AMR-CP24/01

Communication unit

Operation manual

Version 1.01

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Contents

History of revisions

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Revision	Date	Changes
100	17. 04. 2014	New document
101	05. 08. 2014	Change in the chapter Ordering information and completion

Related documentation

1. DetStudio Development Environment Help
2. Application Note AP0016 – Principles of using RS485 interface
   file: ap0016_en_xx.pdf
3. Application Note AP0037 – Principles of using Ethernet network
   file: ap0037_en_xx.pdf
4. Application Note AP0050 – Project documentation for AMiT company products
   file: ap0050_en_xx.pdf

1. Introduction

AMR-CP24/01 is a programmable controller that can be used as a communication centre.

Basic features

- 1 × RS232 interface
- 1 × RS485 interface with Galvanic separation
- 2 × Ethernet interface 10/100 Mbps, with switch functionality
- 1 × wireless interface Poseidon®
- Slot for micro SD card
- Power supply 230 V AC

2. Technical parameters

Processor

Type	STM32F407
FLASH memory	1024 + 4096 KB
RAM	192 KB
EEPROM	32 KB
RAM + RTC back-up	Rechargeable battery Panasonic VL1220
Rechargeable battery lifetime *)	1000 charge cycles 100 % -> 90 % -> 100 % 40 charge cycles 100 % -> 0 % -> 100 %

Note: *) Storage lifetime 5 years.

RTC

Type	STM32F407 (processor component)
Accuracy	±20 ppm

RS232

Quantity	1
Logical level 0 (input)	Min. +3 V, max. +30 V
Logical level 1 (input)	Min. -30 V, max. -3 V
Logical level 0 (output)	Min. +5 V, max. +10 V
Logical level 1 (output)	Min. -10 V, max. -5 V
Maximum cable length	10 m
Galvanic separation	No
Operation indication	LED on the motherboard
Connection point	Connector D-sub DE-9 plug, according to EIA-232

RS485

Quantity	1
Overvoltage protection	Transil 600 W
Galvanic separation *)	Yes
Insulation strength *)	300 V AC / 1 minute
Terminating resistor **)	120 Ω on unit
Idle state definition **) up to +5 V up to 0 V	 1 KΩ on unit 1 KΩ on unit
Maximum wire length	1200 m / 19200 bps
Max. number of stations on segment	256
Operation indication	LED on the motherboard
Connection point	Connector WAGO 231-333/001-000
Wire cross section	0.08 mm^2 to 2.5 mm^2

Note: *) Insulation must not be used for dangerous voltage separation.
**) Terminating resistor and idle state definition are connected concurrently.

Ethernet

Quantity	2 *)
Data transmission rate	10/100 Mbps
Galvanic separation	Yes
Insulation strength	300 V AC / 1 minute **)
Operation indication	Connector built-in LED
Connection point	RJ45 connector, according to IEEE802.3

Note: *) One IP address can be configured in the device. Interface works as a switch.
**) Insulation must not be used for dangerous voltage separation.

Poseidon wireless interface

Carrier frequency	868.3 MHz
Maximum transmitting power	+10 dBm
Range	Up to 150 m (in open space)
Operation indication	LED on the motherboard
Antenna connection *)	Screw terminal block CPP3.5/3

Note: *) Simple wire antenna is a part of a delivery.

SD card

Type	Micro SD (HC)
Capacity	128 MB to 16 GB *)

Note: *) Micro SD card is not part of delivery.

Power supply

Nominal power supply voltage	230 V AC ±10 %
Maximum power consumption	20 mA at 230 V AC
Protection class	1
Galvanic separation	Yes
Connection point	WAGO 231-933/001-000

Mechanics

Mechanical design	Metal box
Mounting	On to the switchboard base plate / to the dropped ceiling
Ingress protection rate	IP20
Weight – netto – brutto	0.66 kg ±5 % 0.78 kg ±5 %
Dimensions (w × h × d)	(157 × 96 × 45) mm

Temperatures

Operating temperature range	0 °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

