APLISENS®

AR633.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

Output 3 x P/SSR 1 x mA/V

Control ON/OFF, PID Program, Serwo

Alarms STB function LATCH

IP65 Protection rating

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, ect.) 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)
- wall mounted housing, IP65 protection rating
- 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 conenctor)
- **Contents of set:**
  - controler with handles mounting
  - user manual

Available accessories:

- USB cable (A - micro B) for connection with a computer, length 1.5 m

APLISENS®

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 M Ω)	0 ÷ 60 mV
- thermocouple B (TC, PtRh30PtRh6)	300 ÷ 1800 °C	- resistance(R, 3- or 2-wire)	0 ÷ 2500 Ω
Response time for measurements (10÷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		
Zakres wskazań (programowalny)	całkowity -1999÷9999 (maksymalny zakres wskazań dla wejść analogowych)		
Display resolution / dot position	programmable, 0 ÷ 0.000, for thermometric inputs 0,1 °C or 1 °C		
Outputs P/SSR (3 separate)	- relay P1÷P3	1 x SPDT (8A/250Vac, for res.), 2 x SPST-NO (5A/250Vac), standard for outputs 1,2	
	- SSR1÷SSR3 (option)	transistor type NPN OC, 11V, current< 23mA, standard for output 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 leve: 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 (direct voltage)		
Power supply for object transducers	24Vdc/50mA		
Communication interfaces (independent, they can be used simultaneously)	- **USB** (mirco 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, Protection rating	0 ÷ 50°C, <100 %RH (no condensation) air and neutral gases, no dust IP65		
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 leve< 2000 m	

Ordering procedure

AR633.B / □ / □ / □ / □ / □ / □

Interface Ethernet *	Kod
Ethernet (10base-T)	**RJ45**

Outpur 1, 2, 3	Code
relay	**P**
SSR ***	**S**

Analog output	Code
0/4÷20 mA	**WA**
0/2÷10 V **	**WU**

Interface RS *	Code
interface RS485	**RS485**

* option for an extra fee

** output 0/2÷10 V it is mounted **instead** of the output 0/4÷20 mA (standard)

*** order with only one SSR output is only available for output 3 (fully functional)

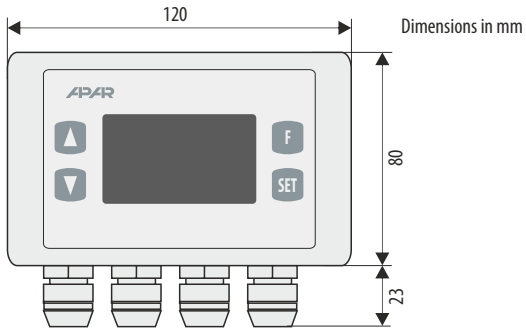
Order examples (standard execution):

AR633.B / P / P / S / WA

AR633.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

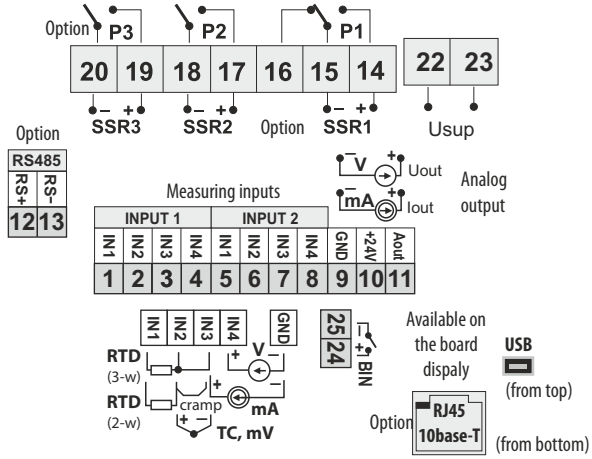
INSTALATION DATA

Housing, material	industrial IP65, Gainta G2104, polycarbonate
Dimensions and weight	120 x 80 x 55 mm (without glands), ~320 g
Mounting(on wall)	4 holes Φ4.3 mm, spacing 108x50 mm, accessible after removing the front cover
Cable cross-sections	2.5mm2 (power supply and outputs P/SSR), 1.5mm2 (other), inserted via cable glands M16 (x4)



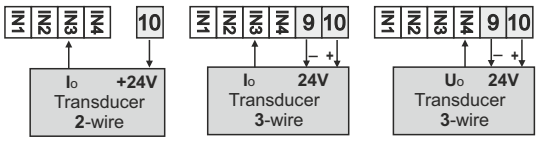
TERMINAL STRIPS, ELECTRICAL CONNECTIONS

1. Description of connectors (connectors are accessible after removing the front cover and display board,, except for USB)

