AMR-CU70B/xx

Programmable controller with graphical display

Operation manual

Version 1.00

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History of revisions

Document name: amr-cu70bxx_g_en_100.pdf

Revision	Date	Author of change	Changes
100	01. 07. 2016	Březina Jiří	New document

Related documentation

1. Help file for EsiDet part of DetStudio development environment
   file: Esidet_en.chm
2. Application Note AP0016 – Principles of RS485 interface usage
   file: ap0016_en_xx.pdf

1 Introduction

AMR-CU70B/xx is a freely programmable controller with a graphical display. The entire display is covered with a touch panel that serves for controller operation.

Basic features

- FSTN display with resolution of (64 × 132) pixels
- Controlling through touchscreen
- RS485 interface without galvanic isolation
- Power supply 24 V DC
- Room temperature measurement – internal sensor
- 2 × RTD input
- 2 × digital output
- 1 × analogue output 0 V DC to 10 V DC
- Programming in DetStudio development environment / EsiDet
- Communication protocol MODBUS or ARION

2 Technical parameters

Processor

Type	STM32F207
FLASH	512 KB
SRAM	128 KB
EEPROM	32 KB
RAM (4 kB) + RTC back-up	Replaceable lithium battery CR1632
Battery lifetime	5 years in normal environment [1])

Note [1]) Normal environment is defined at 25° C temperature.

RTC

Type	Processor component
Precision at 25 °C	±20 ppm

Display

Type	FSTN / positive / BW
Resolution	(64 × 132) pixels
Visible area	(38 × 58) mm
Viewing angle	90 °
Backlight	LED
Backlight colour	White
Backlight lifetime	Min. 50 000 hours [2])

Note [2]) Luminance drop to 50 %.

Touch panel

Type	Resistive
Number of touches	10^6
Touching strength	10 g to 100 g
Hardness	≥ 3 H

Note Touch panel is intended to be operated by finger, tool without sharp edges or by finger-in-glove.

Temperature sensor

Type	Semiconductor sensor
Measurement range	-55 °C to +125 °C [3])
Resolution	12 bits
Accuracy	±2 °C (-55 °C to 0 °C) ±0.5 °C (0 °C to +50 °C) ±2 °C (50 °C to +125 °C)
Device temperating	45 min [4])

Note [3]) Sensing element parameters, operating temperature range of on-wall controller is lower.

[4]) Time after turning on, the measurement accuracy is reduced to ±2 °C at this time.

RTD inputs [5])

Number of inputs	2
Inputs type [6])	Dry contact / Ni1000 / Pt1000
Common wire	AGND [7])
Galvanic isolation	No
Input overvoltage protection	Diodes
Connection point	Terminal block WAGO 252-108
Wire cross section	0.4 mm^2 to 0.8 mm^2
Maximum inlet wire length	30 m

Note [5]) RTD is a shortcut for English term “resistance temperature detector”. This type inputs can be used for temperature measurement using resistive sensors or as dry contact digital inputs.

[6]) The way of RTD input use depends on application created in DetStudio / EsiDet environment.

[7]) Terminal AGND is internally connected with controller’s GND terminal.

Input Ni1000 / Pt1000

Measured temperature range – Ni1000 (6180 ppm/°C) – Ni1000 (5000 ppm/°C) – Pt1000 (3850 ppm/°C)	 -35 °C to +120 °C -40 °C to +145 °C -45 °C to +205 °C
Accuracy – Ni1000 (6180 ppm/°C) – Ni1000 (5000 ppm/°C) – Pt1000 (3850 ppm/°C)	 ±0.5 °C ±0.6 °C ±0.8 °C
Input temperature dependence	70 ppm/°C

Dry contact

R_{min} for log. 0	> 1320 Ω
R_{max} for log. 1	< 1080 Ω

Digital outputs

Number of outputs	2
Switching element	MOS
Switching voltage	21.6 V DC to 26.4 V DC [8])
Switching current	300 mA
Overcurrent protection volume	Typically 1.5 A
Residual current at log. 0	0 mA
Contact closing time	Typically 60 µs
Contact opening time	Typically 60 µs
Short-circuits protection	Electronic
Inductive load handling	Electronic
Galvanic isolation	No
Connection points	Terminal block WAGO 252-108
Wire cross section	0.4 mm^2 to 0.8 mm^2

Note [8]) Switching voltage must be connected to controller’s terminal no. 12.

Analogue output

Number of outputs	1
Output type	0 V DC to 10 V DC
Common wire	AGND [9])
Minimum load	1 kΩ
Maximum capacitive load	10 nF
Maximum current	10 mA

Setting accuracy	0.2 %
Resolution	10 bits
Resolution per 1 bit	10 mV
Transition time 0 V to 10 V DC, accuracy 1 %	Maximum 25 ms
Residual ripple	20 mV
Temperature dependence	35 ppm/°C
Output circuitry protection	Zener diodes
Galvanic isolation	No
Connection point	Terminal block WAGO 252-108
Wire cross section	0.4 mm^2 to 0.8 mm^2

Note [9]) AGND terminal is internally connected with controller's GND terminal.

RS485

Overvoltage protection	Transil 600 W
Galvanic isolation	No
Terminating resistor [10])	120 Ω on the unit
Idle state definition [10]) – to +5 V – to 0 V	820 Ω on the unit 820 Ω on the unit
Maximum wire length	1200 m / 19200 bps
Max. number of stations on segment	256
Connection point	Terminal block WAGO 252-104
Wire cross section	0.4 mm^2 to 0.8 mm^2

Note [10]) Terminating resistor and idle state definition are connected concurrently.