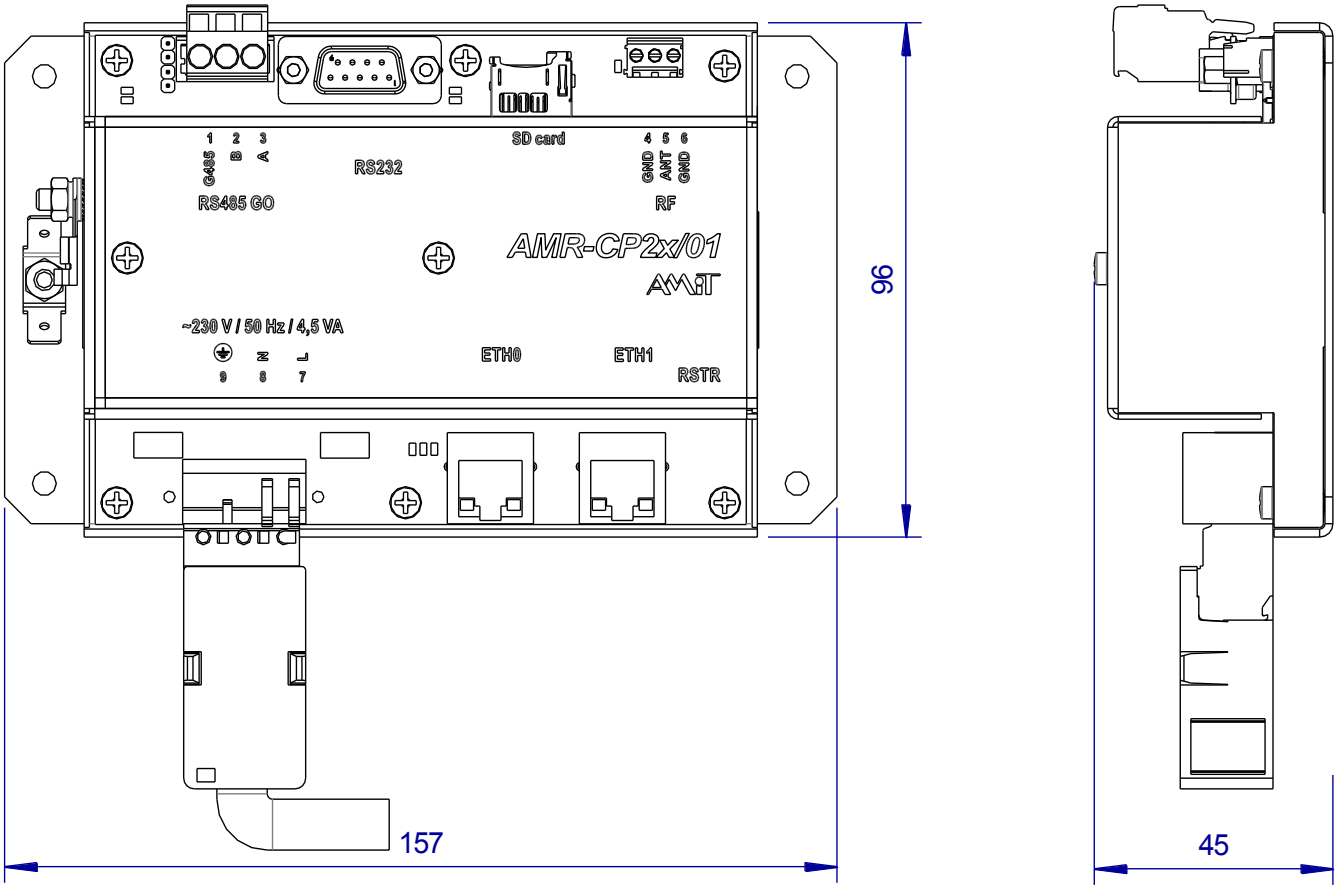

Fig. 1 - **AMR-CP24/01** dimensions

2.2. Recommended drawing symbol

Following drawing symbol is recommended for the unit. Only part of it will be visible in following examples.

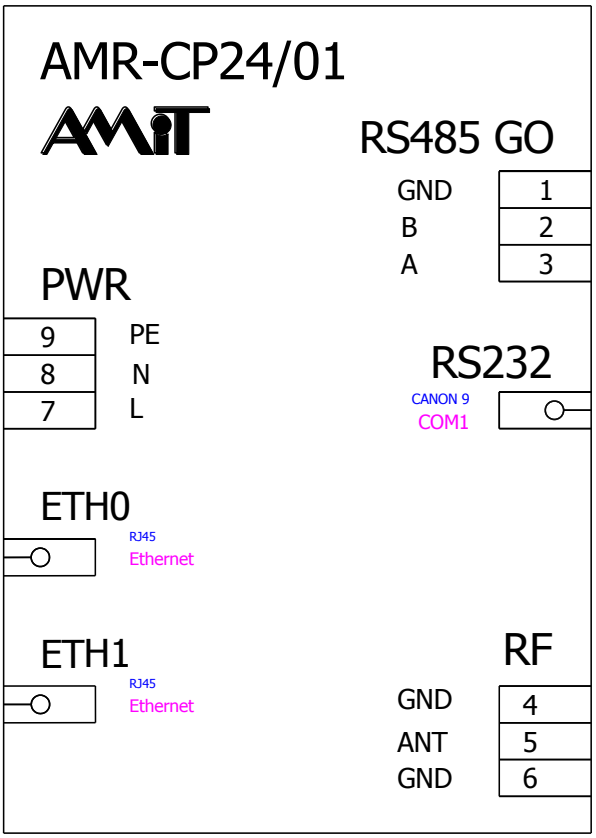

Fig. 2 - Recommended drawing symbol for **AMR-CP24/01**

3. Conformity assessment

This product complies with requirements of Czech Government Decree NV616/2006 and NV17/2003. The compliance assessment with NV616/2006 has been performed in accordance with harmonized standard EN 61326-1, compliance assessment with NV17/2003 has been performed in accordance with harmonized standard EN 61010-1.

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	Class B
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test	Complies
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Radiated, radio-frequency, electromagnetic field immunity test, 80 MHz to 1 GHz	10 V/m
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Radiated, radio-frequency, electromagnetic field immunity test, 1 GHz to 2 GHz	3 V/m
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Radiated, radio-frequency, electromagnetic field immunity test, 2 GHz to 2,7 GHz	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	±2 kV
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Electrostatic discharge immunity test	±2 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	3 V
EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements	Complies

3.1. Other tests

Tested in accordance with standard	Type of test	Classification
EN 61000-4-11:2004	Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations – immunity tests	Complies
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

4. Power supply

Unit is powered by single-phase 230 V AC from the power network. Unit must be protected externally.

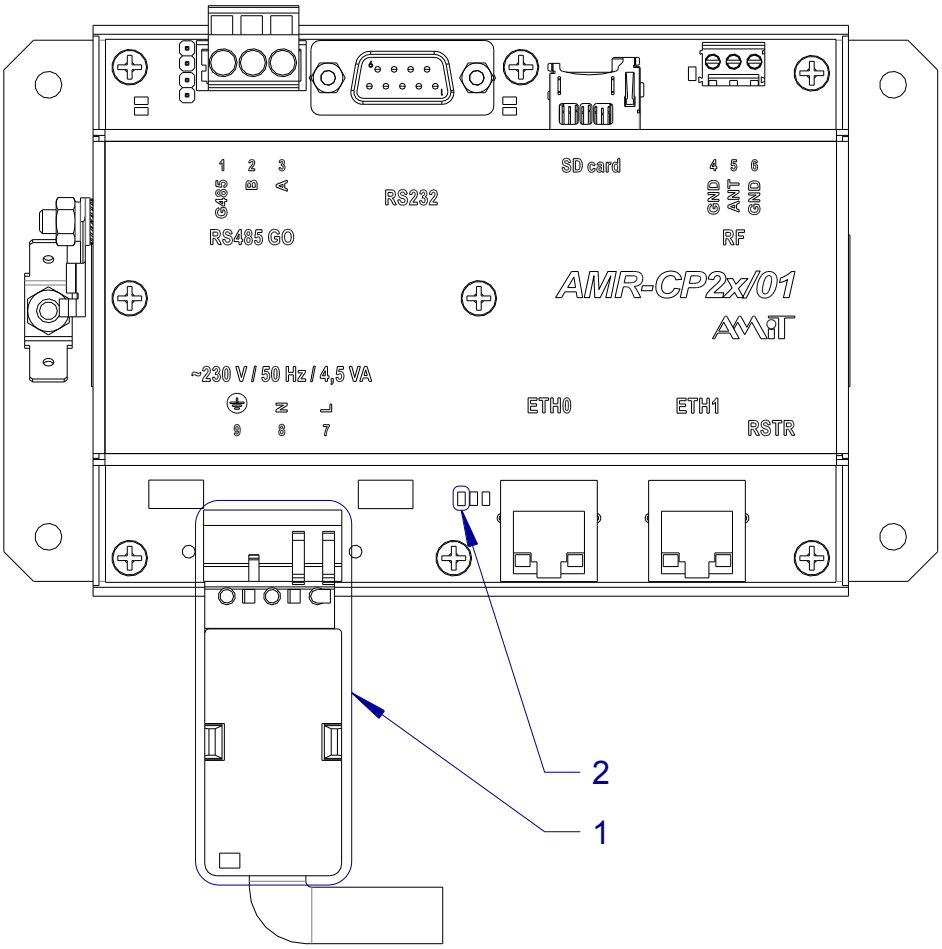

Fig. 3 - Power supply connector location

Legend

Number	Meaning
1	Power supply connector
2	Signal LED

Power supply is realized by connecting of power supply inlet wire via counterpart of power supply connector WAGO 231-933.

