



**UNIVERSAL DUAL CHANNEL  
PROGRAMMABLE CONTROLLER  
WITH TIMER OR ALARM**

**MS8111PWM3S**

**v1.2**



**USER MANUAL**

**PLOVDIV 2018**





- Difference from the previous version of the software :  
- 0.1s format is added in timer modes.



**The controller has 5 outputs / three discrete and two analog /**

- *Discrete outputs K1 and K2 are control outputs of temperature controllers.*
- *The discrete output K3 output is programmed as a timer or alarm in the System Parameters section!*
- *Analog outputs are retransmitting input variables.*



**Timer has 2 main modes:**

- *as an independent from input variables. In this mode the timer is started by front ;*
- *depending on whether the measured parameter has reached the controller setting. In this mode, the timer starts and works until at the control input has a active level.*

**Each of the main modes has two sub-modes of work which define timer output:**

- *The output is switched on during counting*
- *Output is activated after the expiry of the count.*

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- ◆ *Controls two processes simultaneously by proportional or ON-OFF mode*
- ◆ *Programmable timer or alarm*
- ◆ *Analog outputs*
- ◆ *Display: 2 x4 digits LED*

*MS8111PWM3S is used for baked bread, bakery and confectionery, ceramics, rubber production, hardening of metals, HVAC, greenhouses and others.*

### 1. DESIGNATION

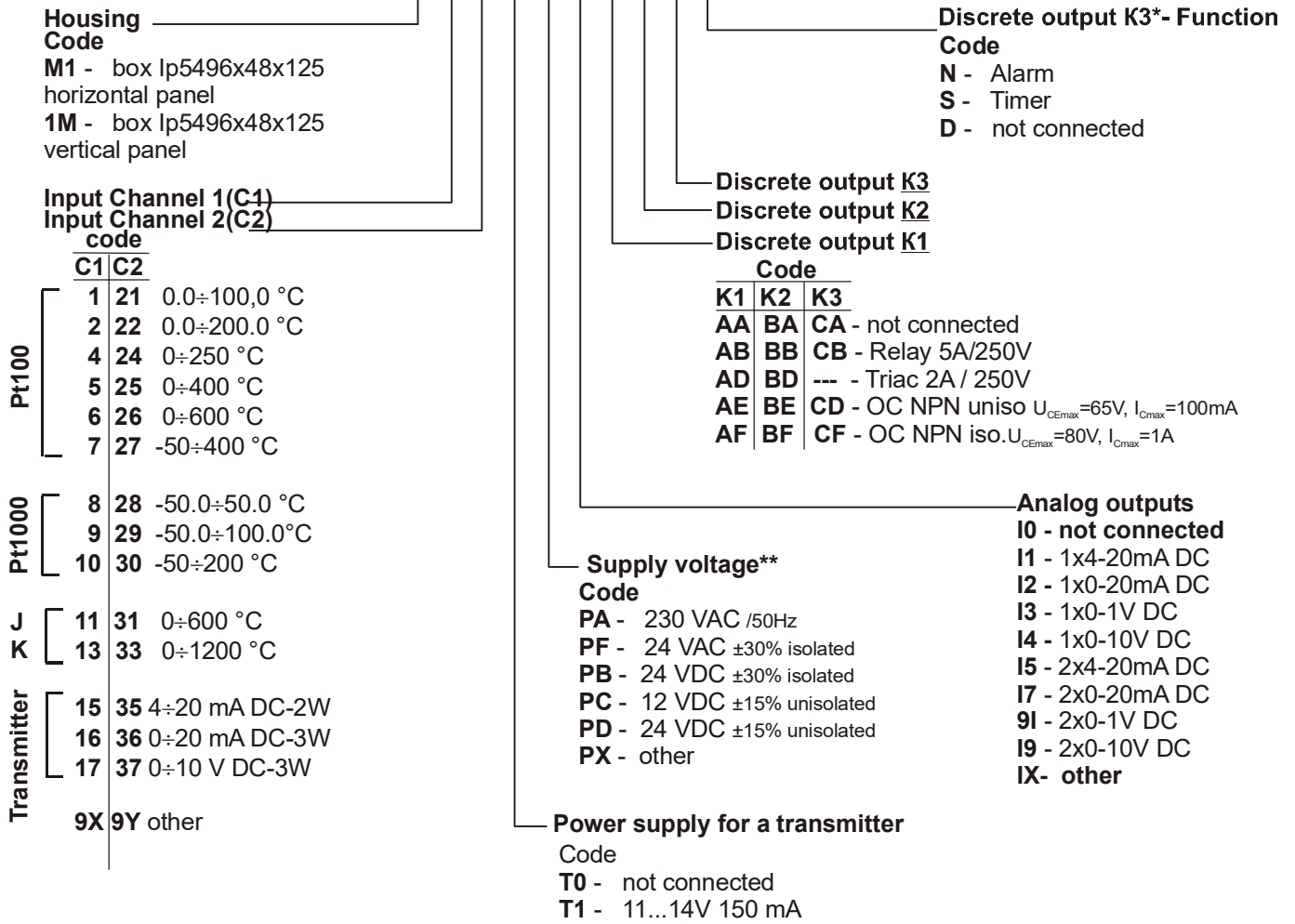
The Microprocessor Two Channel Controller MS8111PWM3S is designed to control two processes simultaneously using a proportional or positional control law.