Power supply

Nominal power supply voltage	24 V DC
Power supply voltage range	10 V DC to 30 V DC
Maximum power consumption	40 mA [11])
Power dissipation (typical)	0.4 W
Connection point	Terminal block WAGO 252-104
Wire cross section	0.4 mm^2 to 0.8 mm^2
Power supplying system	The equipment must not be power supplied from DC distribution network of building [12])

Notes [11]) Without connected inputs and outputs.
[12]) For detailed information see chapter "8.2 Installation rules" paragraph "Power supply".

Mechanics

Mechanical design	Plastic cover, ABS
Mounting	Vertical (on the wall)
Ingress protection rate	IP20
Dimensions (w × h × d)	(90 × 90 × 32) mm
Weight – netto – brutto	0.10 kg 0.14 kg

Temperatures

Operating temperature range	-10 °C to 50 °C
Storage temperature range	-20 °C to 70 °C

Others

Maximum ambient humidity	< 95 % non-condensing
Programming	DetStudio / EsiDet

2.1 Dimensions

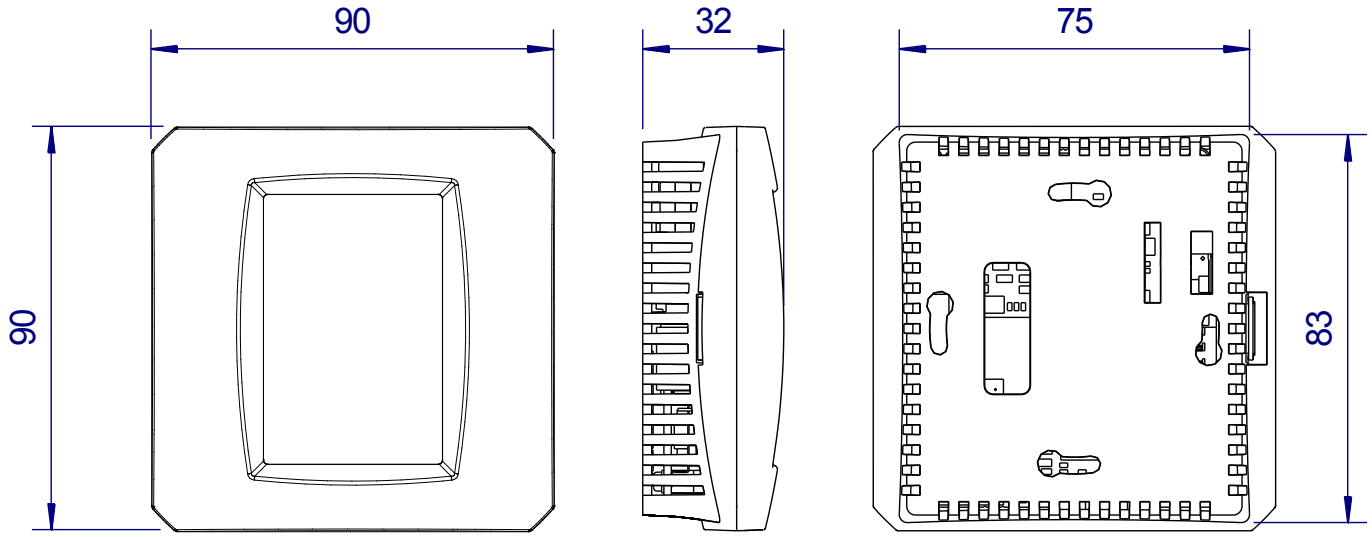

Fig. 1 – **AMR-CU70B/xx** dimensions

2.2 Recommended drawing symbol

Following drawing symbol is recommended for the controller **AMR-CU70B/xx**.

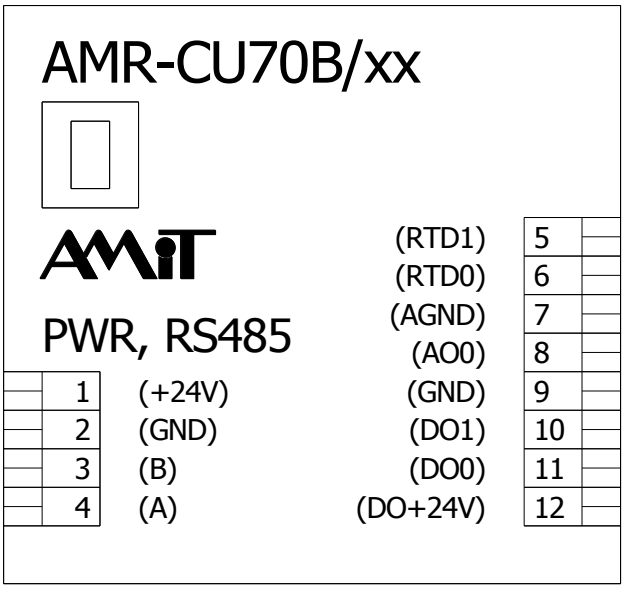

Fig. 2 – Recommended drawing symbol for **AMR-CU70B/xx**

3 Conformity assessment

The equipment meets the requirements of NV616/2006 Czech Government Decree. The compliance assessment with NV616/2006 has been performed in accordance with harmonized standard EN 61326-1.

