

PROTOCOL CONVERTERS EM-482, EM-482-1

Operating Manual



Quality Management System of the device designing and production complies with the requirements of ISO 9001:2015

Dear Customer,

Novatek-Electro Ltd. company thanks you for purchasing our products. You will be able to use properly the product after carefully studying the Operating Manual. Keep the Operating Manual throughout the service life of the product.

PURPOSE

The Protocol Converter EM-482 and EM-482-1 (hereinafter referred to as "Protocol Converter", "Product", or "EM-482"; the name "EM-482-1" is used when the characteristics differ) provides MODBUS communication between clients and servers in TCP networks and between devices at RS-485 interface.

The Product is available in two versions (both with a built-in antenna):

- EM-482 for mounting in conditions with a good Wi-Fi signal (for example, in plastic cases);
- EM-482-1 with additionally included remote antenna for mounting in conditions with a weak Wi-Fi signal (for example, in metal cases).

The Protocol Converter provides for:

- Various RS-485 exchange modes (master or slave, RTU or ASCII, wide range of transmission speeds, parity check selection, 1 or 2 stop bits, configurable delay);
- Custom request redirection;
- Access protection (access password for reading the status, for configuring the Product, for connecting to the MODBUS network, and for writing/reading over the MODBUS network);
- Firmware update option.

The overall and mounting dimensions and controls

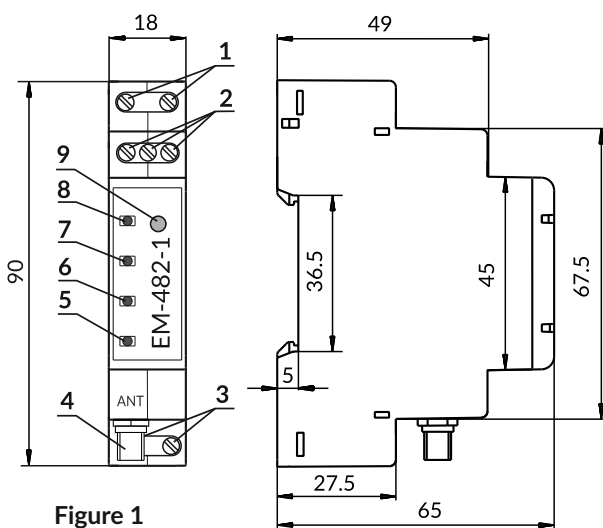


Figure 1

- 1 - The «+» and «-» terminals are designed for power supply connection (from 7 to 30 VDC).
- 2 - Terminals «A», «L» and «B» are used for connecting to the RS-485 network connection.
- 3 - Terminals are not used.
- 4 - SMA-F «ANT» connector (only for EM-482-1) is used for connecting a Wi-Fi antenna (included).
- 5 - The «WI-FI» indicator is lit while Wi-Fi is connected, blinks every three seconds when searching for a Wi-Fi network, and blinks alternately with the «SRV» indicator in the Wi-Fi setup mode.

- 6 - The «485» indicator lights up when waiting for transmission over RS-485 and blinks when data are being exchanged over RS-485.
- 7 - The «SRV» indicator lit while the data collection server is connected, blinks when data is being exchanged with the server, and blinks alternately with the «WI-FI» indicator in the Wi-Fi setup mode.
- 8 - The «PWR» indicator is green during normal operation and flashes red when a communication error occurs.
- 9 - Reset Button «R» may be used for: entering the Wi-Fi setup mode; restarting the Product; and resetting the parameters to the manufacturer's defaults.

The Firmware versions

| Version | Date issued | Remarks |
|---------|-------------|---|
| 3 | 01.10.2019 | • Demo version |
| 5 | 22.11.2019 | • The DNS setup options were added; • Entering the Wi-Fi setup mode was simplified; • The indication self-descriptiveness was improved; • Wi-Fi operation stability was improved |
| 6 | 23.01.2020 | • DNS operation in the automatic IP mode was improved; • The RS-485 operation with parity check was improved |
| 7 | 30.01.2020 | • Wi-Fi operation was accelerated |
| 10 | 20.03.2024 | • Added option to remotely update firmware; • Added option to specify product hostname; • Added option to auto-switch to the best access point |

TRANSPORTATION AND STORAGE

The product in the original package is permitted to be transported and stored at the temperature from minus 45 to +60 °C and relative humidity of no more than 80 %.