An option for user choice of an alarm output or a timer section is provided.

The outputs are controlled by ON / OFF logic or by pulse with variable duration (PWM) respectively.

## 2. ORDER CODE

### MS8111PWM3S - X.X.X.X.X.X.X.X.X.X

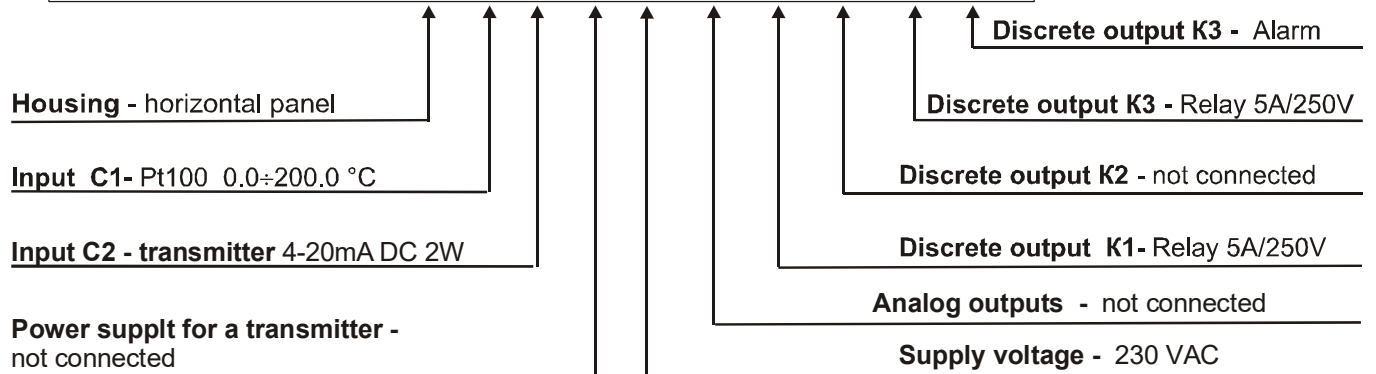


! Decimal point, upper and lower limit of the desired scope must be specified!

\* Only with connected discrete output K3  
\*\* With options PF,PB,PC,PD supply, there can be only current analog outputs:  
- passive (order)  
- active (order and external power supply)  
With options PC and PD supply (not recommended), the sensor and controller need to have the same power supply.

