

# AR654 UNIVERSAL FOUR-CHANNEL CONTROLLER

## WITH PROCESS RECORDING

PROTECTION RATING

IP65

REAR USB PORT

PROTECTION RATING

IP30

FRONT AND REAR USB PORTS



4GB MEMORY

MODBUS TCP

DDNS



Timer



USB



Ethernet



Modbus RTU

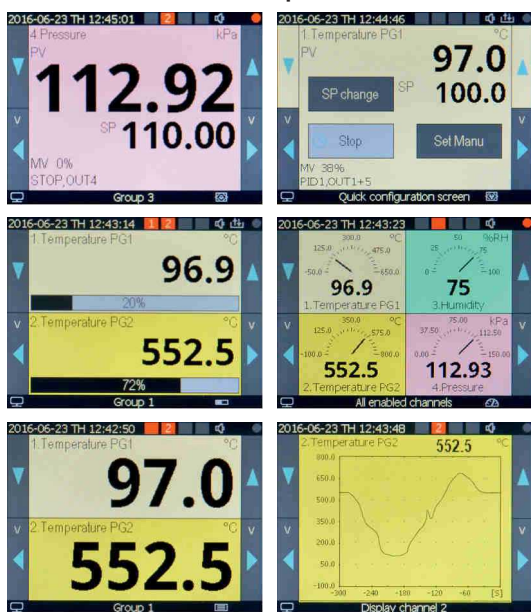


www



e-mail alarms

### Methods of data presentation



### Web server

#### AR654

Measurement Charts

Internal time: 2017-04-07 FR 11:21:36

Measuring channels:

1. Temperature PG1 PID1,OUT1+5 MV 16%	PV 98.6 °C SP 100.0
2. Temperature PG2 PID2,OUT2 MV 100%	PV 544.4 °C SP 560.0
3. Humidity ON-OFF,OUT3 MV 0%	PV 75 %RH SP 80
4. Pressure STOP,OUT4 MV 0%	PV 107.83 kPa SP 110.00

Output status / assigned inputs:

OUT1: ●  
OUT2: ●  
OUT3: ●  
OUT4: ●

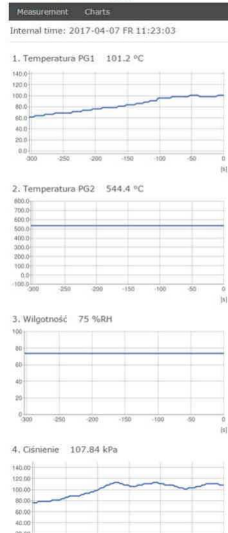
Record: ● Storage memory: Internal  
The record number in the current file: 1661