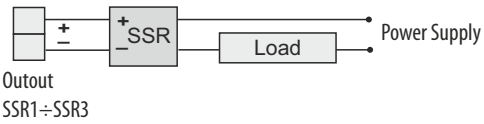


2. Connection of a 2- and 3-wire transducer

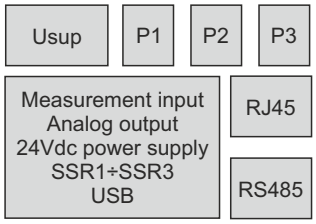
(Io - current, Uo - voltage output)



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



4. Galvanic separation of circuits



APAR® APLISENS GROUP

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, Serwo

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, ect.) 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 conenctor)

Contents of set:
- controler 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 M Ω)	0 ÷ 60 mV
- thermocoupleB (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, 0 ÷ 0.000, for thermometric inputs 0,1 °C or 1 °C		
Outputs P/SSR (3 separate)	- relay P1÷P3	8A/250Vac (for res.), 1 x SPDT, 2 x SPST-NO, sstandard 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 leve: 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** (mirco 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 leve < 2000 m	

Ordering procedure

AR653.B / □ / □ / □ / □ / □ / □

Interfece Ethernet *	Code
Ethernet (10base-T)	**RJ45**

Output 1, 2, 3	Code
relay	**P**
SSR ***	**S**

Analog output	Code
0/4÷20 mA	**WA**
0/2÷10 V **	**WU**

Interfece RS *	Code
interfece RS485	**RS485**

* option for an extra fee

** output 0/2÷10 V it is mounted **instead** of the output 0/4÷20 mA (standard)

*** order with only one SSR output is only available for output 3 (fully functional)

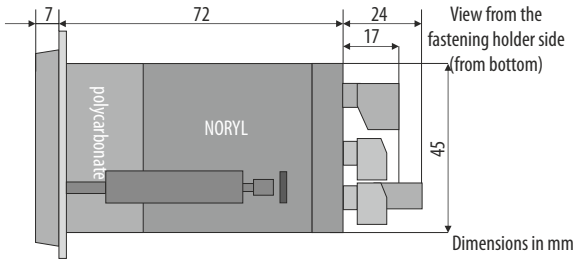
Order examples (standard execution):

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

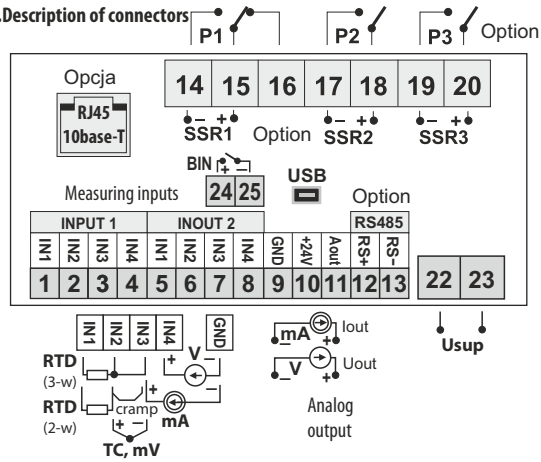
INSTALATION DATA

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 NORYL 94V-0, polycarbonate
Cable cross-sections (separable connectors)	2.5mm2 (power supply and outputs P/SSR), 1.5mm2 (others)



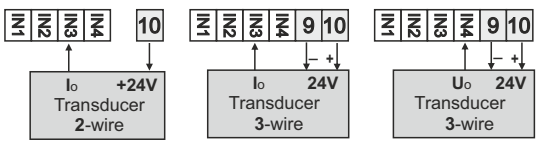
TERMINAL STRIPS, ELECTRICAL CONNECTIONS

1.Description of connectors

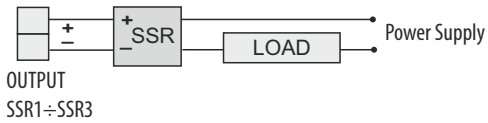


2. Connection of a 2- and 3-wire transducer

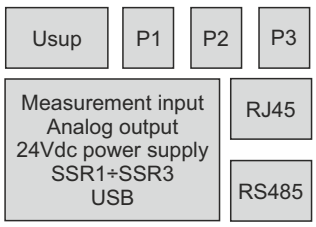
(Io - current, Uo - voltage output)



