

AMR-OP84/G

Graphical industrial terminal

Operation manual

Version 1.00



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History of revisions

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Revision	Date	Changes
100	9. 9. 2015	New document

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 AP0046 – Setting web server
file: ap0046_en_xx.pdf
5. Application Note AP0050 – Project documentation for AMiT company products
file: ap0050_en_xx.pdf

1. Introduction

AMR-OP84/G is a freely programmable control terminal. It is intended to be built-in into switchboard front panel.

- Basic features**
- TFT 4.3" display with resolution (480 × 272) points
 - Display colour depth is 65536 colours, control elements – 256 colours
 - Touchscreen operating
 - 2 × RS485 line (1 × without galvanic separation, 1 × galvanically separated)
 - 10/100 Mbps Ethernet line
 - Internal GSM modem
 - Integrated web server
 - Slot for Micro SD card
 - Power supply 24 V DC
 - Programming in DetStudio / EsiDet environment

Note Usage of peripherals and colourful displaying depends on current possibilities of DetStudio / EsiDet development environment. Details about usage are described in application software documentation.

2. Technical parameters

Processor	Type	STM32F427
	FLASH memory	2 MB
	External FLASH	16 MB
	SRAM	4 MB
	EEPROM	32 KB
	Backed-up RAM	4 MB
	RAM + RTC back-up	Battery BR2477
	Battery lifetime	5 years in normal environment *)

Note *) Normal environment is defined at 25 °C temperature.

RTC	Type	STM32F427 (internal, in CPU)
	Precision at 25 °C	±20 ppm

Display	Type	TFT 4.3"
	Resolution	(480 × 272) pixels
	Visible area	(95.04 × 53.86) mm
	Luminance	240 cd/m ²
	Contrast	250 : 1
	Colour depth	65536
	Viewing angle	Upper 35 ° Bottom 55 ° Left 70 ° Right 70 °
	Backlight	LED
	Backlight colour	White
	Backlight lifetime	20 000 hours *)

Note *) Luminance drop to 50 %.

Touch panel	Type	Resistive
	Number of touches	10 ⁶
	Touching strength	250 g
	Hardness	≥ 3 H

Note Touch panel is intended for operating by finger, by tool without sharp edges or by finger-in-glove.

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

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

GSM	GSM bands	850 MHz, 900 MHz, 1800 MHz, 1900 MHz
	Modem type	TELIT GL865-DUAL V3
	SIM card type	Mini (2FF)
	Antenna connection *)	SMA connector

Note *) Antenna is not included.

RS485	Quantity	2	
	Overvoltage protection	Transil 160 W	
	Galvanic separation *)	COM0	Yes
		COM1	No
	Terminating resistor **)	120 Ω on the unit	
	Idle state definition **)		
	up to +5 V	1 kΩ on the unit	
	up to 0 V	1 kΩ on the unit	
	Maximum wire length	1200 m / 19200 bps	
	Max. number of stations on segment	COM0	256
	COM1	32	
Operation indication	LED on back cover		
Connection points	2 × WAGO 231-303/102-000		
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	1	
	Data transmission rate	10/100 Mbps	
	Operation indication	Connector built-in LED	
	Galvanic separation	Yes	
	Insulation strength	300 V AC /1 minute *)	
	Connection point	RJ45 connector, according to IEEE802.3	

Note *) Insulation must not be used for dangerous voltage separation.

Power supply	Nominal power supply voltage	24 V DC	
	Power supply voltage range	19.2 V DC to 28.8 V DC	
	Maximum power consumption	150 mA at 24 V DC	
	Connection point	WAGO 231-302/102-000	
	Wire cross section	0.08 mm ² to 2.5 mm ²	

Mechanics	Mechanical design	Panel + metal cover	
	Panel material	Dural, EN AW 5754, 6 mm	
	Surface finishing	Komaxit, RAL 9006, fine matte	
	Mounting	Into switchboard front panel	
	Panel side ingress protection rate	IP65	
	Dimensions (w × h × d)	(166 × 96 × 44) mm *)	
	Weight – netto	0.50 kg ±5 %	
	– brutto	0.70 kg ±5 %	

Note *) Dimensions including faston connectors.

Temperatures	Operating temperature range	-20 °C to 70 °C *)	
	Storage temperature range	-20 °C to 70 °C	

Note *) When the temperature reaches 40 °C – maximum backlight level is reduced, when the temperature goes above 70 °C the display is switched off.