Connector terminals labelling

Terminal	Label	Meaning
7	L	Phase conductor
8	N	Neutral conductor
9	⏚	Protective conductor

Presence of supply voltage on the connector is indicated by the PWR LED indicator.

Meaning of LEDs status

LED	Meaning
Lit	Power supply is attached.
Off	Power supply is not attached.

Protective conductor

The protective conductor terminal is connected to metal mechanical components so that protection against hazardous contact voltage is ensured. **The protective conductor must be always connected!!!**

Attached assembly tool of power supply connector counterpart, that comes disassembled in two parts, should be used during installation. Cable clamp and its screws for securing power supply inlet, is supplied with assembly tool.

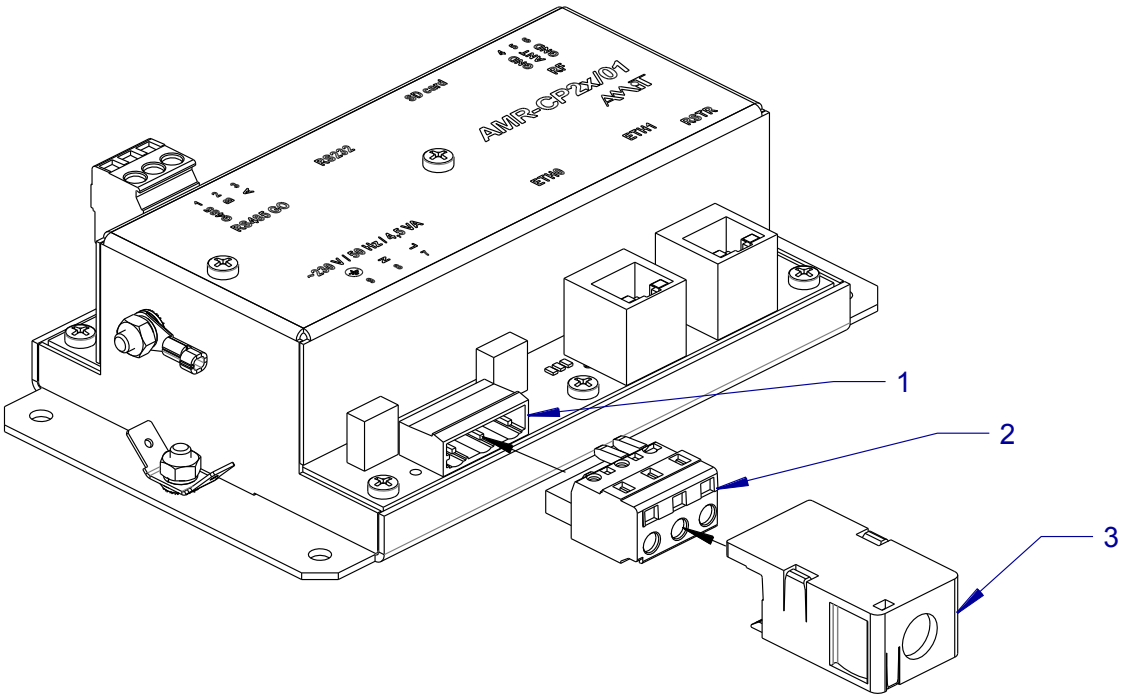

Fig. 4 - Power supply connector assembly

Legend

Number	Meaning
1	Connector WAGO 231-933
2	Connector WAGO 231-703
3	Assembly tool for stress relief WAGO 232-683

5. Communication lines

AMR-CP24/01 is equipped with four communication interfaces.

- 1 × RS232
- 1 × RS485
- 1 × Ethernet switch (two connectors)
- 1 × Poseidon wireless interface

5.1. RS232

According to RS232 standard, this interface is assigned for connection of two devices. Relatively low radius and low immunity to disturbances are disadvantageous.

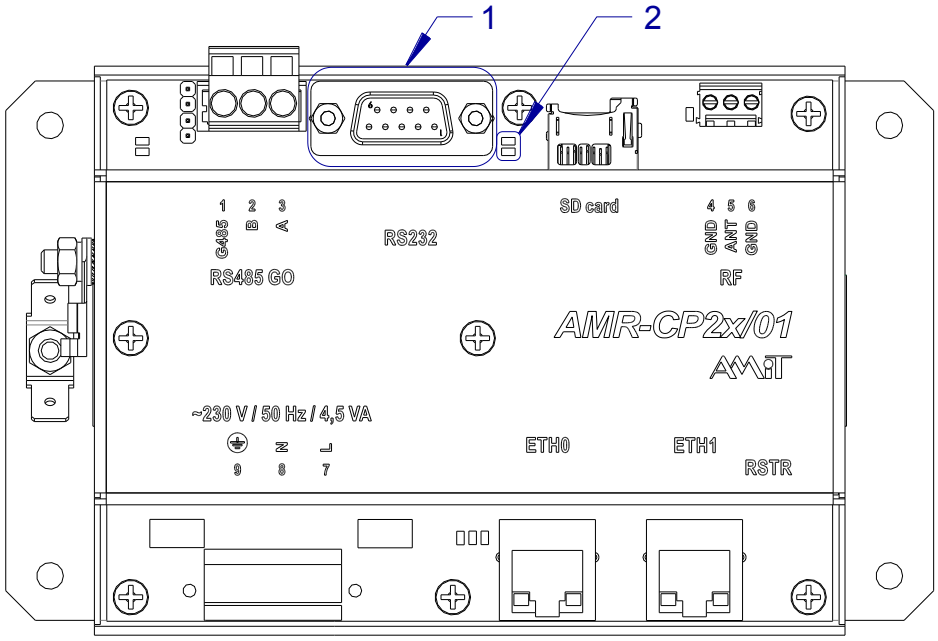

Fig. 5 - RS232 connector location

Legend

Number	Meaning
1	RS232 interface connector
2	LEDs for status indication

Software operation During programming, RS232 is labelled as “COM1 RS232”.

