



**PID and ON / OFF Controller,
universal input
MS8126**



User Manual
v1.5

PLOVDIV 2019

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	<i>In case of a failed calibration or incorrect configuration of parameters, you can reset the factory settings! / cmp. 24 /</i>
	<i>In the absence of a reaction after pressing a key, the keypad may be locked. For this purpose, the keyboard needs to be unlocked.</i>

Versio n	RS485 MODBUS	Analog Set Point	Choice of SP	HOLD input	Filters out, display	Calibration at temperature standards	Second variable. Tab. set measurement function	'Window' alarm	Universe. input
v1.5	+	-	Galley switch	+	+	-	-	+	+

* The version of the device is visible when you exit the 'PROGRAMMING MODE'

I. DESIGNATION

Compact microprocessor PID controller MC8126 of MICROSYST , are designed for measuring and controlling the different process variables. It has a universal input for the most common RTD's, thermocouples and linear signals (see parameter **Sens** pg. 15).

There is an opportunity for a 4-, 3- or 2-wire connection of RTDs . There is no need for an external divider for a voltage input across the range. The device has two isolated analog and three discrete outputs. They can achieve the P, PI, PD or PID control strategy (program selectable), with the possibility of limiting the integral component. 2 and 3 position ON/OFF modes are also integrated. Outputs are controlled by pulse with variable duration (PWM), it is possible to set different times to form a "positive" (K1) and "negative" (K2) output.

The input signal, analog outputs and the RS485 interface are isolated each other and from the power supply.

All data is stored in a non-volatile memory, including the current state of the controller, so after restoring the supply voltage, it enters the same control mode as it was before it dropped (in this case the integral component is reset).

A smooth switching between automatic and manual mode is provided, with direct observation of process variable (Pv), setpoint (SP) and output (Out). By using the Autotuning function, the parameters for P, PI or PID mode are easily set.

The device communicates with MODBUS RTU protocol, RS485 line, which allows remote monitoring of processes and set different parameters and modes of up to 32 connected controllers (without repeater).

II. ORDER CODE

MS8126 - X.X.X.X.X.X.X.X.X

Case code
M1 - IP5496x48x125 horizontal
1M - IP5496x48x125 vertical

Power supply for transmitter code
T0 - without
T1 - 11...14V 150 mA
T2 - 24V 80 mA stabilized
T3 - 15 V 80mA stavilazid

Power supply * Code
PA - 230 VAC +10%-15%/50Hz
PF - 24 VAC +10%-30% isolated
PG - 24 VAC +10%-30% not isolated
PB - 24 VDC ±30% isolated
PC - 12 VDC ±15% not isolated
PD - 24 VDC ±15% not isolated

Digital inputs code
D0 - without
D1 - DIG1, DIG2, HOLD

Digital output K3
Digital output K2
Digital output K1

code

K1	K2	K3
AA	BA	CA
AB	BB	CB
AD	BD	---
AE	BE	CE
AF	BF	CF

CA - without
 CB - Relay 5A/250V
 --- - Triac 2A / 250V
 CE - OC NPN not iso $U_{CE\ max}=65V$, $I_{C\ max}=100mA$
 CF - OC NPN iso $U_{CE\ max}=80V$, $I_{C\ max}=1A$

Analog outputs(ISO)**

I0 - without
I1 - 1x4-20mA DC
I2 - 1x0-20mA DC
I3 - 1x0-10V DC
I4 - 2x4-20mA DC
I6 - 2x0-20mA DC
I8 - 2x0-10V DC
I9 - 2x0-1V DC
IX - other / must specified

Communication code
C0 - without
C1 - RS485 MODBUS RTU

* In power supply options PB the analog outputs and digital inputs are not available