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

2.1. Dimensions

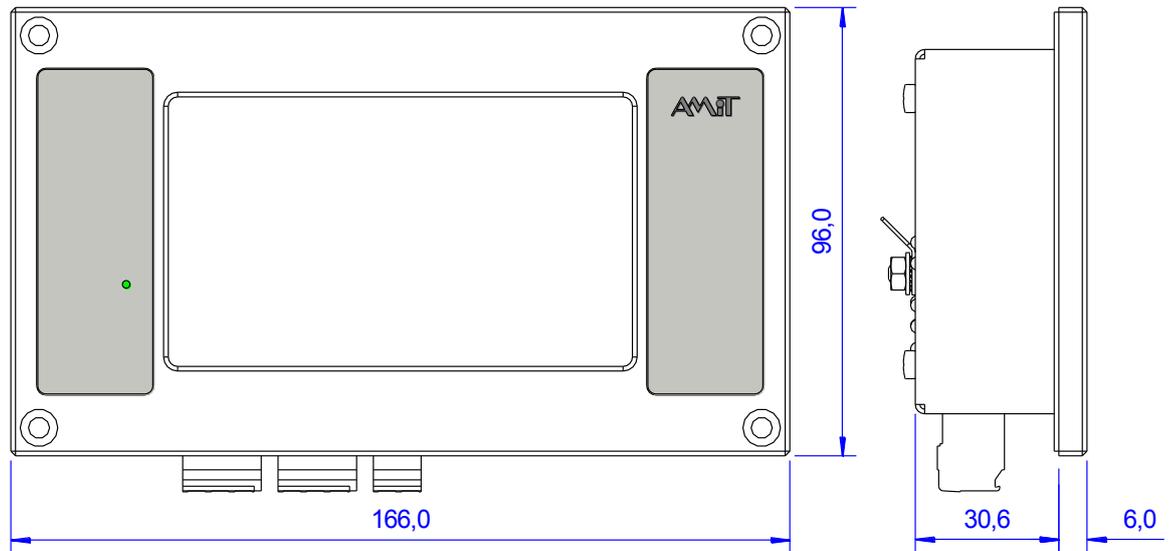


Fig. 1 - AMR-OP84/G dimensions

2.2. Connector, indication elements

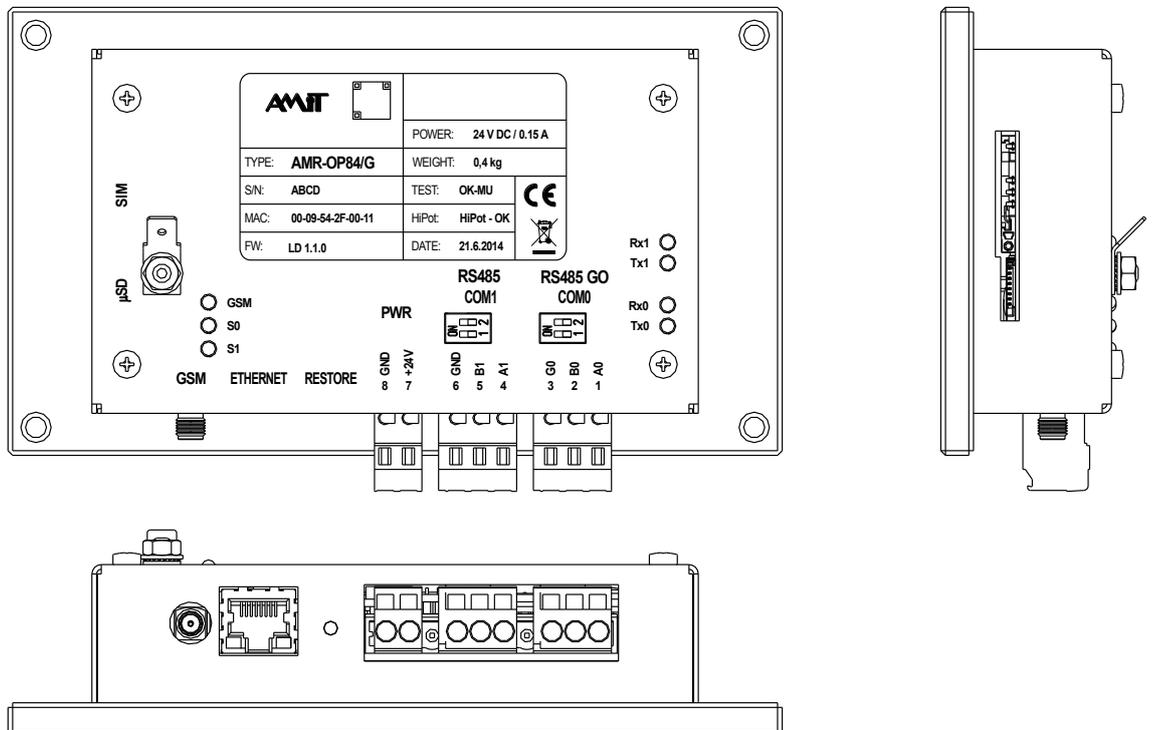


Fig. 2 - Connectors and indication elements location

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 61326-1:2013.

Tested in accordance with standard	Type of test	Class
EN 55011:2009	Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement	Complies, A *)
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test	8 kV
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test	Complies
EN 61000-4-4:2012	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test, power supply	±4 kV
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test, power supply	±2 kV
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test, Ethernet, RS485	±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	10 V

- *) This is device of Class A. In the internal environment this product can cause some radio disturbances. In such case the user can be requested to take the appropriate measures.
- #) Other than power supply circuitry cabling, which is longer than 30 m must be carried out by using the shielded cables.

3.1. Other tests

Tested in accordance with standard	Type of test	Classification
EN 61000-4-29:2000	Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on d.c. input power port 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

AMR-OP84/G controller can be powered only by DC power supply. Power source must meet requirements listed in chapter 2. Technical parameters.

