

# APAR - TRADE OFFICE

05-090 Raszyn, ul. Gałczyńskiego 6  
Tel. 22 853-48-56, 22 853-49-30, 22 101-27-31  
E-mail: automatyka@apar.pl  
Internet: www.apar.pl



## Instruction manual

# Temperature transducers AR550, AR553, AR580, AR581



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*Thank you for choosing our product.*

*This manual will facilitate proper operation, safe use  
and full utilization of this device.*

*Thoroughly read and understand this instruction manual before  
commencing installation and start-up.*

*Should you have any additional questions, feel free to contact our technical advisers.*

## **TABLE OF CONTENTS**

<b>1. SAFETY RULES .....</b>	<b>3</b>
<b>2. INSTALLATION RECOMMENDATIONS .....</b>	<b>3</b>
<b>3. GENERAL SPECIFICATION OF TRANSDUCERS .....</b>	<b>3</b>
<b>4. TECHNICAL DATA .....</b>	<b>4</b>
<b>5. HOUSING DIMENSIONS AND INSTALLATION SPECIFICATION .....</b>	<b>5</b>
<b>6. DESCRIPTION OF THE TERMINAL BLOCK AND ELECTRICAL CONNECTIONS .....</b>	<b>5</b>
<b>7. CONNECTORS – ARRANGEMENT AND DESCRIPTION .....</b>	<b>5</b>
<b>8. PROGRAMMING CONFIGURATION PARAMETERS .....</b>	<b>6</b>
<b>9. OUTPUT CONFIGURATION .....</b>	<b>7</b>
<b>10. INDICATION OF MEASURING ERRORS .....</b>	<b>7</b>
<b>11. NOTES .....</b>	<b>7</b>
<b>12. TRANSDUCER CONNECTION METHODS .....</b>	<b>8</b>

## 1. SAFETY RULES

- **read this instruction manual thoroughly before commencing to use this device**
- before switching on the power supply, make sure that all cables are appropriately connected to avoid device damage
- ensure suitable operating conditions in line with the device specification (supply voltage, humidity, temperature)
- switch off power supply before attempting any modification of connected cables

## 2. INSTALLATION RECOMMENDATIONS

The device has been designed to ensure a suitable level of immunity to the majority of disturbances that can occur in an industrial environment. In environments where the level of interference is unknown it is recommended to use the following measures preventing the potential interference of instrument operation:

- do not supply the voltage from the same lines as high power devices without using appropriate line filters
- use screened supply, sensor and signal cables, the screens should be earthed on one end only as close to the instrument as possible
- avoid laying supply and signal cables directly next to and in parallel to electrical power cables and supply cables
- it is recommended to twist signal cables in pairs
- in the case of resistance sensors with 3-cable connections identical cables should be used
- avoid installing the instrument in proximity to remotely controlled devices, electromagnetic measuring instruments, high power loads, loads with phase or group power control and other devices generating impulse interference
- earth or neutrally ground metal bars on which bar instruments are mounted

## 3 . GENERAL SPECIFICATION OF TRANSDUCERS

- linear processing of the measured temperature to a current or voltage signal
- universal input :
  - thermoresistance ... Pt100
  - thermocouple ..... J, K, S, N, E
- **AR553** in an **AR550** model with an integrated Pt100 sensor
- analogue input proportional to the measured temperature
  - current 4+20mA or 20+4mA (2-cable with current loop supply) or
  - voltage 0+10Vdc (3-cable)
- **AR581** - current output only
- housing
  - AR580, AR581 - for installing on a TS35 bar (DIN bar)
  - AR550, AR553 - industrial IP65, 64x58x35 mm
- processing range, input type and other parameters configured using the AR950 programmer or the AR956 programming set
- exceeded processing range or sensor error signalled with a LED
- high accuracy and immunity to interference

### CAUTION:

When configuring transducer parameters using the AR956 programmer, set the following transmission parameters in ARSOFT-CFG WZ1 options:

- COM port number: specified by Windows after the AR956 driver is installed, go to "Device Manager" group "Ports (COM & LPT)", see "Quick start programmers AR955 and AR956"
- transmission rate (bit/s) 2400 bit/s
- MODBUS address = 1

A detailed description of configuration parameters can be found in Chapter 8 (page 6).

