

# USER MANUAL



**AR507**

# TEMPERATURE METER



*Thank you for choosing our product.  
This manual will enable proper handling, secure  
use and full utilization of the device capabilities.  
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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Please pay particular attention to the text marked with this sign.

The manufacturer reserves the right to make changes to the design and software of the device without any deterioration of technical parameters (some features may not be available in older versions).

## 1. SAFETY PRINCIPLES



- Before using the device, please read this manual carefully
- in order to avoid electric shock or damage to the device mechanical and electrical assembly should be commissioned to qualified personnel
- Before turning on the power, make sure that all cables have been connected correctly
- before making any modifications to the wiring connections, turn off the voltage supplied to the device
- ensure proper working conditions, in accordance with the technical specifications of the device (supply voltage, humidity, temperature, chapter 5)

## 2. INSTALLATION GUIDELINES



The device has been designed to provide an adequate level of resistance to most of the disturbances that can occur in industrial and home environments. 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:

- a) do not supply power to the device from the same lines as large capacity devices without proper mains filters
- b) use shielding of power, sensor and signal wires, and screen-grounding should be single-point, made as close as possible to the device
- c) avoid laying measuring (signal) wires in the immediate vicinity and parallel to power and supply cables
- d) it is recommended to twist signal wires in pairs or use a ready UTP wire
- e) avoid the proximity of remotely controlled devices, moving iron meters, high power loads, loads with phase or group power control and other devices generating large impulse noise
- f) ground or neutralize the metal rails on which the rail devices are mounted

Before starting working with the device, remove the protective foil of the display.

## 3. GENERAL METER CHARACTERISTICS

- 1 universal measuring input (supporting thermo-resistance, thermocouple sensors or digital probes of temperature AR182 and AR183)
- BIN input for stopping the measurement - HOLD function
- LED display with adjustable brightness
- line resistance compensation for resistive sensors
- temperature compensation of cold ends of thermocouples
- programmable input type, filtration and other configuration parameters
- access to configuration parameters protected by a user's password
- ways to configure parameters:
  - from the IP65 membrane keyboard placed on the front panel of the device
  - through the PRG port (AR955 programmer) and the free ARSOFT-CFG program (Windows 7/8/10)
- software and programmer enabling the preview of the measured value and fast configuration of single or ready parameter sets previously stored in the computer for the purpose of re-use, for example in other devices of the same type (duplication of configuration)
- panel enclosure, IP65 from the front
- high accuracy, long-term stability and resistance to noise
- wide range of supply voltages: 15 ÷ 250 Vac (alternating voltage 50/60 Hz), 20 ÷ 350 Vdc (direct voltage)
- available accessories:
  - AR955 programmer
  - digital temperature probes AR182, AR183



**CAUTION**  
Before starting operating the controller please read this manual  
and correctly perform electrical and mechanical installation and parameter configuration.

## 4. CONTENTS OF THE SET

- meter with mounting brackets in the panel window
- instructions for use
- warranty card