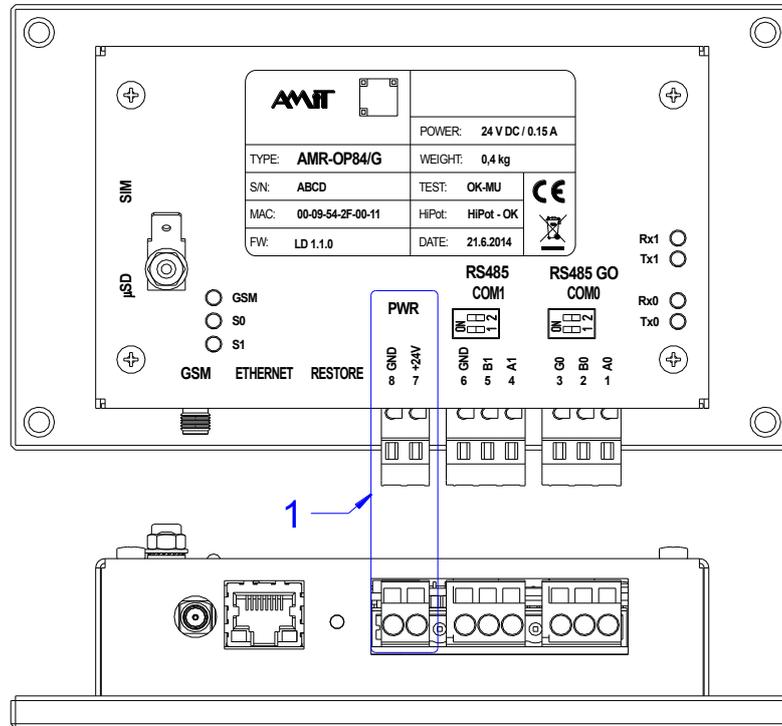


Fig. 4 - Power supply connector location

Legend

Number	Meaning
1	Power supply connector

Connector wiring

Terminal	Description	Meaning
7	+24V	Power supply +24 V DC
8	GND	Power supply Ground

Wiring example

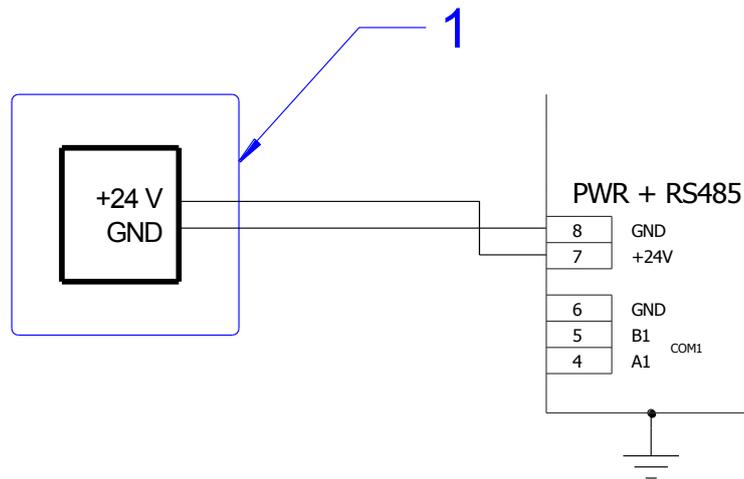


Fig. 5 - Power supply wiring example

Legend

Number	Meaning
1	External power supply 24 V DC

Note GND and PE are galvanically interconnected within the system. PE has its own separate terminal on the cover.

5. Communication lines

5.1. RS485 with galvanic separation (COM0)

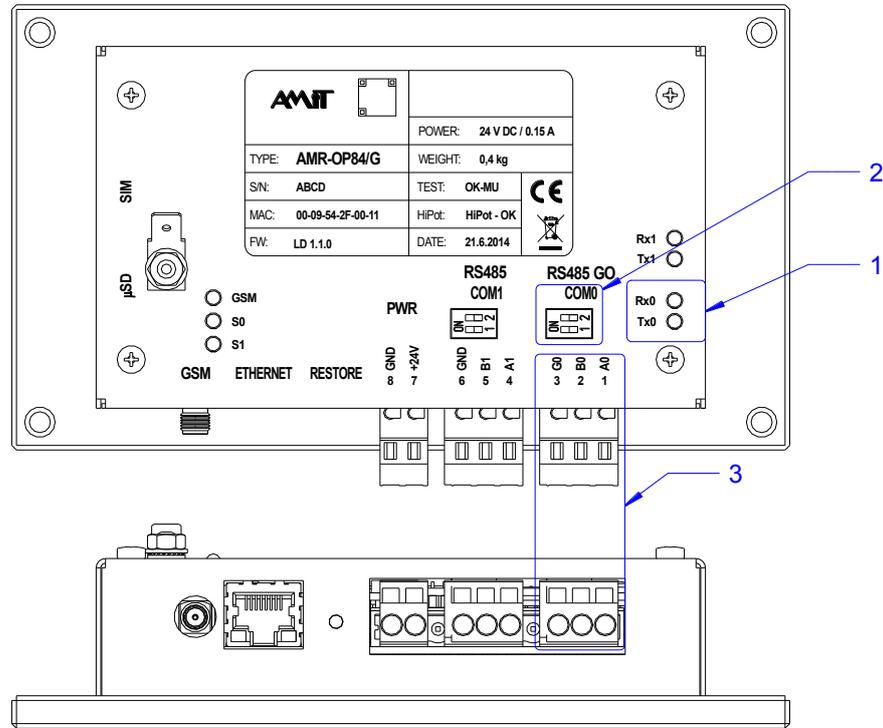


Fig. 6 - Location of galvanically separated RS485 connector

Legend	Number	Meaning
	1	Indication LED, COM0
	2	RS485 line termination, COM0
	3	RS485 connector, COM0

Software operation When programming, the galvanically separated RS485 has number 0.

