AMR-IRC20/01

Programmable controller

Operation manual

Version 1.00

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History of revisions

Document name: amr-irc2001_g_en_100.pdf

Revision	Date	Author of change	Changes
100	12. 10. 2016	Březina Jiří, Říha Zbyněk	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-IRC20/01 is a small, compact, freely programmable controller.

Basic features

- 2 × analogue input 0 V to 10 V
- 2 × RTD input
- 3 × analogue output 0 V to 10 V
- 2 × relay output
- 1 × RS485 interface with galvanic isolation
- 1 × RS485 interface without galvanic isolation
- Programming in DetStudio development environment / EsiDet
- Power supply 230 V AC

2 Technical parameters

Processor

Type	STM32F103
FLASH	512 KB
SRAM	64 KB
EEPROM	32 KB

Analogue inputs

Number of inputs	2
Inputs type	0 V DC to 10 V DC
Common wire	AGND [1])
AD converter resolution / LSB	10 bits / 3.22 mV
Accuracy	1 % [2])
Temperature dependence	50 ppm/°C
Galvanic isolation	No
Input overvoltage protection	Diodes
Connection point	Cage clamp terminals WAGO 256
Wire cross section	0.08 mm^2 to 2.5 mm^2
Maximum inlet wire length	30 m

Note [1]) Terminal AGND is internally connected with controller's terminal GND.
[2]) Measuring precision can be reduced during electromagnetic disturbance, see also chapter "3 Conformity assessment".

RTD inputs [3])

Number of inputs	2
Type of inputs [4])	Dry contact / Ni1000 / Pt1000
Common wire	AGND [5])
Galvanic isolation	No
Input overvoltage protection	Diodes
Connection point	Cage clamp terminals WAGO 256
Wire cross section	0.08 mm^2 to 2.5 mm^2
Maximum inlet wire length	30 m

Input Ni1000 / Pt1000

Measured temperature range	
– Ni1000 (6180 ppm/°C)	-35 °C to +120 °C
– Ni1000 (5000 ppm/°C)	-40 °C to +145 °C
– Pt1000 (3850 ppm/°C)	-45 °C to +205 °C
Accuracy [6])	
– Ni1000 (6180 ppm/°C)	±0.5 °C
– Ni1000 (5000 ppm/°C)	±0.6 °C
– Pt1000 (3850 ppm/°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

Note [3]) RTD is a shortcut for English term "resistance temperature detector". This type of inputs can be used for temperature measurement through resistive sensors or as dry contact digital inputs.

[4]) The way of RTD input use depends on application created in DetStudio / EsiDet environment.
[5]) Terminal AGND is internally connected with controller's terminal GND.
[6]) Valid for 25 °C. The accuracy depends on the measured value and it does not contain the accuracy of the connected stand-alone sensor.

Analogue output

Number of outputs	3
Output type	0 V DC to 10 V DC
Common wire	AGND [7])
Output internal impedance	120 Ω
Minimum load	1 kΩ
Maximum capacitive load	10 nF
Maximum current	10 mA
Setting accuracy	1.5 % [8])
Resolution	10 bits
Resolution per 1 bit	3.22 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	Cage clamp terminals WAGO 256
Wire cross section	0.08 mm^2 to 2.5 mm^2

Note
[7]) Terminal AGND is internally connected with controller's terminal GND.
[8]) Valid for the analogue output loaded with resistance 10 kΩ.

Relay outputs

Number of outputs	2
Type	Switching relay contact
Contacts protection	Varistor
Galvanic isolation	Yes
GI insulation strength	4000 V AC
Nominal switched voltage	230 V AC / 24 V DC
Maximum switched current	4 A (resistance load)
Switch-on time	10 ms
Switch-off time	5 ms
Contact lifetime – without load – nominal load	 $30×10^6$ cycles 10^5 cycles
Maximum switching frequency – without load – nominal load	 72 000 / hour 360 / hour
Connection point	Cage clamp terminals WAGO 256-401
Wire cross section	0.08 mm^2 to 2.5 mm^2

Power supply output

Nominal power supply voltage	24 V DC
Maximum power consumption	70 mA
Protection against short circuit	PTC thermistor
Connection point	Cage clamp terminals WAGO 256-401
Wire cross section	0.08 mm^2 to 2.5 mm^2

RS485

Quantity	2
Overvoltage protection	Transil 600 W
Galvanic isolation [9])	1 × Yes, 1 × No
Terminating resistor [10])	120 Ω on the unit
Idle state definition [10]) – up 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	Cage clamp terminals WAGO 256
Wire cross section	0.08 mm^2 to 2.5 mm^2

Note [9]) Insulation strength is 2500 V against power supply terminals. Insulation strength is 500 V against electronics. Galvanic isolation against electronics must not be used for dangerous voltage separation.

[10]) Terminating resistor and idle state definition for interface COM0 are permanently connected. Terminating resistor and idle state definition are connected through configuration jumpers in case of interface COM1.

Power supply

Nominal power supply voltage	230 V AC
Power supply voltage range	207 V AC to 253 V AC
Maximum power consumption	0.055 A [11])
Power dissipation (typical)	6.3 W
Connection point	Cage clamp terminals WAGO 256
Wire cross section	0.75 mm^2 to 2.5 mm^2

Notes [11]) Without connected inputs and outputs.

Mechanics

Mechanical design	Steel sheet, light grey
Mounting	On the base plate
Ingress protection rate	IP20
Dimensions (w × h × d)	(157 × 95 × 51) mm
Weight – netto – brutto	0.67 kg 0.75 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

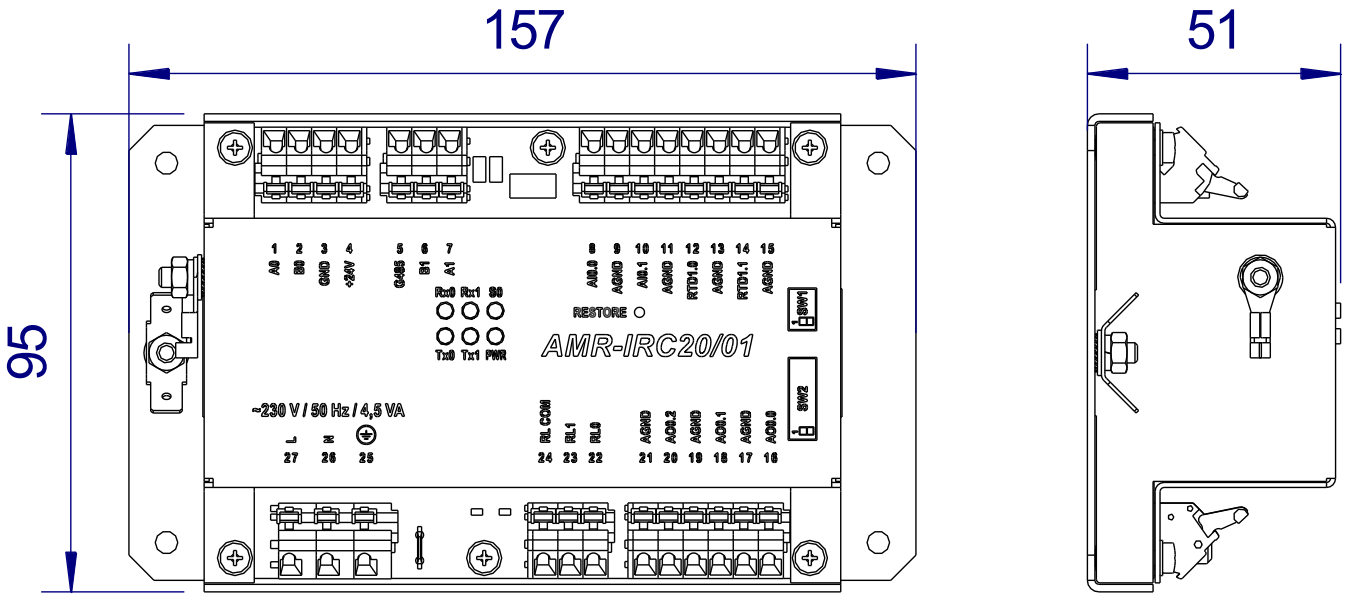

Fig. 1 – **AMR-IRC20/01** dimensions

2.2 Recommended drawing symbol

Following drawing symbol is recommended for the controller **AMR-IRC20/01**.

