** without tenth's precision **0.1 ^{0}C** ÷ **199.9 ^{0}C** with tenth's precision	**10 ^{0}C**
int.t	Integral time	**OFF** – (proportional control only) **1** ÷ **999** secs	**100 sec**
tP .1	Cycle time for output 1 when either P or PI control is selected (**ProP**)	**1** ÷ **250** secs	**15 sec**
Cb	Relative cutback band	**1.0** ÷ **3.0**	**1.0**

Table 2.3. **Output 2 parameters**

PARAMETER		**ADJUSTABLE RANGE**	**FACTORY SETTING**
OUt.2	Output 1 function	**OFF** - output 2 off **HEAt** - heating **COOL** - cooling **ALAr** - alarm	**according to user demand**
Ctr.2	Type of control for output 2 when **OUt.2** is set to either **HEAt** or **COOL**	**ProP** - proportional (P) or PI control (according to the value of the parameter **int.t**) **On.OF** - ON / OFF control	**Prop**
HiS.2	Hysteresis for output 2 when ON / OFF control is selected (**On.OF**)	**0 ^{0}C** ÷ **1000 ^{0}C** without tenth's precision **0.1 ^{0}C** ÷ **100.0 ^{0}C** with tenth's precision	**10 ^{0}C**
Pro.2	Proportional band for output 2 when either P or PI control is selected (**ProP**)	**0 ^{0}C** ÷ **1999 ^{0}C** without tenth's precision **0.1 ^{0}C** ÷ **199.9 ^{0}C** with tenth's precision	**10 ^{0}C**
tP .2	Cycle time for output 2 when either P or PI control is selected (**ProP**)	**1** ÷ **250** secs	**20 sec**
dSP.2	Setpoint deviation for output 2 when **OUt.2** is set to either **HEAt** or **COOL**	**-999 ^{0}C** ÷ **1000 ^{0}C** without tenth's precision **-99.9 ^{0}C** ÷ **100.0 ^{0}C** with tenth's precision	**0 ^{0}C**
rEL.2	Determines the output 2 state when output 2 is set to alarm (**ALAr**)	**no** - normal opened **nc** - normal connected	**no**
H AO	Full scale high alarm definition	**OFF** - full scale high alarm is off **LAt** - latching mode **nLAt** - non-latching mode	**according to user demand**
L AO	Full scale low alarm definition	**OFF** - full scale low alarm is off **LAt** - latching mode **nLAt** - non-latching mode	**according to user demand**
d AO	Deviation alarm definition	**OFF** - deviation alarm is off **LAt** - latching mode **nLAt** - non-latching mode	**according to user demand**
HiAL	Full scale high alarm value	From **LoAL** to max temperature for the chosen probe	**according to type of probe and user demand**
LoAL	Full scale low alarm value	From min temperature for chosen probe to **HiAL**	**according to type of probe and user demand**
dhAL	Deviation high alarm value	**1 ^{0}C** ÷ **1999 ^{0}C** without tenth's precision **0.1 ^{0}C** ÷ **199.9 ^{0}C** with tenth's precision	**according to user demand**
dLAL	Deviation low alarm value	**1 ^{0}C** ÷ **1999 ^{0}C** without tenth's precision **0.1 ^{0}C** ÷ **199.9 ^{0}C** with tenth's precision	**according to user demand**

3. PI control parameters tuning

In tuning, you match the characteristics of the controller to those of the process being controlled in order to obtain good control.

Good control means:
- stable, "straight - line" control of the temperature at setpoint without fluctuation
- no overshoot, or undershoot, of the temperature setpoint
- quick response to deviations from the setpoint caused by external disturbances

This reflects to the quality of final product, efficiency and saving energy. Tuning involves calculating and setting the value of the following parameters:

- **Pro.1** and **Pro.2** - proportional bands for output 1 and output 2
- **int.t** - integral time
- **Cb** - relative cutback band

Adjustment of these parameters provides ideal response as shown in figure 3.1.

3.1.1. Pro.1 (2) - proportional band

Proportional band is the bandwidth, in display units, over which the output power is proportioned between minimum and maximum. Decreasing of the proportional band causes that system becomes too sensitive and unstable. Too wide proportional band causes slow system response to deviations and steady state from the setpoint. Ideal situation is when proportional band is as narrow as possible and does not cause oscillations.