Connector wiring For proper working of RS485 is necessary to abide the rules presented in Application Note AP0016 – Principles of using RS485 interface.

Terminal	Description	Meaning
1	A0	Galvanically separated RS485 line, signal A
2	B0	Galvanically separated RS485 line, signal B
3	G0	Galvanically separated RS485 line, ground

Configuration DIP Each station on RS485 communication line must have properly set the line termination resistors. Configuration DIP switches used for termination adjusting, are located near the RS485 connector.

Switch state meaning	Both switches	Meaning
	ON	End-station – Idle state and line termination is active
	OFF	Intermediate station – Idle state and line termination is inactive

Activity indication The line activity is indicated by LED on back cover.

5.2. RS485 without galvanic separation (COM1)

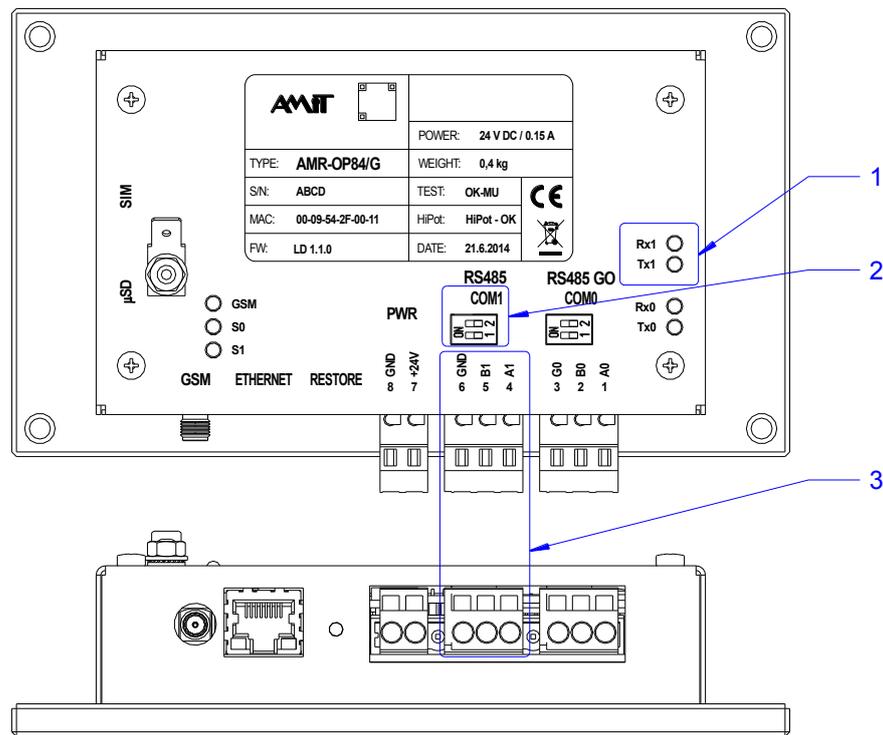


Fig. 7 - Location of RS485 line connectors

Legend	Number	Meaning
	1	Indication LED, COM1
	2	RS485 line termination, COM1
	3	RS485 connector, COM1

Software operation When programming, RS485 without galvanic separation has number 1.

Connector wiring For proper working of RS485 is necessary to abide the rules presented in Application Note AP0016 – Principles of using RS485 interface.

Terminal	Description	Meaning
4	A1	RS485 line, signal A
5	B1	RS485 line, signal B
6	GND	Ground

Configuration DIP Each station on RS485 communication line must have properly set the line termination resistors. Configuration DIP switches used for termination adjusting, are located near the RS485 connector.

Switch state meaning:

Both switches	Meaning
ON	End-station – Idle state and line termination is active
OFF	Intermediate station - Idle state and line termination is inactive

Activity indication The line activity is indicated by LED on back cover.

5.3. Ethernet

Controller can be connected directly into LAN network via Ethernet interface. Components of standard structured cabling can be used for connection.

The Ethernet interface can be used both for visualization and remote upload of application software onto controller via Internet, and is supported by DetStudio development environment. TCP/IP protocols family is used for communication, therefore the communication network can be shared both by controllers and personal computers.