Internal memory: ● Pendrive: ●  
Connected to a computer via USB: ●

Version: 1.0.2

**APAR**  
www.apar.pl

#### Charts AR654



- control, monitoring, and recording of temperature and other physical values (humidity, pressure, level, flow rate, speed, etc.) processed into a standard electric signal (0/4÷20 mA, 0÷10V, 0÷60 mV, 0÷850Q);
- 4 universal inputs(thermoresistance, thermocouple, analogue)with the possibility to create inter-channel mathematical formulas such as difference, average, sum, larger or smaller than, and ratio of measured values;
- 4 control/alarm outputs with independent adjustment algorithms: ON-OFF with hysteresis, PID, autotuning PID, 12-section programmed control;
- an optional module of 4 analogue outputs (0/4÷20mAor/2V÷10V) and 5 functional binary inputs (BIN) to change the operating modes of the associated outputs (control start/stop, selection of the day/night setpoint value, manual/automatic mode for outputs); the analogue outputs are logically connected to the two-state outputs (P/SSR) and are used for control or retransmission of measurements and setpoint values; the inputs and the outputs are not insulated (common ground);
- selection of setpoint values for outputs from among 2 defined for each output, the common value from the 1st output (without and with offset for 3-way control), from the selected program or measurement from any input
- selection of independent PID sets (from the 8 available sets) for individual setpoint values (gain scheduling)
- advanced automatic PID parameter selection function with fuzzy logic elements for each of the outputs
- 4 programs with the possibility to define for each section such parameters as type (gradient/time/stop), setpoint value, hysteresis, set of PID parameters, selection and status of auxiliary output, sound alarm, etc.
- time control/timer, options: continuous operation, periodic daily (hourly), or limited by date and time
- manual mode (open control loop) available for 2-state and analogue outputs with setting of the output signal value in the range of 0÷100% (the impulse period or the entire range of variability for mA/V)
- shockless switching of analogue outputs from manual mode to automatic mode and vice versa
- possibility to select the measured values to be displayed, independently, the type of control signals for outputs (associated inputs or mathematic functions on the measurement signals, such as difference, average, etc.)
- possibility to assign many outputs to one measurement channel and many inputs to one output
- sound and visual signalling of the status of operation of outputs and email alarm notification
- programmable type of control/alarm: heating, cooling, in the band, outside of the band, manual mode
- recording of data in a standard text file located in the internal memory of the controller (4 GB) or an USB memory in a FAT system, with possibility to edit in spreadsheet software, e.g. Microsoft Excel, CRC protection of recorded data
- rich standard equipment with serial interfaces: USB (for work with a computer and USB memories), RS485 (MODBUS-RTU), and Ethernet (100base-T, TCP/IP protocols: MODBUS-TCP, HTTP, SMTP, etc.)
- WWW server for work with any web browser (Opera, IE, Firefox, etc.); the site contains information about active measurement channels, control parameters and status, real time, status of the outputs, recording, etc., with the possibility to show diagrams using the Google Chart API service (diagrams require constant Internet access)
- the DDNS service, which enables easy access over the Internet to a controller connected to a network that has no fixed public IP address, through a friendly Internet address defined by the user; the service is available only for registered users of popular DDNS services, such as DynDNS (www.dyndns.org), No-IP (www.no-ip.com), and DNSO-Matic (www.dnsomatic.com)
- a colour LCD TFT graphic display 320x240 dots (QVGA), with a touch screen, brightness adjustment, and programmable background colour for individual measurement channels
- intuitive use, quick configuration, and clear signalling of device operating statuses and menu position
- a programmable language of the menu and WWW server (Polish, English)
- graphic and text methods of presentation of the measured values (numerical values, bar graph, counter, graph)
- grouping of measurement channels to be displayed, with automatic formatting of the screen (font size, etc.)
- programmable screen function buttons (F1) for each of the displayed control channels for quick selection of one of the available functions (the same as for the binary inputs BIN of the optional module)
- programmable F button for quick selection of one of the available functions: start/stop of control for all outputs, status of the device and of the Internet services, start/stop of recording, copying or moving archives to a USB memory, blocking of sound alarms or the touch screen and the keypad
- a broad selection of recording start methods (continuous, limited by date and time, periodic daily, above or below the permission threshold related to any measurement signal, only during control)
- internal real time clock with a battery backup power supply (up to 8 years of continuous operation)
- free software provided (for Windows 7/8/10) that enables presentation in a graphic or text form of the recorded results (ARSOFT-LOG-WZ3) and configuration of parameters (ARSOFT-CFG-WZ1)
- programmable display options, presented measured values and control signals for the outputs (measurements, mathematic functions, etc.), types of measurement inputs, indication ranges, alphanumeric description of measurement channels and groups, control/alarm, recording, communication, and access options, and other configuration parameters
- administrator and user password, two levels of protection of access to the configuration parameters
- parameters configuration methods:
  - from the film keypad and a touch screen located on the front panel of the device
  - through the USB, RS485, or Ethernet and free ARSOFT-CFG software or a user's MODBUS-RTU and MODBUS-TCP
  - from configuration files saved in the USB memory or on a computer disk
- recording of data until memory is full (at least 2 years of continuous operation with recording of 4 channels every 1 s)
- possibility to transfer archive data and configuration data to a USB memory or to computer via USB, Ethernet
- simultaneous recording of data from all active measurement channels
- controller's software update via USB memory
- an enclosure for panel installation, protection rating from the front side IP65 or IP30 (depending on the version)
- an integrated 24V DC power supply supplying the field transducers (current output depending on the version)