RS232 interface connection

Terminal	Meaning	Type
1	DCD	Input
2	RxD	Input
3	TxD	Output
4	DTR	Output
5	GND	Ground
6	DSR	Input
7	RTS	Output

Terminal	Meaning	Type
8	CTS	Input
9	RI	Input

The **Meaning** item corresponds to **AMR-CP24/01** control system signals. The **Type** item represents the signal type on **AMR-CP24/01** control system.

Status indication Line status is indicated by LEDs located close to D-sub DE9 connector.

LED	Meaning
Rx	Unit is receiving data
Tx	Unit is transmitting data

5.2. RS485

RS485 is used for connection of multiple stations to the network. For proper working of RS485 it is necessary to abide the rules presented in Application Note *AP0016 – Principles of using RS485 interface*.

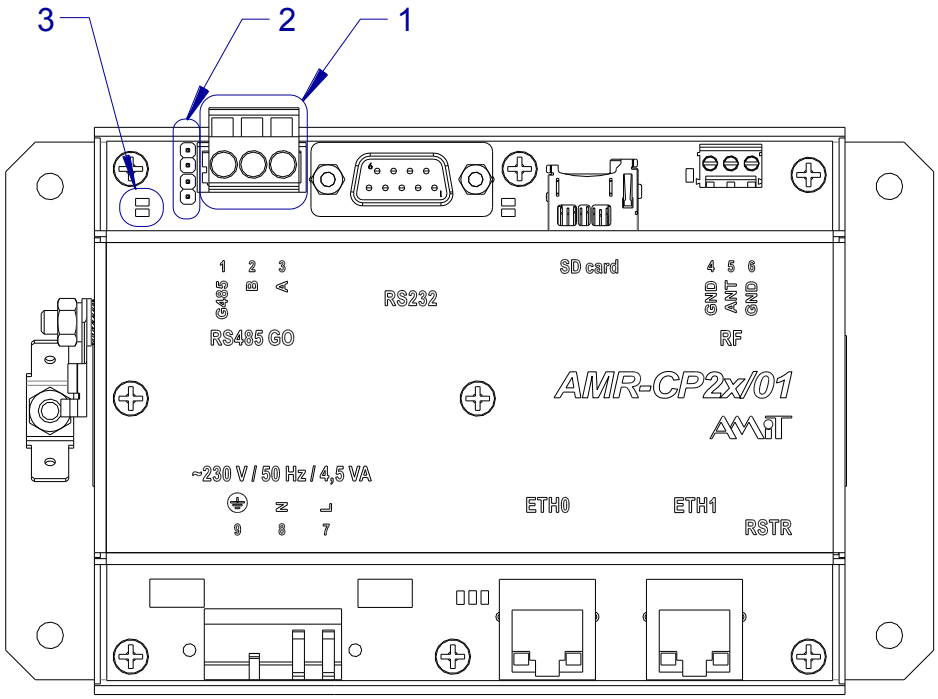

Fig. 6 - RS485 connector location

Legend

Number	Meaning
1	RS485 interface connector
2	Configuration jumpers
3	LEDs for status indication

Software operation RS485 is labelled as “COM0 RS485” during programming.

Connector labelling

Terminal	Label	Meaning
1	G485	RS485 line ground
2	B	RS485 line, signal B
3	A	RS485 line, signal A

Configuration jumpers

Each station on RS485 communication line must have properly set line termination resistors and idle state definition. Configuration jumpers located near the RS485 connector are used for termination adjusting.

Meaning of jumpers

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

Jumpers	Meaning
Are set	End station, terminator is connected
Are not set	Intermediate station, Idle state and line termination is inactive

Status indication

Line status is indicated by LEDs located close to WAGO 231-333/001-000 connector.

LED	Meaning
Rx	Unit is receiving data
Tx	Unit is transmitting data

5.3. Ethernet

Ethernet interface can be used for:

- loading software to the unit
- exchanging information with other devices.

The unit contains Ethernet switch with two ports. It can be connected directly to computer LAN network via Ethernet interface. A family of TCP/IP protocols is used for communication, therefore the communication network can be shared both by units and personal computers.

For connection it is possible to use components of standard structured cabling.

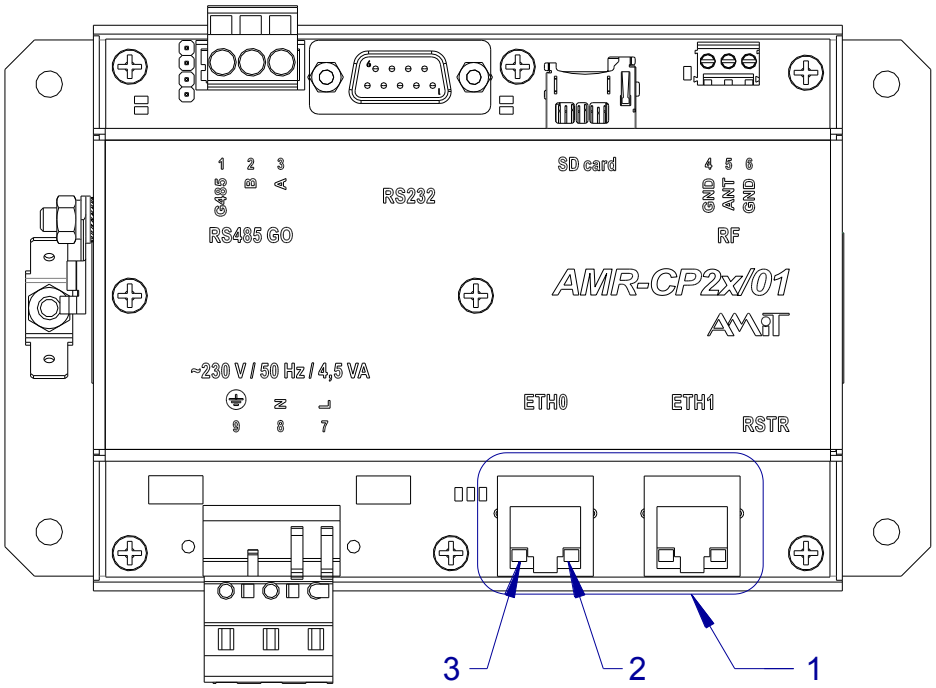

Fig. 7 - Ethernet ETH0 and ETH1 connector location

Legend

Number	Meaning
1	RJ45 connectors of Ethernet0 and Ethernet1 interfaces
2	LED SPEED
3	LED LNK / ACT

Status on Ethernet lines is indicated via LEDs on ETH0 and ETH1 connectors.