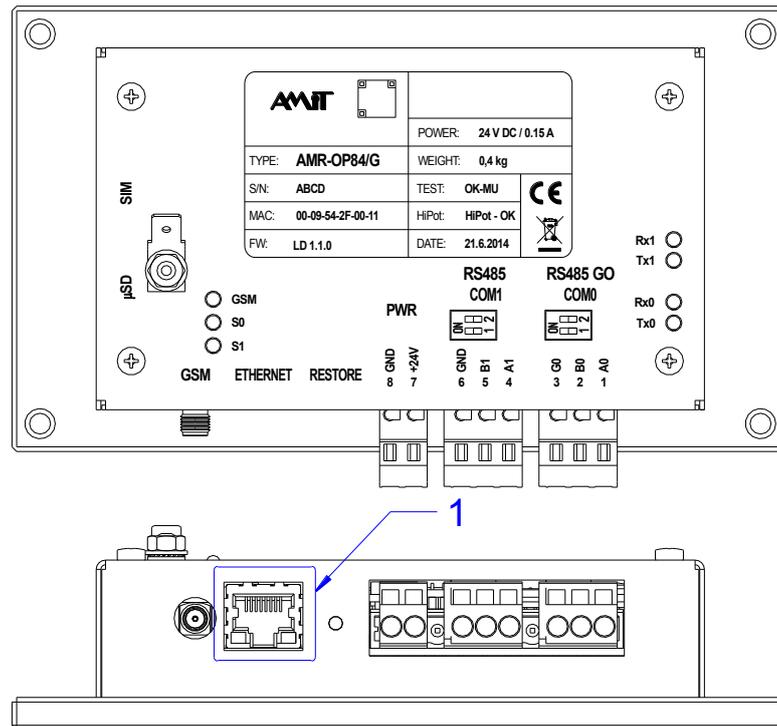


Fig. 8 - Location of Ethernet line connector

Legend	Number	Meaning
	1	Connector RJ45 for Ethernet with LED indicators

Line state indication Activity of Ethernet line is indicated by LEDs (LNK / ACT and SPEED) on Ethernet line connector.

Meaning of LED	LED	Colour	Meaning
	LNK / ACT	green	Ethernet line connection, data reception and transmission
	SPEED	green	LED lights during 100 Mbps connection

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

Note Isolation of Ethernet galvanic separation must not be used for dangerous voltage separation.

5.4. GSM modem

SMS messages can be sent/received to/from control system in UPD mode via integrated modem. Within SW the GSM port has number 2. Antenna (not included) can be connected to control system via SMA connector on the bottom of the control system. SIM card slot is located on the left side of the system, near the Micro SD Card slot.

The way modem is used is given by current possibilities of DetStudio / EsiDet development environment. Details about modem usage are described in application software documentation.

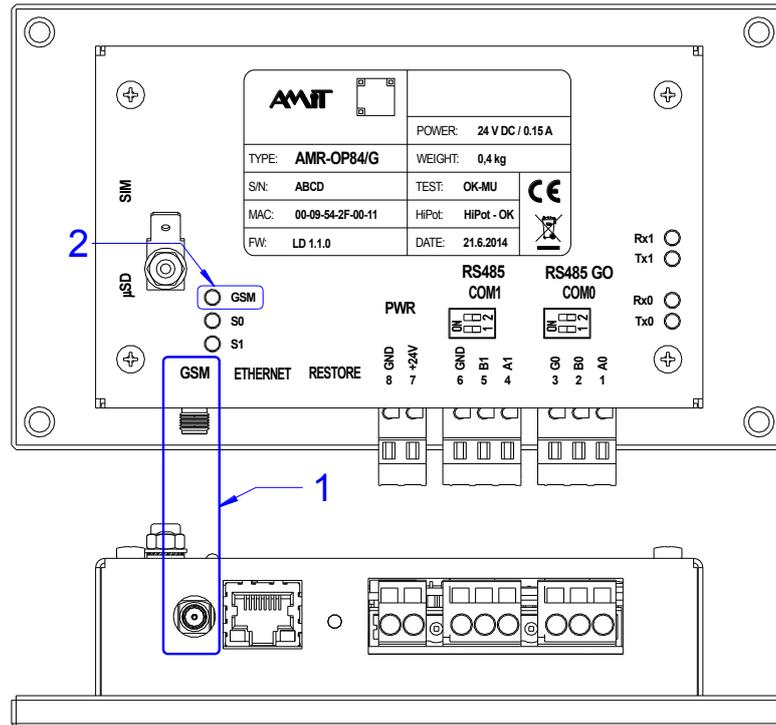


Fig. 9 - Location of Ethernet line connector

Legend

Number	Meaning
1	SMA connector for GSM modem
2	LED indicating GSM modem activity

SIM card is inserted with contacts towards the panel. SIM card insertion / ejection can be performed only when the control system power supply is off!

GSM interface activity is indicated via separate LED on the cover.

When the modem is off, the LED is also off. The LED blinks with 1 s period after the modem is turned on, without logging to GSM network. After the modem is logged on to the network, the LED blinks with 3 s period.