SERVICE LIFE AND MANUFACTURER WARRANTY

The lifetime of the product is 10 years. Upon expiration of the service life, contact the manufacturer. Shelf life is 3 years.

Warranty period of the product operation is 5 years from the date of sale.

During the warranty period of operation (in the case of failure of the product) the manufacturer is responsible for free repair of the device.

ATTENTION! IF THE PRODUCT HAS BEEN OPERATED IN VIOLATION OF THE REQUIREMENTS OF THIS MANUAL, THE USER WILL LOSE THE RIGHT TO WARRANTY SERVICE.

Warranty service is performed at the place of purchase or by the manufacturer of the product.

Post-warranty service of the product is performed by the manufacturer at current rates.

Before sending for repair, the product should be packed in the original or other packing which prevents mechanical damage.

You are kindly requested, in case of the product return and transfer it to the warranty (post-warranty) service please indicate detailed reason for the return in the field of the claims data.

ACCEPTANCE CERTIFICATE

EM-482 has been manufactured and accepted in accordance with the requirements of current technical documentation and classified as fit for operation.

Head of QCD

Date of manufacture

Seal



TECHNICAL SPECIFICATIONS

| | |
|---|----------------------------------|
| Power supply voltage DC | 7 – 30 V |
| TCP networks link interface | Wi-Fi |
| Wi-Fi Module | ESP8266 (ESP-07) |
| Wi-Fi Frequency | 2.4 GHz |
| Supported Wi-Fi standards | IEEE 802.11 b/g/n |
| Supported TCP network protocols | DNS, DHCP, MODBUS, HTTP |
| Built-in TCP servers | MODBUS, HTTP |
| MODBUS network link interface | RS-485 |
| Supported MODBUS network protocols | RTU, ASCII |
| Output short-circuit current of the RS-485 driver (maximum at 12 V bus voltage) | 250 mA |
| Number of devices connected to RS-485: | |
| – when the input current of the receivers on the line is 1 mA | ≥ 32 |
| – when the input current of the receivers on the line is 0.25 mA | ≥ 128 |
| Built-in RS-485 terminator resistance | 1 000 Ω |
| Ready time at power-up | ≤ 2 s |
| Current consumption (at a supply voltage of 12 V) | ≤ 110 mA |
| The Product designation | Switchgear and control equipment |
| Rated operating condition | Continuous |
| Climatic design version | NF 3.1 |
| Protection class rating of the product | IP20 |
| Permissible contamination level | II |
| Electric shock protection class | III |
| Conductor cross-section for connecting to terminals | 0.3 - 3.0 mm ² |
| Tightening torque of the terminal screws of input contacts | 0.4 N*m |
| Insulation rated voltage | 450 V |
| Rated pulse withstand voltage | 2.5 kV |
| Weight | ≤ 0.08 kg |
| Overall dimensions, HxBxL | 90x65x18 mm |
| RS-485 is not galvanically isolated | |
| The product meets the requirements of the following: EN 60947-1; EN 60947-6-2; EN 55011; EN 61000-4-2 | |
| Installation (mounting) - DIN rail 35 mm | |
| The Product remains functional at any position in space | |
| Case material: self-extinguishing plastic | |
| Harmful substances in an amount exceeding the maximum permissible concentrations are absent | |