Tested in accordance with standard	Type of test	Classification
EN 55011:2009	Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement	Complies
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: EMC – Testing and measurement techniques – Electrostatic discharge immunity test, aerial discharge	Complies (8 kV)
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Indirect electrostatic discharge immunity test, contact discharge	Complies (±4 kV)
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test, 800 MHz to 1000 MHz	Complies (10 V/m)
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test, 1000 MHz to 2100 MHz	Complies (3 V/m)
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test, 2100 MHz to 2500 MHz	Complies (1 V/m)
EN 61000-4-4:2012	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test, power supply	Complies (±2 kV)
EN 61000-4-4:2012	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test, RTD inputs, analogue output, digital output, RS485	Complies (±2 kV)
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test, power supply, RTD input, digital output, RS485	Complies (±1 kV)

Tested in accordance with standard	Type of test	Classification
EN 61000-4-6:2009	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields	Complies (3 V)

3.1 Other tests

Device was tested according to:

Tested in accordance with standard	Type of test	Result
EN 60068-2-1:2007	Environmental testing – Part 2-1: Tests – Test A: Cold	Complies
EN 60068-2-2:2007	Environmental testing – Part 2-2: Tests – Test B: Dry heat	Complies
EN 61000-4-29:2000	Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on DC input power port – Immunity test	Complies

4 Power supply and RS485 communication interface

Power supply The programmable controller **AMR-CU70B/xx** can be power supplied only by DC power supply. Power supply must meet requirements listed in chapter “2 Technical parameters”.

RS485 interface The RS485 interface without galvanic isolation uses the common GND terminal together with power supply. It is necessary to follow the rules mentioned in application note *AP0016 – Principles of RS485 interface usage* for correct working of RS485.

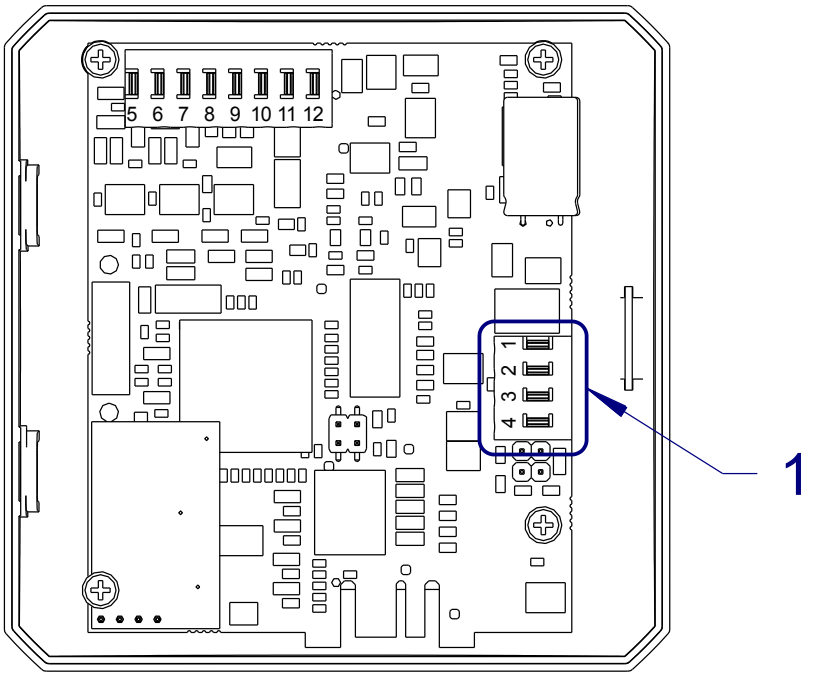

Fig. 3 – Power supply connector location

Legend

Number	Description
1	Terminals for power supply and RS485 interface

Terminal wiring

Terminal	Signal	Description
1	+24V	Power supply +24 V DC
2	GND	Common ground
3	B	RS485 interface, signal B
4	A	RS485 interface, signal A

Wiring example

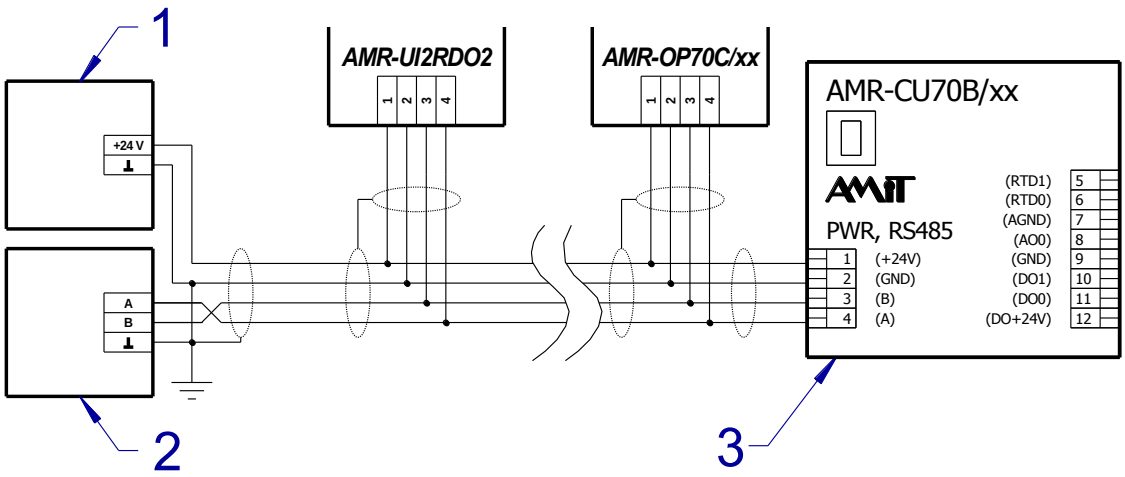

Fig. 4 – Power supply and RS485 wiring example

Legend

Number	Description
1	Power supply 24 V DC
2	Superior control system
3	Programmable controller **AMR-CU70B/xx**

RS485 wires termination

Each station on RS485 communication network must have properly set the wires termination. Configuration jumpers located near the connector are used for termination connection. If jumpers are placed, termination is connected. The terminal stations must have always connected terminating resistors, intermediate stations – disconnected.

