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Instructions for use

AR915.B
Temperature setter – meter

Version 3.0.1
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Thank you for choosing our product.
This manual will enable proper handling, safe
using and making full use of the capacities of the setter.
Before assembling and starting the device please read
and understand this manual.
If you have additional questions, please contact our technical consultant.

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⚠   Pay special attention to the texts marked with this sign

The manufacturer reserves the right to make changes to the design and software of the device without deteriorating its technical parameters.

1. SAFETY RULES   ⚠

- before using the device, please read this manual carefully
- make sure that all wires are connected correctly to the test object
- before making any modifications to the wiring connections, turn off the voltage
- ensure proper operating conditions, consistent with the technical data of the device (signal levels, humidity, temperature, etc., chapter 5)

2. ASSEMBLY RECOMMENDATIONS   ⚠

The device has been designed to provide an adequate level of resistance to most of the disturbances that can occur in industrial environment. In environments with an unknown level of interference, it is recommended to use the following measures to prevent any possible disruption of the device's operation:

- avoid running signal wires in the immediate vicinity and parallelly to the power and power supply cables
- it is advisable to twist the signal wires in pairs
- avoid the proximity of remotely controlled devices, electromagnetic meters, high power loads, loads with phase or group power control and other devices generating large impulse noise
- use shielding of signal cables, whereby the shield grounding should be single-point, made as close as possible to the device
- use the same cables for resistance sensors in a 3-wire connection
- ground or neutralize the metal rails on which the rail devices are mounted

3. GENERAL CHARACTERISTICS OF THE DEVICE

- possibility of testing measuring devices and temperature sensors,
- universal input / output:
  - thermoresistive: Pt100, Ni100,
  - thermoelectric: J, K, S, B, R, T, E, N,
  - linear: voltage (mV), resistance (Ω),
- compact with small size and weight with rubberized non-slip side handles, simple and reliable in use laboratory banana connectors, functional keyboard, standard power supply: battery (2 x 1.5V) or accumulator (2 x 1.2V NiMH, NiCd), AA type (R6),
- long working time on new alkaline batteries or fully charged batteries
- USB interface (micro USB type B connector) for programming the configuration and preview of measurements (ARsoft-CFG), enabling power supply from an external mains or battery power supply of the "Power Bank" type
- intuitive operation, easy configuration and clear signaling of device operation states
- a two-line, readable LCD display with icons and measurement units, showing the type of the sensor, setpoints/measured values, battery level and other diagnostic messages
- IN / OUT operating mode signaled with flashing LEDs
- F key for quick selection of one of the programmed functions: quick change of sensor type, keyboard lock, freezing measurements (HOLD), cold junction temperature preview (connectors temperatures)
- free software available (for Windows 7/8/10) for configuration and copying parameters of the device (ARsoft-CFG), with the possibility of updating from the website
- programmable password protection for accessing configuration parameters
- high resistance to interference in industrial environments

CAUTION: ⚠

Before starting work with the setter, read this manual and perform the parameter configuration and electrical connections correctly.

4. CONTENTS OF THE SET

- Setter with alkaline batteries,
- user manual, warranty card,
- measuring wires,
- storage case.

5. TECHNICAL DATA

| Universal input/output for measuring or setting (in one operation mode: setting **OUT** or measuring **IN**)			
Input/output type:	Measuring range:	Input/output type:	Measuring range:
Pt100 (RTD)	-100÷850 °C	R (PtRh13-Pt) thermocouple	-40÷1600 °C

Ni100 (RTD)	-50÷170 °C	T (Cu-CuNi) thermocouple	-25÷350 °C
J (Fe-CuNi) thermocouple	-40÷800 °C	E (NiCr-CuNi) thermocouple	-50÷750 °C
K (NiCr-NiAl) thermocouple	-40÷1200 °C	(NiCrSi-NiSi) N thermocouple	-80÷1300 °C
S (PtRh 10-Pt) thermocouple	-40÷1600 °C	voltage	-5÷60 mV
(PtRh30PtRh6) B thermocouple	300 ÷ 1800 °C	resistive	20÷540Ω (IN), 20÷3200Ω (OUT)