** The analog outputs are identical

Example : **MS8126 - M1.T0.PA.D1.C1.I1.AB.BB.CA**

Case - IP5496x48x125 horizontal

Power supply for transmitter without

Power supply - 220 VAC

Digital output **K3** - without

Digital output **K2** - реле 5A/250V

Digital output **K1** - реле 5A/250V

Analog outputs - 1x 4-20mA ISO

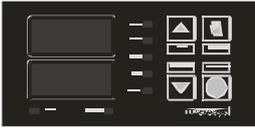
Communication - RS485 MODBUS

Digital inputs - DIG1,2,HOLD

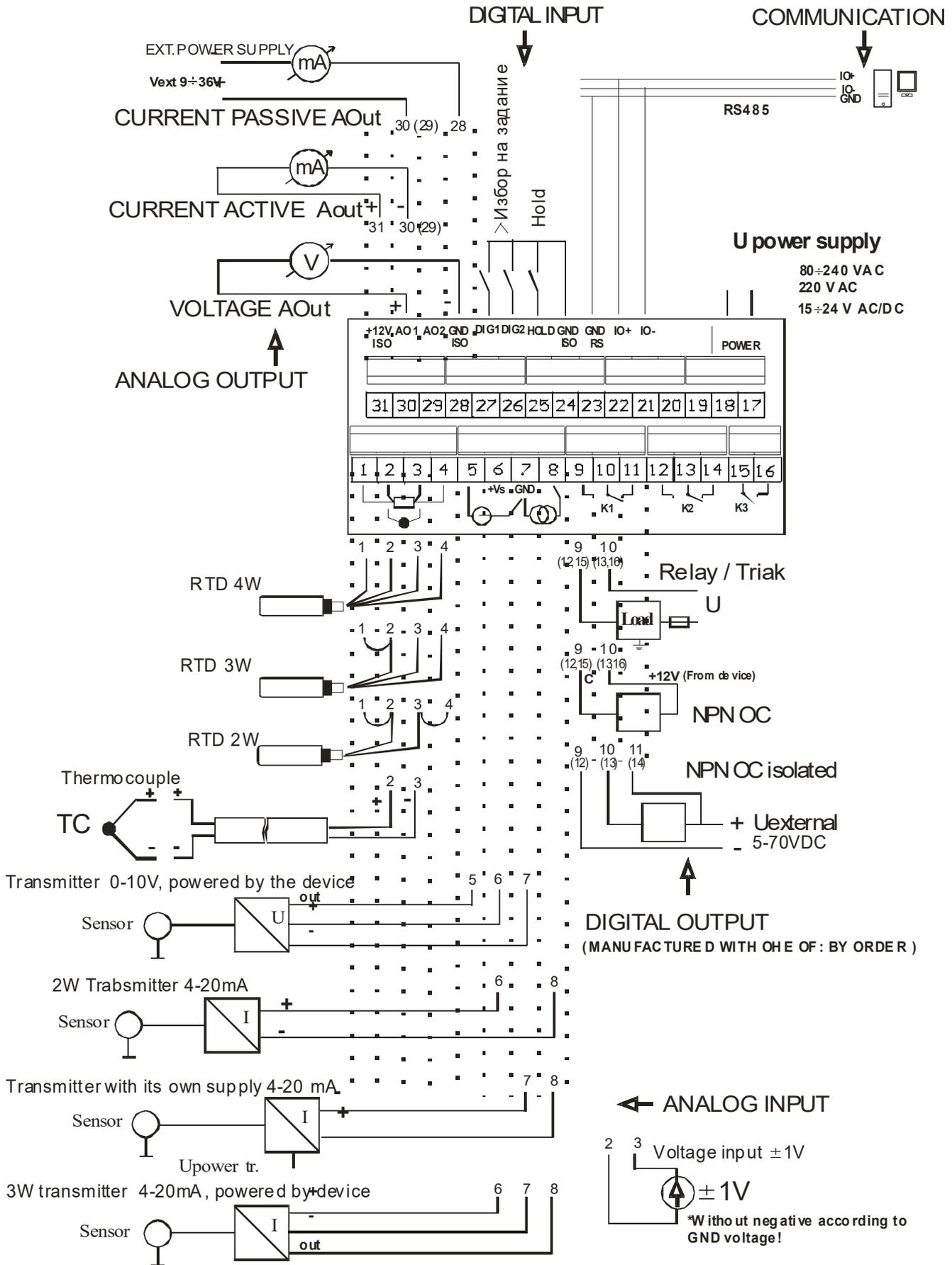
III. ТЕХНИЧЕСКИ ДАННИ

Analog input (universal, user-selectable)		1
Linear current	0÷20 mA; 4÷20 mA DC	
Linear voltage	0÷1V; 0÷10 V DC	
RTDs	Pt₃₈₅10,50,100,200,500,1000; Pt_{391,2}100; Cu₄₈₂100; Ni₆₁₇100; Ni₆₇₂120	
Thermocouple	Обхват ±73,125 mV J, K, S, B, T, E, N, R, C, XK(L) GOST P.585-2001	
Digital inputs – optoisolated (optional – in standard not available , on sticker information)		3
DIG1,2 Inputs to select setpoint	Active level GND	
HOLD Input to reset output	Active level GND	
Digital outputs		3
K1 – ON / OFF or PWM	Relay 250 V / 5 A or OC for TTL	
K2 – ON / OFF or PWM (or Hi Alarm)	Relay 250 V / 5 A or OC for TTL	
K3 – Alarm upper and lower limit / Hi Alarm	Relay 250 V / 5 A or OC for TTL	
options	Triak 250 V / 2 A; Relay 250 V / 5 A and OC for TTL	
Analog outputs AnOut1,2 optoisolated (optional – in standard not available , on sticker information)		2
Transmitting or controlling current	0 (4) ... 20 mA DC 0 ... 1 (10) V DC	
Transmitting or controlling voltage	limiting -1,56% .. +105,4% - i.e. for 4-20 mA – lim. 3,75-20,86 mA (NAMUR level detection)	
Indication and keyboard		
Display	2 x 4 цифри LED	
Range of display	-1999 ÷ 9999	
Accuracy	± 1 LSB	
Reading format	X.XXX XX.XX XXX.X XXXX	
Keyboard	semi-sensory	
Power supply		
Power supply voltage	80...240 V AC / 220 V AC / 15...24 V AC/DC	
Communication (optional)		
RS485 isolated	RS485 2WIRE MODBUS RTU SLAVE 9600, 19200bps; parity – NONE, EVEN ; 1 , 2 stop bit	
Environmental Conditions		
Temperature and relative humidity non-condensing	Operating conditions: -10 ÷ 70 °C / 10 ÷ 85 % rh Storage conditions : -20 ÷ 70 °C / 10 ÷ 90 % rh	
Размери		
Overall dimensions (WxHxL) Montage	MS8126	48 x 96 x 128 mm / Panel Cutout 44 ⁺ x 90 ⁺ mm 96 x 48 x 128 mm / Panel Cutout 90 ⁺ x 44 ⁺ mm
	MS8126AL* not available in this version!	72 x 72 x 104 mm / панелен в отвор 67 ⁺ x 67 ⁺ mm 96 x 96 x 95 mm / панелен в отвор 90 ⁺ x 90 ⁺ mm 48 x 48 x 100 mm / панелен в отвор 45 ⁺ x 45 ⁺ mm
Weight	max 400 g	
Protection	IP40	

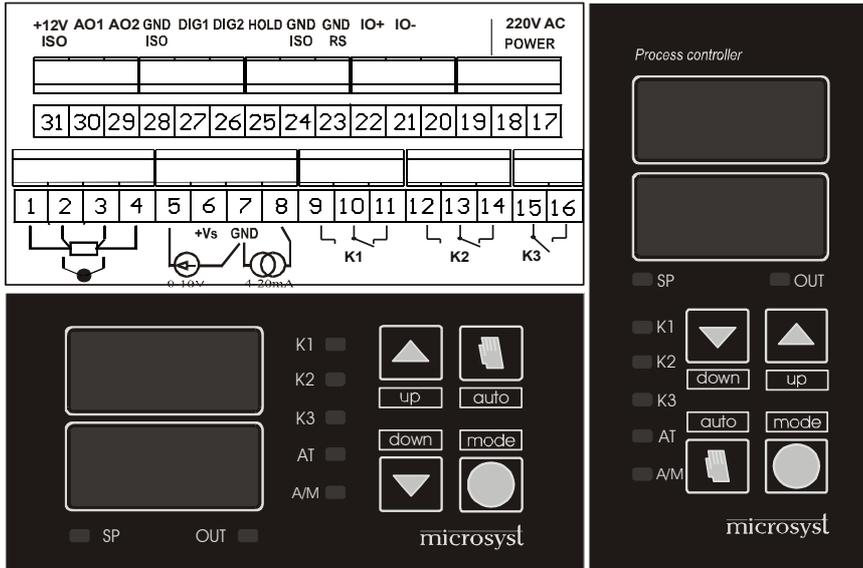




IV. WIRING INSTRUCTIONS MS8126



V. FRONT AND REAR PANEL



CONTROL BUTTONS		
MS8126	ACTION	
Pressed  and 	UNLOCK / LOCK KEYBOARD (Loc / UnLc)	
		Mode selection: manual - automatic
		Parameter setting;(it holds for 4 sec.) Editing Setpoint for control (heating) System parameters Set up Confirm a correction Exit from PARAMETER SETTING MODE(it holds for 4 sec.)
		Change Out <=> SP (setpoint selected from the DIG1.2 assignment inputs) on the second line of the display Increases, decreases the value of a parameter

MS8126 has three levels of programming, which are accessed on the 'SP' display (LED SP illuminated) with different codes by a combination of pressing and holding the control buttons (see Section VIII). Programming is done by accessing and changing parameters from the respective levels. At each level of programming, the functionality of the controller changes to varying degrees, and this requires a corresponding competence:

Ниво	ПАРАМЕТРИ	КОД	ФУНКЦИОНАЛНОСТ	КОМПЕТЕНТНОСТ
I	SYSTEM PARAMETERS	-----	Customization according to the terms and purposes of the operation	User familiar with the technical description
II	HIDDEN SYSTEM PARAMETERS	12	Output and measurement scope configuration options. Restore to factory settings	Person with technical competence for setting up familiar with the technical description
III	SERVICE PARAMETERS	23	Factory settings	Manufacturer's Service Specialist

VII. OPERATING MODE

After switching on the power supply, the controller enters the last operating mode - automatic or manual and displays the process variable of the top row of the display and the setpoint of the lower row. In manual mode, the output is with its value before power failure, the A / M on the front panel lights up, the decimal point flashes. In automatic mode the output is formed according to the selected control law, the decimal point is permanently lit (if the values are in decimal format), LED A / M is not lit.

LEDs K1 and K2 indicate whether the corresponding output is active. When reaching the limits the alarm is waiting for a time T0AH (T0AL), during which the LED K3 flashes. When this delay expires, K3 lights up continuously. Then alarm output (K3) is switched on. Alarm time (T1AH, T1AL) can be set for the alarm output. In this case K3 LED flashes after switching off the output until the alarm conditions have dropped. By means of a parameter (ConF, 2A), the alarm can be divided to the upper limit - out. K3 and lower limit - out. K2, where the LED K2 flashes after crossing the lower limit and illuminates when the alarm output K2 is switched on.

Indicators that the measured process variable is out of range (parameter rnGL, rnGH) serve symbol $\Gamma - - \gamma$ - above the range and $\perp - - \lrcorner$ - under the range when on display is PV

1. Mode selection - automatic / manual

Switching from Manual to Automatic mode

  A/M	switches to automatic mode, indicates "Auto" message and stops flashing of decimal point, A / M LED goes out.
--	---

Switching from Automatic to Manual mode

 или 	the display value Out is selected
  A/M	switches to manual mode, which is indicated by "Hand" and blinking the decimal point. LED A / M on the front panel lights up

The device provides a smooth switching between the two modes - from automatic to manual and vice versa; when switching modes, the value of the output that was in the previous mode is preserved the same in the newly selected mode. In manual mode, when displaying **Out%**, the output can be directly controlled(p.4).

In manual mode, **self-tuning of PID parameters is discontinued** if this function has been activated (see ch.IX).

2. Selection of the variables to display

 or 	Exchange SP ↔ OUT% to the second row of the display. In automatic mode OUT% remains on the screen for 10 seconds after the last button press.
--	---

3. Setpoint Configuration (SP)

  MODE	When SP (or SP ^{II,III,IV}) is displayed, pressing and releasing the button will cause the SP value to flash and editing enabled. This is the assignment selected from the inputs DIG1,2 eg. SP ^{II} , but if it is necessary to correct another, eg. SP ^{IV} , then without leave  is pressed and relaxed  until the desired index is reached. Meanwhile, the controller logically works with the SP selected from the DIG1.2 inputs (e.g.SP ^{II}). A number correction can be made. If no button is pressed within 5 seconds, the main menu returns.
 or 	Set the desired value for Setpoint
  MODE	Confirm the new value (also this can be automatically, 5 seconds after the last button pressed).

4. Adjusting Output (Out)

Only possible in Manual mode!

  MODE	When displaying the Out value by pressing the button, the value of the output starts blinking and editing is enabled. If the button is not pressed within 5 seconds, the controller returns to normal operation.
 	Adjusting Output Value
  MODE	Confirm the new value (also this can be automatically, 5 seconds after the last button pressed).

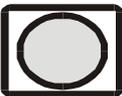
5. Lock / Unlock the keyboard

With a locked keypad, it is not possible to change the parameters and the operating mode, but only to select the display variable by the arrows. This function is a protection against accidental pushing of a button -"Loc" is displayed.