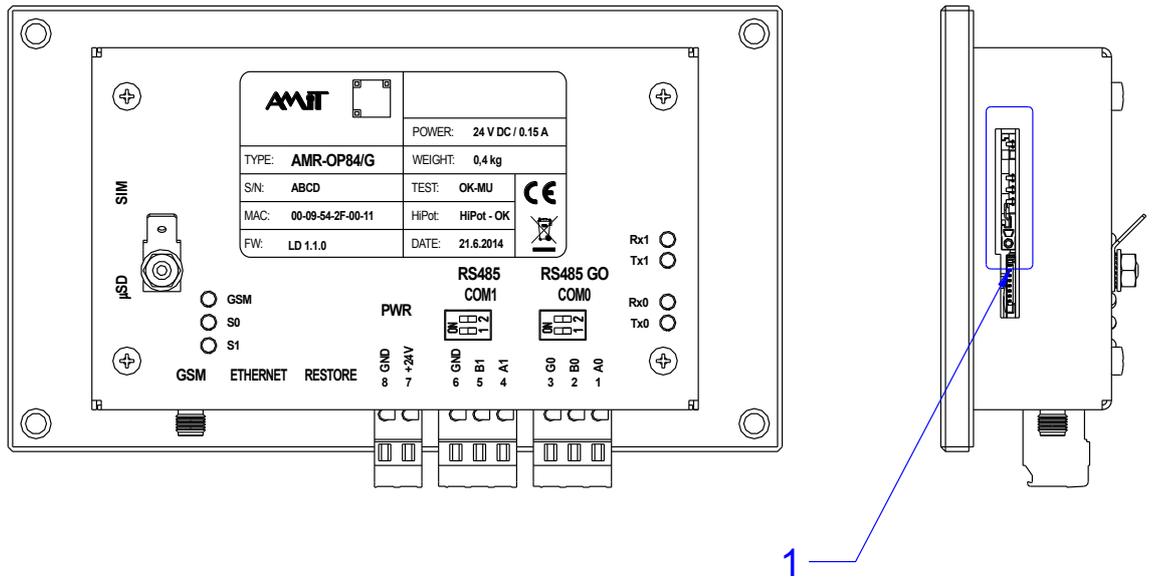


Fig. 10 - Location of SIM card slot

Legend

Number	Meaning
1	Location of input hole for SIM card holder

6. Battery voltage, SD card

6.1. Backup battery voltage

Voltage of backup battery can be measured in applications, written in DetStudio development environment by using the following script:

Operation example Ram.fUbat = IO.VBatt;

Measured value is battery voltage [V].

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

More information regarding backup battery can be found in chapter 12. Maintenance.

6.2. SD card

Micro SD card slot is located on the side of **AMR-OP84/G**.

The way card is used is given by current possibilities of DetStudio / EsiDet development environment. Details about card usage are described in application software documentation.

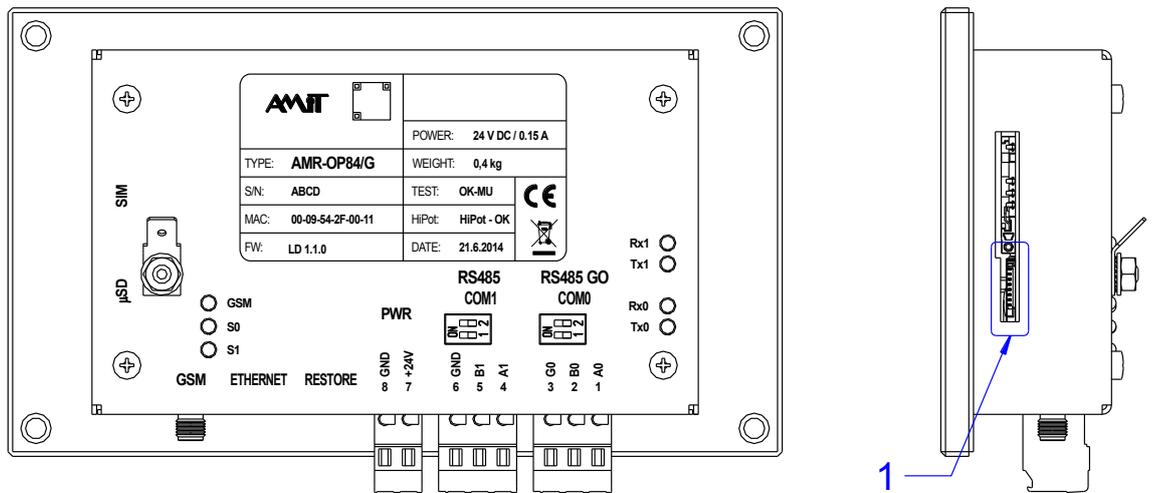


Fig. 11 - Location of Micro SD card slot

Number	Meaning
1	Location of Micro SD card slot

7. SO and S1 LED indication

LED S0 serves for terminal state indication.

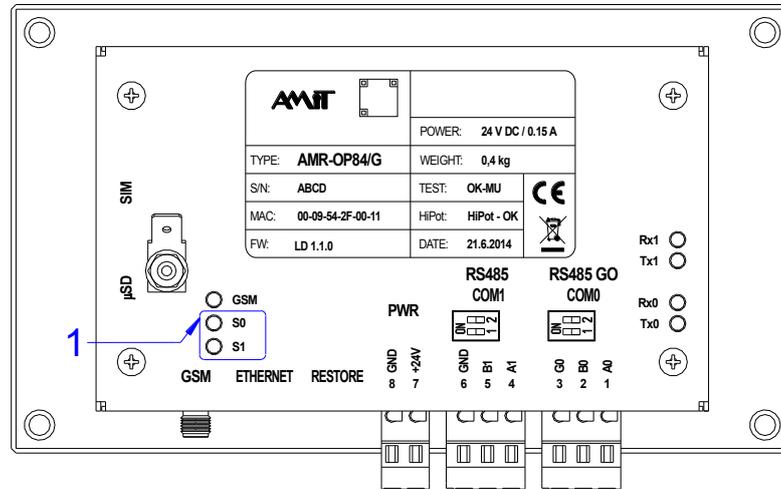


Fig. 12 - Location of indication LED S0

Legend	Number	Meaning
	1	SO and S1 LED indication

LED S0 lights/blinks depending on terminal state, according to table.

Light	Meaning
Blinking 0.1 s during 1 s	Indication of going-through Reset
Lights permanently	Restoring factory settings
Regular blinking with 1 s period	Application / loader is running
Irregular blinking with 0.5 s period	Running application is indicating error. Irregular blinking means, that a pause of to 2 s follows after a particular number of blinks. Number of blinks between to pauses indicates numeric error code: 1 – error reading from BackUp RAM 2 – error during reading from EEPROM 3 – suspiciously frequent writing to EEPROM 15 – unknown error

LED S1 is reserved for future utilization.