Lead resistance for RTD	< 25 Ω (for each line)
Resistance **input / output current (RTD** , Ω)	~250 µA (for measurements), max. 1mA (for setting)
Processing Primary Error (at 25 °C ambient temperature)	for measurement: ≤ 0,3 % of sensor range ± 1C
	for setting: ≤ 0,3 % of sensor range ± 1C
Additional error (non-linearity)	≤ 0,5 °C (≤ 0,2 Ω for resistance measurement and setting)
Additional error (thermocouple input/output)	≤2 °C (only when automatic compensation of cold junctions temperature is active)
Additional error from temperature changes	≤ 0.01% of sensor range/ °C
Indication resolution (programmable)	0.1 or 1 (1Ω for resistance setting)
Setting resolution (programmable)	0.5 ÷ 200 (min. 2.6°C for Pt100, 1.8°C for Ni100, 1.0 Ω for res.)
Response time for measurements (10÷90%)	0.5 ÷3.5 s (programmable filtration degree, default 1.5 s)
Power supply (batteries or accumulators)	2x1.5V or 2x1.2V NiMH, type AA (R6)
Operating time (for 2500mAh alkaline batteries)	300 ÷ 500 hours (depending on operating mode and load)
Communication interface (MODBUS-RTU)	USB (micro B connector), drivers for Windows 7/8/10
Rated operating conditions	0 ÷ 50 °C, <90%RH (without condensation)
Weight	~140g (~190g with batteries, included in set)
Protection degree	IP43 (IP20 from connectors side)
Electromagnetic compatibility (EMC)	resistance: according to PN-EN 61000-6-2 norm
	emissivity: according to PN-EN 61000-6-4 norm

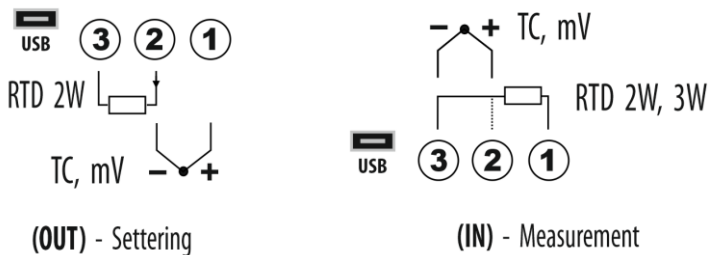## 6. HOUSING AND DESCRIPTION OF CONNECTORS AND EXTERNAL ELEMENTS

6.1. Housing specification

Material, Degree of protection	ABS, IP43 (IP20 from connectors side)
Housing dimensions (height, width, thickness)	136 x 80 x 25mm
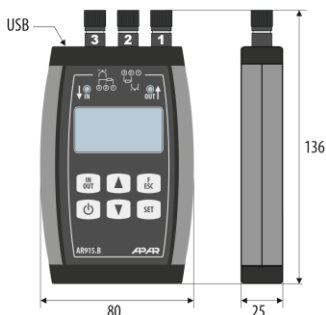
6.2. Description of connectors (top view)

(OUT) - Settering   **(IN)** - Measurement

6.3. How to place the batteries (accumulators) in the container (view from the bottom, after opening the lid)

7. KEYS FUNCTIONS

a) function of keys in the setpoint/ measured value display mode (normal mode)

Key	Description [and the method of marking in the content of the manual]
⏻	**[PWR]:** - switching the device on/off (after holding for about 2 seconds)
IN/OUT	**[IN/OUT]:** - operating mode setting: input - IN (measurement) or output - OUT (setting)
▲ + ▼	**[UP]** and **[DOWN]:** - entering the configuration menu (after a holding time longer than 2 seconds). If parameter 15: `Prot` = `on` (password protection is enabled) enter the access password (chapter 9)
▲ or ▼	**[UP]** or **[DOWN]:** - increasing or decreasing the setpoint of the output signal by the set changes step (parameter 9: `StEP`, chapter 9)
SET + ▲	**[SET]** + **[UP]:** - step (limit) change of the setpoint of the output signal – upper value of the range of the set sensor or narrowing of the settings (parameter 7: `L.iLo`)
SET + ▼	**[SET]** + **[DOWN]:** - step (limit) change of the setpoint of the output signal – lower value of range of sensor or narrowing the settings (parameter 8: `L.iHi`)
F ESC	**[F]:** - function key, performing the function programmed with parameter 17: `Func`

b) key functions in the parameter configuration menu (chapter 9)

Key	Descripiton
SET	- editing the current parameter - approving and saving the edited parameter value
▲ or ▼	**[UP]** or **[DOWN]**: - moving to the next or previous parameter name - changing the value of the edited parameter
SET + ▲ or SET + ▼	**[UP]** and **[SET]** or **[DOWN]** and **[SET]**: - changing the value of the edited parameter (with changes step x10, keys pressed simultaneously)
F ESC	**[ESC]**: - cancelling changes of the edited value (returning to the parameter name) - returning to displaying the setpoint/measured value (hold > 1s)
SET + ▲ + ▼	**SET] and [UP]** and **[DOWN]**: - restoring the default value of the edited parameter