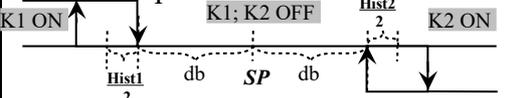
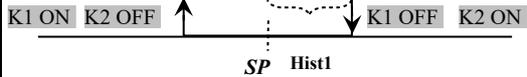
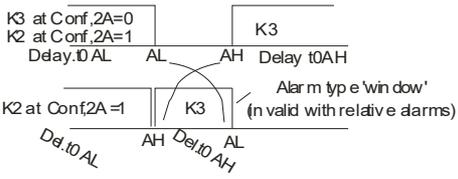
Pressed  and without releasing press 	Switching from unlocked to locked state (labeled Loc) and back (labeled UnLc)
---	--

VIII. PROGRAMMING MODE

MS8126 has three levels of programming that are accessed with different codes.

<i>Access is only possible when is displayed 'Setpoint' (lit - LED SP)!</i>			
TYPES OF PARAMETERS	COD E	Display at entrance	Keyboard
System	---	PROG	 is pressed and hold until an inscription appears "ProG".
Hidden System	12	CODE	 is pressed and hold until an inscription appears "ProG". Without releasing, press and  until an inscription appears CodE .
Сервизни	23		
Set code, select and edit a parameter in Program mode			
		Set code The parameters navigation Changes the value of the selected parameter	
		Confirm the new value. This reflects immediately on the current regulation. Exit - when a parameter name is displayed on the display, it is hold to inscription appears ^v 1_5 End_ to exit PARAMETERS SETTING mode ^v 1_5 is the software version of the device.	
<i>Two minutes after the last operation, the device returns to operating mode.</i>			

SYSTEM PARAMETERS				
Parameter	Description	Range	RS485 COMMUNICATION HOLDING REGISTER ADDRESS, TYPE, SCALE. Where not noted, the scale depends on the decimal point (par dP) (REG №= REG ADDRESS+1)	factory default
Pb	Proportional band Pb>0 means P, PI, PID, PD control Pb=0 - 2 or 3 position control (1)	0 ÷ 9999 (Dimension and decimal point according to the measured variable)	Pb ADR=38; Pb ^{II} ADR=54; Pb ^{III} ADR=76; Pb ^{IV} ADR=82	
	If it is reset during self-tuning, the last one stops.		TYPE Unsigned Int; The variable format is determined by the decimal point	
The next 10 parameters to Atun included are only visible if Pb > 0				
ti	Time Constant by integration (1)	0 ÷ 9999 Sec.	ti-39; ti ^{II} -55; ti ^{III} -77; ti ^{IV} -83, Uint, *1	
td	Derivative Time Constant (1)	0.0 ÷ 999.9 Sec .	td-40; td ^{II} -56, td ^{III} -78, td ^{IV} -84, Uint, *0,1	
ISuL	Lower limit accumulation of the integral factor (2)	-100 ÷ 0 %	48, Signed Int, *1	
ISuH	High limit accumulation of the integral factor (2)	0 ÷ 100 %	49, Sint, *1	
	There is a way in the controller to avoid the effect <i>Integral Windup</i> , independent of the parameters ISuL and ISuH			

OF	Addendum to output Out% in automatic mode (1)	-100.0 ÷ 100.0 %	OF-43; OF ^{II} -59; OF ^{III} -81; OF ^{IV} -87, Sint, *0,1
t0	Term of PID gain calculation	1 ÷ 255 Sec.	35, Uint, *1
tn1	Relay K1 trigger time at 100% calculated (or set) output.	1 ÷ t0 Sec.	36, Uint, *1
tn2	Relay K2 trigger time at 100% calculated (or set) output.	1 ÷ t0 Sec.	37, Uint, *1
AoFt See ch.IX!	Setpoint offset during self-tuning (Autotuning). For less assignment, negative values are entered, and for larger ones - positive	-1999 ÷ 9999 (Dimension and decimal point according to the measured variable)	46, Sint
Atun See ch.IX!	Self-tuning (Autotuning) of parameters : Pb, ti, td	0 – off (stop) 1 – on (start)	45, Uint, *1
db	Deadband in P,PI, PID, PD controller (Pb>0) At On / Off controller (Pb=0) : db>0 - 3 position control  db=0 - 2 position control  In the above charts Hist1>0; Hist2>0 ; K2 is not configured as 'Alarm'	0 ÷ 9999 (Dimension and decimal point according to the measured variable)	44, Uint
HYS1 Visible to Pb=0	Hysteresis at operate output : K1 at 3 position control K1 and K2 at 2position control A negative value inverts the corresponding output	-1999 ÷ 9999 (Dimension and decimal point according to the measured variable)	33, Sint
HYS2 Visible to Pb=0 and db>0	Hysteresis at operate output : K2 at 3 position control A negative value inverts the output K2	-1999 ÷ 9999 Dimension and decimal point according to the measured variable)	34, Sint
AL	Lower alarm limit (1)	rnGL+rnGH {SYST,rA=0} -1999 ÷ 9999 {SYST,rA=1} Dimension and decimal point according to the measured variable)	ALL-41; ALL ^{II} -57; ALL ^{III} -79;ALL ^{IV} -85, Sint
AH	High alarm limit (1) 		ALH-42; ALH ^{II} -58; ALH ^{III} -80; ALH ^{IV} -86, Sint
t0AL	Time to trigger an alarm under limit AL	0 ÷ 100 Sec.	50, Uint, *1
t0AH	Time to trigger an alarm above limit AH	0 ÷ 100 Sec.	50, Uint, *1

! Change with extreme caution. Changing may cause incorrect operation of the unit!

ANALOG OUTPUTS AOut1, AOut2 SCALE

By the next 8 parameters are set range and the operation of the analog outputs.

OtrL (Visible to Syst, tr=1)	PV, corresponding to the lower limit of Aout at the transmitter analogue out. (for example 0°C at 4 mA)	-1999 ÷ 9999 (Dimension and decimal point according to the measured variable)	18, Sint	
OtrH at Syst, tr=1	PV for the high limit of Aout in transmitter Output (for example 100 ° C at 20mA)	-1999 ÷ 9999(Dimension and decimal point according to the measured variable)	19, Sint	
OdrL at Syst, tr=0	Out%, corresponding to the lower limit of Aout at the analogue control out. (example .0% za 4mA)	-100.0 ÷ 100.0 %	16, Sint, *0.1	
OdrH at Syst, tr=0	Out% , corresponding to the high limit of Aout at the analogue control out(for example 100% at 20mA)	-100.0 ÷ 100.0 %	17, Sint, *0.1	
O2tr (Visible to Conf, 2t=1)	PV, corresponding to the lower limit of Aout2 at the transmitter analogue out. (for example 0°C at 4 mA)	-1999 ÷ 9999 (Dimension and decimal point according to the measured variable)	92, Sint	
O2tr at Conf, 2t=1	PV for the high limit of Aout2 in transmitter Output (for example 100 ° C at 20mA)	-1999 ÷ 9999(Dimension and decimal point according to the measured variable)	93, Sint	
O2dL at Conf, 2t=0	Out%, corresponding to the lower limit of Aout2 at the analogue control out. (example .0% za 4mA)	-100.0 ÷ 100.0 %	90, Sint, *0.1	
O2dH at Conf, 2t=0	Out% , corresponding to the high limit of Aout2 at the analogue control out(for example 100% at 20mA)	-100.0 ÷ 100.0 %	91, Sint, *0.1	

SCOPE OF MEASUREMENT

Parameters set the measurement in the linear bands (if ConF, Et = 0) 0-1V, 0-10V, 4-20mA and 0-20mA. TC / RTD may be used as alert levels but are not involved in the measurement. When measured under the rnGL display, it changes over 1 sec. PV↔ L - - J , over rnGH - PV↔i - 7 . Limit setpoint and alarm levels to absolute alarm. Set rnGL <rnGH.

rnGL	Measuring range - lower limit. for 0V/ 0/4mA (ako ConF, Et=0).	-1999 ÷ 9999 (Dimension as PV)	20, Sint	
rnGH	Measuring range - upper limit for 1V/10V/20mA (ConF, Et=0).	-1999 ÷ 9999 (Dimension as PV)	21, Sint	

OTHER

dPnt	Decimal point * After a change is needed to verify / all parameters corrected with the dimension of the displayed value. ** For built-in thermosensors and linear inputs, when changing dPnt, PV automatically switches to the selected format. For non-standard inputs, the point is decorative - you need to scale through the RS485 by calibration coefficients '.	0 ÷ 4 0-xxxx; 1-xxxx.; 2-xxx.x; 3-xx.xx; 4-x.xxx (for RTD and TC-standard or not, 0, 1 and 2 possible)	29, Uint, *1	
A db	ADC filter area	0 ÷ 9999 (Dimension as PV)	24, Uint	
Adbt	Time to perceive value outside the A db area	0 ÷ 255 c	25, Uint, *1	
FILt	Coefficient filter	1 ÷ 100	26, Uint, *1	