3.1.2. int.t - integral time

The integral term automatically removes steady state errors from the setpoint. When it is set to **OFF** the temperature may not settle precisely at setpoint.
This parameter represents the value of the power output that will be delivered when the error is zero. You must set this parameter value manually in order to remove the steady state error.
Increasing this term value causes slow temperature approaching to the setpoint. Decreasing of this term value may cause too fast change of the temperature which results as overshoot, and system may oscillate.

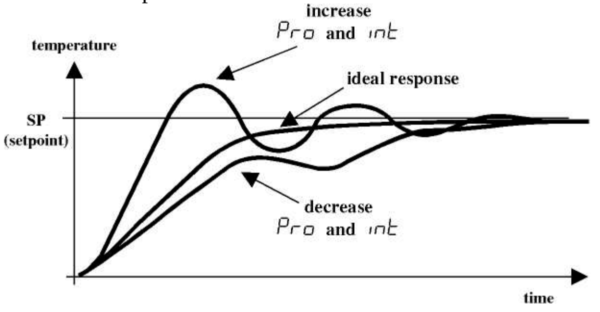


Figure 3.1 **Adjustment of PI control parameters**

3.1.3. Cb - relative cutback band

This value is used for determining the number of display units, above (bellow) setpoint, at which the controller will start changing the output power, in order to prevent undershoot (overshoot). Actual value is obtained as a result of multiplying this value with value of proportional band. Default value is set to **1.0**.

4. Timer function

Parameter **t.hld** determines time period for which the temperature will be held at setpoint. When the value of this parameter is set to **OFF** the timer is inactive. When the value is set to value that is different from **OFF,** the timer becomes active. The LED point on the display marked **TIME** indicates timer status. The timer activates automatically when the controller is connected to power supply. Countdowning starts when the temperature is within the bend defined by parameter **Hb** (temperature is at, or near the setpoint). Symbol HB is flashing alternately with the measured temperature, while the temperature is outside the HB band, which also indicates that the countdown is not started yet. Flashing of the LED point "**TIME"** indicates that the countdown has started. If button **PAR** is pressed while the timer is active or started, symbol **t.End** is displayed and its value represents the remaining countdown time. This value can be altered using buttons **UP** (increasing) and **DOWN** (decreasing) . Since this value represents the remaining time for which the temperature will be held at the setpoint, the whole cycle can be extended, shortened or interupted (by setting this value to zero - **0**). If the value of the parameter **t.hld** is changed, a new cycle will start. If it is set to **OFF**, the timer will become inactive. After the given time has passed, timer becomes inactive, outputs are turned off, and the measured temperature and the symbol **t.OFF** is displayed alternately.
Timer can be started again by pressing **PAR** and **DOWN** buttons simultaniously or by disconnecting and reconnecting the controller to the power supply.

TIMER FUNCTION EXAMPLE:

SP = 180 [^{0}C] proposed temperature
Hb = 5 [^{0}C] hold back value
t.hld = 60 [minutes] held time

Timer starts at 175 ^{0}C, which is the result of subtraction of SP and Hb. It is turned off after 60 mins.

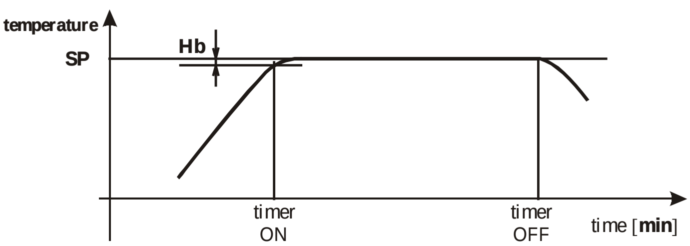


Figure 4.1 **Timer function**

5. Linear input

Table 5.1. **Linear input**

PARAMETER		**ADJUSTABLE RANGE**	**FACTORY SETTING**
in_1	Starting value of the linear input signal	**0 ÷ 9999**	**0**
rd_1	Display reading for **in_1**	**-999 ÷ 1999** without tenth's precision **-99.9 ÷ 199.9** with tenth's precision	**0.0**
in_2	Ending value of the linear input signal	**0 ÷ 9999**	**9999**
rd_2	Display reading for **in_2**	**-999 ÷ 1999** without tenth's precision **-99.9 ÷ 199.9** with tenth's precision	**100.0**