8. SETTING THE VALUE OF THE OUTPUT SIGNAL

Pressing the **[UP]** or **[DOWN]** key in simulation mode (output - OUT) changes the setpoint value by the   set step (parameter 9: **StEP**). Using the combination of **[SET]**+**[UP]** keys sets the output on the smaller of   the following values: upper limit of the simulated sensor range or value of parameter 8: **t_IHI**, while **[SET]** + **[DOWN]** sets the output on the larger of the following values: lower limit of the simulated sensor range or value of parameter 7: **t_ILo**. In addition, the output signal can also be set in parameter programming mode (parameter 10: **SEt**).

9. SETTING CONFIGURATION PARAMETERS

All configuration parameters are contained in the non-volatile internal memory (saving when **[PWR]** is off). Parameters can be changed using the keyboard or the computer and the ARsoft-CFG software:

1. Configuration with the keyboard:
- from the setpoint/measured value display mode of the inputs in the configuration menu (press the **[UP]** and **[DOWN]** keys for a period longer than 2 sec.) If parameter 15: **Prot** = **on** (password protection is enabled) the display shows the message **CodE**, followed by **0000** with the first digit flashing, using the **[UP]** or **[DOWN]** key enter the access password (default parameter 14: **PASS** = **1111**), to move to the next positions and to confirm the code the **[SET]** key is used
- after entering the configuration menu, the mnemonic names of parameters are displayed (**StYP** <-> **rrtd** <-> **cutY** <-> etc.), the **[UP]** key takes you to the next, **[DOWN]** to the previous parameter
 (see Table 9 for a summary list of configuration parameters)
- to change or preview the value of the current parameter, press the **[SET]** key
- using the combination of **[UP]** or **[DOWN]** keys allows to change the parameter value (other combinations - chapter 7)
- confirm the changed value of the parameter with the **[SET]** key or cancel **[ESC]**, return to displaying the parameter name
- exit from the configuration: long (>1s) pressing the **[ESC]** key or automatically after approx. 2 min of inactivity

2. Configuration with ARsoft-CFG software:

- connect the device to the computer using a USB port and configure the ARsoft-CFG application
- setting and previewing device parameters are available in the **Parameters** window
- new parameter values must be confirmed with the **Approve changes** key
- before disconnecting from the computer, use the **Disconnect Device** key in ARsoft-CFG software
For details, see the ARsoft-CFG user manual, available on the website or in the installation folder.

In the event of a discrepancy between the indications and the actual value of the input/output signal, it is possible to tune zero and sensitivity to a given signal: parameters 11:`cALo` (zero) and 12:`cALG` (sensitivity) **(**note **4** under table 9**).**

To restore the factory settings , press the **[UP]** and **[DOWN]** keys until the password entering menu (`CodE`) appears, then enter the code `0112` and confirm with the **[SET]** key.

Table 9. Configuration parameters

Parameter	Range of parameter variability and description				Default settings
0:`StYP` sensor type (for measurement and simulation)	`Pt`	Pt100 sensor (RTD, -100÷850 °C)			`Pt`
	`ni`	Ni100 sensor (RTD, -50÷170 °C)			
	`rES`	resistive (IN: 20÷540Ω, OUT: 20÷3200Ω)			
	`tc-J`	thermocouple J (-40÷800°C)	`tc-r`	thermocouple R (-40÷1600°C)	
	`tc-k`	thermocouple K (-40÷1200°C)	`tc-t`	thermocouple T (-25÷350°C)	
	`tc-S`	thermocouple S (-40÷1600°C)	`tc-E`	thermocouple E (-50÷750°C)	
	`tc-b`	thermocouple B (300÷1800°C)	`tc-n`	thermocouple N (-80÷1300°C)	
	`U60`	voltage (-5÷60 mV)			
1:`rtd` total resistance of 2-wire for input `Pt`, `ni` and `rES`	`00`÷`50.00` Ω	compensation of the resistance of the lead for the 2-wire connection in the measurements			`0.0` Ω
2:`cJtY` cold junctions temperature compensation type (connectors temp.)	`Auto`	automatic, measurement with a sensor inside the housing, located close to the laboratory banana connectors			`Auto`
	`conS`	constant, defined by parameter 3:`cJtt`			
3:`cJtt` cold junctions temperature	`0.0` ÷ `50.0` °C	concerns thermocouples when `cJtY` = `conS` (for constant compensation)			`25.0` °C
4:`ModE` calibrator operating mode	`in`	measurement			`in`
	`out`	setting – simulation			
5:`FiLt` degree of filtration **(1)**	`3`÷`25`	affects the smoothness of the measured value jumps, greater filtration results in greater response time **(1)**			`9`
6:`dot` indication resolution **(2)**	`0` ÷ `1`	`0` - resolution 1 °C `1` - resolution 0.1 °C			`1`
7:`LLo` lower limit of settings	`-100.0` ÷ `3200`	lower limit of settings for setpoint:`SEt`			`-100.0`