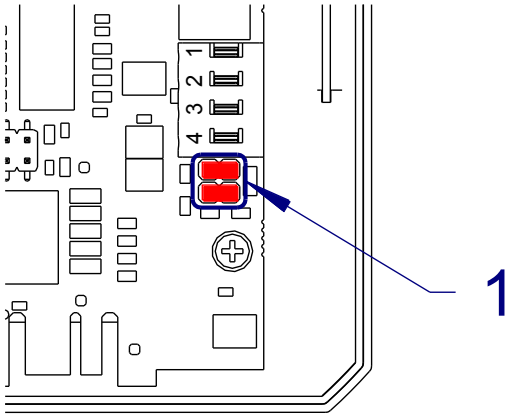

Fig. 5 – RS485 configuration jumpers location

Legend

Number	Description
1	RS485 configuration jumpers

Jumpers description

Jumpers	Description
Are set	Terminal station – idle states and wires termination are active.
Are not set	Intermediate station – idle states and wires termination are inactive.

Note It is recommended to use structured cabling for power supply and RS485 wiring during installation. For power connection, it is recommended to use one pair of wires for positive terminal and second pair for negative terminal. Cable shielding must be connected in a single point to a PE terminal on the side of the power supply source.

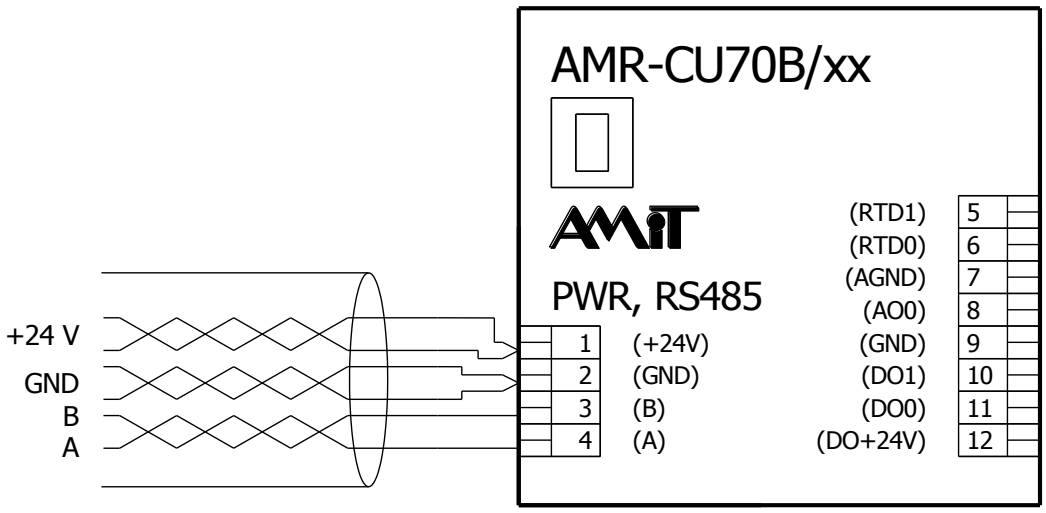

Fig. 6 – Structured cabling use example

5 RTD inputs

The programmable controller **AMR-CU70B/xx** contains two RTD inputs. The inputs can operate in a dry contact mode or as inputs for resistive temperature sensors Ni1000/6180, Ni1000/5000 or Pt1000.

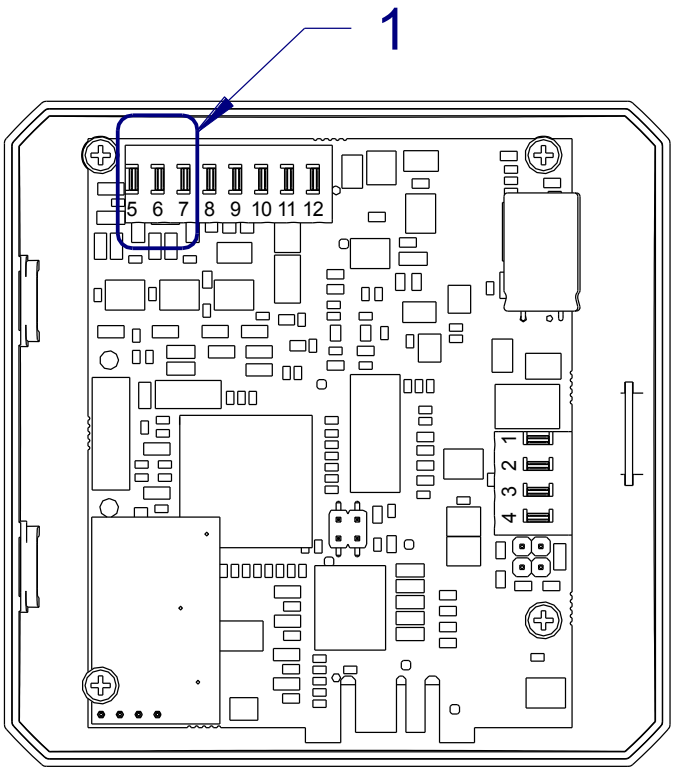

Fig. 7 – Location of terminals for RTD inputs

Legend

Number	Description
1	Terminals for RTD inputs terminals

Terminals wiring

RTD inputs together with analogue output use the common terminal AGND.