## TECHNICAL DATA

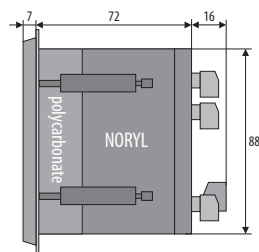
<b>Number of measurement inputs</b>	universal, without galvanic separation (common earth)		
<b>Universal inputs</b> (programmable, 16 types, 18-bit A/C processing), measurement ranges			
Pt100 (RTD, 3- or 2-wire)	-200 ÷ 850 °C	thermocouple R (TC, PtRh13-Pt)	-40 ÷ 1600 °C
Pt500 (RTD, 3- or 2-wire)	-200 ÷ 620 °C	- thermocouple T (TC, Cu-CuNi)	-25 ÷ 350 °C
Pt1000 (RTD, 3- or 2-wire)	-200 ÷ 620 °C	thermocouple E (TC, NiCr-CuNi)	-25 ÷ 850 °C
Ni100 (RTD, 3- or 2-wire)	-50 ÷ 170 °C	thermocouple N (TC, NiCrSi-NiSi)	-35 ÷ 1300 °C
thermocouple J (TC, Fe-CuNi)	-40 ÷ 800 °C	- current (mA, Rwe = 100kΩ)	0/4 ÷ 20mA
thermocouple K (TC, NiCr-NiAl)	-40 ÷ 1200 °C	- voltage (V, Rwe = 150kΩ)	÷ 0.0V
thermocouple S (TC, PtRh 10-Pt)	-40 ÷ 1600 °C	- voltage (mV, Rwe > 2MΩ)	0 ÷ 60 mV
thermocouple B (TC, PtRh30PtRh6)	300 ÷ 1800 °C	resistance (R, 3- lub 2-wire)	÷ Ø50Ω
<b>Response time for measurements</b> (10÷90%)	0,5 ÷ 2,5 s (programmable)		
<b>Resistance of leads</b> (RTD, R)	Rd < 25Ω (for each line), compensation of line resistance		
<b>Resistance input current</b> (RTD, R)	650μA (Pt100, Ni100, 850Ω), 150μA (Pt500, Pt1000), multiplexed		
<b>Processing errors</b> (at ambient temperature of 25 °C):			
- basic	for RTD, mA, V, mV, R	≤ 0.1% of the measurement range ± 1 digit	
	for thermocouples	≤ 0,2 % of the measurement range ± 1 digit	
additional for thermocouples	≤ 2 °C (compensation of temperature of cold tips)		
additional from ambient temp.-changes	≤ 0.005% of the input range / °C		
<b>Indication range</b> (programmable)	total: -9999÷99999, resolution for analogue inputs -9999÷9999		
<b>Display resolution / dot point position</b>	programmable, for thermometric inputs 0.1°C or 1 °C, for other inp. 0÷0.000		
<b>Outputs</b> relay P1÷P4 (4 separate)	5A / 250Vac (for resistance loads), SPST; as a standard option		
	SSR1÷SSR4 (optional)	transistor, type NPN OC, 24V, internal resistance 850Ω	
<b>Analogue outputs</b> (4, option) (1)	current output 5÷8	0/4 ÷ 20 mA, load: R < 1000Ω, max resolution 0,33μA, 16 bit	
	voltage output 5÷8	0/2 ÷ 10V, load: lo < 3,7mA (Ro > 2,7kΩ), max resolution 0,17mV, 16bit	
<b>Digital input BIN</b> (5, option)	contact or voltage < 24V, bistable, active level: short circuit or < 0,8V		
<b>Power supply</b>	230Vac (standard)	85 ÷ 260Vac/ 10VA	
	24Vac/dc (option)	20 ÷ 50Vac/ 10VA, 22 ÷ 72Vdc/ 10W	
<b>Power supply of field transducers</b> 24Vdc (2)	when 230Vac/24Vac/dc	200/100mA (without optional module mA/V and BIN)	
	when 230Vac + module mA/V	150mA-21mA*N (N = number of active current outputs)	
	when 24Vac/dc + module A/V	50mA-21mA*N (N = number of active current outputs)	
<b>Communication interfaces</b> (in IP30 version USB port also available from the front of controller)	<b>USB</b> (connection type A4, programmable mode of operation)	slave mode (communication with a computer)	drivers for the Windows XP/7/8/10: exchangeable disk (mass memory, read speed: 335kb/s) + virtual COM port (MODBUS-RTU protocol)
	<b>RS485</b>	master mode (host)	support USB memory (pendrive) up to 4GB (~135kb/s)
	<b>Ethernet</b>	100base-T, RJ45, server www, MODBUS-TCP, e-mail client (SMTP), DDNS server client, TCP/IP protocols: DHCP (client, server), SMTP, NetBIOS, ICMP, UDP, TCP, data transfer up to 135 kb/s (depending on the network)	
<b>Real time clock (RTC)</b>	quartz, takes leap years into account, backup lithium battery CR1220		
<b>Data recording interval</b>	programmable from 1s to 8 h. (3)		
<b>Data storage memory</b> (non-volatile, recording of approx. 59 million measurements from 4 channels and 4 GB memory):			
internal	4GB, micro SDHC card (industrial, MLC), FAT32 file system		
external USB memory (pendrive)	maximum size 4GB, FAT16, FAT32, A4 USB socket type		
<b>Graphical display LCD</b> (with touch panel)	TFT, 320x240 pixels (QVGA), 3.5", background brightness adjustment		
<b>Rated operating conditions</b>	÷ 50°C, < 100 %RH (no condensation), air and neutral gases, no dust		
<b>Protection rating</b>	IP65 or IP30 from the front, IP20 from the side of the connections		
<b>Electromagnetic compatibility (EMC)</b>	immunity: according to the PN-EN 61000-6-2, emission: PN-EN 61000-6-4		
<b>Safety requirements according to PN-EN 61010-1 standard</b>	overvoltage category: II pollution degree: 2		
	voltage to the ground (earth): 300V for power supply and output relay circuits, 50V for other inputs/outputs circuits and communication interfaces		
	insulation resistance > 20 MΩ height above sea level < 2000 m		