<p>SYST Output configuration options, options for different parameters depending on SP input selection, BackUp options.</p> <p>The output value can be seen on the display in Out mode and ranges from -100% ÷ 100%. From this magnitude are formed two analog (if they are controlling) and two (one if K2 is an alarm) digital outputs.</p> <p>Digital outputs: If used in the ON / OFF mode, they depend on the Hist1 and Hist2 character - minus means inverting.</p> <p>If not in ON / OFF, the field iv (inverse out) is determined.</p> <p>Analog Output AOut1: The field tr specifies a control (proportional to the output Out) or a Transmitter (proportional to the input PV). The values corresponding to the range of the analog output are in the OtrL, OtrH for transm. parameters. and OdrL, OdrH for control exit. In addition, the ob (out band) field determines these values for 0-100% outputs refer to either 20-100% (serves for easy transition from 0-20mA ↔ 4-20mA).</p> <p>Analog output Aout2 is configured by param. Conf, 2t.</p> <p>The dA and dP fields indicate whether the different assignments of the task selection key work with the same or different sets of parameters for each SP_{-II,III,IV}.</p> <p>BackUp options: The input / output settings as well as some parameters (p.2) keep a backup. By matching the rE = 1 option, these settings and parameters return factory values and lose currents.</p> <p>ACCESS TO OPTIONS: SYST <input type="radio"/> → tr <input type="radio"/> → iv <input type="radio"/> → At≡</p> <p>CHANGE OF OPTION <input type="checkbox"/> or <input type="checkbox"/>, example: tr=0 <input type="checkbox"/> → tr=1</p>		<p>tr= 0 - control analogue output 1 - transmitter analogue output</p> <p>iv= 0 - K1 "heating"; K2 "cooling" 1 - K2 "heating"; K1 "cooling"</p> <p>rA=0 - absolute alarm 1 - relative alarm</p> <p>ob=0 - Aout 0-100% (example 0-20mA) 1 - Aout 20-100% (example 4-20mA)</p> <p>dA=0 - ALL,ALH SP, SP^{II},SP^{III},SP^{IV} 1 - ALL _{-II,III,IV},ALH _{-II,III,IV} for SP _{-II,III,IV}</p> <p>dP=0 - Pb,ti,td,OF com. to SP, SP^{II},SP^{III},SP^{IV} 1 - Pb _{-II,III,IV},ti _{-II,III,IV},td _{-II,III,IV},OF _{-II,III,IV} for SP _{-II,III,IV}</p> <p>rE=1- Resets the factory settings to I / O and parameters labeled (2),then automatically rE= 0.</p> <p>Warning - the current settings are lost!</p> <p>St=1 - Creates a backup of the settings and parameters marked with (2), (thus losing the recorded copy at the factory), after which automatic St = 0. The option is visible on the display only after a special service code has been entered in COdE.</p>																																									
		<p>MODBUS HOLDING REGISTER ADDRESS (REG №= REG ADDRESS+1) 30, Uint, *1.</p> <table border="1"> <thead> <tr> <th colspan="8">MODBUS COIL ADDRESS at RS485 communication (COIL №= COIL ADR+1)</th> </tr> <tr> <th>St</th> <th>rE</th> <th>dP</th> <th>dA</th> <th>ob</th> <th>rA</th> <th>iv</th> <th>tr</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> </tr> <tr> <td>9</td> <td>9</td> <td>9</td> <td>9</td> <td>9</td> <td>9</td> <td>8</td> <td>8</td> </tr> <tr> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> <td>0</td> <td>9</td> <td>8</td> </tr> </tbody> </table>	MODBUS COIL ADDRESS at RS485 communication (COIL №= COIL ADR+1)								St	rE	dP	dA	ob	rA	iv	tr	4	4	4	4	4	4	4	4	9	9	9	9	9	9	8	8	5	4	3	2	1	0	9	8	
MODBUS COIL ADDRESS at RS485 communication (COIL №= COIL ADR+1)																																											
St	rE	dP	dA	ob	rA	iv	tr																																				
4	4	4	4	4	4	4	4																																				
9	9	9	9	9	9	8	8																																				
5	4	3	2	1	0	9	8																																				
t1AL	Trigger Time of the alarm output after it is switched on below the AL limit	1 ÷ 100 sec., 0- permanently on MODBUS HOLD.REG. ADDRESS 97, Uint, *1	0																																								
t1AH	Trigger Time of the alarm output after it is switched on above the AH limit	1 ÷ 100 sec., 0-permanently on MODBUS HOLD.REG. ADDRESS 98, Uint, *1	0																																								
At ≡	Self-tuning options (see section IX)	1 ÷ 4 MODBUS HOLD.REG. ADDRESS 47, Uint, *1	4																																								
FOut	Output filter coefficient	1 ('heavy' filter) ÷ 100 (without filter) MODBUS HOLD.REG. ADDRESS 114, Uint, *1	100																																								
ZnFo	Output filter area	1 ÷ 100 % Out MODBUS HOLD.REG.ADDRESS 115, Uint, *1	1																																								
FdSP	Coefficient filter on display	1 ('heavy' filter) ÷ 100 (without filter) MODBUS HOLD.REG.ADDRESS 116, Uint, *1	100																																								
ZnFd	Filter area on display	0 ÷ 9999 (Dimension and decimal point according to the measured variable) MODBUS HOLD.REG. ADDRESS 117, Uint	1																																								

SERVICE PARAMETERS Available with CODE = 23 (2)

! Change with extreme caution. Changing may cause incorrect operation of the unit!

Parameter	Description	Values, MODBUS HOLD.REG. ADR, TYPE SCALE.	factory default																																																																																																													
PARAMETERS FOR FACTORY CALIBRATION OF ANALOG OUTPUTS.																																																																																																																
<p>When a value is changed by the buttons on the panel, Aout1,2 falls into the calibration mode other than the operating mode. This must be taken into account when connected measuring instruments! The settings are made with Syst, ob = 1. It is first indicated which type of analogue output is being set - voltage or current, via param. AtYP. In case of a user change, use the AOut scaling parameters (p.14).</p>																																																																																																																
PA0	Offset for AOut1. Adjust to AOut1 = 4mA (Current Output)	-1999 ÷ 9999																																																																																																														
		MODBUS HOLD.REG. ADDRESS I-23, U-123 Sint, *1																																																																																																														
PA1	Multiple coef. for Aout1. Adjusts after PA0 to AOut1 = 20mA.	-1999 ÷ 9999																																																																																																														
		MODBUS HOLD.REG. ADDRESS I-22, U-122 Sint, *1																																																																																																														
PA20	Offset for AOut2. Adjust to AOut2 = 4mA (Current Output)	-1999 ÷ 9999																																																																																																														
		MODBUS HOLD.REG. ADDRESS I-95, U-125 Sint, *1																																																																																																														
PA21	Multiple coef. for Aout2. Adjusts after PA20 to AOut1 = 20mA.	-1999 ÷ 9999																																																																																																														
		MODBUS HOLD.REG. ADDRESS I-94, U-124 Sint, *1																																																																																																														
OTHER SERVICE PARAMETERS																																																																																																																
SenS	Select sensor.	<i>MODBUS HOLD.REG. ADDRESS 28, Uint, *1</i>																																																																																																														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>№</th> <th>input</th> <th>display</th> <th>№</th> <th>input</th> <th>display</th> <th>№</th> <th>input</th> <th>display</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>TC J</td> <td>tc J</td> <td>10</td> <td>4-20 mA linear</td> <td>4-20</td> <td>14</td> <td>Pt10 385</td> <td>Pt10</td> </tr> <tr> <td>1</td> <td>TC K</td> <td>tc </td> <td>11</td> <td>0-20 mA linear</td> <td>0-20</td> <td>15</td> <td>Pt50 385</td> <td>Pt50</td> </tr> <tr> <td>2</td> <td>TC S</td> <td>tc S</td> <td>12</td> <td>0-1V linear</td> <td>0-1v</td> <td>16</td> <td>Pt100 385</td> <td>P100</td> </tr> <tr> <td>3</td> <td>TC B</td> <td>tc b</td> <td>13</td> <td>0-10 V linear</td> <td>010v</td> <td>17</td> <td>Pt200 385</td> <td>P200</td> </tr> <tr> <td>4</td> <td>TC T</td> <td>tc t</td> <td></td> <td></td> <td></td> <td>18</td> <td>Pt500 385</td> <td>P500</td> </tr> <tr> <td>5</td> <td>TC E</td> <td>tc E</td> <td>25</td> <td>TC nonstandard</td> <td>nStc</td> <td>19</td> <td>Pt1000 385</td> <td>1000</td> </tr> <tr> <td>6</td> <td>TC N</td> <td>tc n</td> <td>26</td> <td>RTD 4KΩ nonstandard</td> <td>nSr </td> <td>20</td> <td>Pt100 392</td> <td>P392</td> </tr> <tr> <td>7</td> <td>TC R</td> <td>tc r</td> <td>27</td> <td>RTD 400Ω nonstandard</td> <td>nSr0</td> <td>21</td> <td>Pt100 391</td> <td>P391</td> </tr> <tr> <td>8</td> <td>TC C</td> <td>tc C</td> <td>28</td> <td>0-20mA nonstandard</td> <td>nS20</td> <td>22</td> <td>Cu100 482</td> <td>C100</td> </tr> <tr> <td>9</td> <td>TXK(L)</td> <td>tc L</td> <td>29</td> <td>0-1V nonstandard</td> <td>nS01</td> <td>23</td> <td>Ni100 617</td> <td>n100</td> </tr> <tr> <td></td> <td></td> <td></td> <td>30</td> <td>0-10V nonstandard</td> <td>nS10</td> <td>24</td> <td>Ni120 672</td> <td>n120</td> </tr> </tbody> </table>	№	input	display	№	input	display	№	input	display	0	TC J	tc J	10	4-20 mA linear	4-20	14	Pt10 385	Pt10	1	TC K	tc	11	0-20 mA linear	0-20	15	Pt50 385	Pt50	2	TC S	tc S	12	0-1V linear	0-1v	16	Pt100 385	P100	3	TC B	tc b	13	0-10 V linear	010v	17	Pt200 385	P200	4	TC T	tc t				18	Pt500 385	P500	5	TC E	tc E	25	TC nonstandard	nStc	19	Pt1000 385	1000	6	TC N	tc n	26	RTD 4KΩ nonstandard	nSr	20	Pt100 392	P392	7	TC R	tc r	27	RTD 400Ω nonstandard	nSr0	21	Pt100 391	P391	8	TC C	tc C	28	0-20mA nonstandard	nS20	22	Cu100 482	C100	9	TXK(L)	tc L	29	0-1V nonstandard	nS01	23	Ni100 617	n100				30	0-10V nonstandard	nS10	24	Ni120 672	n120		
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virE	Connect RTD 3/4 wire (output only with RTD sensor)	3÷4	<i>MODBUS HOLD.REG. ADDRESS 32, Uint, *1</i>																																																																																																													
nEtA	MODBUS device address	1 ÷ 255	<i>MODBUS HOLD.REG. ADDRESS 127, Uint, *1</i>																																																																																																													
ConF	<p>Системни настройки System Settings: 2A-Output mode K2. 2t - Analog Output AOut2 Control / Transmitter. The values corresponding to the range of AOut2 are in the parameters O2tL, O2tH for transmitter. and O2dL, O2dH for Control output. The field Syst, ob (out band) determines these values for 0-100% output refer to either 20-100% (0-20 / 4-20 mA). BAUDRATE, PARITY, STOP BIT are communication parameters in the RS485 network. Et - Enables the 'Set Linear input by Two Reference Points' function. In the case of a change, the current setting remains valid until a new (Et = 1) or a range adjustment rnGL, rnGH (Et = 0)</p>	<p>2A = 0 -K2 is a control output : 2A = 1-K2 is Alarm 2t = 0-Controll AOut2; 2t = 1- Transmit AOut2 br=0 BAUDRATE 9600 bps ; =1-19200 bps Pr=0 PARITY NONE ; =1-EVEN Sb=0 - 1 stop bit; =1 - 2stop bits bC=0 BROADCAST requests are executed (such to device address 0). =1-BROADCAST requests are not executed Et=0-Disabled line setting two reference points. Adjustment is via the rnGL-rnGH range at pre-known param. of the connected transmitter. =1- Permitted line setting two reference points. The range rnGL-rnGH is only for warning when measuring beyond these limits. °F=0 -°C =1 -°F</p>	<p>2A=0 Br=0, Pr=0, Sb=0, bC=0</p>																																																																																																													