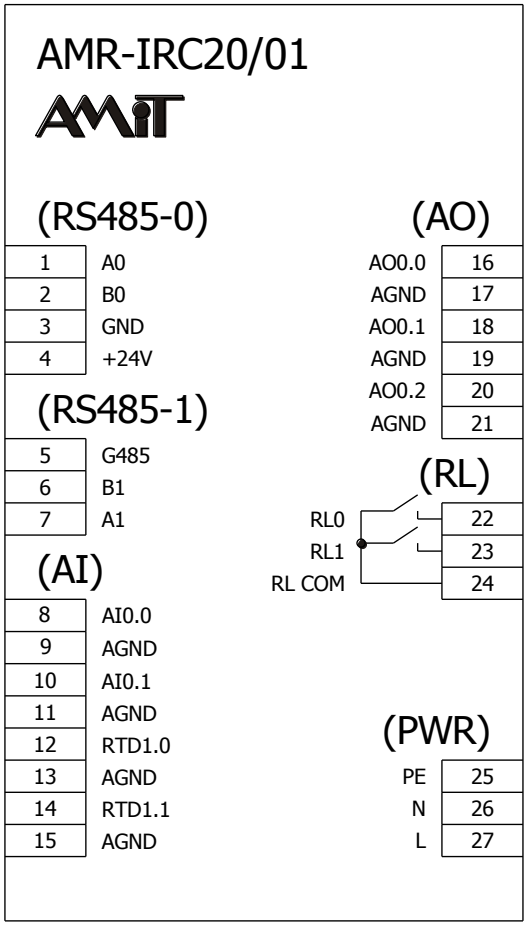

Fig. 2 – Recommended drawing symbol for **AMR-IRC20/01**

3 Conformity assessment

The equipment meets the requirements of NV616/2006 Czech governmental 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: Testing and measurement techniques – Direct electrostatic discharge immunity test, indirect contact discharge	Complies (±8 kV)
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test, direct 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 outputs, digital outputs, RS485	Complies (±1.5 kV)
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test, power supply between wires and PE	Complies (±2.5 kV)

Tested in accordance with standard	Type of test	Classification
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test, power supply between wires, analogue inputs, analogue outputs, digital outputs	Complies (±1.5 kV)
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test, RS485	Complies (±1.5 kV)
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

Power supply The programmable controller **AMR-IRC20/01** is power supplied from single-phase network 230 V AC. The controller must be protected externally through circuit breaker. Power supply voltage connection is indicated by the LED PWR.

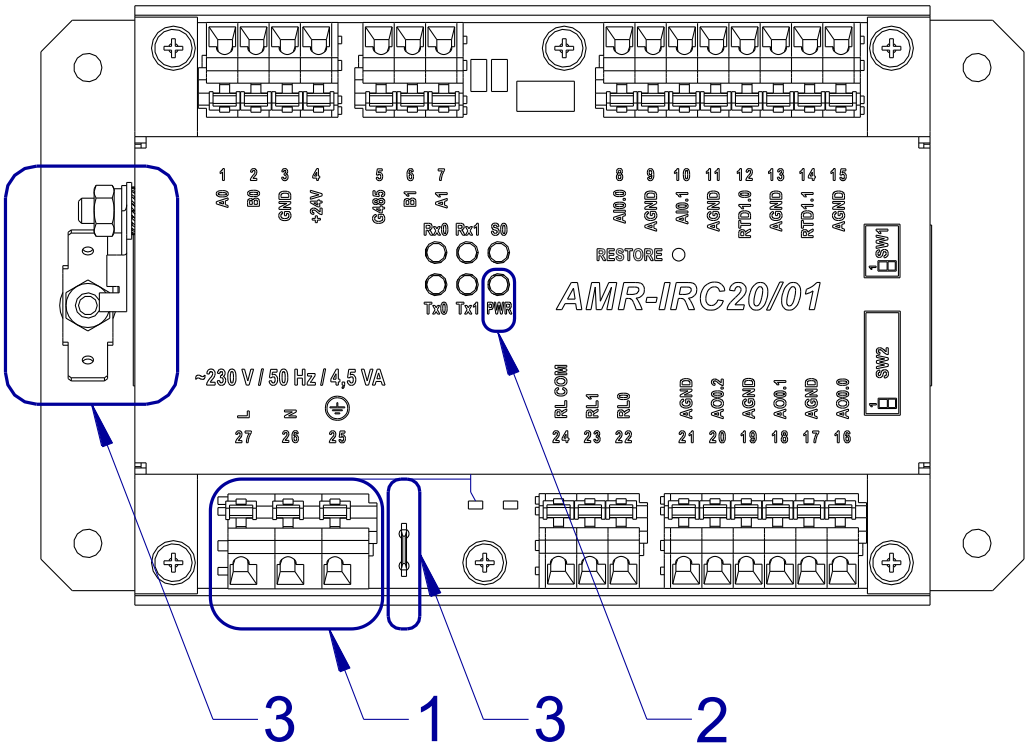

Fig. 3 – Terminals location for power supply

Legend

Number	Description
1	Terminals for power supply
2	LED PWR
3	Terminals for connection between metal parts and protective conductor

Terminals marking

Terminal	Signal	Description
25	⏚	Protective conductor
26	N	Neutral conductor
27	L	Phase conductor

Protective conductor The protective conductor terminal is connected with metal mechanical components in a way that hazardous contact voltage protection is ensured. **The protective conductor must be always connected!!!**

LEDs state description

LED	Description
Lit	Power supply is connected
Not lit	Power supply is not connected

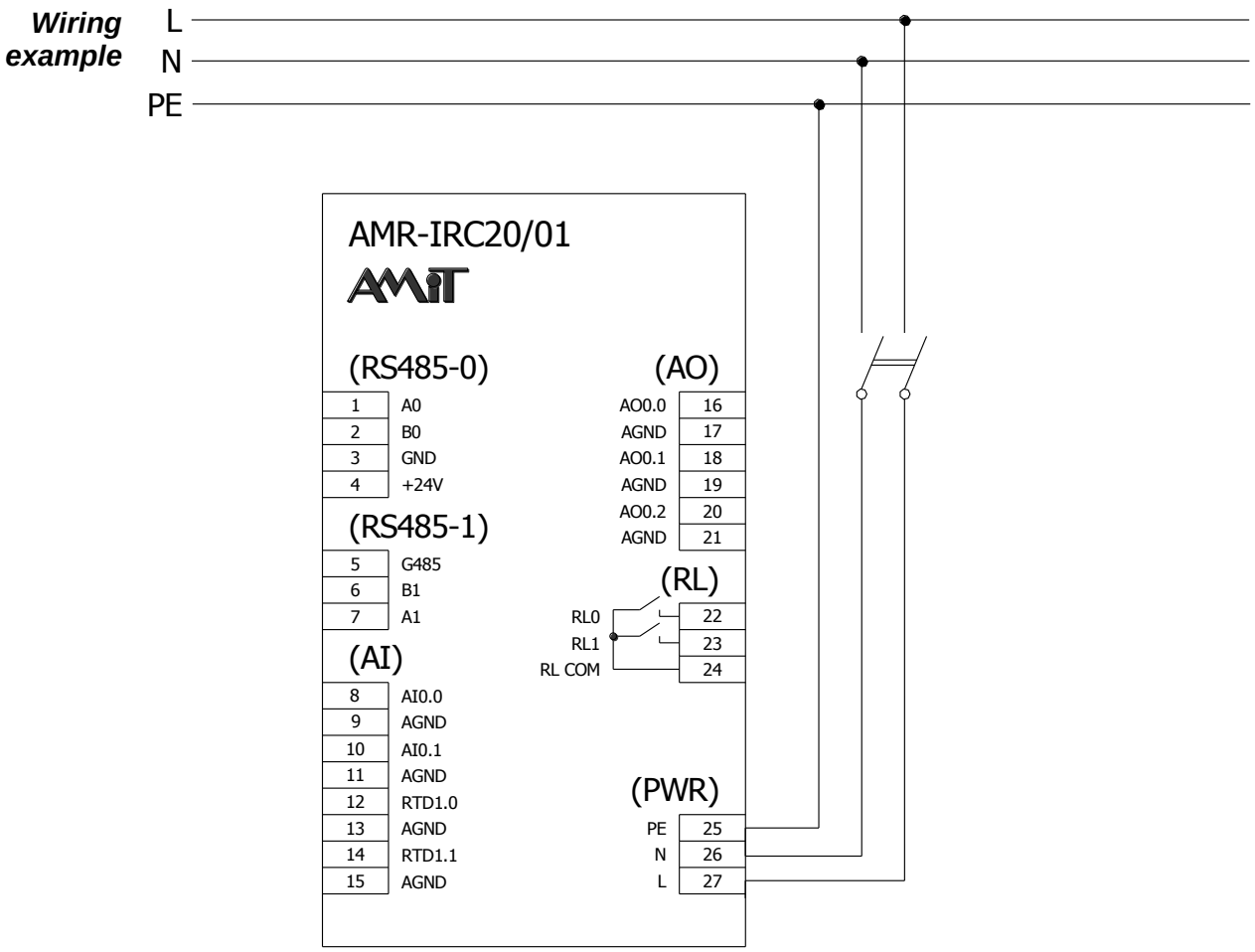

Fig. 4 – Power supply wiring example

5 Communication interfaces

The programmable controller **AMR-IRC20/01** is fitted with two RS485 communication interfaces. RS485 is a half-duplex serial interface. It is used for application software uploading into the controller and can be also used for multiple stations connection. All stations communicate through single signal pair.