Terminal	Signal	Description
5	RTD1	RTD input 1
6	RTD0	RTD input 0
7	AGND	Analogue ground [13])

Note [13]) Terminal no. 7 (AGND) is common for both RTD inputs and the analogue output. Terminal AGND is internally connected with controller's terminal GND.

Wiring examples

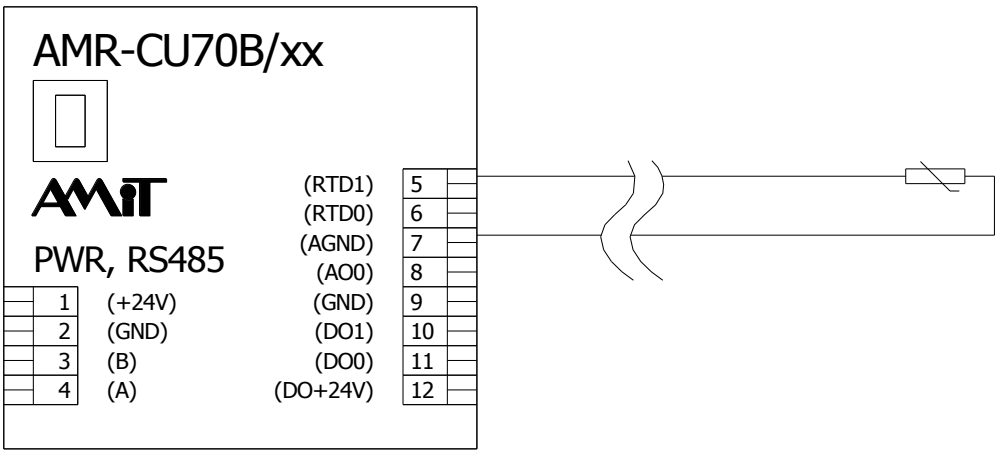

Fig. 8 – Temperature sensor wiring example

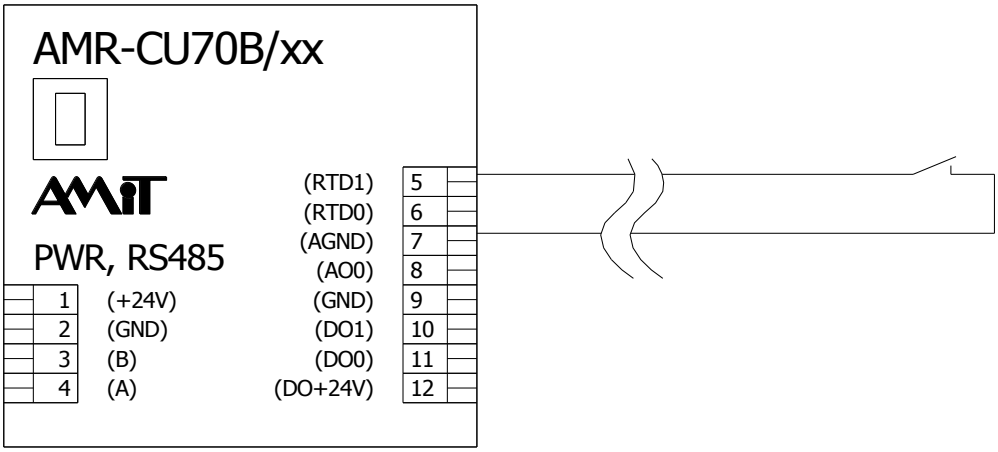

Fig. 9 – Dry contact wiring example

6 Analogue output

The programmable controller **AMR-CU70B/xx** contains one analogue voltage output. The analogue output has a current limit, see chapter “2 Technical parameters”.

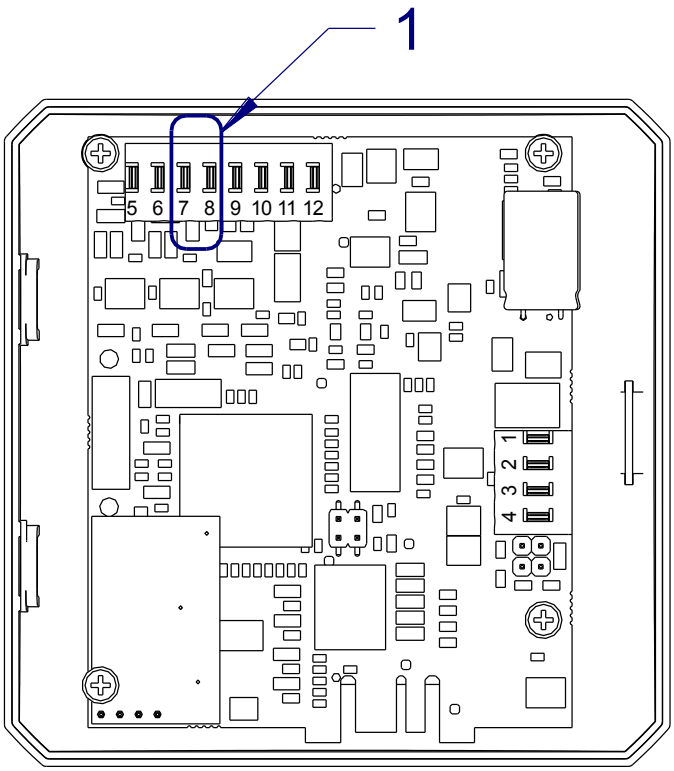

Fig. 10 – Location of terminals for analogue output

Legend

Number	Description
1	Terminals for analogue output

Terminals wiring

Analogue output and RTD inputs use the common terminal AGND.

