

AR653.B

UNIVERSAL CONTROLLER WITH TWO ROW DISPLAY

Two channel process controller with autotuning PID parameters functions



2 Inputs
RTD, TC, mA
V, mV, Ω, BIN



Outputs
3 x P/SSR
1 x mA/V



Control
ON/OFF, PID
Program, Servo



Alarms
STB function
LATCH



Protection rating
Front



RS485
MODBUS-RTU



USB
port COM
MODBUS-RTU



Ethernet
MODBUS-TCP
MQTT



Software
ARSOFT-CFG



Access protection
Password



Bargraph
8-segment

- control and monitoring of temperature and other physical values (humidity, pressure, flow rate, level, speed, etc.) processed to a standard electrical signal
- configurable architecture enabling use in many fields and applications (industrial, heating, food, energy, etc.)
- 2 universal measuring input (resistance thermometers, thermocouple, analogue 0/4÷20mA, 0÷10V, 0÷60mV, 0÷2,5kΩ) with mathematical functions (difference, sum, average, greater or lesser of the measurements) available independently for displaying and controlling control/alarm outputs
- 2 function buttons (F i SET) and digital input (BIN) for quick selection operating mode of controller, separately programmable: start/stop of control, manual/ automatic mode for outputs, step change of the set point value SP (day / night, with separate control parameters), keyboard lock, resetting errors and alarms STB (LATCH), unconditional preview of measured values from inputs 1 and 2
- 3 control/alarm outputs ON/OFF type (two-state P/SSR) with independent functionalities and control algorithms (setpoints defined by the parameter or taken from the measurement input 1/2):
 - ON-OFF with hysteresis (characteristics for heating and cooling, band alarms in range, out of range and with deviation for 3-position control)
 - PID (choice of 3 separate sets of parameters, gain scheduling for SP setpoint taken from measurement input 1 or 2), advanced functions of automatic selection of PID smart logic parameters
 - programmed control characteristic (process controller with timer, up to 6 sections, including 3 ramping sections - inclination for heating/cooling or for cooling/defrosting, 3 setpoints SP with ON-OFF or PID control, selection of the auxiliary output and its status, displaying remaining time for the entire section or after exceeding SP, etc.)
 - thermostat/ safety controller STB (alarm state open or closed, can be used as LATCH alarm memory e.g. when exceeds a threshold or a band)
 - ability to control a three-way mixing valve with an actuator (step control, Servo) with two contact inputs (open - close)
 - manual mode (open control loop) with initial value of control signal (MV) taken from current automatic mode or programmed by user
 - direct or inverse copy of the output 1 state (applies to outputs 2 and 3, can be used e.g. to implement DPDT changeover relay or to take over the function of the damaged P1)
 - limiting maximum level of output signal (power), also includes associated mA/V analog output
 - analog output 0/4÷20mA lub 0/2÷10V for control or retransmission of measurements and set values:
 - getting control parameters from any associated two state output (1, 2, 3), both in automatic and manual mode
 - shockless (soft) switching of the output signal, e.g. after changing manual/automatic mode or control start/stop
 - correction (calibration) of range of changes of output signal (offset for end values to obtain non-standard ranges e.g. 2÷16mA or 1÷9V)
- wide range of supply voltages (18÷265 Vac / 22÷350 Vdc) and built-in power supply for supplying on-site transducers 24Vdc/50mA
- readable LED display with adjustable brightness, typical units of measurement and signaling work status (messages, errors, etc.):
 - white color - measured value PV (upper row), units and symbols of status of outputs and serial transmissions (1, 2, 3, °C, %, %RH, mA, A, mV, V, m, . or none)
 - red, bottom row - selectable setpoints SP or 8-segment bargraph for MV (control signal), PV (measurement), output signal mA/V or none
- optional RS485 serial interface, protocol MODBUS-RTU for reading measurements and parameter configuration
- optional Ethernet interface, protocol MODBUS-TCP i MQTT (for internet of things IoT/M2M, a cloud and mobile applications), possibility of data exchange via the Internet
- USB interface (micro USB port, standard equipment, for parameter programming, viewing measurements and updating firmware)
- automatic or fixed line resistance compensation for resistive sensors and thermocouple cold junction temperature compensation
- programmable type of input, indication range (for analog inputs), control options, alarms, display, communication, access, and other configuration parameters
- access to configuration parameters protected with a user password or without protection
- methods for configuring parameters:
 - via membrane keyboard IP65 located on the front panel
 - via USB, RS485 or Ethernet and freeware ARsoft-CFG (for Windows 7/10) or user application (using protocols MODBUS-RTU i TCP)
- free software ARSOFT-CFG (download from www.apar.pl) enabling the preview of measured value and quick configuration single or ready parameter sets previously saved on a computer for re-use, e.g. in other controllers of the same type (duplicate configuration)
- panel housing, IP65 from the front (after using an additional accessory gasket or other sealing), IP54 without a gasket
- modern technical solutions, intuitive and clear operation, high accuracy and long-term stability as well as resistance to interference
- optional to choose from (in the way of ordering): control outputs for SSR, analog output 0/2÷10V (instead 0/4÷20mA) and RS485 and Ethernet interface (RJ45 connector)