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



4. Galvanic separation of circuits



AR663.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

Output
3 x P/SSR
1 x mA/V

Control
ON/OFF, PID
Program, Serwo

Alarms
STB function
LATCH

Protection rating
Front

RS485
MODBUS-RTU

USB
port COM
MODBUS-RTU

Ethernet
MODBUS-TCP
MQTT

Software
ARSOFT-CFG

Bargraph
8-segment

- control and monitoring of temperature and other physical values (humidity, pressure, flow rate, level, speed, ect.) 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)
- housing for mounting on a 35 mm DIN rail, protection class IP40 (IP20 from the side of connectors)
- 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 conenctor)
- **Contents of set:**
  - controler with handles mounting
  - user manual

Available accessories:
- 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 M Ω)	0 ÷ 60 mV	
- thermocoupleB (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, 0 ÷ 0.000, for thermometric inputs 0,1 °C or 1 °C			
Outputs P/SSR (3 separate)	- relay P1÷P3	5A/250Vac (for res.), 2 x SPDT, 1 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 leve: 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** (mirco 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 9 mm			
	bottom row: red color, 7-segment, height digit 7 mm			
Rated operating conditions	0 ÷ 50°C, <90 %RH (no condensation) air and neutral gases, no dust			
Protection rating	enclosure IP40, connection side IP20			
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 leve < 2000 m		

Ordering procedure

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Interfece Ethernet *	Code
Ethernet (10base-T)	**RJ45**

Output 1, 2, 3	Code
relay	**P**
SSR ***	**S**

Analog output	Code
0/4÷20 mA	**WA**
0/2÷10 V **	**WU**

Interfece RS *	Code
interfece RS485	**RS485**

* option for an extra fee

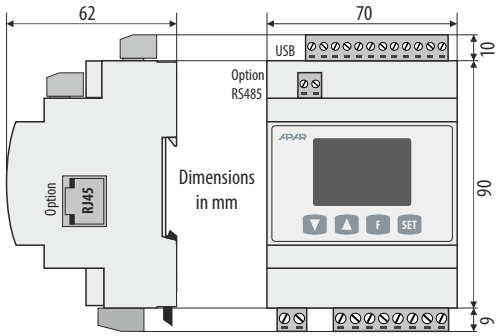
** output 0/2÷10 V it is mounted **instead** of the output 0/4÷20 mA (standard)

*** order with only one SSR output is only available for output 3 (fully functional)

Order example (standard execution):
AR663.B / P / P / S / WA
AR663.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

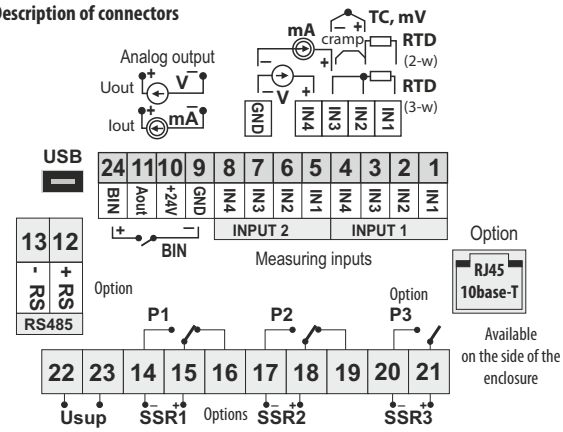
INSTALATION DATA

Enclosure and material	on rail, Modulbox 4MH53, PC/ABS self-extinguishing
Dimensions and weight	70 x 90 x 62 mm (without connectors), ~190 g
Fixing methods	on rail TS35 (DIN EN 60715)
Conductor cross-sections (separable connectors)	2.5mm2 (supply and outputs P/SSR), 1.5mm2 (othrers)

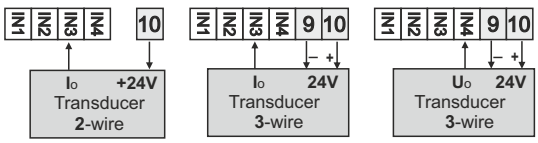


TERMINAL STRIPS, ELECTRICAL CONNECTIONS

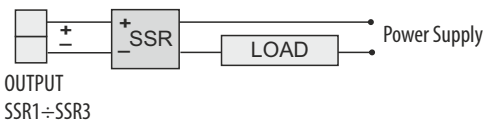
1. Description of connectors



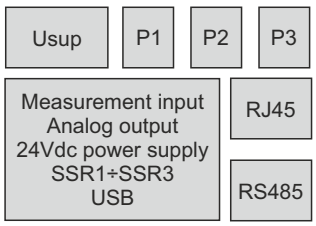
2. Connection of a 2- and 3-wire transducer
(Io - current, Uo - voltage output)



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



4. Galvanic separation of circuits



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