In order to use linear input, some adjustments and additional settings are needed (if not already set by the manufacturer according to user demand):

a) turn controller off, disconnect power supply, open the case, disconnect jumper **JP1** (see figure 1.2)
b) set DIP SWITCH into a position for adequate either current or voltage linear input (see figure 1.2 and table 1.4), return jumper JP1, close the controller, connect it to power supply
c) parameter **Sond** should be set to **.Lin** or **Lin** (for displaying with or without tenth's precision). Also, set the parameter **L.tiP** to define the type of linear input (voltage or current)
d) - set parameter **in_1** to starting value of the input linear signal and parameter **rd_1** to starting display reading (measuring)
   - set parameter **in_2** to ending value of the input linear signal and parameter **rd_2** to ending display reading (measuring)

EXAMPLE 1: If we desire to tune the controller so that for the voltage input signal in range 0 ÷ 1V (or accordingly current input in range 0 ÷ 20 mA), it displays digit values in range 0 ÷ 100, following settings should be used:
in_1 = 0, **rd_1** = 0, **in_2** = 9999 and **rd_2** = 100.

EXAMPLE 2: If we desire to tune the controller so that for the current input signal in range 4 ÷ 20mA it displays digit values in range 30.0 ÷ 199.9, following settings should be used:
in_1 = 2000, **rd_1** = 30.0, **in_2** = 9999 and **rd_2** = 199.9.

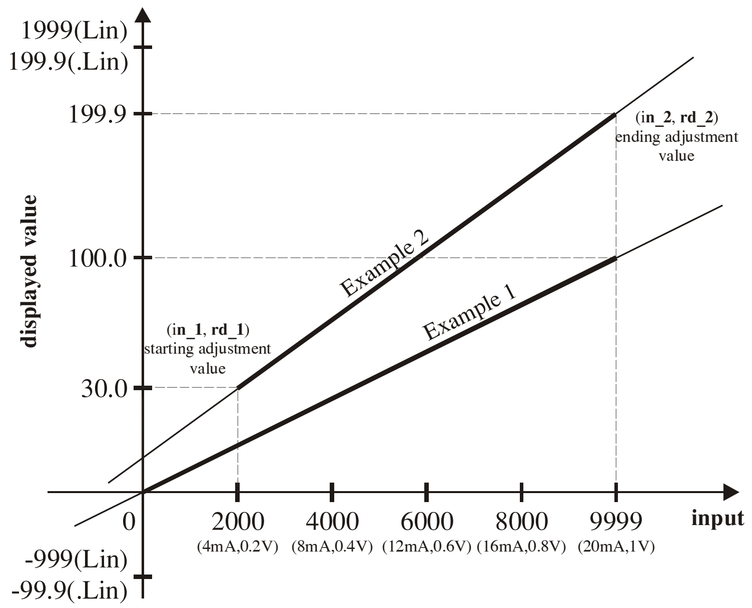


Figure 5.1 **Linear input setting**

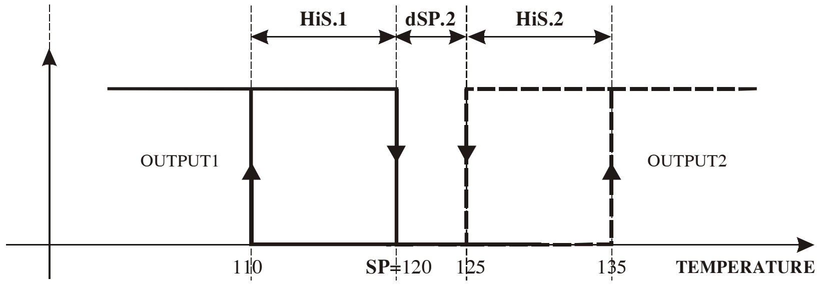
6. Example of output 1 and output 2 parameter setup

Output 1 is used for process control, while output 2 could be used either for process control or alarm signalling. For each of the outputs heating **(HEAt)** or cooling (**COOL**) function can be set independently by appropriate setting of parameter **OUt.1** for output 1 and parameter **OUt.2** for output 2. Also, using the parameters **Ctr1** and **Ctr.2** the type of control can be independently set for outputs 1 and 2 respectively. Output states are displayed on **OUT 1** and **OUT 2** indicators for controller 1012, and **OUT** indicator for controller 1011.