Terminal	Signal	Description
7	AGND	Analogue ground [14])
8	AO0	Analogue output

Note [14]) Terminal no. 7 (AGND) is common for both RTD inputs and analogue output. Terminal AGND is internally connected with controller’s terminal GND.

Wiring examples

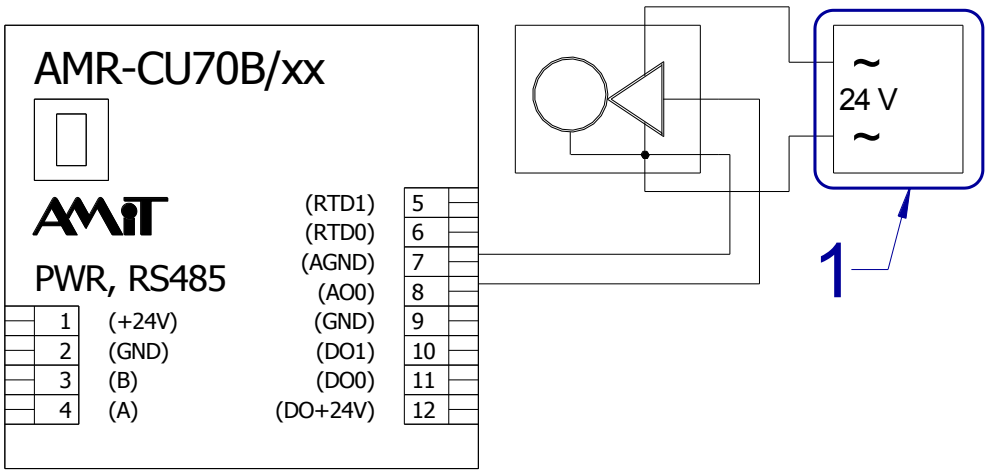

Fig. 11 – Wiring example of servo connection with AC voltage power supply

Legend

Number	Description
1	AC voltage power supply

7 Digital outputs

The programmable controller **AMR-CU70B/xx** contains two digital inputs with a common power supplying input.

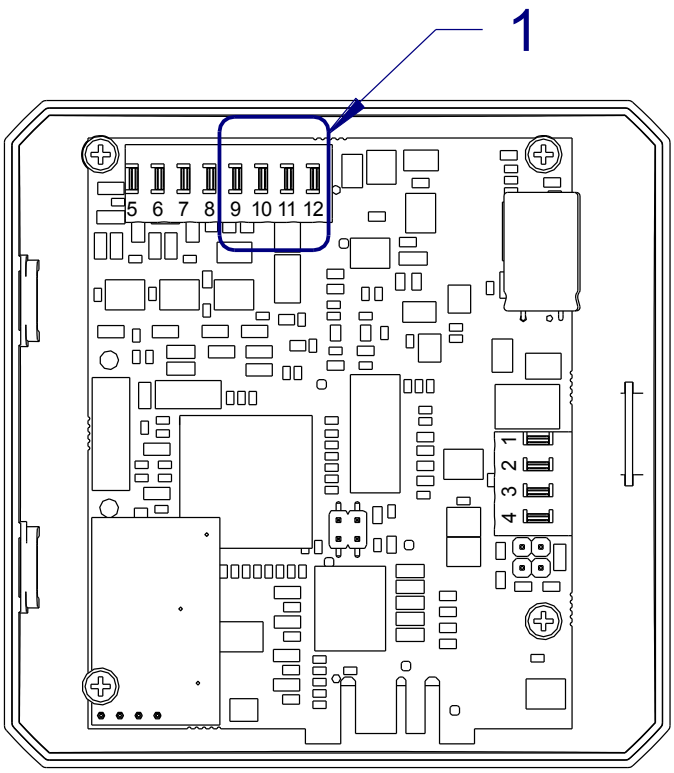

Fig. 12 – Location of terminals for digital outputs

Legend

Number	Description
1	Terminals for digital outputs

Terminals wiring

Terminal	Signal	Description
9	GND	Digital ground
10	DO1	Digital output 1
11	DO0	Digital output 0
12	DO+24V	Power supply input for digital outputs