Status indication

Line status is indicated by LEDs located on each RJ45 connector.

LED	Status	Meaning
LNK / ACT	Lit	Connection to the Ethernet network
	Blinks	Data transmitting / receiving
SPEED	Lit	100 Mbps
	Off	10 Mbps

More information can be found in Application note *AP0037 – Principles of using Ethernet network*.

5.4. Poseidon wireless interface

Unit can be connected to the Poseidon 868 MHz wireless control system via wireless interface. Bi-directional communication is possible with receivers and transmitters of this system. Unit can also work as a repeater of the Poseidon system signal.

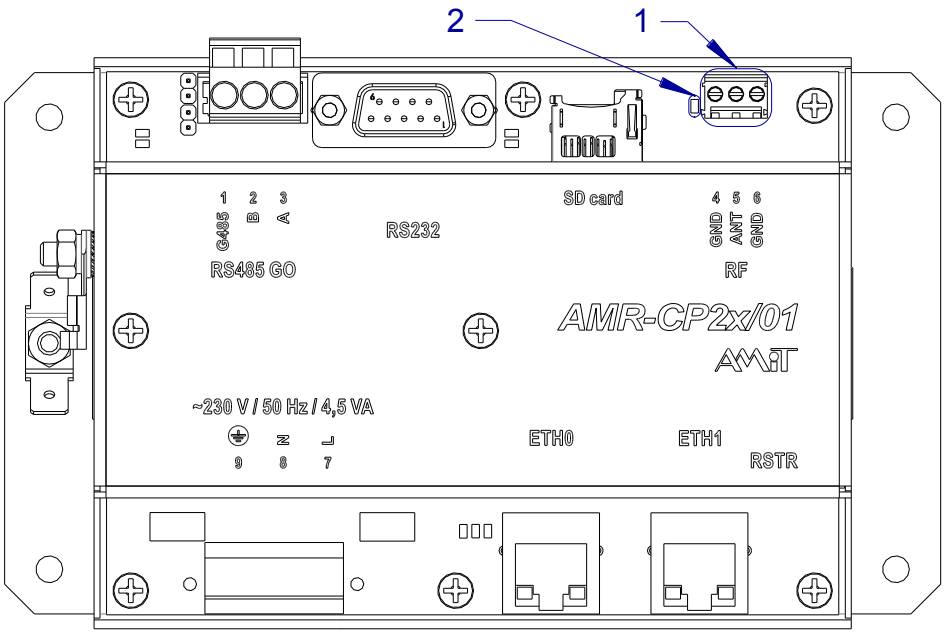

Fig. 8 - Location of the Poseidon system antenna connector

Legend

Number	Meaning
1	Poseidon system antenna connector
2	LEDs for status indication

Software operation During programming this interface is labelled as “COM2 Poseidon”.

Connector labelling

Terminal	Label	Meaning
4	GND	Poseidon, shielding
5	ANT	Poseidon, antenna
6	GND	Poseidon, shielding

Note: In case of using standard supplied antenna, it is connected to the pin 5, that has a label “ANT”.

Status indication Line status is indicated with LED, located close to the CPP3.5/3 terminal.

Status	Meaning
Blinking	Unit is receiving / transmitting data
Off	Unit is not receiving / transmitting data

6. SD card

Micro SD card slot is located on the motherboard (under the SMA connector). Details about card usage are described in application software documentation.

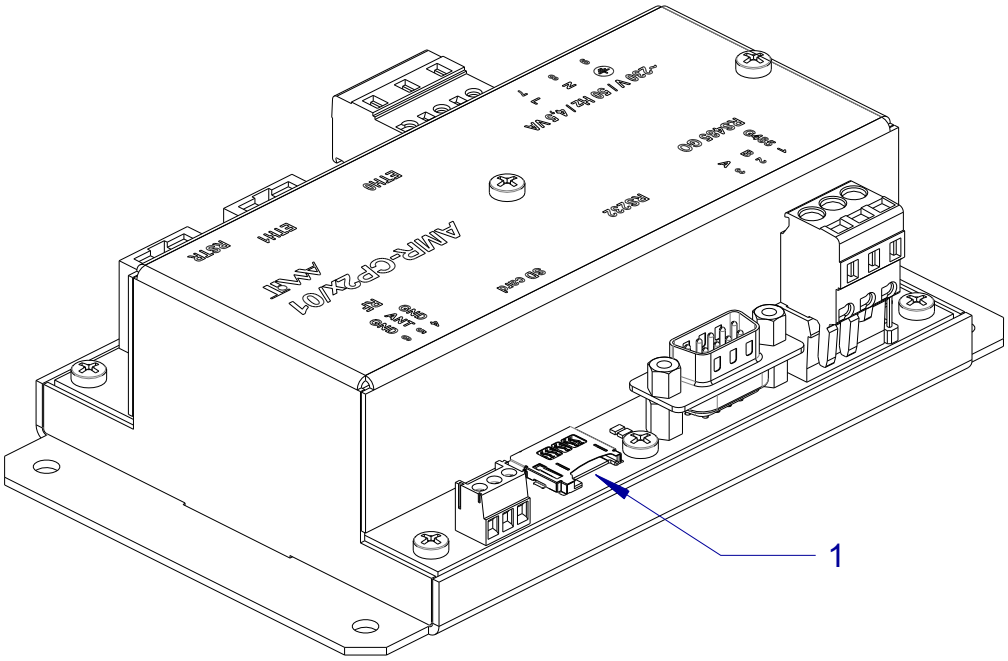

Fig. 9 - Location of Micro SD card slot

Legend

Number	Meaning
1	Micro SD card connector

Card is inserted with contacts directed downwards (towards the unit's motherboard). Inserting / removing an SD card is not subject to the connected / disconnected power supply. Card can be freely manipulated during system run, without danger of data loss or corruption.

Note: Cards under 2 GB must be formatted with FAT16. Cards bigger that 2 GB must be formatted with FAT32.

7. Rechargeable battery

The unit is equipped with rechargeable battery. Voltage of rechargeable battery can be measured in applications, written in DetStudio development tool by using the following script:

Operation example

```
Ram.fUbat = IO.VBatt;
```

Measured value is rechargeable battery voltage [V].

Based on this check, the operator can be alerted to necessity of rechargeable battery exchange.

More information regarding rechargeable backup battery can be found in chapter 13. Maintenance.