### Example:

**MS8111PWM3S - M1.2.35.T0.PA.I0.AB.BA.CB.N**



### 3. TECHNICAL DATA

<b>Analog inputs</b>		
Linear current	0 ÷ 20 mA DC; 4 ÷ 20 mA DC	
Linear Voltage	0 ÷ 1 (10) V DC	
Thermoresistor	Pt 100, P1000	EN 60751
Thermocouple	J, K,	EN 60584
Other	By order	
Measurement accuracy	± 0.15% of the range	
<b>Digital inputs</b>		
Start / Stop timer	Optically isolated- active level GND ISO, for NPN sensor	
<b>Discrete outputs</b>		
K1 - ON/OFF or PWM K2 - ON/OFF or PWM K3 - Function	Options: Relay 250 V / 5,10 A Triac 250 V / 2 A NPN OC uniso Ucemax=65V ,Icemax=100 mA NPN OC iso Ucemax=80V ,Icemax=1A	
<b>Function K3</b>	- Alarm - Timer	
<b>Analog outputs, (optional )</b>	<b>optically isolated</b>	
AO1 – current or voltage AO2 – current or voltage	0 ÷ 20 mA DC; 4 ÷ 20 mA 0 ÷ 1 (10) V DC	
Power supplying a transmitter	(11.5 ÷ 14.5) V DC 150 mA unstabilized	
<b>Indication and keyboard</b>		
Display	2 x 4 digits LED 10 mm	
Display range	-1999 ... 9999	
Display format	X.XXX X X.XX XXX.X XXXX	
Keyboard	semi-sensor	
<b>Power supply</b>		
Supply voltage ; frequency	230VAC / max 20mA; 50 Hz	
Other	Depending on order code	
<b>Operating conditions</b>		
Temperature and relative humidity without condensation	Operating: -10 ÷ 70 °C / 10 ÷ 85 % rh Storage : -20 ÷ 70 °C / 10 ÷ 90 % rh	
<b>Dimintions</b>		
Overall dimensions (WxHxL)	96 x 48 x 128 mm	
Installation	in hole 90 x 44 mm	
Weight	max 300 g	
<b>Protection class</b>	IP40	

## 4. OPERATION

Display	Basic parameters used in the device:
SP	Set Point
Zon	Zone - proportional zone or hysteresis in ON/OFF control
PV	Process variable - input parameter
Ahi	Alarm Hi - upper alarm limit
ALO	Alarm Lo - lower alarm limit

In operational mode, the upper display shows the value of Channel 1, while the lower display shows the value of Channel 2. Green LED s indicate whether the corresponding output is active, respectively, the top for Channel 1 and the bottom for Channel 2.

### 4.1. TEMPERATURE CONTROLLER SETTINGS

To access programming mode, press and hold the **SET** button for more than 5 seconds (while the button is pressed, the display shows the values of the two set points. If the button is released before the time expires, the entry into the mode does not take place).

In programming mode, the lower display displays the parameter name and the upper display - its value. Editing the values is done with the **DOWN** and **UP** buttons, and passing on to the next parameter - with the **SET** button.

Name	Description	Values
SP 1	Channel 1 Set point	Within the range of change of the input parameter
SP 2	Channel 2 Set point	Within the range of change of the input parameter

### 4.2. ALARM OUTPUT

*Permitted by the SrEG parameter from the Hidden System Parameters section.*

When the value of PV for some channel goes over (falls below) the upper (lower) alarm limit, it is triggered and "ALL" message appears periodically on the channel display.

The alarm output is common to both channels and it is triggered regardless of which channel is in an alarm situation. On the corresponding display alternating "ALL" and the measured value are displayed.

### 4.3. TIMER - MODES OF OPERATION

Permitted by the SrEG parameter from the Hidden System Parameters section.

The timer section can work independently of the rest of the controller (from the measured value) by starting / stopping with buttons or on the pulse front at the "Start timer" input or it works depending on the measured value as the timer starts when the assigned value is reached(selected by the SrEG parameter).

- **MODE 1 - The timer works independently of the controller**

***Starting from digital input Start timer / start on front /  
A button is used to manually start.***

**MODE 1.1:** The timer is started by activating the GND level at the Start timer input ( pressing an external button,for example), with which the timer output is activated and begins to decrease the set time. The timer output is active until the time has elapsed or the external button is pressed again.

The red LED blinks until the time has elapsed.

**MODE 1.2:** TThe timer is started by pressing an external button. The red LED flashes until the set time elapses. After that, the output activates (indicated by a permanently illuminated red LED) and remains active until pressing the external button or by a power failure.

- **MODE 2 - The timer starts depending on whether the measured value (PV) has reached the controller (SP) setting.**

***The Start timer input must have a GND-level enable.  
A switch is used for manual permission.***

**MODE 2.1:** The timer starts when the starting conditions are reached and an active level at **Start timer** (permission from an external switch), which activates the timer output and the set time starts to count down. The timer output is active until the time elapses or until disabled by the external key. The red LED flashes until the time runs out. A new start is only possible afterwards prohibition and re-authorization by the external switch.