8. Mounting

Device can be mounted in any position.

8.1. Mounting procedure

1. Cut the rectangular hole in switchboard front panel, with dimensions (132 × 80) mm; attached template makes the work easier.
2. Drill a mounting holes with a spacing (154 × 84) mm, Ø 4.2 mm.
3. Insert the controller into hole in switchboard from the front side.
4. Screw the controller into the front panel, using four M4 bolts and nuts.
5. Attach the communication and supplying conductors.

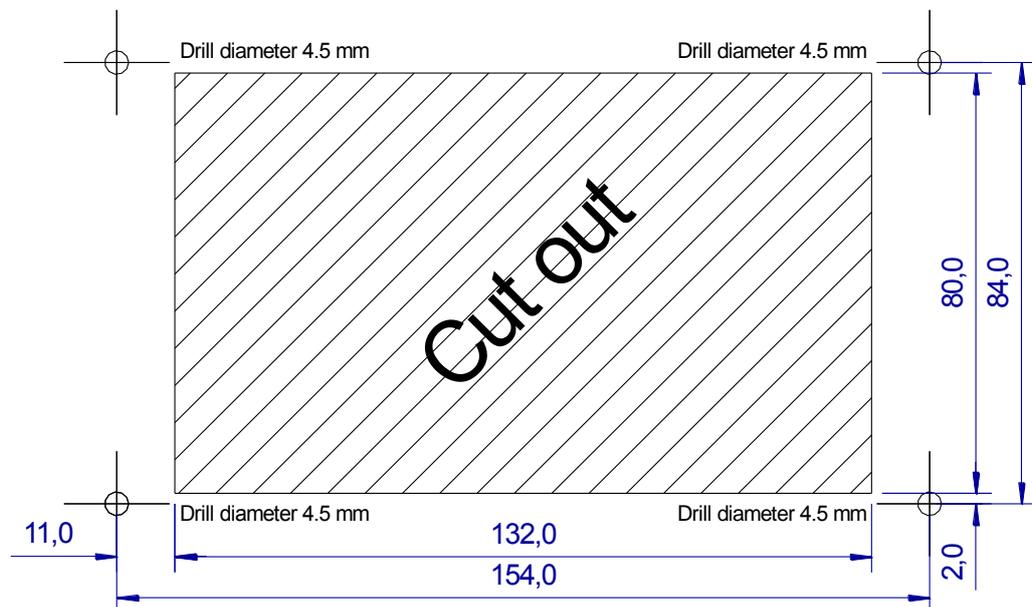


Fig. 13 - Mounting apertures

8.2. Installation rules

EMC filter Use an EMC filter on 230 V AC supply voltage input. Based on environment character and wiring layout this requirement can be revised.

Connecting to PE Negative supplying terminal (GND) of the device is internally connected with PE.

If the wires are led outside the building, the appropriate communication lines must 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.

Ethernet line 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 impedance as low as possible. Technical parameters of terminal are guaranteed only when these wiring principles are applied.

9. Programming, setting

Personal application creation is possible by means of:

- DetStudio / EsiDet development environment

Application can be loaded into **AMR-OP84/G** unit by means of:

- DetStudio development environment

“Landscape” and “Portrait” orientation is supported (needs to be selected in development environment during creation of user application).

Not all graphical elements are supported in both orientation versions.

SW download Development environment is free to download on www.amitotation.com.

9.1. Setting of communication parameters

Change of communication parameter can be performed:

- from PC via DetStudio / Find station on Ethernet,
- in service mode, see chapter 9.2 Service mode.

Connection to PC **AMR-OP84/G** terminal must be connected to PC via Ethernet. Utilization of active Ethernet elements (switch, router, etc.) is possible, as well as direct connection.

9.2. Service mode

Service mode is activated by this procedure:

- disconnect **AMR-OP84/G** from power supply,
- Touch the touchscreen in any place,
- connect **AMR-OP84/G** power supply while touching the touchscreen,
- release the touch of touchscreen.

After the service mode activation, menu is displayed, where you can set:

- Brightness
- Contrast
- Calibration
- Serial interfaces communication parameters (speed / parity) *)
- Ethernet interface communication parameters (IP address, mask, default gateway)
- Menu language
- Factory setting

Note *) Can be set only in case they are not given by user application.

Menu is always displayed with Landscape orientation, regardless of assembly, or selected in user application, Portrait / Landscape orientation.

To quit from the service mode, after the work is done, in menu select item “Return to the application”. On-wall controller will restart.

9.3. Loader

In case it is not possible to connect to the terminal (user application causes problems, like for example, repetitive restarts, etc.), it is necessary to run Loader.

Loader activation Loader can be activated by pressing and holding button *RESTORE* (see chapter 10.2. The *RESTORE* button). If button is press for more than 3 s – the system resets. This state is indicated by LED S0 blinking with 10 Hz period, the display is dark. If the button is released in this moment, the system goes to “Loader” mode, message on the display says: “Load application” with correct IP address and mask settings. If you do not want to update the application, the only way how to exit this mode is to switch the device off and on.