8. Connectors and terminals layout

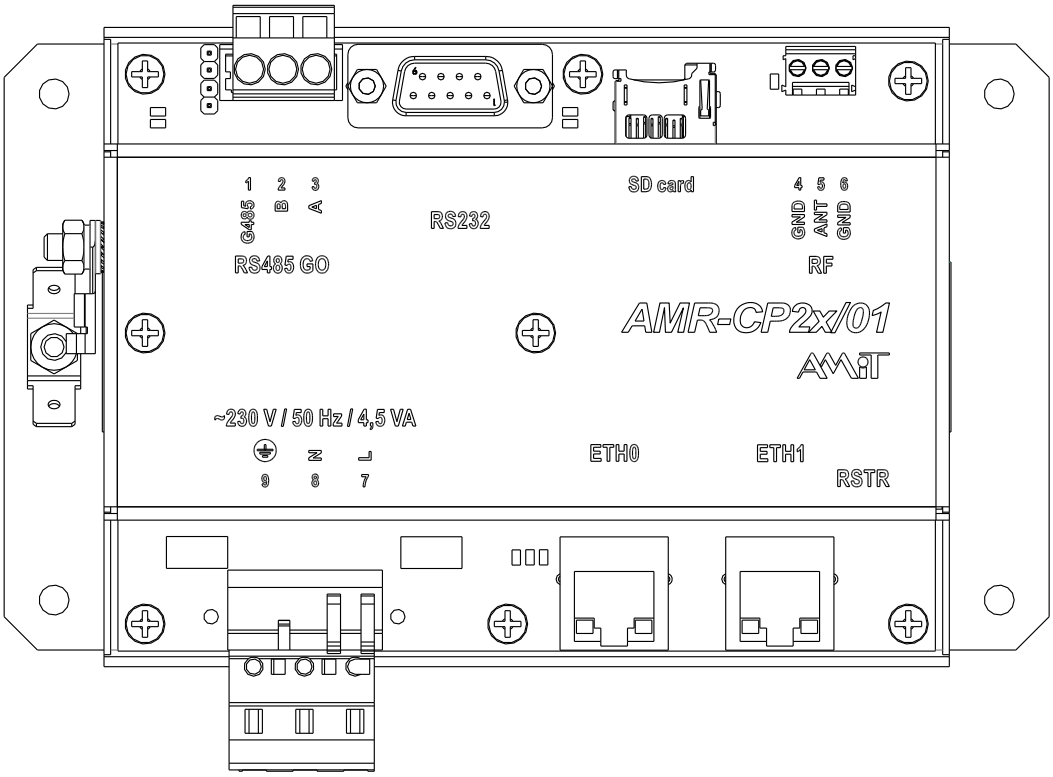

Fig. 10 - Connectors and terminals layout

Connectors

Label	Meaning
RS232	RS232 interface (connector D-sub DE9)
SD card	Slot for Micro SD card
ETH1	Ethernet interface (RJ45 connector)
ETH0	Ethernet interface (RJ45 connector)

Terminals

Terminal	Label	Meaning
1	G485	RS485 interface, ground
2	B	RS485 interface, signal B
3	A	RS485 interface, signal A
4	GND	Poseidon, shielding
5	ANT	Poseidon, antenna
6	GND	Poseidon, shielding
7	L	Phase conductor
8	N	Neutral conductor
9	⏚	Protective conductor

9. Mounting

Unit is intended for mounting with four holes with a 5 mm diameter. The unit can be mounted in arbitrary position, either in switchboard or inside the room dropped ceiling.