6.1.1. Examples of output 1 and output 2 parameter settings

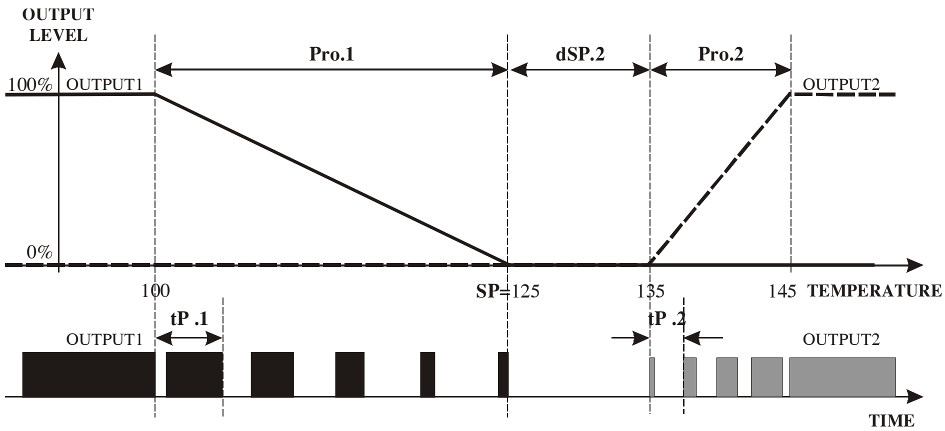
EXAMPLE 1:
ON / OFF control

SP = 120.0 [^{0}C] setpoint
OUt.1 = HEAt output 1 function set to heating
Ctr1 = On.Of ON /OFF control on output 1
HiS.1 = 10.0 [^{0}C] output 1 hysteresis
OUt.2 = COOL output 2 function set to cooling
dSP.2 = 5.0 [^{0}C] setpoint deviation for output 2
Ctr.2 = On.Of ON /OFF control on output 2
HiS.2 = 10.0 [^{0}C] output 2 hysteresis



EXAMPLE 2:
P control

SP = 125.0 [^{0}C] setpoint
OUt.1 = HEAt output 1 function set to heating
Ctr1 = ProP P control on output 1
Pro.1 = 25.0 [^{0}C] proportional band for output 1
tP .1 = 20 [sec] cycle time for output 1
OUt.2 = COOL output 2 function set to cooling
dSP.2 = 10.0 [^{0}C] setpoint deviation for output 2
Ctr.2 = ProP P control on output 2
Pro.2 = 10.0 [^{0}C] proportional band for output 2
tP .2 = 10 [sec] cycle time for output 2

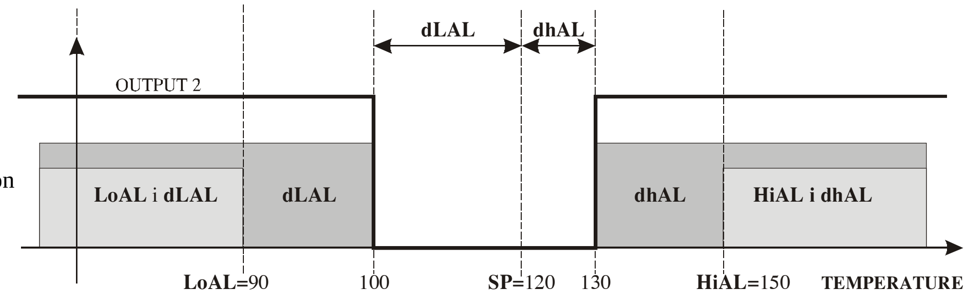


6.1.2. Example of using output 2 as an alarm

Output 2 has alarm function if the parameter **OUt.2** is set to **ALAr**. In the alarm condition, the indicator **OUT 2** is lit. Also, a measured temperature is displayed with the symbols **HiAL** (full-scale high alarm) or **LoAL** (full-scale low alarm) and/or **d_AL** (deviation high **dhAL** or deviation low **dLAL** alarm) displayed alternately. If there is more than one alarm condition, the display cycles through all the relevant alarm messages.

EXAMPLE:

SP = 120.0 [^{0}C] setpoint
OUt.2 = ALAr output 1 function set to alarm
H AO = nLAt non-latching high alarm
L AO = nLAT non-latching low alarm
d AO = nLAT non-latching deviation alarm
HiAL = 150 [^{0}C] full-scale high alarm
LoAL = 90 [^{0}C] full-scale low alarm
dhAL = 10 [^{0}C] deviation high alarm
dLAL = 20 [^{0}C] deviation low alarm



If an alarm type is configured as "latching" (**LAt**), the alarm annunciation on the display must be acknowledged by pressing button **PAR**. Acknowledgement is not possible if alarm condition is still present. In case of non-latching alarm (**nLAt**), the alarm annunciation disappears as soon as the alarm condition has cleared.