## 4. TECHNICAL DATA

<b>Universal input</b> (programmed with <b>inP</b> parameter)	<b>measuring range</b>
- Pt100 (3- or 2-cable) .....	-100 ÷ 850 °C, <b>AR553</b> : -30 ÷ 60 °C
- thermocouple J .....	-5 ÷ 800 °C
- thermocouple K .....	-5 ÷ 1200 °C
- thermocouple S .....	-5 ÷ 1600 °C
- thermocouple N .....	-5 ÷ 1300 °C
- thermocouple E .....	-5 ÷ 700 °C
<b>Cold ends temperature compensation</b> .....	automatic or fixed
- programmed with parameters <b>CELE</b> and <b>CEEE</b> .....	see chapter 8, Table 1
<b>Lead resistance for Pt100</b> .....	Rd < 25 Ω - each line with 3-cable connection
<b>Pt100 resistance input current</b> .....	~300 µA
<b>Processing range</b> (programmable) .....	within the input measuring range
- processing range minimum width .....	40°C
- measuring resolution .....	0,1 °C
<b>Current output</b> (programmable) .....	4+20 mA, 20+4 mA
- load characteristics .....	Robc < (Uzas-10V) / 21mA < 1238 Ω
- output current resolutions .....	16000[µA] / (processing range [°C])
- maximum resolution .....	2µA
- nonlinearity .....	< 0,04%
<b>Voltage output</b> (programmable) .....	0+10 lub 10+0 Vdc
- load characteristics .....	lobc < 4mA (Robc > 2500 Ω)
- output voltage resolutions .....	10000[mV] / (processing range [°C])
- rmaximum resolution .....	1,25mV
- nonlinearity .....	< 0,04%
<b>Offset and slope correction</b> .....	parameters <b>ERL0</b> (zero offset) and <b>ERL1</b> (sensitivity)
<b>Processing intrinsic error</b> (25°C)	
- for Pt100 input .....	< 0,2% of the full measuring range
- for thermocouple input .....	< 0,3% of the full measuring range
- processing resolution error (%) .....	± 0,1°C x 100 / processing range [°C]
<b>Additional errors</b>	
- cold ends temperature compensation .....	< 2°C (thermocouple inputs only)
- cables resistance compensation .....	< 0,1% Pt100 input measuring range
- environment temperature variation .....	< 0,01 % measuring range / °C
<b>Rated operating environment</b>	
- supply (+Vz) - transducer with current output .....	10+36Vdc (>10[V]+Robc[Ω]x0.021[A])
- supply (+Vz) - transducer with voltage output .....	18+36Vdc, lobc < 4mA
- operating temperature and relative humidity range	
AR580, AR581 .....	0+60°C, 0+ 90%RH (no condensation)
AR550, AR553 .....	-30+60°C, 0+100%RH (no condensation)
<b>Response time</b> (10+90%) .....	programmable within range 350+1600 ms
<b>Indication of detected errors</b>	
- optical .....	red LED
- current output signal .....	3,8 or 21 mA
- voltage output signal .....	10,6 V
<b>Housing AR580</b> for TS35 bar (MODULBOX 1MH53) .....	dimensions 18x90x58 mm, weight ~20g
- protection rating .....	IP40 (housing), IP20 (terminals)
<b>Housing AR581</b> for TS35 bar (GUIDEBOX COMPACT) .....	dimensions 6,2x76,9x99,1 mm, weight ~20g
- protection rating .....	IP40 (housing), IP20 (terminals)
<b>Housing AR550, AR553 (industrial)</b> .....	dimensions 64x58x35mm, weight ~100g
- protection rating .....	IP65
<b>Electromagnetic compatibility (EMC)</b>	
- immunity : wg normy PN-EN 61000-6-2:2002(U)	
- emissivity : wg normy PN-EN 61000-6-4:2002(U)	
<b>Factory setting</b> .....	see Chapter 8, Table 1