	<p>F-°C/°F In Linear or Nonstandard.input, PV is not converted to AutoClean ° F. Automatic PV is in the desired type - Celsius or Fahrenheit for the TC, RTD and cold end of the TC (Sens = nStc - cold end only).</p> <p>ACCESS TO OPTIONS:</p> <p>Conf <input type="checkbox"/> → 2A <input type="checkbox"/> → 2t <input type="checkbox"/> → br → Pb</p> <p>CHANGE OF OPTION <input type="checkbox"/> or <input type="checkbox"/></p>	<table border="1"> <thead> <tr> <th colspan="8">MODBUS COIL ADDRESS ППН RS485</th> </tr> <tr> <th>Fh</th> <th>Et</th> <th>bC</th> <th>Sb</th> <th>Pr</th> <th>br</th> <th>2t</th> <th>2A</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> </tr> <tr> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> </tr> <tr> <td>7</td> <td>6</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> <td>0</td> </tr> </tbody> </table> <p>MODBUS HOLDING REG ADDRESS 27, Uint, *1</p>	MODBUS COIL ADDRESS ППН RS485								Fh	Et	bC	Sb	Pr	br	2t	2A	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	7	6	5	4	3	2	1	0	
MODBUS COIL ADDRESS ППН RS485																																											
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7	6	5	4	3	2	1	0																																				
AtYP	<p>Other options</p> <p>The fields 1u, 2u indicate the type of analogue output that is used (corresponding to the hardware).</p> <p>The hr field allows Output to be reset beyond the range -2.5% ... + 106.25% of the range. The action is like HOLD.</p> <p>Field rr - Normal Mode Rejection Ratio</p> <p>ACCESS TO OPTIONS - like the previous par.</p>	<p>1u=0- Aout1 current; =1- Aout1 voltage 2u=0- Aout2 current; =1- Aout2 voltage hr- HOLD beyond the -2,5%...+106,25% FS rnGL-rnGH (display[OFF]) 0-no / 1-yes rr=0- NMRR 80dB 50Hz; =1- NMRR 65dB 50/60Hz</p> <table border="1"> <thead> <tr> <th colspan="8">MODBUS COIL ADDRESS ППН RS485</th> </tr> <tr> <th></th> <th></th> <th></th> <th></th> <th>rr</th> <th>hr</th> <th>2u</th> <th>1u</th> </tr> </thead> <tbody> <tr> <td>9</td> <td>9</td> <td>9</td> <td>9</td> <td>9</td> <td>9</td> <td>9</td> <td>9</td> </tr> <tr> <td>7</td> <td>7</td> <td>7</td> <td>7</td> <td>7</td> <td>7</td> <td>6</td> <td>6</td> </tr> <tr> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> <td>0</td> <td>9</td> <td>8</td> </tr> </tbody> </table> <p>MODBUS HOLD.REG. ADDR 60, Uint, *1</p>	MODBUS COIL ADDRESS ППН RS485												rr	hr	2u	1u	9	9	9	9	9	9	9	9	7	7	7	7	7	7	6	6	5	4	3	2	1	0	9	8	
MODBUS COIL ADDRESS ППН RS485																																											
				rr	hr	2u	1u																																				
9	9	9	9	9	9	9	9																																				
7	7	7	7	7	7	6	6																																				
5	4	3	2	1	0	9	8																																				

Съкращения: Uint – UNSIGNED INT, Sint – SIGNED INTEGER

Note 1: There are 4 sets of parameters marked(1), indicated by ^{-II,III,IV} after the name - eg. Pb^{II}, which refers to the operation of a selected SP^{II} (via the input of a SP assignment) Access is done by scrolling between the parameters with , When the next parameter appears, without releasing the button, press the other arrow - eg. Pb & → Pb^{II}. Each press of it switches Pb→Pb^{II}→Pb^{III}→Pb^{IV}→Pb ... (Initially, the index selected from the inputs DIG1,2)

The operation of the parameters for the selected SP 'depends also on the SYST-dA, SYST-dP options.

Note 2: For the parameters marked (2) (hidden, service without nEtA) and for the calibration of the input, a backup is preserved, from which the factory set values can be returned via SYST, rE = 1. Factory parameters may need adjustments for the particular application.

IX.SELF ADJUSTMENT OF THE CONTROLLER (AUTO TUNING)

Indication: running decimal point and AT LED on the front panel

Activation: $Atun = 1$

Deactivation: $Atun = 0$ (done automatically);

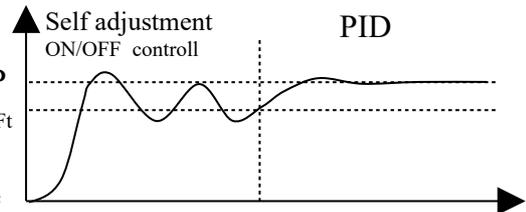
In manual mode, self-tuning is canceled

This feature allows the device to only set values for the Pb , Ti , and Td parameters. Before starting, all other parameters must be specified. Pb , Ti , and Td also have to set any protection values that remain valid if the self-tuning is unsuccessful - for example, for a PID gain, a large Pb (Proportional band), a long integration time Ti , a short Derivative Time Td . Activating self tuning when $Atun$ is assigned 1. The procedure can be stopped at any time using $Atun = 0$. Changing the output in manual mode also deactivates it. After the PID factors are calculated, this is done automatically. The value of Pb , Ti and Td before the end of the procedure determines what control strategy will be implemented: all $Pb > 0$, $Ti > 0$ and $Td > 0$ are set for PID control; for PI are set $Pb > 0$, $Ti > 0$, and $Td = 0$; for P are set $Pb > 0$, and $Ti = 0$ and $Td = 0$. Self-tuning does not change the parameters with value 0, but takes into account the type of controller you want. It is possible for the controller to register an unsuccessful self-tuning - then the initial values of Pb , Ti and Td will not be changed automatically. Therefore, it is advisable to have defensive values that do not occur in the unacceptable conditions of the object.