**MODE 2.2:** The timer starts when the starting conditions are reached and an active level at Start timer (permission from an external switch). The red LED flashes until the set time elapses. After that, the output activates (indicated by a permanently illuminated red LED) and remains active until disabled by the external key or by a power failure. A new start is only possible afterwards prohibition and re-authorization by the external switch .

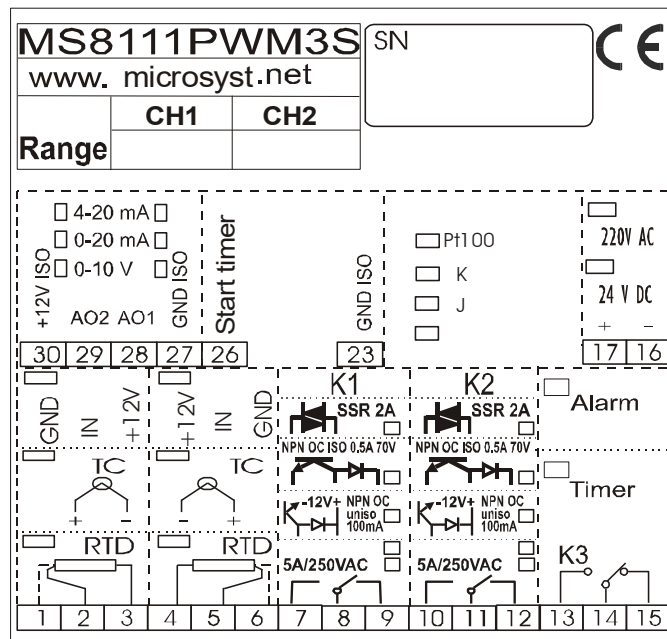
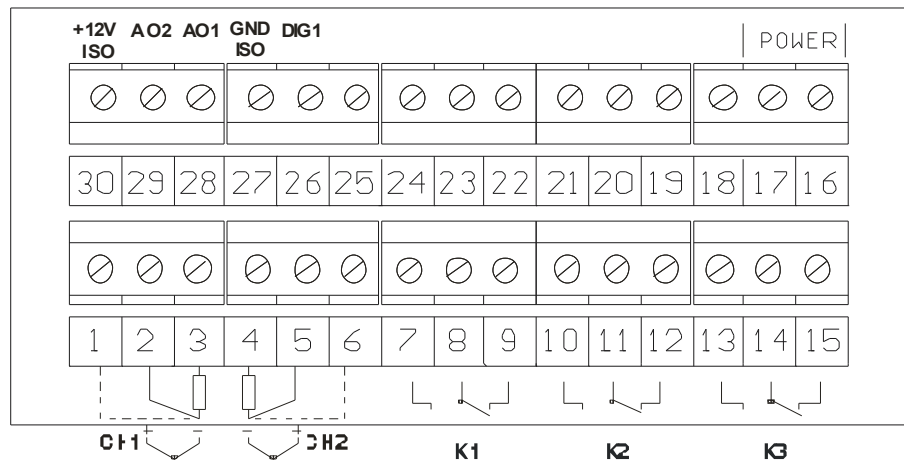
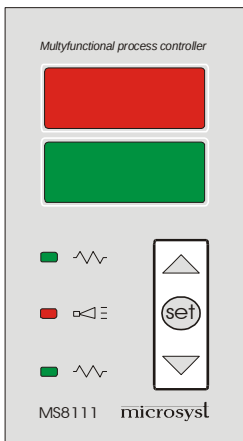
*In the above two modes, when feeding the supply voltage, if enabled from the external switch and the startup conditions are present, the timer restarts!*

#### 4.4. TIMER - EDIT TIME

When the timer is started, the remaining time is displayed.

<p><b>Display of the remaining or set time on the timer display</b></p>	<p>-by pressing and holding the <b>SET</b> and <b>UP</b> buttons in the indicated sequence</p>
<p><b>Change the set time</b></p>	<p>- by pressing and holding the <b>SET</b> and <b>UP</b> buttons in the indicated sequence for more than 5 seconds (until <b>SP t</b> shows on the lower display). - Editing the value is done via the <b>DOWN</b> and <b>UP</b> buttons, while confirmation - with the <b>SET</b> button.</p>

### 5. FRONT AND BACK PANEL. TERMINALS



## 6. ANALOG INPUTS CONNECTIONS

For the sake of good functioning, it's important that the probes are located on a suitable place in the environment, in which the temperature regulation will take place.