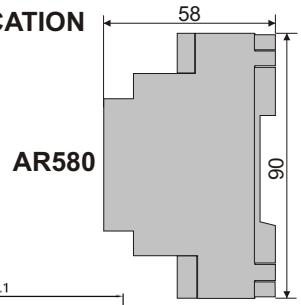
**CAUTION** - programmable parameters can be configured with the AR950 programmer or the AR956 programming set

- programming port in AR550 and AR553 can be accessed after the face cover is removed

## 5. HOUSING DIMENSIONS AND INSTALLATION SPECIFICATION

### AR580, AR581

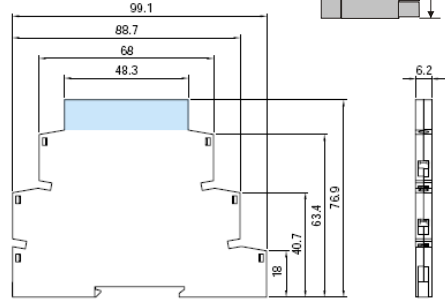
AR580 - MODULBOX 1MH53 .....	18x90x58 mm
AR581 - GUIDEBOX COMPACT .....	6,2x76,9x99,1 mm
Installation on bar .....	TS35 (DIN EN 50022-35)
Connecting loads and supply .....	screw terminals



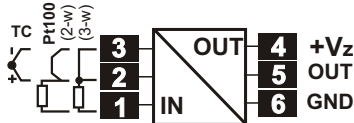
### AR550, AR553 (figure in Chapter 7)

Dimensions .....	64x58x35mm
Mounting holes .....	2 x $\Phi$ 4,3mm
Material .....	polycarbonate, IP65

### AR581



## 6. DESCRIPTION OF THE TERMINAL BLOCK AND ELECTRICAL CONNECTIONS



AR581 - current output only

terminals	descriptions
1-2-3	Pt100 input, 2- or 3-wire
2-3	termocouple input TC (J, K, S, N, E)
4	supply input +Vz
5	4÷20mA current or 0÷10Vdc voltage output
6	voltage output ground

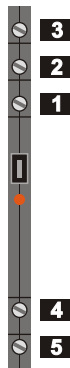
## 7. CONNECTORS – ARRANGEMENT AND DESCRIPTION

### AR580



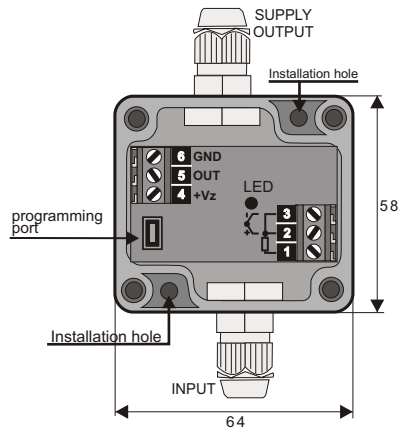
programming ports  
LEDs

### AR581



### AR550, AR553

inside with face cover removed



3 cable model



**CAUTION :**  
Connecting devices other than AR950 or AR956 programmer can cause permanent damage to the connected device and to the transducers

## 8. PROGRAMMING CONFIGURATION PARAMETERS

All the configuration parameters of the device are stored in the non-volatile internal memory.

When the device is switched on for the first time, an error may occur due to the lack of a sensor or the fact that the sensor that is connected is not one that is factory-programmed. In such a situation, the appropriate sensor or analog signal should be connected or the parameter configuration must be performed.