5.1 RS485 without galvanic isolation (COM0)

Up to 255 stations can be connected to RS485 without GI. The RS485 interface without galvanic isolation uses the common GND terminal together with power supply for external periphery. It can be used for communication with on-wall controller of type **AMR-OPxx**.

RS485 interface activity is indicated by LEDs located on front panel.

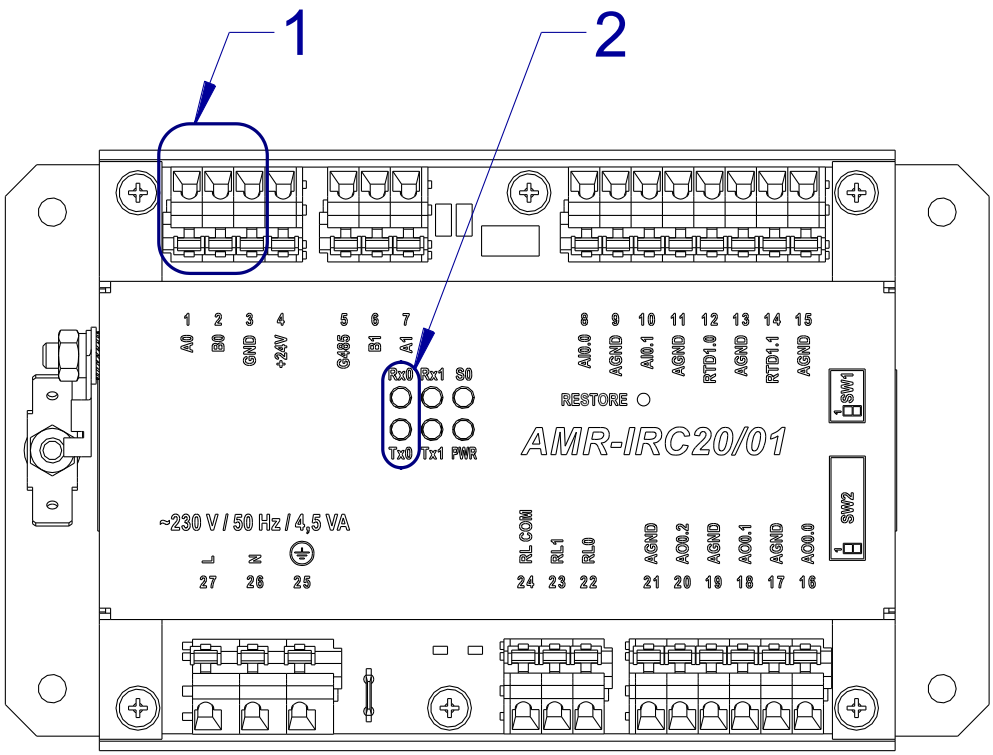

Fig. 5 – Terminals and LEDs location for RS485 without GI

Legend

Number	Description
1	Terminals for RS485 without GI
2	Status LED for RS485 without GI

Terminals marking

Terminal	Signal	Description
1	A0	RS485 interface without GI, signal A
2	B0	RS485 interface without GI, signal B
3	GND	Common ground for both RS485 interface without GI and external periphery power supply.

LEDs description

LED	Description
Rx0	Controller is receiving data
Tx0	Controller is transmitting data

Terminating resistor and idle state definition are permanently connected.

5.1.1 On-wall controller connection

Terminals 1 to 4 are typically used for on-wall controllers connection of type **AMR-OPxx** from AMiT production. It is necessary to turn off the controller power supply voltage before the on-wall controller is connected.

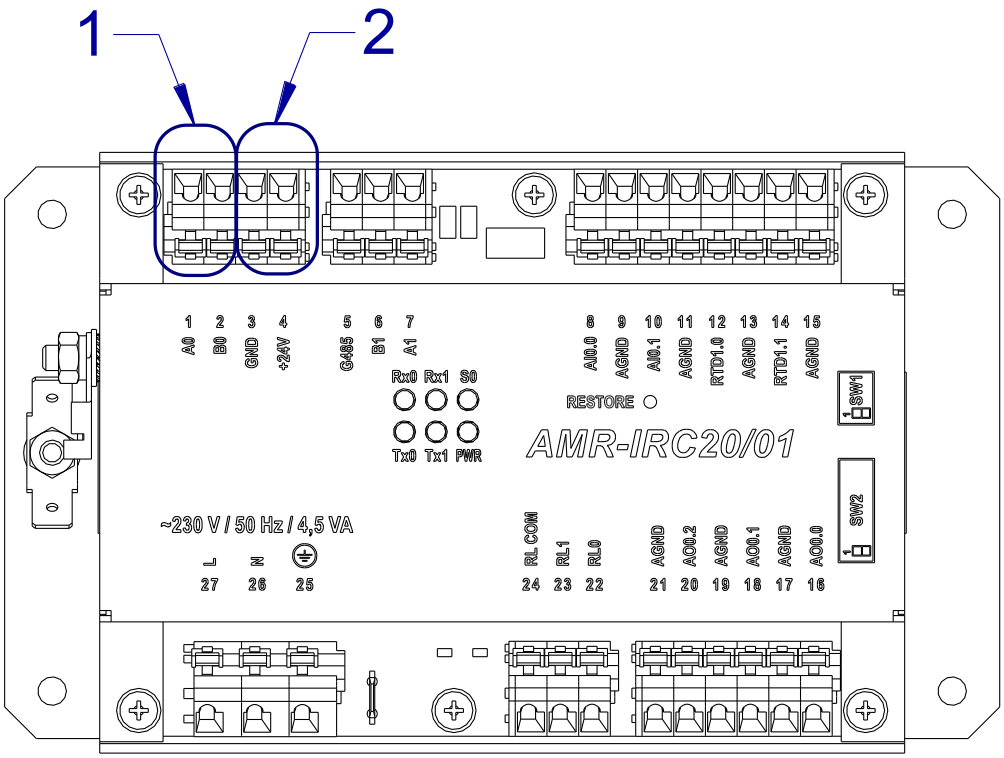

Fig. 6 – Terminals location for on-wall controller connection

Legend

Number	Description
1	Terminals for RS485 connection of on-wall controller
2	Terminals for power supply connection of on-wall controller

The on-wall controller is power supplied by 24 V DC from the controller **AMR-IRC20/01** and communicates through RS485 without galvanic isolation.

Wiring example

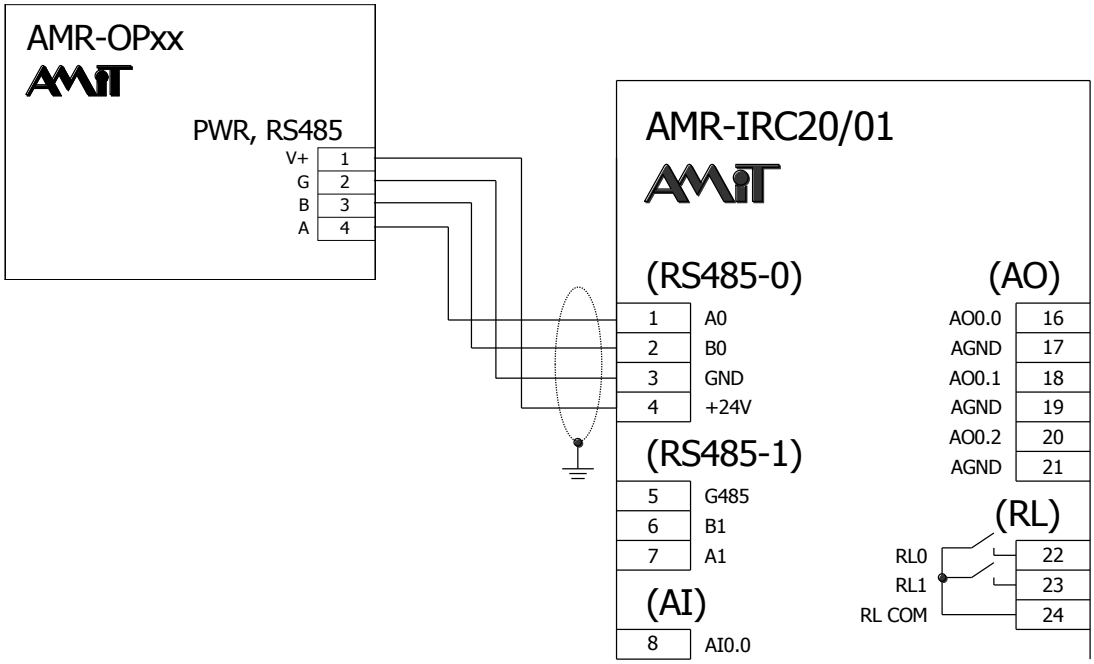

Fig. 7 – Wiring example of on-wall controller connection to **AMR-IRC20/01**

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 one 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.