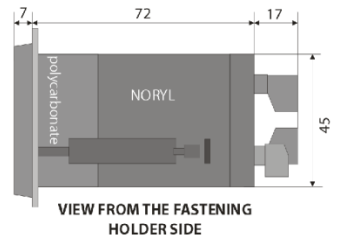
## 5. TECHNICAL DATA

universal input (set by parameter 0: <b>IP</b> )		measuring range
- Pt100 (3- or 2-wire)		-100÷850°C
- J (Fe-CuNi) thermocouple		0 ÷ 880 °C
- K (NiCr-NiAl) thermocouple		0 ÷ 1200 °C
- S (PtRh 10-Pt) thermocouple		0 ÷ 1750 °C
- B (PtRh30PtRh6) thermocouple		300 ÷ 1800 °C
- R (PtRh13-Pt) thermocouple		0 ÷ 1600 °C
- T (Cu-CuNi) thermocouple		0 ÷ 380 °C
- E (NiCr-CuNi) thermocouple		0 ÷ 700 °C
- N (NiCrSi-NiSi) thermocouple		0 ÷ 1300 °C
- AR182 digital temperature probe		-50÷120°C
- AR183 digital temperature probe		-50÷80°C
<b>Response time</b> (10 ÷ 90%)		0.5 ÷ 2 s (programmable with parameter 1: <b>FE</b> )
<b>Lead resistance</b> (Pt100)		Rd <30 Ω (for each line)
<b>Resistance input current</b> (Pt100)		~ 250 μA
<b>Processing errors</b> (at an ambient temperature of 25 °C):		
- basic	- for Pt100	0.2% of the measuring range ± 1 digit
	- for thermocouples	0.3% of the measuring range ± 1 digit
- additional for thermocouples		<2 °C (temperature of cold ends)
<b>Resolution of the measured temperature</b>		programmable, 0,1 °C or 1 °C
<b>Binary input</b> (contact or voltage <24 V)		bistable, active level: short circuit or <0.8 V
<b>Communication interfaces</b>	- PRG programming connector (without separation), standard	- 2,4 kb/s speed, - 8N1 character format (8 bits of data, 1 bit of stop, no parity bit) - MODBUS-RTU protocol (SLAVE)
<b>7 segment LED display</b> (with brightness adjustment)		red, 4 digits 20 mm
<b>Signalling</b>	- messages and errors	LED display
<b>Power supply</b> (Uzas)	universal, compliant with 24 V and 230 V standards	15 ÷ 250 Vac, <0,8 VA (alternating voltage, 50/60 Hz)
		20 ÷ 350 Vdc, <0,8 W (direct voltage)
<b>Nominal operating conditions</b>		0 ÷ 50 °C, <90% RH (without condensation)
<b>Working environment</b>		air and neutral gases

<b>Protection level</b>	IP65 from the front, IP20 from the connectors	
<b>Weight</b>	~ 145 g	
<b>Electromagnetic compatibility (EMC)</b>	resistance: according to PN-EN 61000-6-2 norm	
	emissivity: according to PN-EN 61000-6-4 norm	
<b>Safety requirements according to PN-EN 61010-1</b>	installation category - II	
	Pollution degree - 2	
	value of voltage to earth for the power supply circuit, output - 300 V	
	value of voltage to earth for input circuits - 50 V	
	insulation resistance > 20 MΩ	
	altitude above the sea level <2000 m	

## 6. ENCLOSURE DIMENSIONS AND INSTALLATION DATA

<b>Enclosure type</b>	panel, Incabox XT
<b>Material</b>	self-extinguishing NORYL 94V-0, polycarbonate
<b>Enclosure dimensions (W x H x D)</b>	96x48x79 mm
<b>Panel window (W x H)</b>	92 x 46 mm
<b>Mounting</b>	with handles on the side of the housing
<b>Cable cross-sections (for separable connectors)</b>	2,5mm <sup>2</sup> (power supply), 1,5mm <sup>2</sup> (other)

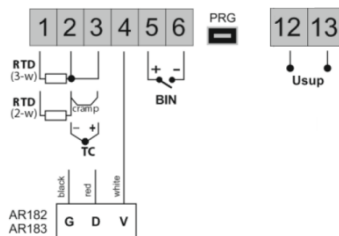


## 7. DESCRIPTION OF TERMINAL STRIPS AND ELECTRICAL CONNECTIONS

Table 7. Numbering and description of clamping rails







Clamps	Description
1-2-3	Pt100 input (2- and 3-wire)
2-3	thermocouple input TC (J, K, S, B, R, T, E, N)
2-3-4	input for digital temperature probes AR182, AR183
5-6	binary input (contact or voltage <24 V)
PRG	programming connector for cooperation with the programmer ( <b>only AR955 or AR956</b> )
12-13	power input

a) AR507 - description of brackets Table 7








## 8. MEANING OF BUTTONS

a) button functions in the measurement display mode

Button	Description [and the method of marking in the content of the manual]
 + 	<b>[UP]</b> and <b>[SET]</b> : display of the maximum measurement (holding down the buttons for more than 6s deletes the stored maximum measurement)
 + 	<b>[DOWN]</b> and <b>[SET]</b> : display of the minimum measurement (holding down the buttons for more than 6s deletes the stored minimum measurement)
 + 	<b>[UP]</b> and <b>[DOWN]</b> (simultaneously): enter the parameter configuration menu (after holding time greater than 2 seconds). If parameter 4: <b>PPro</b> = <b>on</b> (password protection is enabled), enter the access password (Chapter 9)