### Notes:

- each of the outputs can work in only one programmed standard: 0/4 ÷ 20 mA or 0/2 ÷ 10V
- output power depends on the equipment version (type of power supply, presence and number of current outputs used); in the case of insufficient current efficiency, an external power supply and/or voltage outputs instead of current outputs should be used
- for a recording interval equal to 1 s, uneven recording may take place during transfer of an archive via Ethernet and also because of an excessive number of files, their sizes, and type and manufacturer of the USB memory (pendrive) used

## DIMENSIONS, INSTALLATION DATA

<b>Fixing methods</b>	panel, grips on the side of the enclosure
<b>Enclosure dimensions and weight</b>	96 × 96 × 79 mm, ~420 g
<b>Panel window</b>	92 × 89 mm
<b>Material</b>	self-extinguishing NORLY 94V-0, polycarbonate
<b>Conductor cross-sections</b> (separable connectors)	2.5 mm² (supply and outputs P/SSR), 1.5mm² (others)



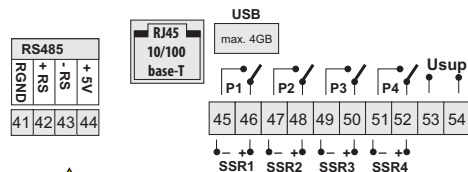
## TERMINAL STRIPS, ELECTRICAL CONNECTIONS

connections of the optional analogue output module (OUTPUTS ÷ 8) and of functional binary inputs (BIN1÷BIN5), without galvanic separation (common ground)

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
GND	mA	V	GND	mA	V	GND	mA	V	GND	mA	V	GND	GND	GND	BIN1	BIN2	BIN3	BIN4	BIN5
OUTPUT 5				OUTPUT 6				OUTPUT 7				OUTPUT 8				BIN INPUTS			

measurement connections (RTD, TC, mA, V, mV, R), INPUT 1÷4, without galv. separation

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
N1	N2	N3	GND	+24 V	N1	N2	N3	GND	+24 V	N1	N2	N3	GND	+24 V	N1	N2	N3	GND	+24 V
INPUT 1				INPUT 2				INPUT 3				INPUT 4							

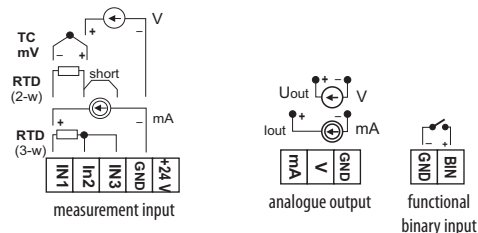


### NOTE:

In the IP30 version, the USB connection is also available on the front panel.

### DO NOT USE SIMULTANEOUSLY WITH THE BACK CONNECTION!

Connection method for sensors and electrical signals:



## Ordering procedure:

AR654/	/	/	/	/	/	/	/	/	/	<b>Inputs/Outputs module*</b>	<b>Code</b>
										4 outputs mA/V, 5 bin inputs	<b>W</b>
										*option for an extra fee	
<b>Supply</b>	<b>Code</b>	<b>Outputs 1, 2, 3, 4</b>	<b>Code</b>								
230 Vac	<b>S1</b>	relay	<b>P</b>								
24 Vac/dc	<b>S2</b>	SRR	<b>S</b>								
				<b>Protection ratio</b>	<b>Code</b>						
				IP30, USB also from the front	<b>IP30</b>						
				IP65, USB only at the back	<b>IP65</b>						

### Order examples:

AR654 / S2 / P / P / P / P / IP65

supply 24Vac/dc, 4 relay outputs, IP65, USB port only at the back