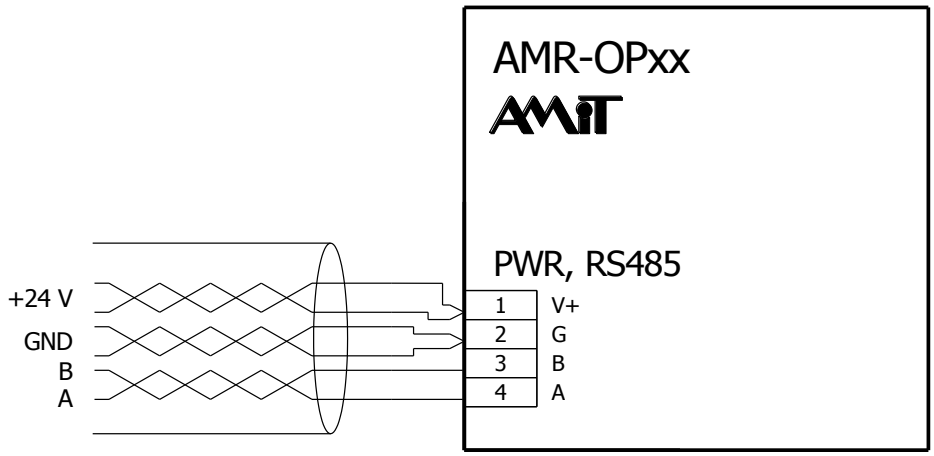

Fig. 8 – Structured cabling use example

5.2 RS485 with galvanic isolation (COM1)

Up to 255 stations can be connected to RS485 with GI. It can be used for, e.g. communication with superior control system.

RS485 interface activity is indicated by LEDs located on front panel.

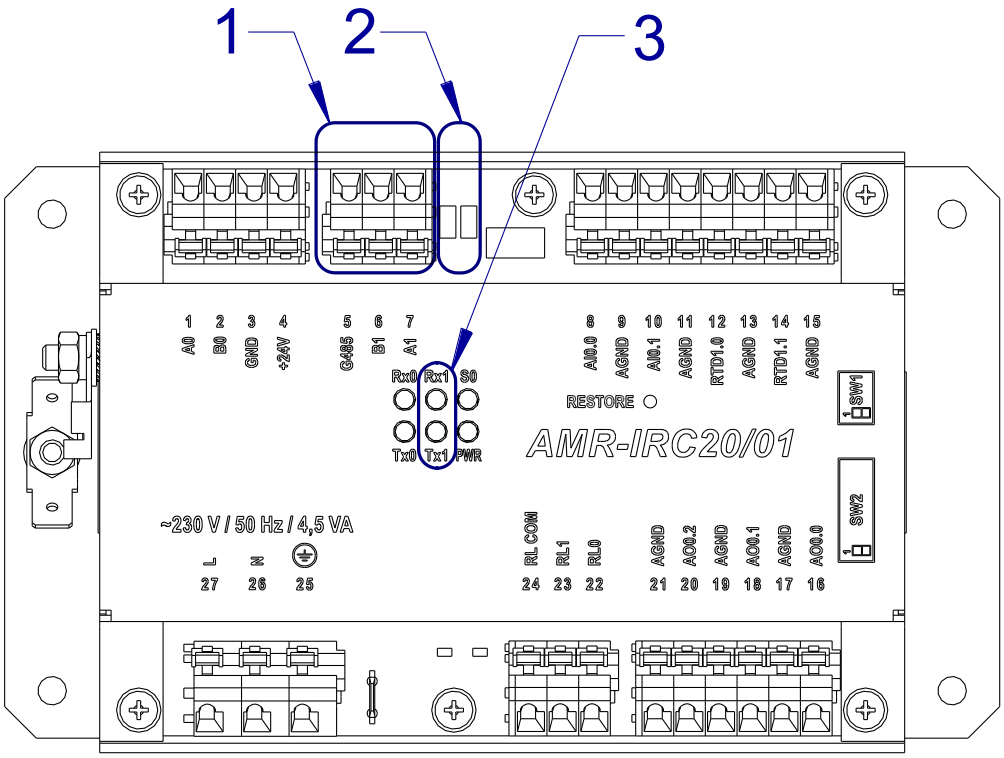

Fig. 9 – Terminals and LEDs location for RS485 with GI

Legend

Number	Description
1	Terminals for RS485 with GI
2	Configuration jumpers
3	Status LEDs for RS485 with GI

Terminals marking

Terminal	Signal	Description
5	G485	RS485 interface with GI, ground
6	B1	RS485 interface with GI, signal B
7	A1	RS485 interface with GI, signal A

LEDs description

LED	Description
Rx1	Controller is receiving data
Tx1	Controller is transmitting data

Each station in RS485 network must have properly set terminating resistor and idle states definition. Configuration jumpers located near the RS485 connector are used for termination setting.

Jumpers description

Jumper	Description
J8	Signal A idle state + termination
J9	Signal B idle state + termination

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

More information about using the RS485 interface can be found in Application Note *AP0016 – Principles of RS485 interface usage*.

6 Inputs / outputs

6.1 Analogue inputs

The programmable controller **AMR-IRC20/01** contains 2 analogue inputs for connection of sensors with voltage output 0 V DC to 10 V DC.

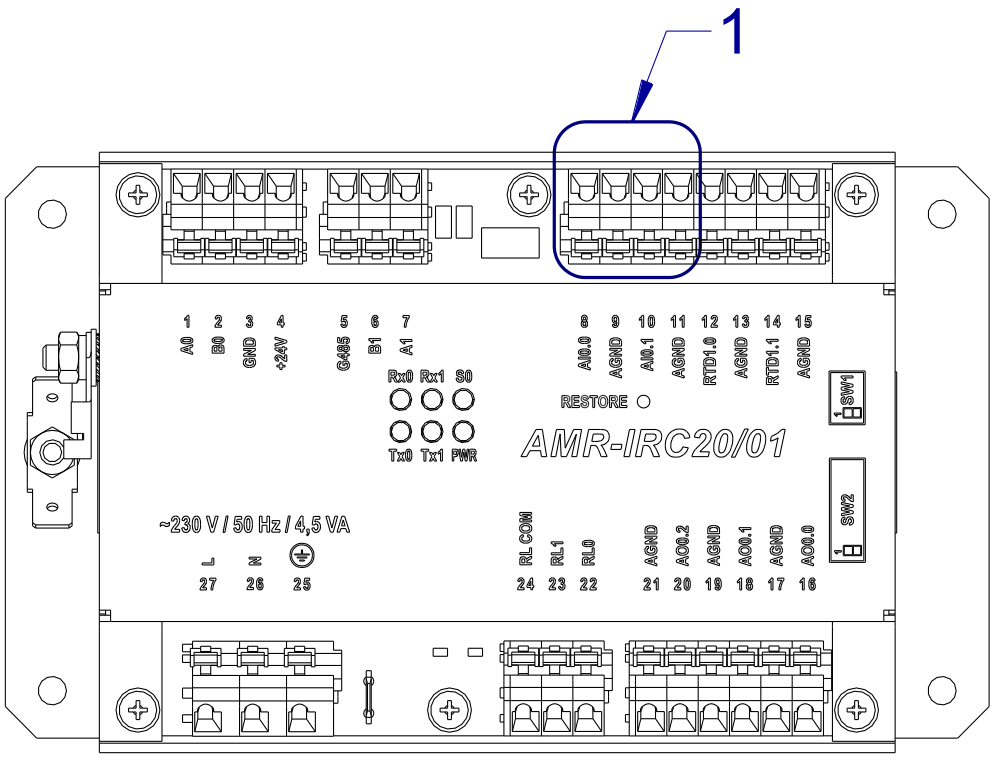

Fig. 10 – Terminals for analogue input

Legend

Number	Description
1	Terminals for analogue inputs

Terminals marking

Terminal	Signal	Description
8	AI0.0	Analogue input 0
9	AGND [12])	Analogue input ground
10	AI0.1	Analogue input 1
11	AGND [12])	Analogue input ground

Note [12]) Terminal AGND is internally connected with controller's terminal GND.