With the 'Self-tuning' function started, it switches to ON / OFF control without hysteresis, resulting in oscillations. This lasts for two periods, after which the main mode returns with set parameters. **Attention! In this ON / OFF mode, the Setpoint can be significantly exceeded.** Therefore, during self-tuning, the Setpoint is sum of $SP + AoFt$. Thus, by means of the offset $AoFt$ and SP , a safe area can be selected for self-tuning, possibly closer to in normal operation For example, when set to $SP = 150^\circ$ and $AoFt = -20^\circ$, then the actual SP in self-tuning will be 130° . As long as the process lasts, maximum changes in object characteristics and disturbing impacts must be avoided. When selecting t_0 , it should be borne in mind that for a period of oscillation less than $8 \cdot t_0$ or greater than $1024 \cdot t_0$ the procedure is considered unsuccessful. In this case, the controller automatically returns to the same mode as it was before the start of the procedure. The process variable must be filtered using the tools provided in the device and not to be out of range. **Power off does not deactivate the procedure.** In this case, after restoring, the self-tuning starts from the beginning. The final result also depends on the At parameter. For comparison, the transition process of a test object (temperature control) is shown after a PID controller self-tuning in SP change and a change in load for the four possible values of At

It is possible to leave reserves for improving the performance of the device by manually adjusting the parameters according to the specific object and criteria.

Забелѝка: In P mode at all At values and in PI mode at $At = 1, 2, 3$ the same parameters are calculated.



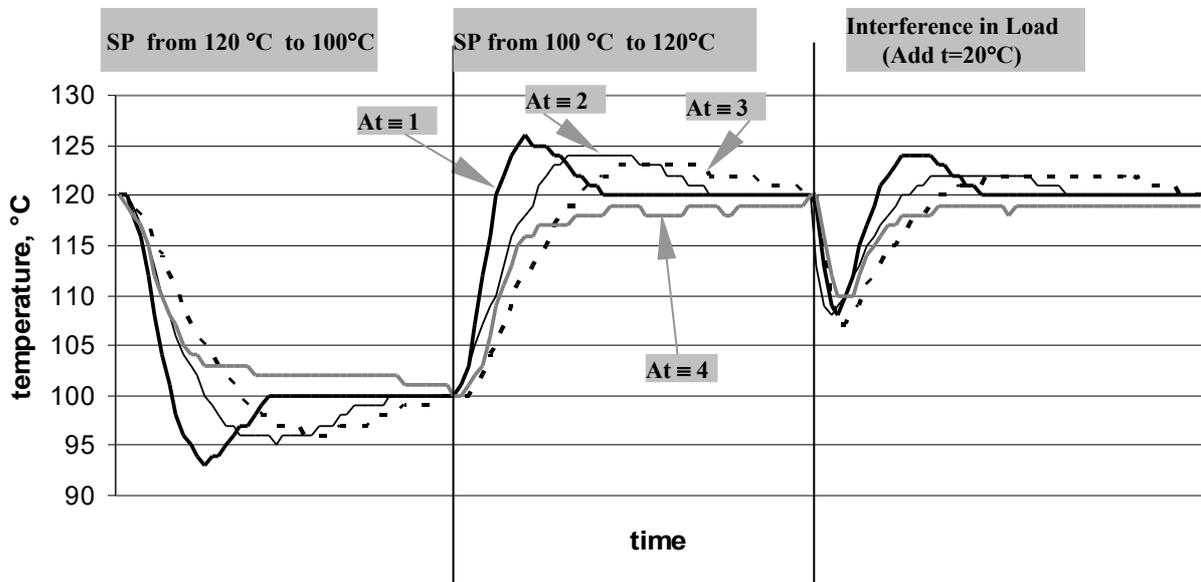
Sample adjustment schedule depending on the selected self-tuning criteria - At

$At=1$ – Over - tuning:*bigger* / Time to stability:*little*;

$At=2$ – Over - tuning:*average* / Time to stability:*moderate*

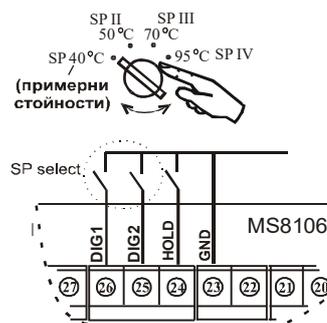
$At=3$ –Over - tuning:*moderate* / Time to stability:*average* ;

$At=4$ – Over - tuning:*little* / Time to stability:*bigger*



X. INPUTS FOR SETPOINT SELECTION (optional)

There are two inputs for selecting the setpoint by active level GND. By means of them you can choose 1 of 4 possible sets of parameters SP, AH, AL, Pb, ti, td, OF with an index I (not displayed), II, III and IV. One or both may not be saturated at production - this limits the possible assignments (and parameters) to SP (unsaturated inputs) or SP, SPII (saturated in DIG1)



N	Input DIG2	input DIG1	setpoint	Hi alarm*	Low alarm*	Proportional band.**	Time Constant by integration**	Derivative Time Constant**	ADD FOR PID CONTROLL**
	-	-	SP	AH	AL	Pb	ti	Td	OF
II	-	GND	SP ^{II}	AH ^{II}	AL ^{II}	Pb ^{II}	ti ^{II}	td ^{II}	OF ^{II}
III	GND	-	SP ^{III}	AH ^{III}	AL ^{III}	Pb ^{III}	ti ^{III}	td ^{III}	OF ^{III}
IV	GND	GND	SP ^{IV}	AH ^{IV}	AL ^{IV}	Pb ^{IV}	ti ^{IV}	td ^{IV}	OF ^{IV}

* If param. SYST, dA is set to 0, then for the four states of inputs DIG1, DIG2, the instrument will work with the parameters AH and AL, ie. works with one pair of alarm levels.

** If param.SYST, dP is set to 0, and for the four states of inputs DIG1, DIG2, the instrument operates with the parameters Pb, ti, td, OF - ie. it works with one set of PID parameters.

In case the choice is to work with different alarms and PID parameters at the various combinations of the DIG1, DIG2 inputs, care must be taken to set them correctly and completely!

Changing the state of the inputs DIG1, DIG2 during the correction of any of the described parameters does not select another correction parameter. In terms of managing any change act immediately. Handwriting in the 'PARAMETERS' menu + or SP correction + is valid only for the current parameter, and does not specify a work index, but only an index for correcting a current parameter. The working index (a set of parameters with which the device logically functions) is indicated only by the DIG1,2 inputs.

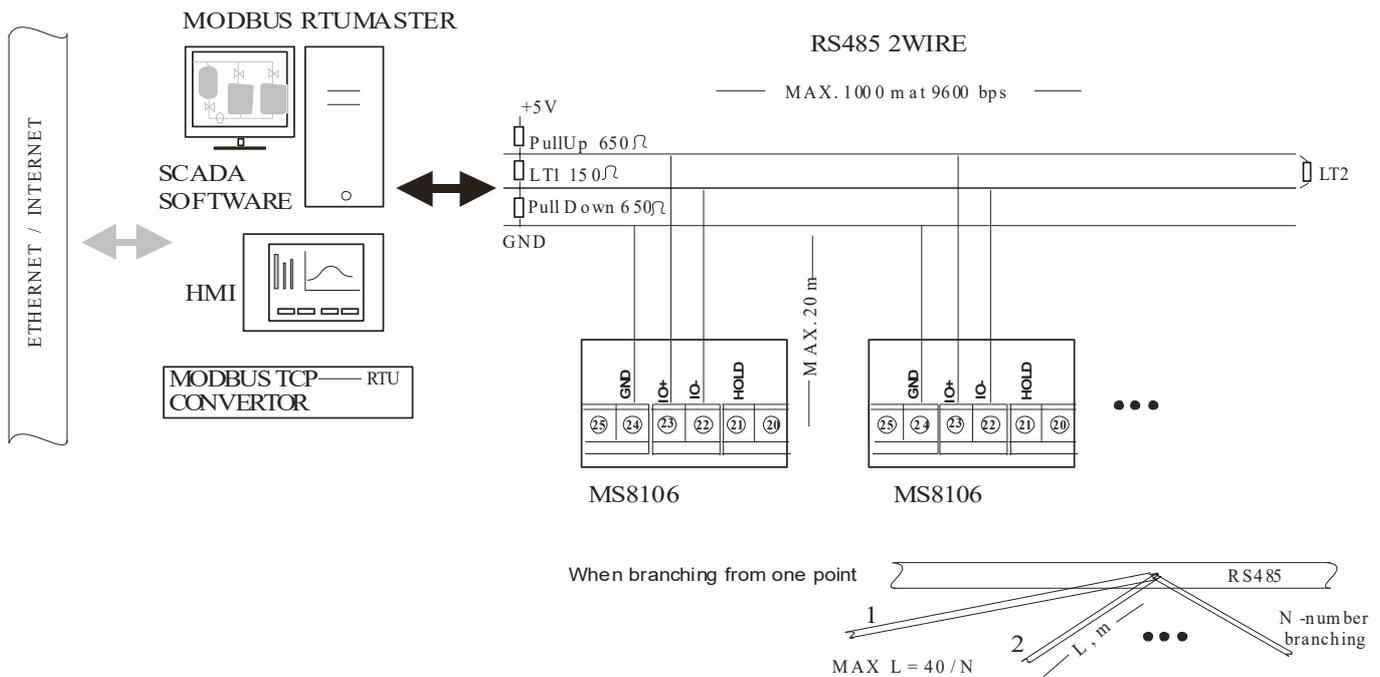
During self-tuning, it is not permissible to change the selected setpoint in order to calculate correct parameters.