Methods of parameter configuration via the PR socket (accessible by opening the transparent front cover):

1. Use the AR956 programmer and the ARSOFT-CFG software to:

- connect the device to a computer port and to start and configure the ARSOFT-CFG application
- after the connection has been established, the current measured value is displayed in the window of the software
- setting and viewing of the device parameters is possible in the parameter configuration window
- new parameter values must be approved with the **Approve changes** button
- the current configuration can be saved in a file or set using values read from a file

### NOTE:

- before disconnecting the device from a computer, press the **Disconnect device** button (ARSOFT-CFG)
- in the event of no response:
- in the **Program options** check the configuration of the port and the **MODBUS address of the device** (transmission speed 2,400 bit/s, MODBUS address=1)
- make sure that the serial port drivers in the computer have been properly installed for the AR956 programmer
- disconnect for a few seconds and then reconnect the AR956 programmer
- restart the computer
- if the AR955 programmer is used instead of the AR956 programmer, connect the power supply voltage to the transducer (put it in the current loop)

2. Use the autonomous AR950 programmer to:

- connect the power supply voltage to the transducer;
- use the cable included in the set to connect the AR950 programmer to the device being configured (an AR5xx series transducer);
- the programmer can be connected both before the power supply is switched on and during operation of the device;
- enter the configuration parameters programming mode by pressing (for about 2 s) the **CONF** button until the **CONF** message briefly appears on the display and then the mnemonic name of the first parameter is displayed ( **inP** ); by pressing the **▲** button, you can move to the next parameter, and by pressing the **▼** button - to the previous parameter ( **inP** ↔ **FIL** ↔ **doE** ↔ ... ); a list of configuration parameters can be found in the user instruction of the device being configured;
- in order to change or view the value of the current parameter, press SET (edition of the parameter);
- by using **▲** or **▼**, you can change the value of the current parameter;
- by pressing SET again, you can save the edited value and return to the parameter name display (e.g. **FIL** );
- in the parameter edition mode, by pressing **ESC** for a short time, you can cancel the changes and return to the parameter name display mode;
- you can exit the configuration parameters programming mode by pressing the **ESC** button for a long time (approx. 1 s); otherwise, the mode is switched off after approx. 2 minutes;
- in the normal mode, the measured value is displayed;

Detailed information can be found in the user instruction of the AR950 programmer.

In the event of indications different than the actual value of the input signal, the zero and the sensitivity of a sensor can be tuned: parameters 7: **FIL** (zero offset) and 8: **FIL** (sensitivity).

In order to restore the default settings, use the file with the default configuration in ARSOFT-CFG software.

Table 1. Configuration parameters

Table 1. Configuration parameters				Settings		
No	Name	Parameter description	Parameter value and change range	factory	user	
0	<b>inp</b>	input type (sensor)	RTD Thermocouples	<b>0</b> = Pt100 <b>1</b> = J, <b>2</b> = K, <b>3</b> = S, <b>4</b> = E, <b>5</b> = N	<b>0</b> = Pt100	
1	<b>fil</b>	filtration level (1)	<b>2</b> + <b>15</b>	<b>0</b> = 0,9s		
2	<b>dob</b>	indication resolution (2)	<b>0</b> = 1°C, <b>1</b> = 0,1°C	<b>1</b> = 0,1°C		
3	<b>cut</b>	cold end temperature compensation type	<b>0</b> = automatic, <b>1</b> = fixed, value in acc. with parameter 4 <b>cut</b>	<b>0</b>		
4	<b>cut</b>	cold ends temperature	<b>00</b> + <b>500</b> °C (for thermocouples for <b>cut=1</b> )	<b>250</b> °C		
5	<b>rbot</b>	temperature for 4mA/0V	in the measuring range of input type	<b>00</b> °C		
6	<b>rtop</b>	temperature for 20mA/10V	in the measuring range of input type	<b>1000</b> °C		
7	<b>zro</b>	zero offset	<b>-0000</b> + <b>10000</b> °C or <b>0000</b> + <b>10000</b> units (1)	<b>00</b> °C		
8	<b>zro</b>	amplification	<b>-850</b> + <b>1150</b> %	<b>1000</b> %		