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

Button	Description [and the method of marking in the content of the manual]
	<b>[SET]</b> : - editing the current parameter (flashing of the edited value) - confirmation and saving of the changed parameter value
 lub 	<b>[UP]</b> or <b>[DOWN]</b> : - going to the next or previous parameter - changing the value of the edited parameter
 + 	<b>[UP]</b> and <b>[DOWN]</b> (simultaneously): - cancelling changes of the edited value (flashing stops) - return to the measurement display mode (holding time > 1s)

## 9. SETTING OF THE CONFIGURATION PARAMETERS

All controller configuration parameters are contained in non-volatile (permanent) internal memory. When switching on the device for the first time, an error signal (chapter 10) may appear on the display due to the lack of a sensor or an attached one other than the factory programmed one. In this case, the appropriate sensor should be attached or the configuration parameters should be corrected.

There are two ways to configure the parameters:

1. From the membrane keyboard placed on the front panel of the device:

- from the display mode of input measurements in the configuration menu (simultaneously press the **[UP]** and **[DOWN]** buttons) for a period longer than 2 sec. If parameter 4: **PPro** = **on** (password protection is enabled) on the display the message **Code** will appear, followed by **0000** with the first digit flashing, with the **[UP]** or **[DOWN]** button enter the access password (company parameter 3: **PASS** = **1111**), to move to the next positions and to confirm the code **[SET]** button is used
- after entering the configuration menu (with the message **Conf**) the display shows the mnemonic name of the parameter (**inP** <-> **FiL** <-> **doE** <-> etc.)
- the **[UP]** button will take you to the next one, **[DOWN]** to the previous parameter (summary list of the configuration parameters is included in Table 9)
- to change the value of the current parameter, briefly press the **[SET]** button (flashing in edit mode)
- change the value of the parameter being edited using the **[UP]** or **[DOWN]** buttons
- confirm the changed parameter value with the **[SET]** button or cancel it with **[UP]** and **[DOWN]** (simultaneous, short press), takes you back to displaying the parameter name

- exit from configuration: long press of **[UP]** and **[DOWN]** buttons or automatically after approx. 2 minutes of inactivity

**2.** Through the PRG port (AR955 / AR956 programmer) and the ARSOFT-CFG computer program (Chapter 11):

- connect the controller to the computer port, run and configure the ARSOFT-CFG application
- after establishing the connection, the current measured value is displayed in the program window
- setting and viewing device parameters is available in the parameter configuration window
- new parameter values must be confirmed with the Apply **changes** button
- the current configuration can be saved to a file or set with values read from the file

**CAUTION:** 

- before disconnecting the device from the computer, use **the Disconnect the device** (ARSOFT-CFG) button
- in the absence of a response:
  - check the port configuration in **the Program Options**
  - make sure that the serial port drivers on the computer have been correctly installed for AR955 / AR956 programmer
  - disconnect for a few seconds and reconnect the AR955/AR956 programmer
  - restart the computer

If there is a discrepancy between the indications and the actual value of the input signal, it is possible to tune the zero and sensitivity to a given sensor: parameters 7: **ARLo** (zero) and 8: **ARLQ** (sensitivity).

In order to restore the factory settings press the **[UP]** and **[DOWN]** buttons during start until the password entry menu appears (**Code**), and then enter the code **0112**. Alternatively, you can use the file with the default configuration in the ARSOFT-CFG program.

**CAUTION:** 

Do not configure the device simultaneously from the keyboard and through the serial interface (AR955 / AR956).

Table 9. A cumulative list of configuration parameters

Parameter	Range of parameter variability and description		Default settings
0: <b>inp</b> type of measurement input	<b>PL</b>	thermo-resistance sensor Pt100 (-100 ÷ 850 °C)	<b>PL</b>
	<b>tc-J</b>	thermoelectric sensor (thermocouple) type J (0 ÷ 880° C)	
	<b>tc-K</b>	thermoelectric sensor (thermocouple) type K (0 ÷ 1200° C)	
	<b>tc-S</b>	thermoelectric sensor (thermocouple) type S (0 ÷ 1750° C)	
	<b>tc-B</b>	thermoelectric sensor (thermocouple) type B (300 ÷ 1800° C)	
	<b>tc-R</b>	thermoelectric sensor (thermocouple) type R (0 ÷ 1600° C)	
	<b>tc-T</b>	thermoelectric sensor (thermocouple) type T (0 ÷ 380° C)	
	<b>tc-E</b>	thermoelectric sensor (thermocouple) type E (0 ÷ 700° C)	
	<b>tc-N</b>	thermoelectric sensor (thermocouple) type N (0 ÷ 1300° C)	
	<b>AR-18</b>	digital temperature probe AR182 or AR183	
1: <b>FILt</b> filtration (1)	<b>5</b> ÷ <b>15</b>	digital filtration of measurements (response time)	<b>5</b>
2: <b>dot</b> dot position / resolution	<b>0</b>	resolution 1° C	<b>0</b> (0.1° C)
	<b>1</b>	resolution 0.1° C	
3: <b>PASS</b> access password	<b>0000</b> ÷ <b>9999</b>	password to access the parameter configuration menu	<b>1111</b>