Wiring examples

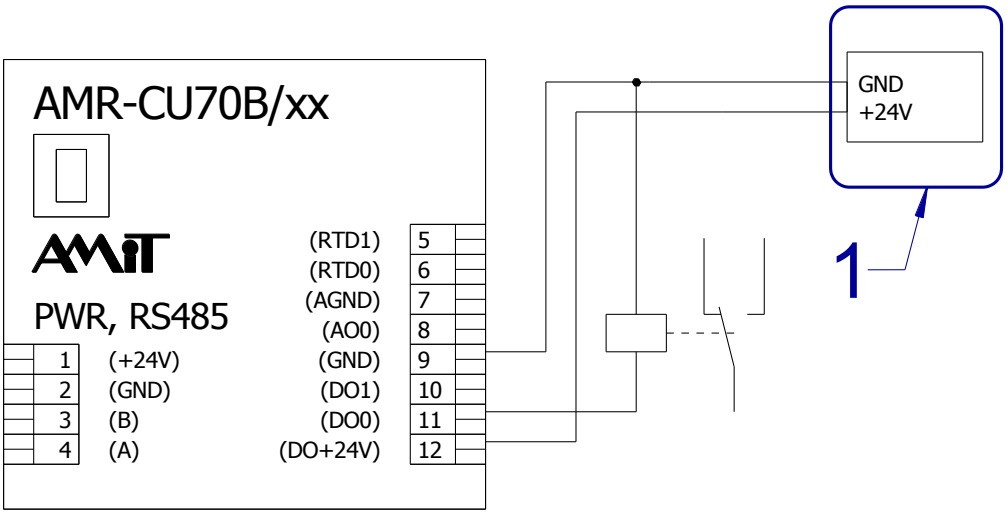

Fig. 13 – Wiring example of relay coil connection to digital output

Legend

Number	Description
1	DC power supply

8 Mounting

The programmable controller is intended to be mounted in indoor, dry environment. The controller should be placed about 1.5 m above the floor in a place with good air circulation in case of the internal temperature measurements. The controller should not be placed in area where its temperature can be affected by the wind, sunshine, heat radiation from the heater, or other undesirable influences. If the inlet wires are led through the plastic pipe, it is necessary to seal the pipe to avoid an air flow.

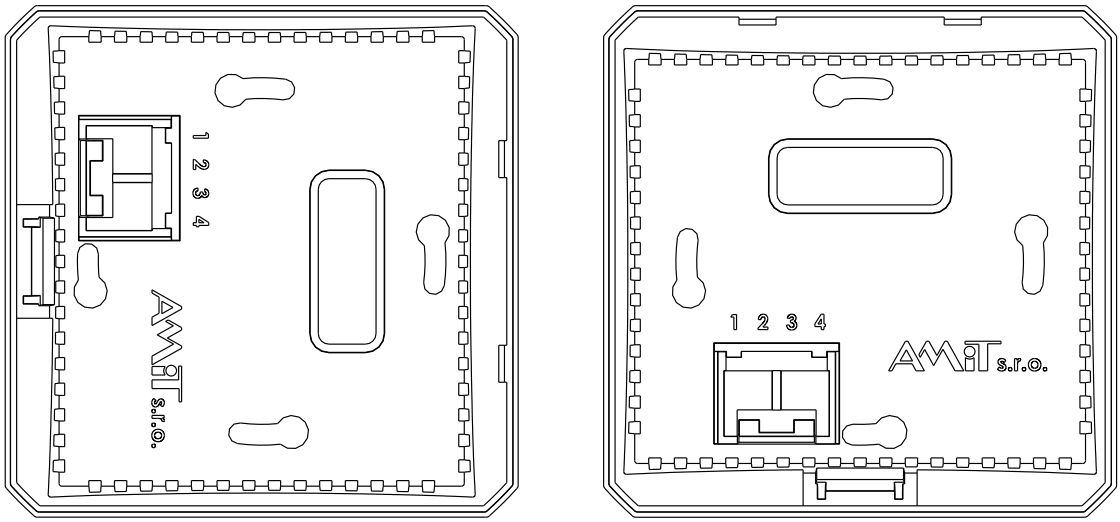

Fig. 14 – The controller mounting in vertical position (left), in horizontal position (right)

Vertical mounting The controller is mounted according to Fig. 14 left. The temperature sensor is located in left lower corner.

Horizontal mounting The controller is mounted according to Fig. 14 right. The temperature sensor is located in right lower corner.

Note The temperature sensor is heated by internal electronics in another assembly method than it is recommended. This leads to erroneous temperature readings.

8.1 Mounting procedure

1. Release the cover by pressing the latch on the left side of the controller (e.g. with screwdriver or blunt spike) and pull out the front part with display and the electronics at the same time.