Wiring example

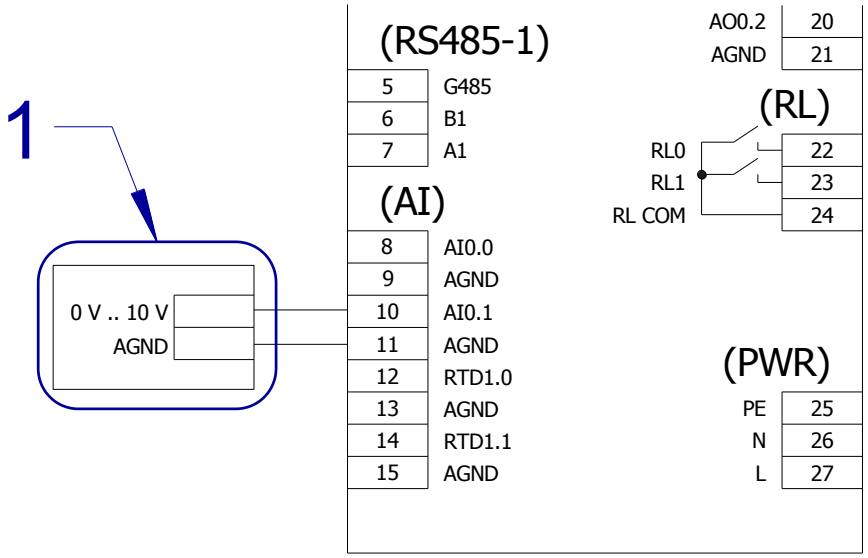

Fig. 11 – Voltage sensor 0 V to 10 V connection

Legend

Number	Description
1	Voltage sensor with output 0 V to 10 V

6.2 RTD inputs

The programmable controller **AMR-IRC20/01** contains 2 RTD (resistance temperature detector) inputs. RTD inputs can be used as:

- analogue inputs for sensors connection,
  - Ni1000 with sensitivity 6180 ppm or with sensitivity 5000 ppm,
  - Pt1000,
- dry contact digital inputs.

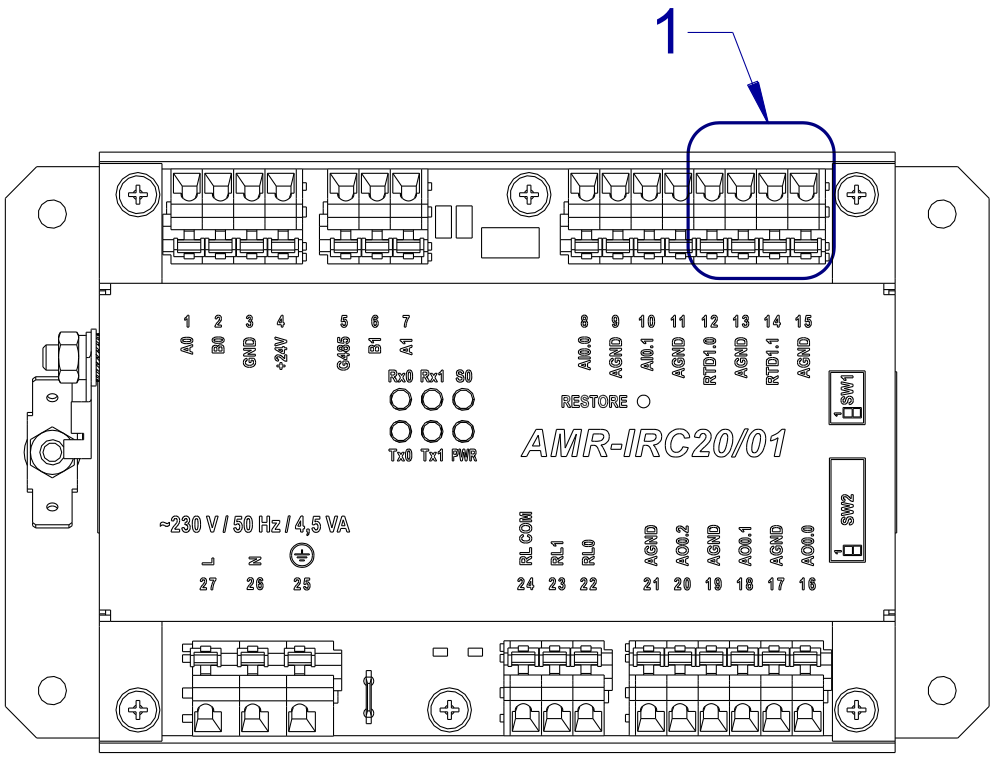

Fig. 12 – Terminals location for RTD inputs

Legend

Number	Description
1	Terminals for RTD inputs

Terminals marking

Terminal	Signal	Description
12	RTD1.0	RTD input 0
13	AGND [13])	RTDl input ground
14	RTD1.1	RTD input 1
15	AGND [13])	RTDl input ground

Note [13]) Terminal AGND is internally connected with controller's terminal GND.

Wiring examples

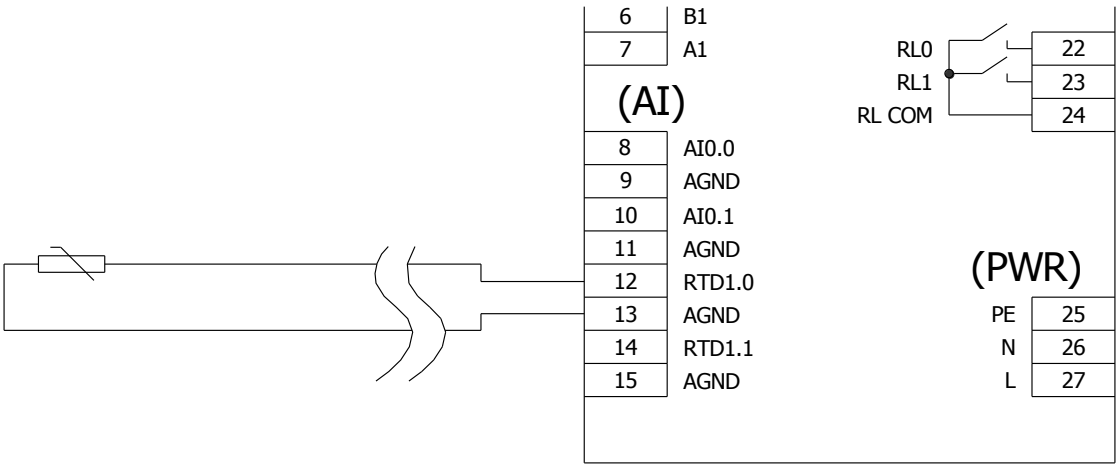

Fig. 13 – Temperature sensor wiring example

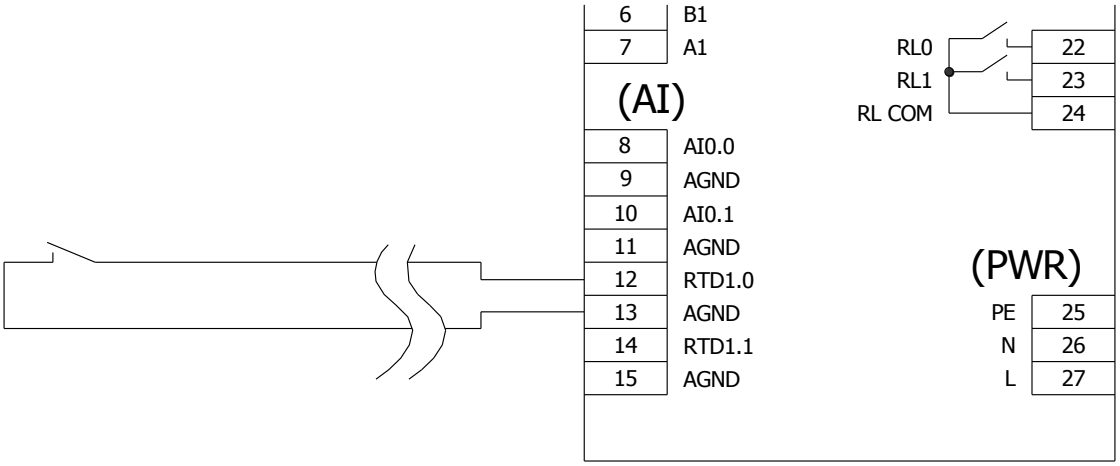

Fig. 14 – Dry contact wiring example

7 Analogue outputs

The programmable controller **AMR-IRC20/01** has three analogue voltage outputs. Output range is 0 V DC to 10 V DC. Outputs control is internally realized through Pulse Width Modulation – PWM.