In terms of 2 or 3 position mode operation (use as ON / OFF regulator) is the parameter Pb (not Pb^{II, III или IV}). If Pb = 0, the controller turns ON / OFF with hysteresis Hist1 (2-position) or Hist1, Hist2 (3-position) for all setpoints and Pb^{II, III, IV}, ti^{II, III, IV}, td^{II, III, IV} are irrelevant. Conversely, if Pb^{II, III or IV} = 0, this only applies to SPII, III or IV and means PID with zone 1 (or 0.1; 0.01; 0.001 if the display is in decimal format).

XI. INPUT HOLD IN(optional)

Вход за активиране на HOLD режим (режим изчакване) – нулиране на OUT% и интегралната съставка. Не се насища в текущата версия на уреда, освен ако на стикера на конкретното устройство не е специално обозначен. За индикация на режим HOLD се извежда на дисплея съобщение **HoLd** през 4 с.

XII. COMMUNICATION via RS485 with MODBUS RTU protocol (optional)



The device is MODBUS RTU SLAVE capable of communicating at 9600 or 19200 bps on a RS485 2WIRE line (**par.ConF**). With standard performance without the use of repeaters, up to 32 devices can be connected in one line, with repeaters up to 247. There is a special version option for up to 128 devices without repeaters. HOLDING REGISTER ADDRESS column in tables of parameters is shown the addresses of the relevant parameters. Here are the other options for communication. There is a parity between changing a parameter or operating mode using the buttons on the front panel and changing over the network - that is, the device can be affected simultaneously by both sources. If the network is a priority, the keyboard can be locked (can be unlocked through the front panel).

Implementation MODBUS FUNCTION	
MODBUS FUNCTION	COMMENT. LIMITS. Only addresses with parameter and dimension names specified can be used and the non-listed in the guide are considered reserved. The address fields in the table only indicate that the operation is executable without EXEPTION (protocol error message)
01	Reading a single bit. Max number COILS – 520.
03	Reading of HOLDING REGISTERS, $0 < \text{REG ADR} < 127$ – registers in non-volatile memory, $128 < \text{REG ADR} < 256$ – reg. in RAM. When adding 512 – FLOAT, calibration coefficients are read in format IEEE754 (otherwise they are in a format EXP, S.B0,B1,B2). Max number of registers in the query – 32.
05	Recording a single bit, $439 < \text{COIL ADR} < 512$
06	Recording a single HOLDING REGISTER, $0 < \text{REG ADR} < 127$ – registers in non-volatile memory; OUT and SP in RAM.
16	Record multiple consecutive HOLDING REGISTERS. Action Area as a function 06, plus addresses 512-528. At $\text{REG ADR} > 528$ recording is not running, but without EXEPTION. At $512 < \text{ADR} < 528$ the function is for recording a calibration FLOAT coefficients in IEEE754 format

PROCESS VARIABLE PV: HOLDING REG ADR 210, TYPE SINT, READ ONLY, Dimension according to DP parameter (decimal point). For example, for a temperature in whole C°, the register contains whole degrees. In case of a device with readings in one decimal place of C° (XXX.X C°), respectively, and the contents of this registry will be in one decimal place of C°.

SETPOINT SP: HOLDING REG ADR 209, TYPE SINT, Dimension according to DP. Assign the controller to its RAM (non-volatile) memory. Suitable for frequent continuous changes. When the power is turned on, switching a SP selection key or recording in one of the non-volatile setpoints is initialized with (equals) the non-volatile setpoints, which is selected by the key.

NON-VOLATILE SETPOINT SP: HOLDING REG ADR 51, TYPE SINT, Dimension according to DP. Assignment in non-volatile memory. Max. number of records - 1000000. When recording is updated and the CURRENT READING SP. Appropriate for less frequent changes. Value is taken from it, when the device is turn on or change the input to select a SP. Manual change from the buttons on the front panel of the appliance concerns both (non-volatile and current) SP, i.e. they are the same assignment. The control application designer or the Human Mashine Interface (HMI) has a choice to use them as well, only to use the NON-VOLATILE SETPOINT. However, if the application's specificity requires a continuous change, e.g. in a few seconds, the limited number of records in the NON-VOLATILE SETPOINT enforces another scheme - to assign value to the NON-VOLATILE SETPOINT, which is initializing at turned on the power, but to change the CURRENT SETPOINT.

NON-VOLATILE SETPOINTS SPII, III, IV : HOLDING REG ADR 52, 88, 89 TYPE SINT, Dimension according to DP. Assignment SP' in non-volatile memory. Everything said above about NON-VOLATILE SETPOINT SP is also valid for SPII, III, IV. These are separate assignments - one for each of the positions of the task selection key (if one is not saturated, SP is selected).

CURRENT OUTPUT OUT : HOLDING REG ADR 208, TYPE SINT, x 0,1%. From this register reads the status of the device output. In automatic mode, recording a new value does not affect the output. In manual mode, the recording is equivalent to changing the output. This is a non-volatile register that manually initiates the controller when the power is turned on from INITIAL OUTPUT VALUE IN HAND MODE.

INITIAL OUTPUT VALUE IN MANUEL MODE : HOLDING REG ADR 53, TYPE SINT, x 0,1%. Non-volatile register from which in manual mode of the controller, at turned on the power initialize CURRENT OUTPUT OUT. Changing the CURRENT OUTPUT by pushing the buttons on the front panel simultaneously affects the INITIAL VALUE of output in MANUAL MODE. Also when switching to manual mode with button , INITIAL VALUE is equated to the last value of CURRENT OUTPUT in AUTO MODE.

AUTO / MANUAL MODE : COIL ADR 504. Non-volatile flag. Reflects and manages the mode of operation: 0-manual, 1-automatic. It is also available through HOLDING REG ADR 31, bit0. Sample usage - when you need to set the CURRENT OUTPUT OUT directly on the network, this flag is reset to enter the device in manual mode. Thus, the output signal can be set manually using the buttons on the front panel or via the network. If the keypad is locked, only the second option remains (but the keypad can still be unlocked via the buttons on the panel)

LOCK / UNLOCK THE KEYPAD : COIL ADR 505. Non-volatile flag. Reflects and controls the button mode on the front panel of the device. 0-unlocked, 1-locked. It is also available through HOLDING REG ADR 31, bit1. Manipulate and manually through the front panel.

HOLD COMMAND : COIL ADR 506. Nonvolatile flag for mode control HOLD - reset to OUT% and the integral component, which acts if the HOLD IN input of the controller is inactive or not saturated (ie, the input if saturated prior to network control). If the HOLD IN input is activated, the unit goes into HOLD regardless of the HOLD COMMAND status. When switching to HOLD IN from active to inactive state, HOLD COMMAND is also reset. 0-operating mode, 1-mode HOLD. It is also available through HOLDING REG ADR 31, bit2. To monitoring the controller status, use the next parameter.

STATE HOLD : COIL ADR 3034. HOLD state flag on controller 0-normal mode, 1-HOLD. (Input HOLD IN reads COIL ADR 3030 0-inactive / unsaturated, 1-active) READ ONLY

STATE OF INPUT FOR SELECTION : COIL ADR 3026, 3031. READ ONLY

PV over range rngL-rngH : COIL ADR 3027. 1- PV>rngH 0- PV<rngH READ ONLY

PV under range rngL-rngH : COIL ADR 3028. 1- PV<rngL 0- PV>rngL READ ONLY

LED INDICATion	K1	K2	K3	AT (autotune)	A/M	Display OUT	Display SP
COIL ADR (READ ONLY)	2535 0-off, 1-on	2534 0-off, 1-on	2533 0-off, 1-on	2530 0-off, 1-on	2531 0-manual, 1-auto	2529 0-no, 1-yes	2528 0-no, 1-yes

FIRMWARE VERSION : HOLDING REG ADR 126, TYPE UINT.