Contents of set:

- controller with handles mounting
- user manual and warranty card

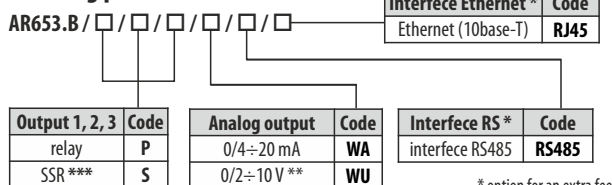
Available accessories:

- gasket for IP65 tightness from the front,
- USB cable (A - micro B) for connection with a computer, length 1.5 m

TECHNICAL DATA

Number of measuring inputs	2 universals (resistance thermometer RTD, thermocouple, analog mA/V/Ω)		
Universal input (programmable, 17 types, conversion A/C 18 bits), measuring 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 ÷ 520 °C	- thermocouple E (TC, NiCr-CuNi)	-25 ÷ 820 °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 = 50 Ω)	0/4 ÷ 20 mA
- thermocouple K (TC, NiCr-NiAl)	-40 ÷ 1200 °C	- voltage (V, Rwe = 110 kΩ)	0 ÷ 10 V
- thermocouple S (TC, PtRh 10-Pt)	-40 ÷ 1600 °C	- voltage (mV, Rwe > 2 MΩ)	0 ÷ 60 mV
- thermocouple B (TC, PtRh30PtRh6)	300 ÷ 1800 °C	- resistance (R, 3- or 2-wire)	0 ÷ 2500 Ω
Response time for measurements (0÷90%)	0,5 ÷ 5 s (programmable, default ~1,0 s)		
Resistance of leads (RTD, R)	Rd < 25 Ω (for each line), compensation of line resistance		
Resistive input current (RTD, R)	400 μA (Pt100, Ni100), 200 μA (Pt500, Pt1000, 2500 Ω)		
Processing errors (at 25°C ambient temperature):			
- basic	- for RTD, mA, V, mV, R	0,1 % of the measurement range ±1 digi	
	- for thermocouple	0,2 % of the measurement range ±1 digi	
- additional for thermocouples	< 2 °C (thermocouple cold junction temperature compensation)		
- additional from ambient temp. changes	< 0,004 % of the input range /°C		
Indication range (programmable)	total-1999÷9999 (maximum range of indications for analog inputs)		
Display resolution / dot position	programmable, 8 ÷ 9/10/11, for thermometric inputs 0,1 °C or 1 °C		
Outputs P/SSR - relay P1÷P3 (3 separate)	8A/250Vac (for res.), 1 x SPDT, 2 x SPST-NO, standard for outputs 1 i 2		
	- SSR1÷SSR3 (option)	transistor type NPN OC, 11V, current < 23mA, standard for outputs 3	
Analogue output (mA or V, without separation from input)	- current (standard)	0/4 ÷ 20 mA, load Ro < 1 kΩ, max resolution 1,4 μA, 14 bit, active	
	- voltage (option)	0/2 ÷ 10 V, load Io < 3,7mA (Ro > 2,7 kΩ), max resolution 0,7mV, 14 bit	
	- errors (at 25°C)	basic < 0,1 % output range, additional < 0,004 % /°C	
Digital input BIN (2-state)	contact or voltage < 24V, active level: short circuit or < 0,8V		
Power (Usup, universal, comply with the standards 24Vac/dc and 230Vac)	18 ÷ 265 Vac, < 3VA (alternating voltage, 50/60Hz) 22 ÷ 350 Vdc, < 4W (napięcie stałe)		
Power supply for object transducers	24Vdc/50mA		
Communication interfaces (independent, they can be used simultaneously)	- USB (micro type B, standard)	drivers for the Windows 7/8/10 (virtual serial port COM, communication with computer, MODBUS-RTU protocol, Slave)	
	- RS485 (option)	MODBUS-RTU protocol (Slave), bitrate 2,4÷115,2 kbit/s, programmable sign format (8N1, 8E1, 8o1, 8N2), galvanic separation	
	- Ethernet (option)	RJ45 connector, 10base-T, protocols TCP/IP: MODBUS-TCP (Server), MQTT (client, v.3.1.1), DHCP (client, ICMP (ping)), galvanic separation	
Display (LED with brightness adjustment, signaling status of outputs and measuring units)	top row: white color, 7-segment, height digit 13 mm bottom row: red color, 7-segment, height digit 10,5 mm		
Rated operating conditions	0 ÷ 50°C, < 90 %RH (no condensation) air and neutral gases, no dust		
Protection rating	front IP65 (with gasket) or IP54 (without gasket), IP20 from the side of connectors		
Electromagnetic compatibility	immunity: according to the PN-EN 61000-6-2, emission: PN-EN 61000-6-4		
Safety requirements according to PN-EN 61010-1	overvoltage category: II pollution degree: 2 voltage to the ground (earth): 300 V for power supply and output relay circuits 50 V for other inputs/outputs circuits and communication interfaces insulation resistance > 20 MΩ height above sea level < 2000 m		