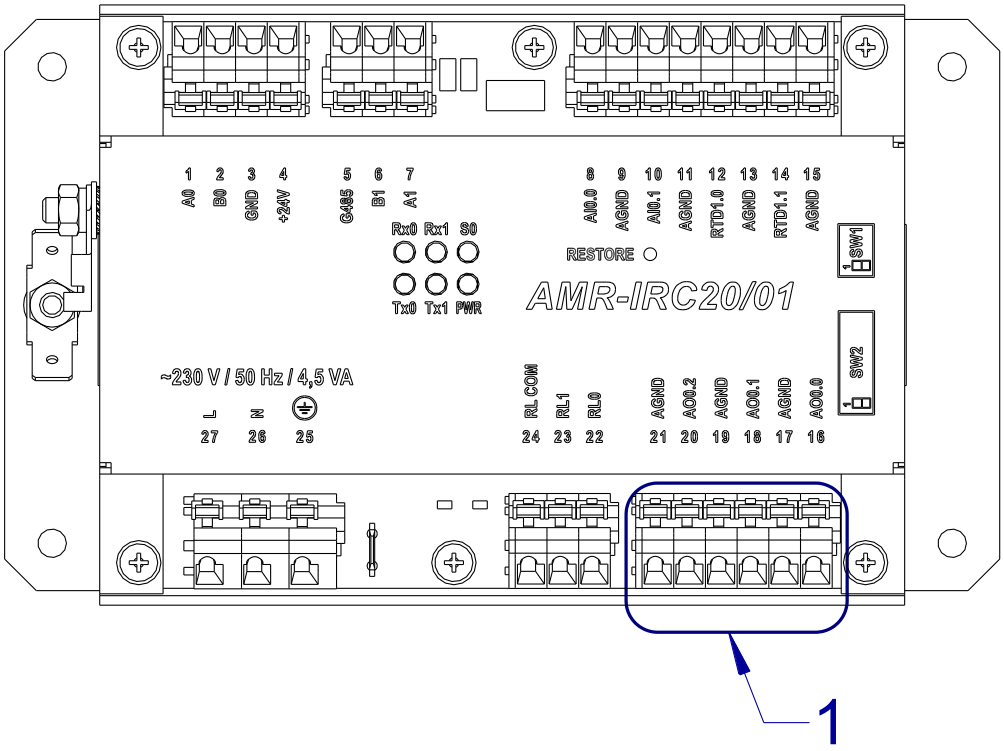

Fig. 15 – Terminals location for analogue outputs

Legend

Number	Description
1	Terminals for analogue outputs

Terminals marking

Terminal	Signal	Description
16	AO0.0	Analogue output 0
17	AGND	Analogue output ground
18	AO0.1	Analogue output 1
19	AGND	Analogue output ground
20	AO0.2	Analogue output 2
21	AGND	Analogue output ground

Wiring example

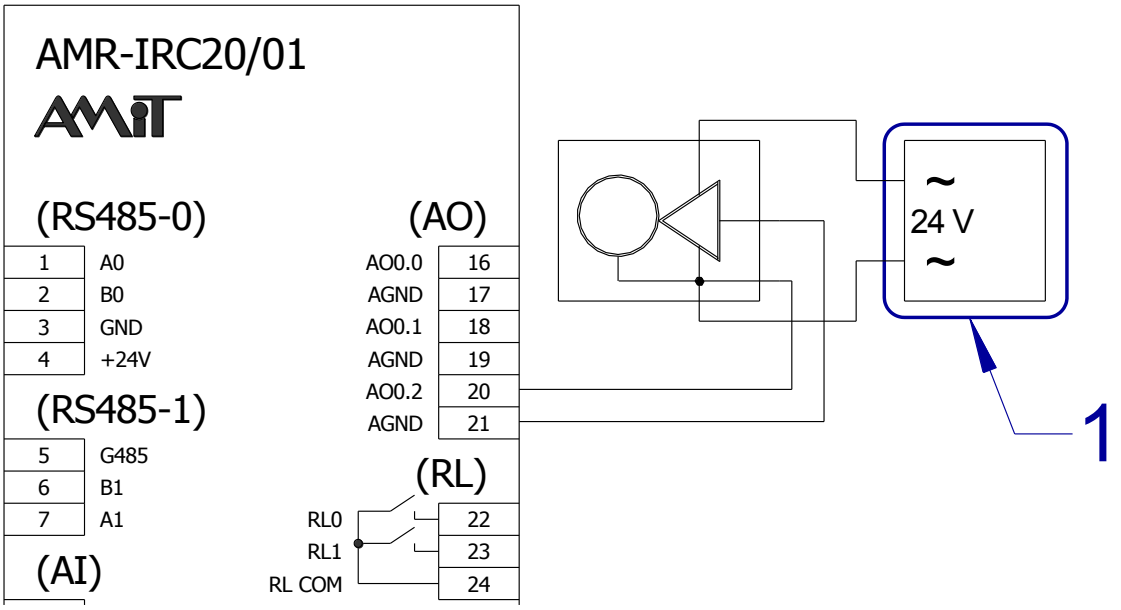

Fig. 16 – Wiring example of servo connection with AC voltage power supply

Legend

Number	Description
1	AC voltage power supply

8 Relay outputs

The programmable controller **AMR-IRC20/01** contains two relay outputs with common input terminal.

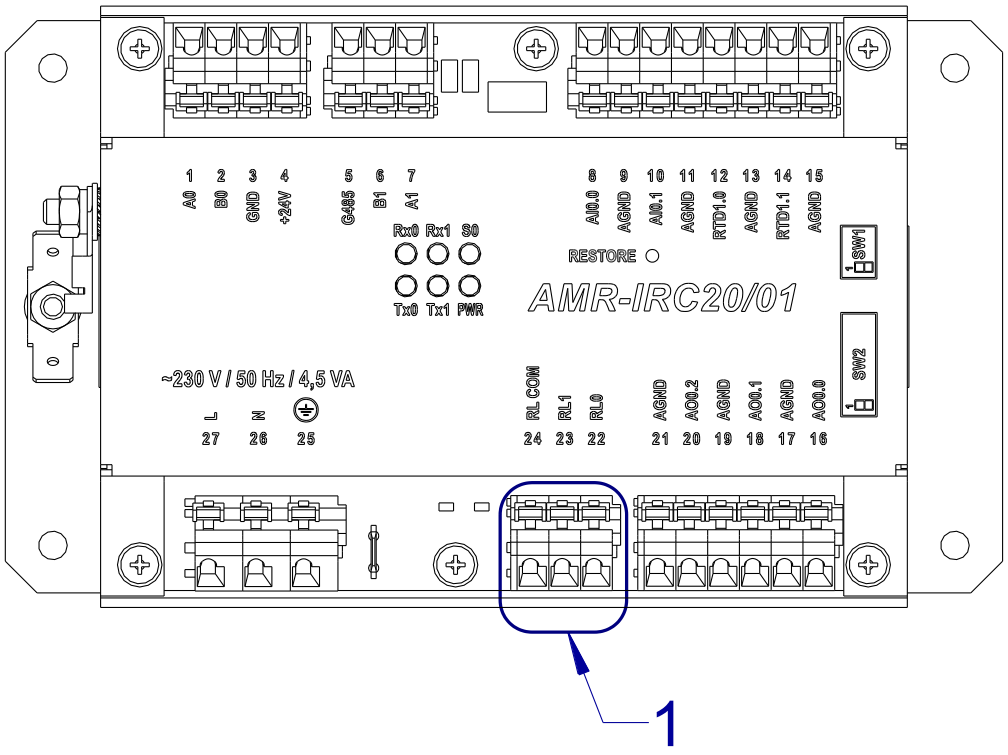

Fig. 17 – Terminals location for relay outputs

Legend

Number	Description
1	Terminals for relay outputs

Terminals marking

Terminal	Signal	Description
22	RL0	Relay 0 output
23	RL1	Relay 1 output
24	RL COM	Common input relay terminal 0 and 1