CALIBRATION REGIME (CLBR) HOLDING REG ADR 249, TYPE UINT. Values: 0 - operating mode; 1-internal calibration; 2 - Pt1000; 3 - 10V; 4 - 20mA; 5 - confirms a related standard. If set to 2.3 or 4, it can not be changed without going through 0 or 5.

CALIBRATION COEFFICIENTS: HOLDING REG ADR 512 - 524, 626, 628 , TYPE FLOAT 4 BYTE IEEE754 RSP3 -512; RSP2-514; RSP1 -516; RSP0-518 - Polynomial calibration coefficients 'Non-standard input'. Convert norms. Linear Input 0-10000 (0-1V, 0-10V, 0-20mA Constant), μ V (TC intertemperature), Ω (RTD400 Ω inst.), Ω / 10 (RTD4K Ω constant), ==> a grade 3 polynomial.

Note: "Nonstandard input" transforms are a measured value without a decimal point. In this mode, the point has a decorative role. If the measurement should be displayed with more or less characters after a point, except to change the par. dPnt, you need to scale and coef. RSP0-3.

Example: 'nonstandard input' 0-10000 ==> PV 0-200 is transformed 0-10000 ==> PV 0.0-200.0 by assigning dPnt = 2 and RSP0 = 10.RSP0; RSP1 = 10.RSP1; RSP2 = 10.RSP2; RSP3 = 10.RSP3.

K-522, P-520: Polar Coefficients Converting Standard Line Input 0-10000 ==> Measured Dimension

Ret-526: coffe. in the conversion ADC ==> Ω

Offset-524 - offset of the measured value

K_C4, K_C3: K_C4-630 norms 0-20mA ==> 0-10000; K_C3- 632 norms 0-10V ==> 0-10000;

OTHER FEATURES:

- Individual registers bits are available through MODBUS FUNCTION 01 (READ SINGLE COIL), such as COIL ADR = HOLDING REG ADR * 16 + BIT NUMBER (in bytes). Add 8 if it is in ml. byte.
- It should not be read or recorded in registers not specified in the manual. When changing a register, the boundaries typical of the relevant parameter - the automotive device - are respected. only checks the parameters $tn1, 2 \leq t0$.
- Address uniqueness must be provided in advance for more than one device. line (par.nEtA).

HOLDING REGISTERS address table for MODBUS RTU RS485 communication

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0																	AOut1 %4	AOut1 %20	AOut1 PV4	AOut1 PV20
20	rnGL	rnGH	A1P1	A1P0	Adb	Adbt	Filt	Conf	Sens	DP	Syst			Hyst1	Hyst2	t0	tn1	tn2	Pb	ti
40	td	ALLo	ALLH	OF	db	Atun	AoFt	At=	ISuL	ISuH	TALo	SP e	SPII e	OUTe	PbII	tiII	tdII	ALII	AHII	OFII
60																	PbIII	tiIII	tdIII	ALIII
80	AHIII	OFIII	PbIV	tiIV	tdIV	ALIV	AHIV	OFIV	SPIII	SPIV	AOut2 %4	AOut2 %20	AOut2 PV4	AOut2 PV20	A2P1	A2P0	TAHi	T1AL	T1AH	
110					FOut	ZnFo	Fdsp	ZnFd									Ver	ADR		
200									OUT	SP	PV									
240									CLBR											
510			RSP3		RSP2		RSP1		RSP0		K		P		OFS		Ret			
630	K_C4		K_C3																	

The gray fields shown are part of the RAM. These parameters when the power is failure and subsequent switching on, initialize (equalize) their values from their respective (non-colored) fields in the non-volatile memory or are formed in the current mode according to the controller. All parameters in the non-volatile memory have a maximum number of records — 1000000.

XIII. 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 variable fluctuates and is not stable it is necessary to reduce the filter coefficient **FILt**. 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 **AdBt**. When increasing this parameter, the device reacts slower at an unexpected “jump” in the input, but ignores the short-term interference.

XIV.		USER OFFSET ADJUSTMENT FOR ANALOG INPUT <i>Incorrect intervention results in a measurement error!</i>
<p>In this mode, users can enter a value that will always be added when measuring the input variable (offset). This can be done when there is a discrepancy between the value displayed by the controller and the measured by reference instrument.</p> <p>At display SP (LED SP lit) push  and hold until the appearance of an inscription “ProG”.</p> <p>Without relaxing press and  until the appearance of an inscription COdE.</p> <p>Entered COdE= 47 (see ch.VIII. POGRAMING MODE). You see message "OFSt". A button is pressed.</p> <p> . Seen 0.0 . By  and  che desired offset is set. Confirmed with  (automatically 5 seconds after the last button pressed).</p> <p style="text-align: center;">EXAMPLES FOR USE SETTING OF OFFSET</p> <ol style="list-style-type: none">1. Display Indication: 129 enter offset: 3.42. New Display Indication: 132 enter offset: 0.63. New Display Indication: 133 enter offset: -1.0 New Display Indication: 132		

ANALOG INPUT CALIBRATION	
XV.	 <p style="color: red; text-align: center;"><i>Incorrect intervention results in a measurement error!</i></p> <p style="color: red; text-align: center;"><i>Calibration is done in the production process and does not need to be done by the user.</i></p>
<p>The service mode for setting the analogue input is only allowable to a person qualified to do so.</p> <p>Display [SP] →  (5s) → Display [Prog] → hold on  and push  → Display [CodE], release →  → Display [0] → with   entered [CodE=81] →  → Display [Clbr End], continues along the table :</p>	
[Clbr End]	 returns to operating mode,   select input Clbr End → Clbr Intr → Pt 3 → 10 v → 20 mA → Clbr End → ...
[Clbr Intr]	<p>Internal calibration. Short circuit compensation points of 3-wire RTD (Terminals 3,4) are connected. After confirmation, message is displayed. [Clbr UAit]. Wait for the calibration to complete itself for ~ 10 s.</p> <p> confirms the standard, <u>calibration is performed</u> for a short display [done]. Goes to the next input.</p>
[Pt 3]	4-wire 3kΩ reference resistor is connected
[10 v]	A reference voltage of 10V is connected
[20nA]	A reference current signal of 20 mA is connected
	  select the next input without calibrating

* only some of the inputs or only internal calibration can be calibrated. This does not affect the others. Step [Pt 3] sets the measurement of all RTDs (Pt, Ni, Cu) and the cold end of the TC. If an internal calibration is performed, it is done first.

SETTING A LINEAR INPUT ON TWO REFERENCE POINTS

Setting is common to the ranges 0-1V, 0-10V, 4-20mA и 0-20mA. For the function to be available, have to set ConF, Et = 1, ie. the rnGL, rnGH range does not adjust the readings, it is only a warning. Appropriate when the parameters of the connected transmitter are not known and can not be entered into rnGL, rnGH respectively. Only possible choice when the measurement range is outside the display (eg input 0-0,1V → readings 0-2000 - the measurement has a hardware range up to 20,000 at input 0-1V but 20,000 can not be Assign rnGH using the panel buttons), or if you want to tighten / expand rnGL, rnGH, without affecting the measurement, or reverse (since rnGL > rnGH should not be set).

To access must **ConF, Et to be = 1**, otherwise it returns automatically in operating mode. Entered [CodE=80] (see ch.VII) →  → Display [tun1] →  → at the input is given a first reference value →  → with   the value is set →  → Display [tun2] →  → given a second reference value →  → with   the value is set →  → operating mode

NON-STANDARD INPUT

At param. **Sens**, assimilated to any of the non-standard inputs (a name starting with **nS**), the device uses polynomial calibration coefficients '**Nonstandard input**'. They convert normal linear input 0-10000 (**0-1V, 0-10V, 0-20mA Nonstandard**), **μV(TC Nonstandard)**, **Ω (RTD400Ω Nonstandard)**, **Ω/10 (RTD4KΩ Nonstandard)**, ==>in measured value by a grade 3 polynomial. They are only set up via RS485 communication with the device (Chapter XIV), which must be calculated in advance according to the sensor characteristics.

* By "non-standard" is meant a sensor input with a non-linear transmission characteristic, for which no linearization has been applied in the device, i. is absent from the param values. **Sens**. This does not mean that the sensor does not comply with an industry standard.

** In the case of a "non-standard" TC sensor, the unit reads the cold end temperature, as is the case for all other thermocouples.

XVI. RESTORE TO FACTORY SETTINGS

In case of unsuccessful calibration or incorrect configuration of parameters, it is possible to return the factory settings by aligning the **SYST** option, **rE = 1** (see **HIDDEN SYSTEM PARAMETERS**). Factory parameters may need adjustments for the particular application.

The function only applies to certain parameters (see ch.VIII, note 2) – **hidden, service PARAMETERS**, calibration of input / output.

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, nature 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 e-mail: info@microsyst.net