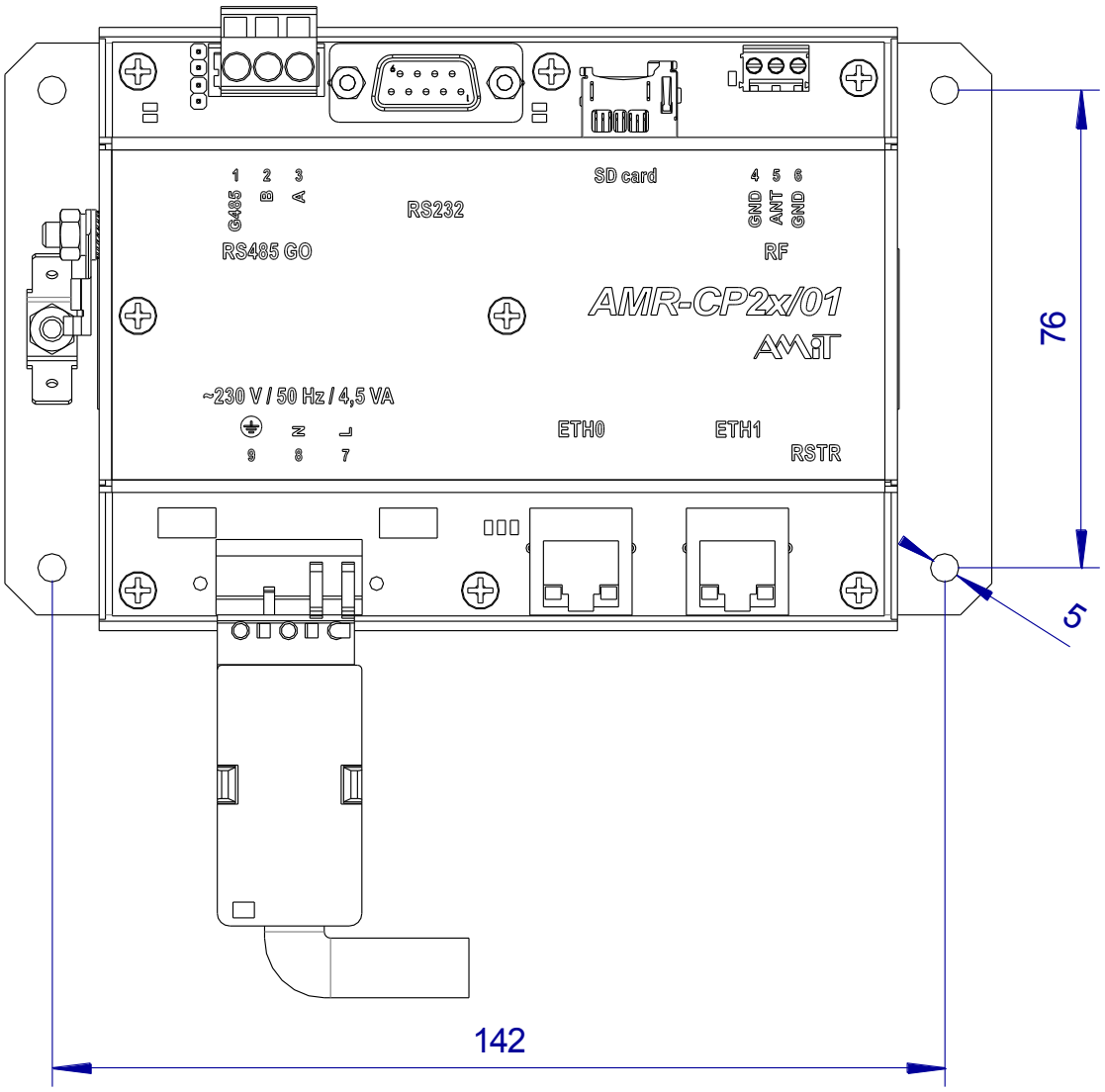

Fig. 11 - Dimensions of mounting holes

9.1. Installation rules

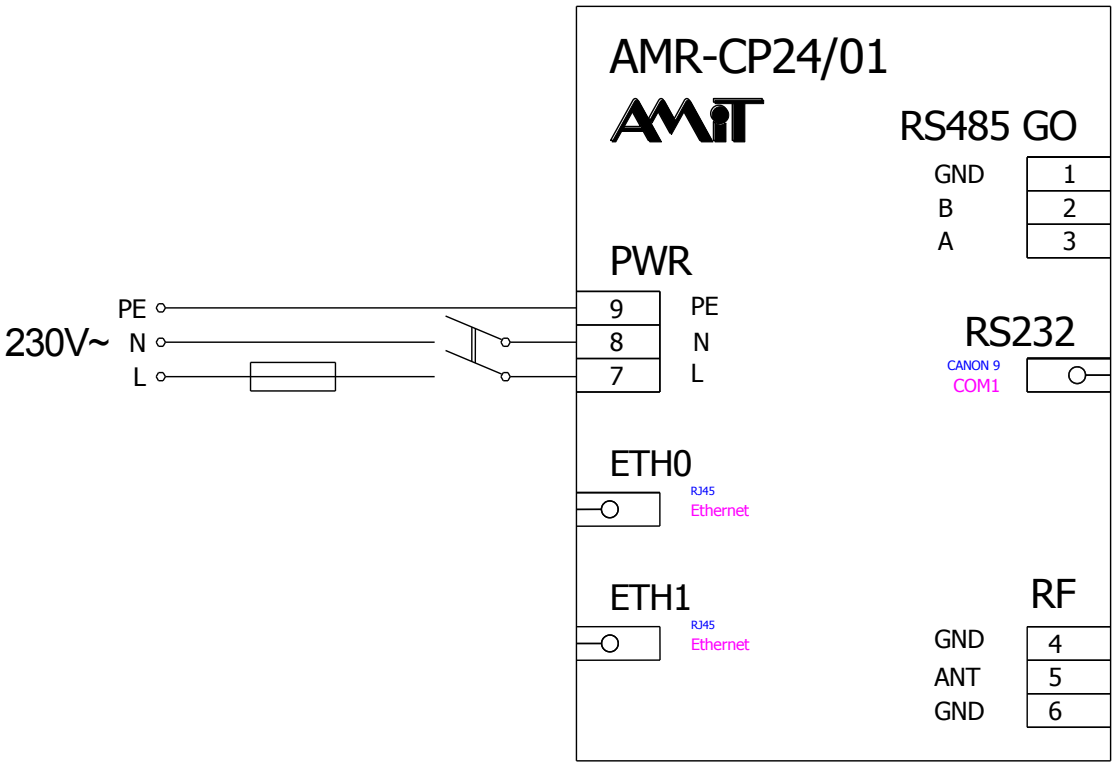

Fig. 12 - Powering scheme of **AMR-CP24/01**

EMC filter It is recommended to use EMC filter on power input. Based on environment nature, power source properties and wiring layout this requirement can be revised.

Mains As a disconnecting device must be used a double-pole switch, alternatively circuit breaker with coupled disconnecting contact.

The disconnecting element must be part of the installation and placed in equipment immediate vicinity, available for operator and it must be marked as equipment disconnecting element.

Protection Unit must be protected by external circuit breaker.

Connecting to PE The negative supplying terminal (GND) is connected to PE inside the device. Connection with PE should be realized on the switchboard entry.
If the wires are led outside the building, the appropriate inputs and outputs needs to be overvoltage protected.

RS485 line It is necessary to perform connecting of RS485 line according to recommendations presented in Application Note *AP0016 – Principles of using RS485 interface*.

RS232 line When used only for service or utilized within the switchboard frame, the unshielded flat communication cable can be used.

Use the shielded cables for permanent use outside the switchboard frame. Connect the shielding to the PE terminal just on switchboard input. Cable length is limited to 30 m.

Ethernet interface Unshielded – patch cable can be used for service or when utilized within the switchboard frame.

In case of permanent use outside the switchboard frame, it is necessary to perform connecting of Ethernet line according to recommendations presented in Application Note *AP0037 – Principles of using Ethernet network*.

Note: All connections to PE terminal must be realized with as low as possible impedance. Technical parameters of unit are guaranteed only when these wiring principles are applied.

10. Programming

The unit is factory-programmed with Loader. The appropriate application software must be loaded into the unit prior to first use.

New application can be created by using:

- DetStudio / EsiDet development tool

Application software can be loaded into module by:

- DetStudio development tool
- AMRconfig service and programming utility
- AMRmultidownload multiprogramming utility
- AppLoader tool for loading application

Programs are available at www.amitomation.com, section Download.

10.1. Loader

The state, when the Loader is running is indicated on unit with S0 LED. This state can be used in cases when the user application is causing any troubles, for example repetitive restarting, inability to connect to the unit, etc. The unit can be switched in to the running Loader state by service button.

10.2. Indication LED and service button

LED S0 serves for indication of module program status.