### 6.1 Resistive sensors connection (Pt100 or others)

The sensors can be connected via a two-wire or three-wire line. The connection of two-wire sensors to a three-wire line follows the diagram shown in FIG. 6, while between terminals 1 and 2 and terminals 5 and 6 of the controller, cable bridges are placed (short-circuited).

At longer distances between sensor and controller, it's recommended to use a three-wire line because it compensates the measurement error of the temperature due to the additional resistance introduced by the connecting wires. Connecting three-wire sensors to the controller is done according to the scheme shown on FIG. 2 as to terminals 1 and 2 and terminals 5 and 6 of the controller connect the cables connected to the short circuit in the sensor.

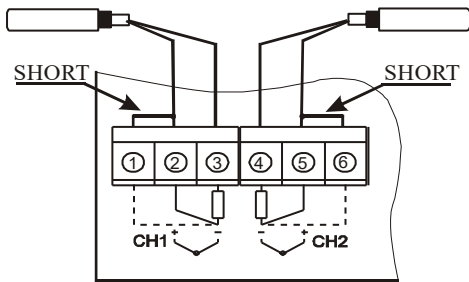


Figure 1

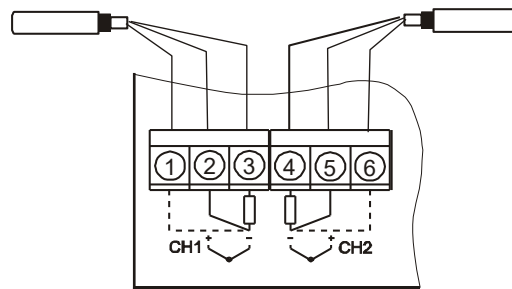


Figure 2

### 6.2 Thermocouple connection

When connecting a sensor - type thermocouple, care must be taken about the polarity of the sensor. If polarity is inverted, the device's readings will be incorrect.

**When working with thermocouples, it is necessary to use a compensation cable, corresponding to the type of thermocouple used (Figure 3).**

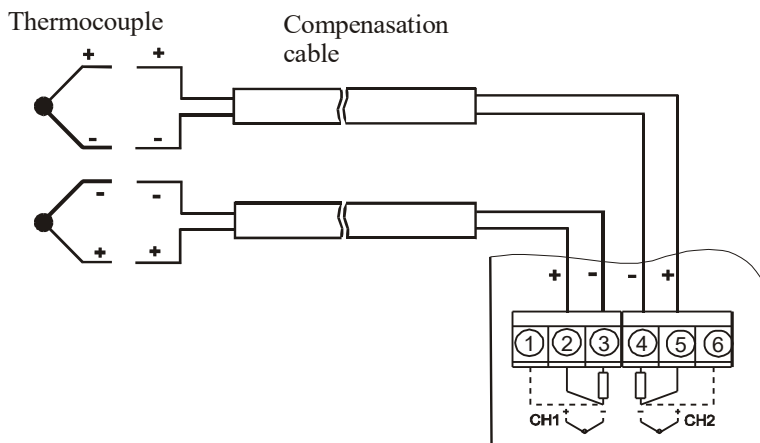
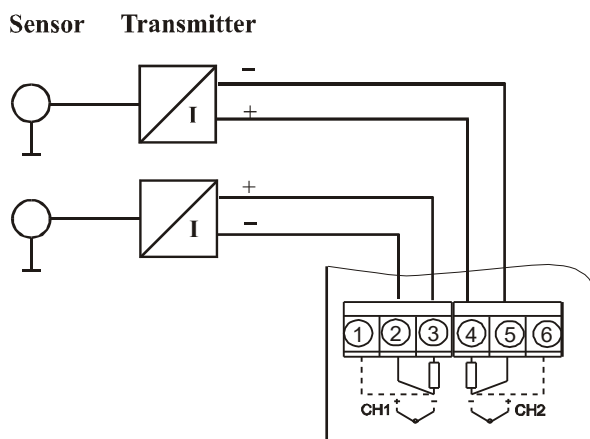