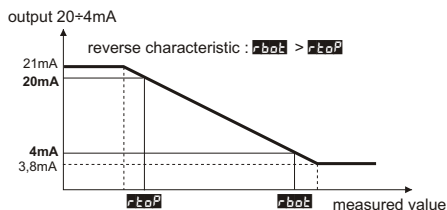
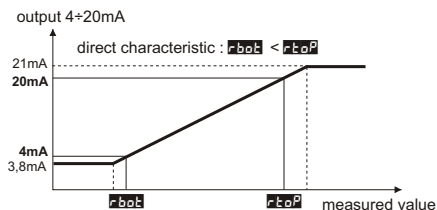
**Remarks:** (1) - dla **fil=0** response time is about 0,35s, for **fil=15** about 1,6s. A higher filtering level corresponds to a smoother measurement value and longer response time  
(2) - this applies to displaying data on the AR950 programmer

Reverse characteristics can be obtained by setting **rbot** > **rtop**

for AR553: **rbot** = -30.0, **rtop** = 60.0

## 9. OUTPUT CONFIGURATION

Input signal is directly proportional to the measured signal within the range set with parameters 5: **rbot** and 6: **rtop**. Figures below present the principle of operation of the analogue output.



## 10. INDICATION OF MEASURING ERRORS

The transducer detects the following measuring errors:

- low or high processing range exceeded
- connected sensor differs from the one set in configuration parameters
- sensor circuit damaged

Indication of measuring errors:

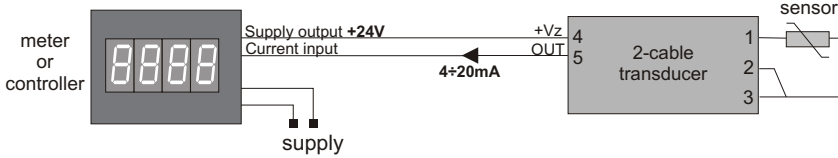
- LED flashes

## 11. NOTES

## 12. TRANSDUCER CONNECTION METHODS

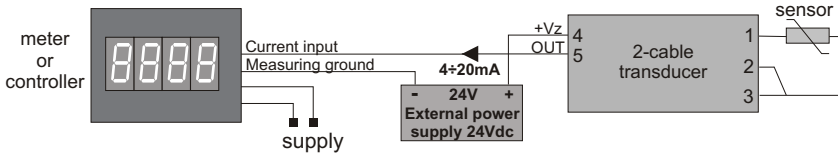
### 12.1. Connecting the sensor, power supply and output of a 2-cable transducer (transducer supplied from the instrument)

- Pt100 temperature sensor connected to terminals 1, 2 and 3, thermocouples to terminals 2 and 3
- supply cable to terminal +Vs (4)
- instrument current or voltage input cable to terminal OUT (5)



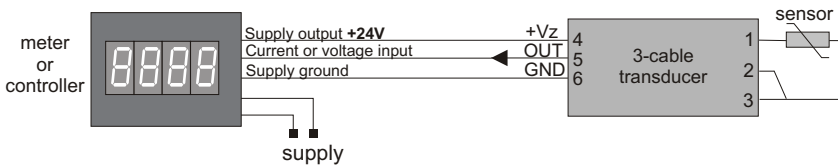
### 12.2. Connecting the sensor, power supply and output of a 2-cable transducer (with an external power supply)

- Pt100 temperature sensor connected to terminals 1, 2 and 3, thermocouples to terminals 2 and 3
- power supply cable +24V to terminal +Vs (4)
- power supply cable -24V to instrument measuring ground
- instrument current or voltage output cable to terminal OUT (5)



### 12.3. Connecting the sensor, power supply and output of a 3-cable transducer (transducer supplied from the instrument)

- Pt100 temperature sensor connected to terminals 1, 2 and 3, thermocouples to terminals 2 and 3
- supply cable to terminal +Vs (4)
- instrument measuring ground cable to terminal GND (6)
- instrument current or voltage input cable to terminal OUT (5)



### 12.4. Connecting the sensor, power supply and output of a 3-cable transducer (with an external power supply)

- Pt100 temperature sensor connected to terminals 1, 2 and 3, thermocouples to terminals 2 and 3
- power supply cable +24V to terminal +Vs (4)
- power supply cable -24V to terminal GND (6), then to instrument ground
- instrument current or voltage input cable to terminal OUT (5)