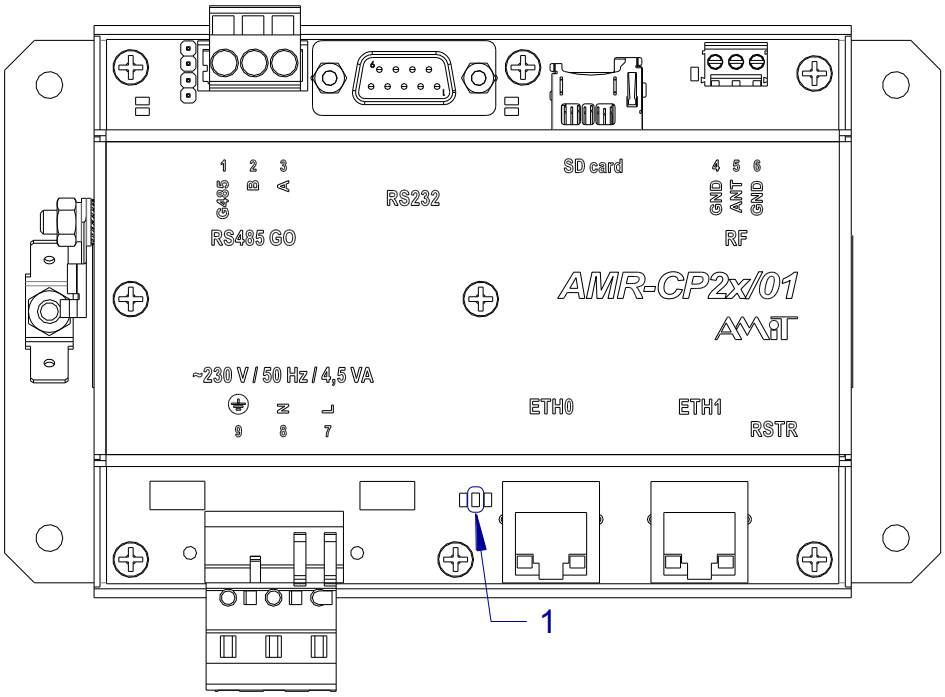

Fig. 13 - Location of indication LED S0

Legend

Number	Meaning
1	LED S0

LED S0 flashes with different period and length according to different program status.

Indication LED

Light	Meaning
Flashes 0.1 s for 1 s period	Indication of going-through Reset
Continuous flashes with 0.2 s period	Loader is launched
Continuous flashes with 1 s period	Application run
Irregular flashes with 0.5 s period	Running application is indicating error / alert. Irregular flashes means that a pause of to 2 s follows after a particular number of flashes. Number of flashes between to pauses indicates numeric error code: 2 – error during reading from EEPROM 3 – suspiciously frequent writing to EEPROM 15 – unknown error

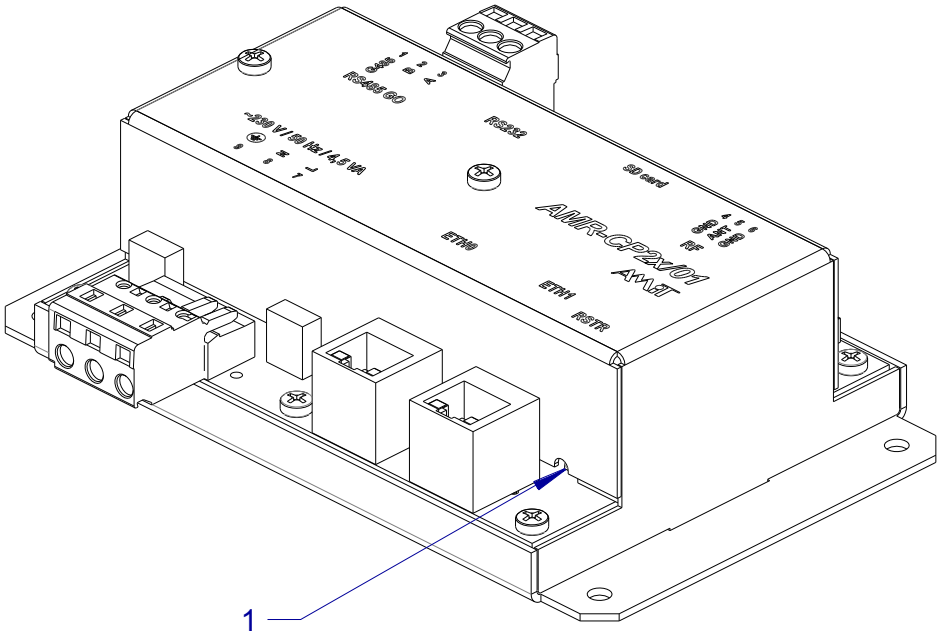

Fig. 14 - Service button location

Legend

Number	Meaning
1	Service button

Loader can be executed with different communication parameters depending on the length of time you press the service button.

Service button

Pressing length	Action
> 1 s after turning-on	Loader with original communication parameters is launched.
> 1 s, but < 10 s during application run	Loader with original communication parameters is launched.
> 10 s	Loader with default communication parameters is launched The original application is launched after each further start.

11. Factory settings

RS 485 configuration Jumpers, which activate the line termination and idle state definition, are fitted.

Ethernet

Parameter	Default value
Unit IP address	192.168.1.1
Network mask	255.255.255.0
Default gateway	0.0.0.0

12. Ordering information and completion

Unit	**AMR-CP24/01**	Complete, see chapter 12.1. Completion

Others	**P8 A INT1 3299-01008**	Poseidon – Internal rod antenna, cabel 2 m, SMA connector, adapter for connection to unit.
	P8 A INT2 3299-01018	Poseidon – Internal panel antenna, cabel 2 m, SMA connector, adapter for connection to unit.
	P8 A EXT1 3299-01058	Poseidon – External rod antenna, cabel 2 m, SMA connector, adapter for connection to unit.
	P8 A EXT2 3299-01068	Poseidon – Outdoor directional antenna, cabel 5 m, SMA connector, adapter for connection to unit.
	P8 A CA5 3299-00058	Poseidon – Antenna extension cable 5 m, SMA connector, terminations for connection to unit.
	P8 A CA10 3299-01058	Poseidon – Antenna extension cable 10 m, SMA connector, terminations for connection to unit.

12.1. Completion

AMR-CP24/01

Part	Quantity
Communication unit	1
WAGO 231-333/001-000 connector counterpart	1
WAGO 231-933/001-000 connector counterpart	1
Assembly tool for stress relief WAGO 232-683	1
WAGO 209-177 cable clamp	1
WAGO 209-176 cable clamp screw	2
Poseidon interface antenna (rod)	1
Operation manual	1

13. Maintenance

The device does not require any regular inspection or service, except checking of voltage of rechargeable backup battery.

Rechargeable backup battery

For program and parameters backup in the RAM memory the rechargeable backup battery is used. Its nominal voltage is 3.0 V; nominal capacity is 7 mAh. Rechargeable battery capacity is big enough for backing up unit's programs and parameters for at least 7 days without power supply.

Rechargeable battery inspection must be carried out once every five years.

Cleaning

Time after time with regard to way of device usage, it is necessary to remove dust from inside electronics. The equipment 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 of in common public waste. It must be delivered to places specified for that purpose and recycled.

Rechargeable battery disposal

Device contains lithium rechargeable battery. The rechargeable battery is a dangerous waste. Therefore, it must be delivered to places specified for that purpose. Disposal of worn-out batteries and accumulators must not be in contrary to valid regulations.