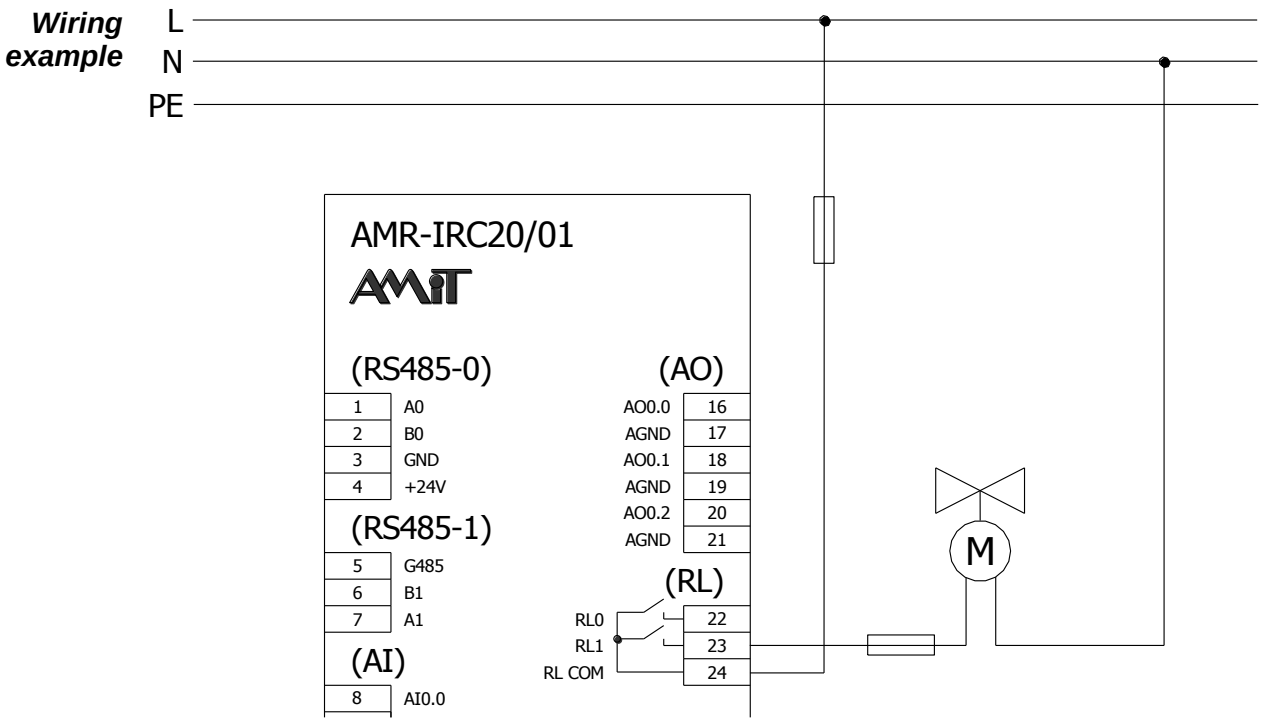

Fig. 18 – Wiring example of thermoelectric head connection to relay output

9 Mounting

9.1 Installation rules

EMC filter Use an EMC filter on 230 V AC power supply voltage input. This requirement can be revised on the basis of environment character and wiring layout.

Main power inlet A bi-polar switch must be used as disconnecting element, alternatively circuit breaker with coupled break contact. The disconnecting element must be: implemented into the installation, placed in close vicinity of the equipment, available for operator and it must be marked as disconnecting element of equipment.

Protection Equipment must be protected with external circuit breaker.

Connection to PE It is recommended to connect the negative supplying terminal of unit GND (terminal no. 3) on input to the switchboard's PE terminal.

Relay outputs Cabling must be installed so that accidental release of any single wire does not cause introduction of mains voltage into safe part and vice versa.

Maximum current in the bulb is greater than its nominal current. Either the short-time value of switched current must not overcome its maximum allowed value.

If the inlet wires are led outside the building, the appropriate outputs need to be overvoltage protected.

Analogue outputs It is necessary to pay attention that power supply circuit must not be closed through controller's analogue ground during the installation of power source for analogue drives.

Use shielded cables for wiring. Connect the cable shielding to the PE terminal immediately on switchboard input.

If the inlet wires are led outside the building, the appropriate outputs need to be overvoltage protected.

Analogue and RTD inputs Use shielded cables for analogue signals connection. Connect the cable shielding to the PE terminal immediately on switchboard input.

Use shielded wires for RTD inputs in digital input mode in environments with higher interference levels and for longer cablings. Connect the cable shielding to the PE terminal immediately on switchboard frame input.

If the inlet wires are led outside the building, the appropriate outputs need to be overvoltage protected.

RS485 interface It is necessary to perform RS485 interface connection according to recommendations 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 device are guaranteed only when these wiring principles are applied.

On-wall controller It is necessary to turn off the controller power supply voltage before the on-wall controller is connected.

10 Programming and setting

The programmable controller **AMR-IRC20/01** is factory-programmed with Loader that allows uploading of user application.

This application can be created using:

- DetStudio / EsiDet development environment

Application uploading into controller can be performed only through RS485 with galvanic isolation (COM1). It can be performed using:

- DetStudio development environment
- AMRconfig service and programming utility
- AMRmultidownload multiprogramming utility

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

10.1 Communication parameters setting

10.1.1 RS485 without galvanic isolation (COM0)

It is necessary to set the communication parameters (address, communication speed and parity) in application created in EsiDet part of DetStudio environment.

10.1.2 RS485 with galvanic isolation (COM1)

Two sets of DIP switches located on the controller side serve for communication parameters setting.

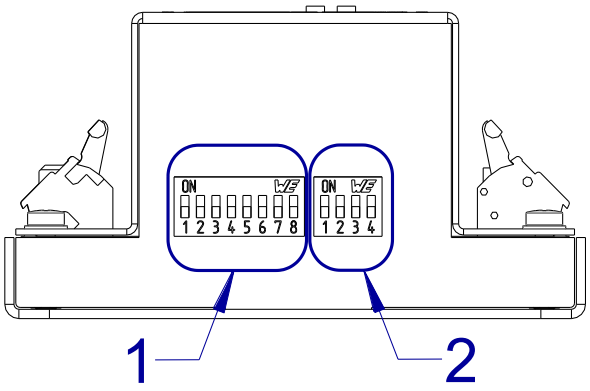

Fig. 19 – DIP switch location for communication parameters setting

Legend

Number	Description
1	DIP switches SW2
2	DIP switches SW1

Switch description

Switches	Description
SW1	Communication speed and parity setting
SW2	Controller address setting

PC connection

The controller **AMR-IRC20/01** must be connected to the PC through RS485 converter (for example type **SB485s** from AMiT offer) in point – to – point connection.

Note

Communication with controller can be established from DetStudio only through MODBUS RTU communication protocol (e.g. any time after loader activation, see chapter 10.3 Loader).

DIP SW1 – communication speed and parity setting

All devices must have identical parity and communication speed in network. Parity (if not given by communication protocol) and communication speed can be set by different DIP switches combination according to the tables.

SW1.1	SW1.2	SW1.3	Speed	Parity
OFF	OFF	OFF	9 600	According to SW1.4
ON	OFF	OFF	19 200	According to SW1.4
OFF	ON	OFF	38 400	According to SW1.4
ON	ON	OFF	57 600	According to SW1.4
OFF	OFF	ON	9 600	Without parity, SW1.4 setting is meaningless
ON	OFF	ON	19 200	Without parity, SW1.4 setting is meaningless
OFF	ON	ON	38 400	Without parity, SW1.4 setting is meaningless
ON	ON	ON	115 200	According to SW1.4

SW1.4	Parity
OFF	even
ON	odd

Stop bits number is set automatically according to selected parity:

Even parity	1 stop bit
Odd parity	1 stop bit
Without parity	2 stop bits

DIP SW2 – address setting

The controller occupies a single network address. Each device must have a unique network address (usable addresses range is given by communication protocol). Address can be set by DIP switches combination according to the table.