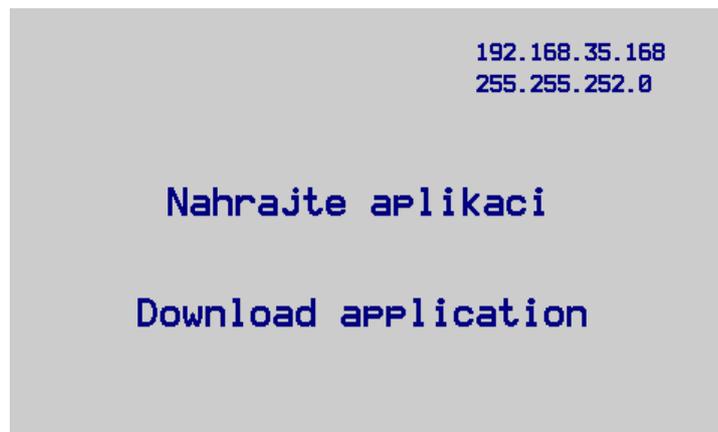


Fig. 14 - Request to load application

9.4. Battery check

In a service mode, the “BackUp battery” screen can be call out, where the current state of RAM memory backup battery is shown. Three texts can be shown on the screen:

- Battery OK – battery voltage equal or bigger than 2.1 V
- Battery LOW! – battery voltage is lower than 2.1 V
- Battery MISSING! – battery voltage is lower than 1 V

If the battery voltage is lower than 2.1 V, texts are shown with red background.

10. Factory settings

RS485 configuration Both RS485 lines have DIP switches ON, which activates the line termination and idle state definition.

Ethernet setting

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

Web server settings

Parameter	Default value
Administrator login/pass	root/amit
Service login/pass	service/amit
User login/pass	user/amit

Parameter	TCP port default value
FTP server – data	20
FTP server – control	21
WEB server	80

Web server factory settings has significance only in case the server is included in user application.

10.1. Restore the factory setting

Factory settings can be restored in a service menu, or using *RESTORE* button (see chapter 10.2. The *RESTORE* button).

To restore factory settings using *RESTORE* button, hold the button for at least 13 seconds, until S0 LED lights up with constant light (display remains dark during restoring process). After the factory settings are restored, user application starts automatically.

10.2. The *RESTORE* button

The *RESTORE* button is located on the rear side of the terminal.

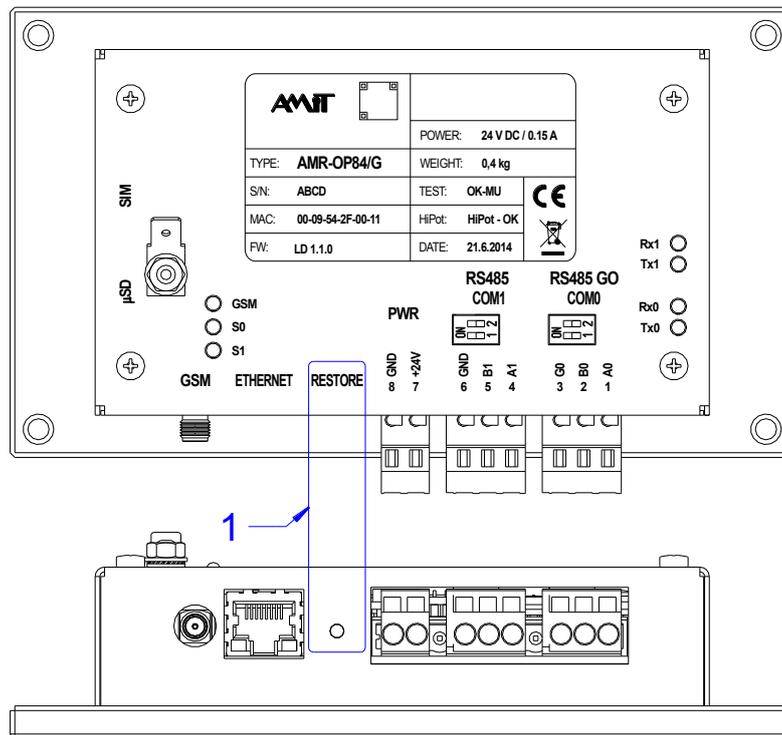


Fig. 15 - The RESTORE button

Legend	Number	Meaning
	1	Location of RESTORE button

RESTORE button can be pushed by suitable unsharp tool anytime during user application run.

11. Ordering information and completion

<i>Graphical terminal</i>	AMR-OP84/G	Unit complete – see chapter 11.1 Completion
<i>Others</i>	GSM-ANT-M5S	GSM – magnetic antenna, 5 dB, cabel 3 m, SMA

11.1. Completion

<i>AMR-OP84/G</i>	Part	Quantity
	Industrial graphical terminal with GSM modem	1
	WAGO 231-303/102-000	2
	WAGO 231-302/102-000	1

12. Maintenance

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

Backup battery For backing-up program, clock and parameters in RAM memory is used a backup battery. Its nominal voltage is 3.0 V DC; nominal capacity is 1 Ah. If battery voltage drops under 2.1 V DC, then it is considered to be discharged. When it happens, the battery must be changed.

Inspection must be carried out once per year. With reference to manufacturer, the assumed battery lifetime is 5 years. We recommend to implement the procedure of backup battery measuring direct into application.

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 Battery can not be changed by user. It can be performed by manufacturer or authorized service only.

13. 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.

Battery disposal The equipment contains a lithium battery. The 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.