8: `L_iHi` upper limit of settings	`-1000` ÷ `3200`	upper limit for setpoint: `SEt`	`3200`

9: `StEP`
step of change `SEt` **(3)**
	`05` ÷ `200`	step of changing the setpoint : `SEt`
		(`26` ÷ `2004` for `Pt` , `18` ÷ `1003` for `ni`) **(3)**
			`10`
			`[26 for Pt]`
			`[18 for ni]`

10: `SEt` setpoint	in the measuring range of the set sensor (parameter 0: `StYP`) or in the range of narrowing, defined by the limits `L_iLo` ÷ `L_iHi`		`0.0`
11: `cALo` zero calibration **(4)**	`-50.0` ÷ `50.0`	zero offset (does not apply to setting `Pt` , `ni` , `rES`)	`0.0`
12: `cALU` slope calibration **(4)**	`-85.0` ÷ `115.0`	reinforcement (does not apply to the setting `Pt` , `ni` , `rES`)	`100.0` %
13: `bLoc` keys lock	`oFF`	without locks	`oFF`
	`inou`	key **[IN/OUT]** lock	
	`SEt`	setpoint change lock **[UP]** and **[DOWN]**	
	`ALL`	all keys lock (except **[PWR]** and entering the configuration menu)	
14: `PASS` access password	`0` ÷ `9999`	access password to the parameter configuration (`0112` company values restoration code)	`1111`
15: `Prot` password protection	`oFF`	disabled, immediate access to configuration	`on`
	`on`	enabled, access password required	
16: `toFF` auto-off time	`0` ÷ `240` min.	when `toFF` = `0` function inactive	`0`
17: `Func` **F** key function	`nonE`	no function of **F** key, key inactive	`nonE`
	`StY`	quick editing of parameter 0: `StYP` sensor type	
	`hoLd`	holding the measured value in the measurement mode	
	`cJt`	cold junctions temperature preview (connectors temperature)	
	`bLoc`	keypad lock (except **[PWR]** and entering the conf. menu)	

NOTES:
(1) - `FiLt` = `9` , the response time is approx. 1.5s. For `FiLt` = `25` about 3.5 s. A higher degree of filtration means a smoothened value of the measurement and longer response time.
(2) - Does not apply to voltage setting when par. 0: `StYP` = `u60` . For voltage setting, displaying resolution is 0.01 mV.
(3) - The resistance setting is possible with a minimum step of 1 , therefore the setting for sensors `Pt` , `ni` , `rES` is respectively at least 2,6 ℃, 1,8° C, 1 Ω.
(4) - Does not apply to resistance setting and RTD (Pt100 and Ni100).

10. SIGNALING MESSAGES AND ERRORS. DIAGNOSTIC FUNCTIONS

a) measurement and setting errors (diagnostic functions):

Code	Possible causes of the error
`‾‾‾‾` `____`	- exceeding the permissible measuring range/set signal from top (`‾‾‾‾`) or bottom (`____`) - a different signal than the one set in the configuration is included (chapter 9, parameter 0: `StYP`)

b) messages and temporary errors (one time or periodic):

Code	Description of the message
`----`	initialization of the operating mode (input/output)
`PoFF`	switching off the calibrator (manual or automatic at too low battery voltage)
`CodE`	entering the mode of entering access password to the configuration parameters (chapter 9)
`Err`	an incorrect access password has been entered
`ErrE`	RAM fault
`EcJt`	error or damage to the internal temperature sensor of the connectors (cold junctions)
`ConF`	entry in the parameter configuration menu
`bLoc`	lock of setpoint setting or **[IN]**, **[OUT]** keys is enabled (parameter 13: `bLoc`, chapter 9)
`bLon`	keypad lock enabling - function of **F** key (sets parameter 13: `bLoc` = `ALL`)
`bLoF`	keypad lock-off - function of **F** key (sets parameter 13: `bLoc` = `oFF`)
`hoLd`	stopping the measurements (when the function key is active and parameter 17: `Func` = `hoLd`, chapter 9)
`SAuE`	recording of company parameter values (chapter 9)