Figure 3

## 6.3 Transmitters connection

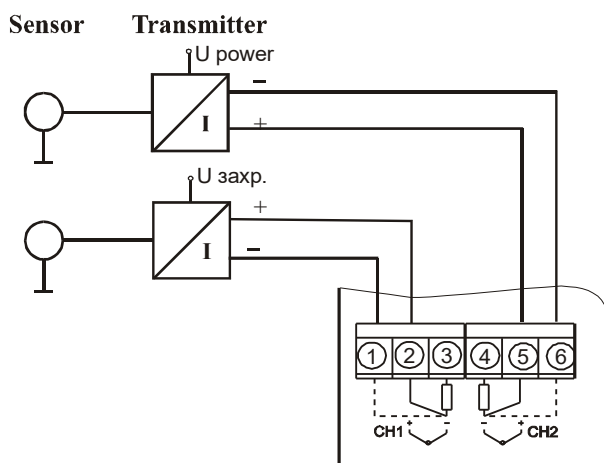
### 6.3.1. Transmitters with two-wire connection

*The power to the transmitters is provided by the unit.*



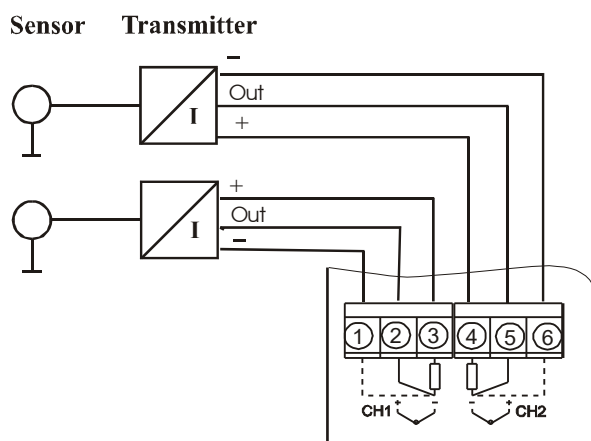
*Fig. 4 \* The device provides unstable voltage from 11.5V to 14.5V / max 50mA*

### 6.3.2. Transmitter with own power supply



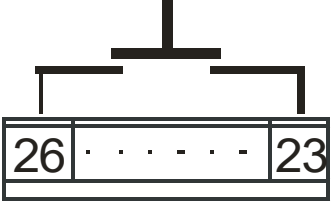
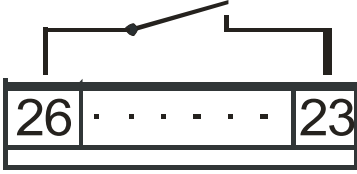
*Fig. 5*

### 6.3.3. Three-wire transmitter powered by the device



*Fig. 6 \* The device provides unstable voltage from 11.5V to 14.5V / max 50mA*

## 7. CONNECTION TO START THE TIMER

<p>external button (start by front) Used when the timer operates independently of the measured input variables</p>		<p>Start Timer – кЛ.26</p>
<p>external switch (start by level) Used when the timer operates depending of the measured input variables</p>		<p>GND ISO – кЛ.23</p>

## 8. OUTPUTS CONNECTIONS

Depending on the option of executing the corresponding digital output in the order code, the connections to load is made according the schemes on fig.7

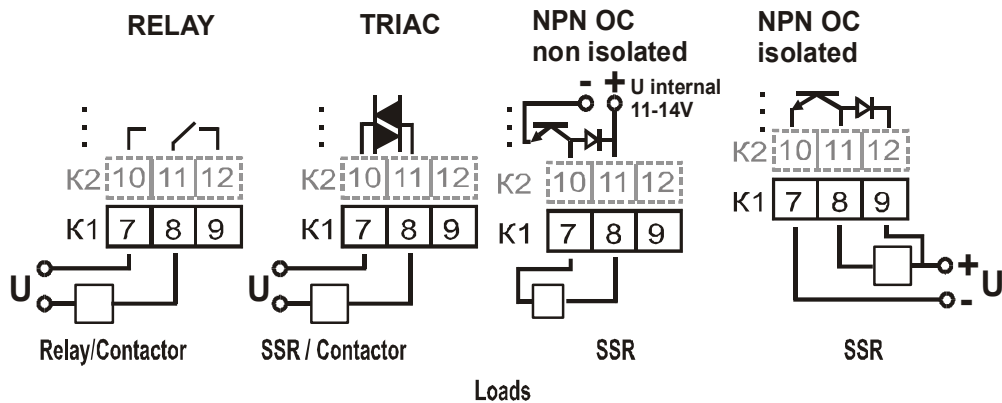


fig.7

## 9. SYSTEM PARAMETERS

The system parameter programming mode is accessed by pressing buttons **UP** and **DOWN** simultaneously for more than 5 seconds.