Ordering procedure



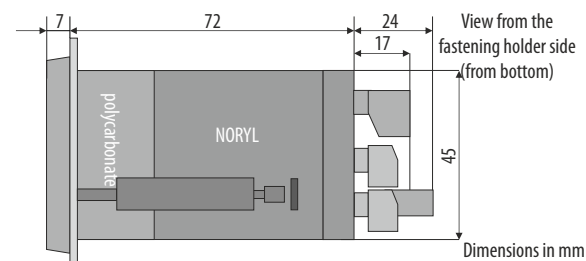
Order examples (standard execution):

AR653.B / P / P / S / WA

AR653.B, 1 and 2 relay outputs, output 3 for control SSR (NPN-OC), analog output 0/4÷20 mA (active), without RS485 and Ethernet interfaces

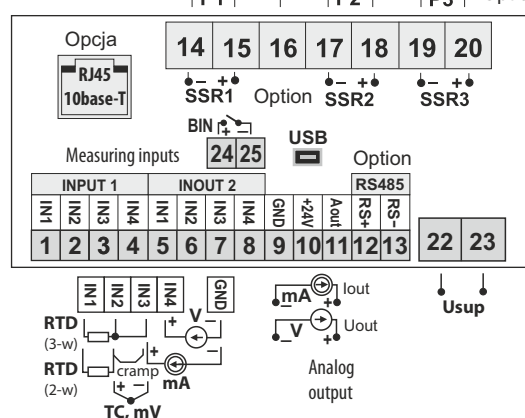
INSTALLATION DATA

Fixing methods	panel, with handles on the side of the housing
Dimensions and weight	96 × 48 × 79 mm (without connectors), ~200 g
Panel windows	92 × 46 mm
Material	self-extinguishing NORLY 94V-0, polycarbonate
Cable cross-sections (separable connectors)	2.5mm ² (power supply and outputs P/SSR), 1.5mm ² (others)

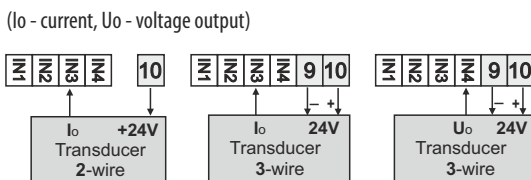


TERMINAL STRIPS, ELECTRICAL CONNECTIONS

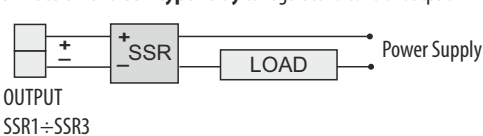
1. Description of connectors



2. Connection of a 2- and 3-wire transducer



3. Connection of a SSR type relay to regulator's control output



4. Galvanic separation of circuits