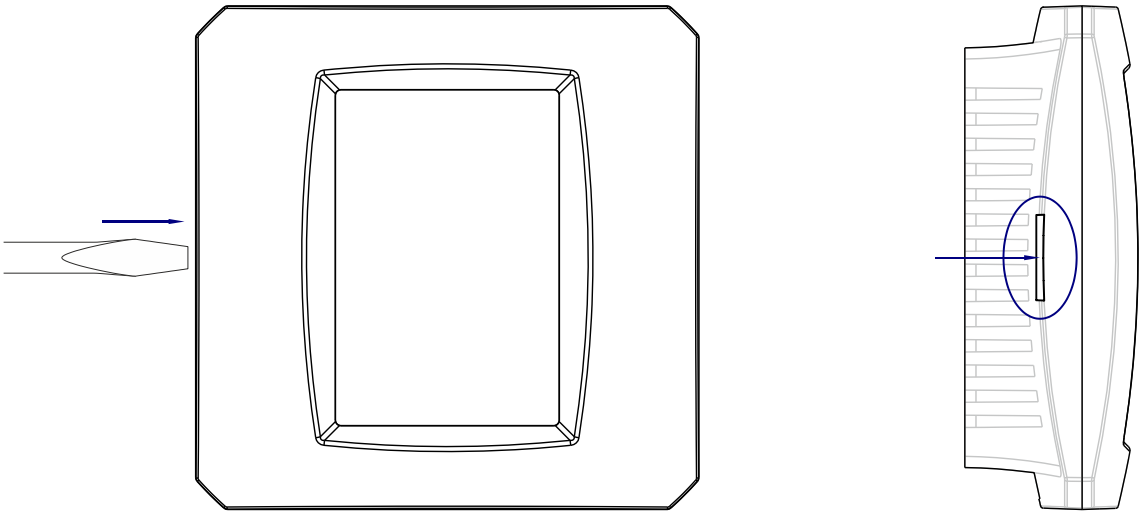

Fig. 15 – Place that must be pressed with blunt spike

2. Push the cabling through a cover hole. Mount the cover on a selected location. There are two pairs of mounting holes available.
3. Remove the terminal block for power supplying connection with communication interface (see chapter “4 Power supply and RS485 communication interface”). Connect the communication and power supplying wires to the terminal block and place the terminal block back on the connector pins. Cables led towards the unit center.
4. Set the configuration jumpers (see chapter “4 Power supply and RS485 communication interface”).
5. Remove the terminal block for input and output wires connection from connector (see chapter “5 RTD inputs”, chapter “6 Analogue output” and chapter “7 Digital outputs”). Connect the inputs and outputs and place the terminal block back on the connector pins.
6. Put on the front part with electronics on rear cover and fit it in.

8.2 Installation rules

EMC filter Use an EMC filter on power supply voltage input. This may be revised on a basis of wiring layout, environment character and power source properties.

Power supply The equipment must not be power supplied from DC distribution network in building. More equipment can be power supplied from a single power supply assuming the similar-type equipment and the same building location.

Cabling design Cablings connected to terminals for power supply and RS485 interface must be shielded.

Connection to PE Wire the negative power supplying terminal of controller (GND) and cable shielding to a PE terminal in one place, close to the power supply.

RS485 interface It is necessary to perform RS485 interface connection according to recommendations mentioned in application note *AP0016 – Principles of RS485 interface usage*.

Note All PE terminal connections must be realized with the lowest impedance as possible. Technical parameters of the programmable controller are guaranteed only when these wiring rules are applied.

9 Programming and setting

The programmable controller **AMR-CU70B/xx** is factory-programmed with a loader that allows a user application uploading.

This application can be created through:
- DetStudio / EsiDet development environment

The application can be uploaded into the controller through:
- DetStudio development environment
- AMRconfig service and programming utility
- AMRmultidownload multiprogramming utility

Development environment can be freely downloaded from www.amitomation.com.

9.1 Loader

Loader running state can be used in the cases the user application is causing any troubles, e.g. repeated restarting, controller connection inability, etc.

Loader activation

Loader can be activated by service jumper connection. Particular action is called-out according to the moment and duration of the connection, see following table.

Connection duration	Action
> 1 s – after turning on	Loader with original communication parameters is launched.
> 3 s and < 10 s – during application run	Loader with original communication parameters is launched.
> 10 s	Loader with factory pre-set communication parameters is launched, see chapter “10 Factory settings”. The original application is launched after each next start.

Jumper location

The service jumper located on PCB is accessible after the cover is taken off, see Fig. 16.

Note

An unwanted connection of the neighbouring pins has no effect on controller's functionality when it is powered-on.

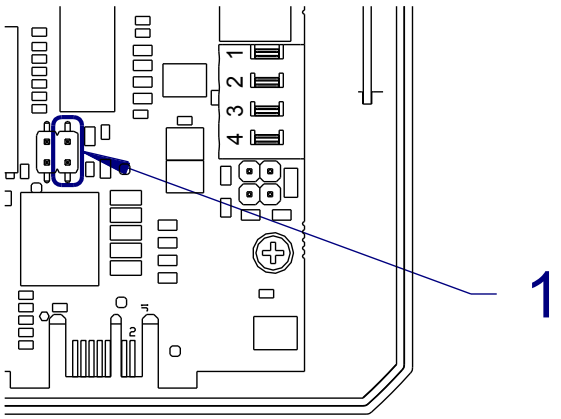

Fig. 16 – Service jumper connection on PCB of **AMR-CU70B/xx**

Legend

Number	Description
1	Service jumper

10 Factory settings

Program settings

Item	Set value
Network type	Modbus RTU
Address	1
Speed	38400 bps
Parity	Even

11 Ordering information and completion

Programmable controller	**AMR-CU70B/xx** [1])	Complete, see chapter 11.1 Completion

Note [1]) **xx** indicates a product colour design. Available versions are showed in the following table.

Colour variants

	Rear cover colour	**Front cover colour**
AMR-CU70B/01	grey	white
AMR-CU70B/02	ivory	ivory
AMR-CU70B/03	grey	grey
AMR-CU70B/04	white	white

Others	**MN1**	Cover removal tool

11.1 Completion

AMR-CU70B/xx

Part	**Quantity**
Programmable controller	1
Battery CR1632	1

12 Maintenance

With exception of cleaning, the device requires no periodic control, nor maintenance.

Cleaning Time after time it is necessary to remove dust from the device according to the way of use. The device can be cleaned by dry soft brush or vacuum cleaner, only when turned-off and disassembled.

Note **The maintenance mentioned above can be performed by manufacturer or authorized service only!**

13 Waste disposal

Electronics disposal A disposal of the device is governed by regulations on handling electrical waste. The device must not be disposed in common public waste. It must be delivered to the places specified for that purpose and recycled.