In the mode, the parameter's name is shown on the lower display. With buttons **DOWN** and **UP** the desired parameter is selected, and with **SET** button, on the upper display, the parameter's value is displayed.

Editing the values is done with the **DOWN** and **UP** buttons and the switching to the next parameter - with the **SET** button.

Name	Description	Values
<b>t 1</b>	Channel 1 period	0 - 128 seconds When the value is zero, the regulation becomes positional, with parameter <b>Zon1</b> assuming the role of hysteresis
<b>Zon1</b>	Zone of proportionality for Channel 1	Within the range of change of the input parameter
<b>t 2</b>	Channel 2 period	0 - 128 seconds When the value is zero, the regulation becomes positional, with parameter <b>Zon2</b> assuming the role of hysteresis
<b>Zon2</b>	Zone of proportionality for Channel 2	Within the range of change of the input parameter
<b>ALO1</b>	Channel 1 low level alarm	Within the range of change of the input parameter
<b>ALO2</b>	Channel 2 low level alarm	Within the range of change of the input parameter
<b>Ahi1</b>	Channel 1 high level alarm	Within the range of change of the input parameter
<b>Ahi2</b>	Channel 2 high level alarm	Within the range of change of the input parameter
<b>End</b>	Exit system parameters mode	Pressing <b>SET</b> while selected exits system parameters mode.



*Changes in parameters should to be made with extreme caution, due to potential incorrect function of the device.*

## 10. CONSUMER SETTING OF OFFSET ON ANALOG CHANNELS

In this mode, users can freely enter a programmable value, which will always be added to the measurement ("offset"). This is used when there's a discrepancy between the value displayed by the device and measured with another reference instrument.

To authorize the user offset of the readings of both channels, it is necessary to power on the device while the **DOWN** button is pressed.

In this case, values are added (subtracted when with minus sign) to channel readings.

Assigning each separate offset is done the way, as is setting the setpoint **SP** of each channel in normal work mode.



**Caution – the device does not display previously made changes!  
Changing with extreme caution can lead to incorrect operation of the unit!  
Offset mode is available only until the next shut down.**

## 11. RECOMMENDATION AGAINST EMI (Electromagnetic Interference)

- *Recommendations for use of connecting wires*

- Wires that carry a similar type of signals can be packed together, but if the signals are different, the wires must be separated to prevent electromagnetic interaction.

- When there have to be crossed wires with different signal types this must be done at an angle of 90 degrees and a long distance.

- Wires, which carry weak signals and wires connecting the sensors to the controller must not be near contactors, motors, generators, radios and wires, which carry large currents.

- *Noise suppression using the built-in in the controller filter*

- If the input parameter fluctuates and is not stable it is necessary to reduce the filter coefficient **Fr 1 or Fr2**. As lower the value, the heavier the filter and slowly change the input parameter.

- If the process variable on the display jumps periodically for short intervals, it is necessary to increase the parameter **tJ 1 or tJ2**. When increasing this parameter, the device reacts slower at an unexpected “jump” in the input, but ignores the short-term interference.

## 12. HIDDEN SYSTEM PARAMETERS


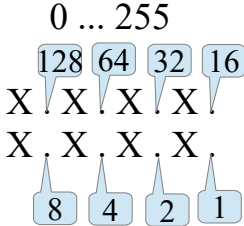


**USED ONLY BY SERVICE SPECIALIST!  
WRONG SETTINGS MAY LEAD TO THE INCORRECT FUNCTION OF THE DEVICE!**

*Hidden system parameters are “visible” only until the next shut down.*

To access hidden system parameters, it's needed to feed the power supply while holding and pressing the **UP** button. In this case, in the list of system parameters, after **End**, the following ones appear:

Name	Description	Values
<b>Fr 1</b>	Filter coefficient for Channel 1	0 - 128 units A lower value corresponds to a “heavier” filter of the input variable
<b>tJ 1</b>	Waiting time before a filter jump for Channel 1	0 - 128 seconds
<b>JP 1</b>	Filter rebound threshold of Channel 1	0 .. 255 units of input When changing the input variable to a value greater than the preset and maintaining the new state for a time greater than <b>tJ 1</b> , the filter bounces and takes the new value directly.
<b>Fr 2</b>	Filter coefficient for Channel 2	0 - 128 units A lower value corresponds to a “heavier” filter of the input variable
<b>tJ 2</b>	Waiting time before a filter jump for Channel 2 when changing the input variable with a value greater than <b>JP 2</b> .	0 - 128 seconds
<b>JP 2</b>	Filter rebound threshold of Channel 2	0 .. 255 units of input When changing the input variable to a value greater than the preset and maintaining the new state for a time greater than <b>tJ 2</b> , the filter bounces and takes the new value directly.

<b>SrEG</b>	<b>0 - K3 - ALARM</b>		
	<b>K3 – TIMER</b> – timer operates independently of the measured input variables  <b>129</b> – mode 1 in seconds <b>130</b> – mode 1 in minutes <b>131</b> – mode 2 in seconds <b>132</b> – mode 2 in minutes <b>133</b> - mode 1 in seconds x 0.1 <b>134</b> - mode 2 in seconds x 0.1  <ul style="list-style-type: none"> <li>• <i>The modes in seconds are indicated with a decimal point</i></li> </ul>		
	<b>K3 – TIMER-</b> is started depending of the measured input variables  <b>1</b> – mode 1 in seconds <b>2</b> – mode 1 in minutes <b>3</b> – mode 2 in seconds <b>4</b> – mode 2 in minutes <b>5</b> – mode 1 in seconds x 0.1 <b>6</b> – mode 2 in seconds x 0.1  <i>The modes in seconds are indicated with a decimal point</i>	<i>To start when the set point is reached, add to the value of parameter :</i>  <b>32</b> – start at PV1>SP1 & PV2>SP2 <b>40</b> – start at PV1<SP1 & PV2>SP2 <b>48</b> – start at PV1>SP1 & PV2<SP2 <b>56</b> – start at PV1<SP1 & PV2<SP2 <b>64</b> – start at PV1>SP1 or PV2>SP2 <b>72</b> – start at PV1<SP1 or PV2>SP2 <b>80</b> – start at PV1>SP1 or PV2<SP2 <b>88</b> – start at PV1<SP1 or PV2<SP2 <b>96</b> – start at PV1>SP1 <b>104</b> – start at PV1<SP1	
<b>dPnt</b>  Decimal points of the channels (MEANINGFUL, ONLY IF IT'S SCALING!) ONLY FOR SERVICE SPECIALISTS		0 ... 255 	
<b>PA 1</b>	Division coefficient of analog output 1*	-1999 ... 9999	
<b>PA 0</b>	Offset of analog output 1*		
<b>PB 1</b>	Division coefficient of analog output 2*		
<b>PB 0</b>	Offset of analog output 2*		
<b>rs__</b>	Initialize communication through serial channel		<b>Do not press SET</b>

\*The calculation of the analog output is done by the following formula:

$A_{out} = \frac{PV * 1023}{PX1} + PX0$ , where **PV** is the value of the measured parameter, and **PX1** and **PX0** are **PA1** and **PA0** or **PB1** and **PB0** respectively.

## WARRANTY CARD

Warranty card №:.....

Warranty term:..... months

Factory number:.....

The items were purchased from :.....

Invoice number:...../..... 20..... year .

### GUARANTEE CONDITIONS

The guaranty consists in free repairs of all the factory defects which can occur during the guarantee period. **The repair is performed as in the repair base is being presented the current guarantee card with which the device is bought.** The warranty does not refer to issue caused by a bad transport, bad conservation, wrong exploitation, natural disasters, not following the instructions and the cases when there is an attempt to fix any defects by other people. In those cases the issue is being fixed only against payment.

The maintenance during the guarantee period and doing the claims happens according to the valid legislation.

### PERFORMED REPAIRS IN THE SERVICE

Service	Date of receipt	Order number	Type of repairs done	Date of transmission	Carried out the repair

Seller:.....

Buyer:.....

4, Murgash str., Plovdiv city, Bulgaria, 4000  
Тел.: (+359 32) 642 519, 640 446 факс: (+359 32) 640 446  
[www.microsyst.net](http://www.microsyst.net) e-mail: [info@microsyst.net](mailto:info@microsyst.net)