				SW2.8	OFF	OFF	OFF	OFF	ON	ON	ON	ON
				SW2.7	OFF	OFF	ON	ON	OFF	OFF	ON	ON
				SW2.6	OFF	ON	OFF	ON	OFF	ON	OFF	ON
SW2.1	SW2.2	SW2.3	SW2.4	SW2.5	Module address in MODBUS network							
OFF	OFF	OFF	OFF	OFF	0	32	64	96	128	160	192	224
ON	OFF	OFF	OFF	OFF	1	33	65	97	129	161	193	225
OFF	ON	OFF	OFF	OFF	2	34	66	98	130	162	194	226
ON	ON	OFF	OFF	OFF	3	35	67	99	131	163	195	227
OFF	OFF	ON	OFF	OFF	4	36	68	100	132	164	196	228
ON	OFF	ON	OFF	OFF	5	37	69	101	133	165	197	229
OFF	ON	ON	OFF	OFF	6	38	70	102	134	166	198	230
ON	ON	ON	OFF	OFF	7	39	71	103	135	167	199	231
OFF	OFF	OFF	ON	OFF	8	40	72	104	136	168	200	232
ON	OFF	OFF	ON	OFF	9	41	73	105	137	169	201	233
OFF	ON	OFF	ON	OFF	10	42	74	106	138	170	202	234
ON	ON	OFF	ON	OFF	11	43	75	107	139	171	203	235
OFF	OFF	ON	ON	OFF	12	44	76	108	140	172	204	236
ON	OFF	ON	ON	OFF	13	45	77	109	141	173	205	237
OFF	ON	ON	ON	OFF	14	46	78	110	142	174	206	238
ON	ON	ON	ON	OFF	15	47	79	111	143	175	207	239
OFF	OFF	OFF	OFF	ON	16	48	80	112	144	176	208	240
ON	OFF	OFF	OFF	ON	17	49	81	113	145	177	209	241
OFF	ON	OFF	OFF	ON	18	50	82	114	146	178	210	242
ON	ON	OFF	OFF	ON	19	51	83	115	147	179	211	243
OFF	OFF	ON	OFF	ON	20	52	84	116	148	180	212	244
ON	OFF	ON	OFF	ON	21	53	85	117	149	181	213	245
OFF	ON	ON	OFF	ON	22	54	86	118	150	182	214	246
ON	ON	ON	OFF	ON	23	55	87	119	151	183	215	247
OFF	OFF	OFF	ON	ON	24	56	88	120	152	184	216	248
ON	OFF	OFF	ON	ON	25	57	89	121	153	185	217	249
OFF	ON	OFF	ON	ON	26	58	90	122	154	186	218	250
ON	ON	OFF	ON	ON	27	59	91	123	155	187	219	251
OFF	OFF	ON	ON	ON	28	60	92	124	156	188	220	252
ON	OFF	ON	ON	ON	29	61	93	125	157	189	221	253
OFF	ON	ON	ON	ON	30	62	94	126	158	190	222	254
ON	ON	ON	ON	ON	31	63	95	127	159	191	223	255

Attention *All switch setting changes take their effect only after controller restarting (i.e. power supply disconnection and connection).*

10.2 LED S0

LED S0 serves for module program state indication.

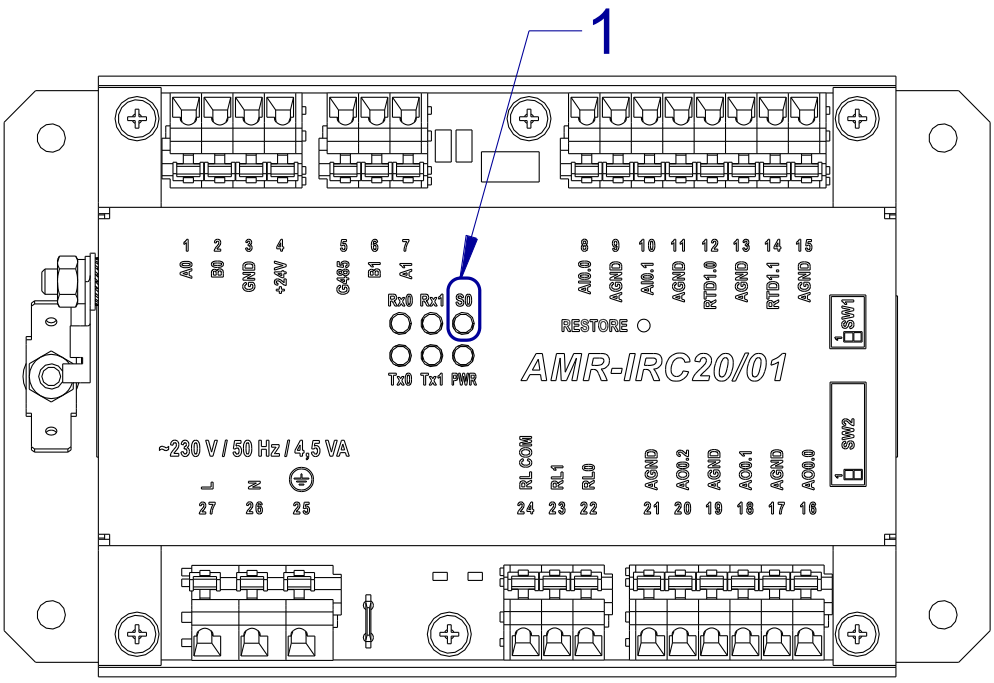

Fig. 20 – LED S0 location

Legend

Number	Description
1	LED S0

LED S0 indicates different program states by blinking with different period and length.

LED	Light	Description
S0	0.1 s flashing for 1 s period	Reset passage indication.
	Regular flashing with 0.2 s period	Loader is launched.
	Regular flashing with 1 s period	Application is launched.
	Irregular flashing with 0.5 s period	Running application is indicating error. Irregular flashing means that 2 s pause follows after a particular number of flashes. Number of flashes between two pauses indicates numeric error code: 1 – BackUp RAM reading error, 2 – eeprom reading error, 3 – suspiciously frequent writing to eeprom, 15 – unknown error.

10.3 Loader

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

Loader activation

The loader can be activated by pressing ***"RESTORE"*** button.

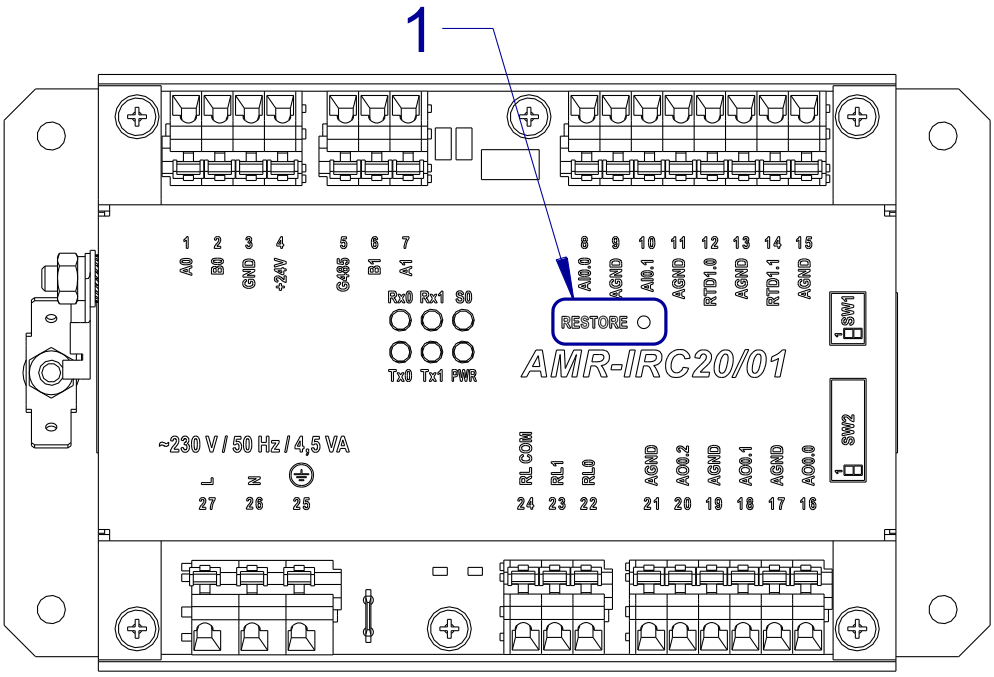

Fig. 21 – Button RESTORE button location

Legend

Number	Description
1	Button RESTORE

Particular action is called-out according to moment and duration of button press, see following table.

Pressing length	Action
> 1 s After turning-on	Loader with communication parameters set on DIP switches (SW1 a SW2) is launched.
> 3 s During application run	Loader with communication parameters set on DIP switches (SW1 a SW2) is launched.

11 Factory settings

RS485 configuration The RS485 interface (COM1) is fitted with jumpers that activate wires termination and idle state definition.

Program settings of interface COM1 Communication protocol MODBUS RTU. Communication parameters are set according to DIP SW1 and DIP SW2 position.

12 Ordering information and completion

Programmable controller	**AMR-IRC20/01**	Complete, see chapter 12.1 Completion

12.1 Completion

AMR-IRC20/01

Part	Quantity
Programmable controller	1

13 Maintenance

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

Cleaning Time after time with regard to way of device usage, it is necessary to remove dust from inside electronics. 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!**

14 Waste disposal

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