4: <b>PrPo</b> protection of configuration with access password	<b>off</b>	entering the configuration menu is <b>not</b> protected with password	<b>on</b>
	<b>on</b>	entry to the configuration menu is protected with an access password	
5: <b>br d</b> brightness	<b>50 ÷ 100%</b>	display brightness, 10% increments	<b>100 %</b>
6: <b>Func</b> <b>BIN</b> input function	<b>none</b>	<b>BIN input</b> is inactive	<b>none</b>
	<b>hold</b>	suspension of measurement	
7: <b>ARLo</b> zero calibration	zero offset for measurements: <b>-500 ÷ 500</b> °C		<b>0.0</b> °C
8: <b>ARLo</b> reinforcement	<b>85.0 ÷ 115.0%</b>	slope calibration (sensitivity) for measurements	<b>100.0 %</b>

**Notes: (1)** - for **FiltL** = **0** the response time is about 0.5 seconds, for **FiltL** = **15** at least 2 s.

Higher degree of filtration means more "smoothed" measured value and longer response time, recommended for turbulent measurements (eg water temperature in a boiler)

## 10. MESSAGE AND ERROR SIGNALING

a) measurement errors:

Code	Possible causes of the error
<b>----</b>	- sensor measurement range exceeding from top ( <b>----</b> ) or from bottom ( <b>----</b> )
<b>----</b>	- damage or incorrect connection of the sensor
<b>----</b>	- a sensor other than the one set in the configuration has been connected (chapter 9, parameter 0: <b>mP</b> )
<b>----</b>	- no communication with the AR182, AR183 digital probe
<b>----</b>	- damage or incorrect connection of the digital probe
<b>----</b>	- a sensor other than the one set in the configuration has been connected (chapter 9, parameter 0: <b>mP</b> )

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

Code	Description of the message
<b>EodE</b>	the mode of entering the access password to configuration parameters, chapter 9
<b>Err</b>	an incorrect access password has been entered
<b>EonF</b>	entry in the parameter configuration menu
<b>hold</b>	suspension of measurements
<b>SRUE</b>	recording of company parameter values (chapter 9)

## 11. CONNECTING THE CONTROLLER TO A COMPUTER AND AVAILABLE SOFTWARE

Connecting the meter to a computer can be useful in the following situations:

- quick configuration of parameters, including copying the settings to other meters of the same type
- monitoring and recording of the measured temperature.

The meters are normally equipped with a PRG port enabling connection with a computer using the AR955/AR956 programmer (without galvanic separation, cable length ≈ 1.2m). The programmer requires that the supplied serial port drivers are installed in the computer. Please pay attention to the port configuration in the options of the ARSOFT-CFG program (virtual COM port number). Communication with devices is carried out using a protocol compatible with MODBUS-RTU. The ARSOFT-CFG application is available on the website [www.apar.pl](http://www.apar.pl) in the *Download* section or on a CD provided with the AR955 / AR956 programmer (for Windows 7/8/10 operating systems). The main features of the program are as follows:



Name	Description of the program
<b>ARSOFT-CFG</b> (free of charge)	<ul style="list-style-type: none"> <li>- display of current measurement data from the connected device</li> <li>- quick configuration of device parameters, type of measuring input, filtration, access, etc. (chapter 9)</li> <li>- creation on the disc a file with the extension ".cfg" containing the current configuration of the parameters for re-use (e.g., to duplicate configurations)</li> <li>- the program requires communication with the meter via the PRG port (AR955/AR956)</li> </ul>

A detailed description of the above mentioned application is in the installation folder.