TERMS AND ABBREVIATIONS

- **Wi-Fi station** means a device connected to another device through Wi-Fi (access point);
- **Wi-Fi access point** means a device enabling connection to it through Wi-Fi;
- **DHCP** – means a Protocol enabling the network units to automatically obtain TCP/IP parameters (IP address);
- **HTTP** means the Transmission Protocol for Web pages and other data using client-server technology;
- **IP (address)** – means the address of the unit, which is unique within one network that is operated according to IP Protocol;
- **IPv4** means a four-byte IP address;
- **MAC (address)** – means the address used in network transmissions for devices identification. As a rule, it is globally unique;
- **MAC-48** means a six-byte MAC address;
- **MODBUS** means the standard Packet Communication Protocol based on the client-server technology intended for industrial electronic devices;
- **MODBUS RTU** means the Devices Linking Protocol, over which the packet is transmitted byte by byte;
- **MODBUS ASCII** means the Devices Linking Protocol, over which the packet is transmitted in the form of ASCII characters;
- **MODBUS TCP** means MODBUS Packet Transmission Protocol according to TCP/IP standard;
- **WEB** means the server documents access system used in the

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Internet;

- **Wi-Fi** means a family of standards for data transmission via radio channels.



COMPLETE SET

| | Quantity |
|---|----------|
| Protocol converter | 1 pc. |
| Operating manual | 1 pc. |
| Antenna for SMA connector (only for EM-482-1) | 1 pc. |
| Packaging | 1 pc. |



CONNECTION

Before connecting to the power supply keep the product under the operating conditions within two hours (because of the possible condensation on the product elements).

ALL CONNECTIONS MUST BE PERFORMED WHEN THE PRODUCT IS DE-ENERGIZED.

Error when performing the installation works may damage the product and connected devices.

For a reliable contact, tighten the terminal screws with the force 0.4 N*m.

To ensure the reliability of electrical connections, use flexible (stranded) wires, the ends of which must be stripped of insulation by 5±0.5 mm and compressed with bushing tips. It is recommended to use a wire with a cross section of at least 1 mm².

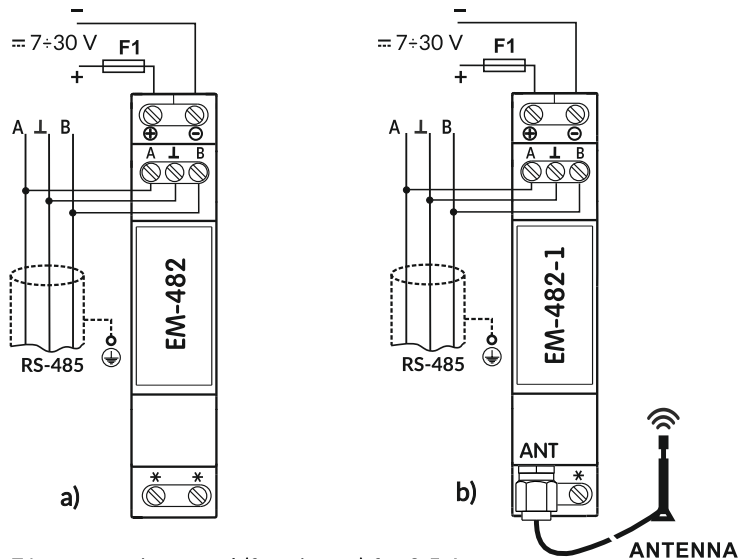
When connecting to the RS-485 bus, use a twisted pair cable. Cat. 1 or higher. A shielded grounded cable is recommended.

When fixing the wires, avoid mechanical damage, twisting or wearing down the insulation of the wires.

To improve the performance of the Product, it is recommended to install the protective guard F1 (fuse insert) or its equivalent in the EM-482 power supply circuit at a current of 0.5 A.

1. Connect EM-482 according to Figure 2a.

2. Connect EM-482-1 according to Figure 2b. Install the antenna outside of the case.



F1 – protective guard (fuse insert) for 0.5 A current.

Figure 2



USING THE PRODUCT

After power is applied, all indicators light up and the EM-482 initializes. Thereafter, within 2 seconds, the indicators go out, except for the «PWR» indicator (which is green), and the Product goes to start the Wi-Fi link interface. The start can take up to 30 seconds depending on the settings and the connection quality.

IMPORTANT! If after switching on EM-482 the «PWR» indicator is constantly red or blinking red, contact the seller or manufacturer of the product.

EM-482 establishes and maintains the connection to the Wi-Fi network.

If the «WI-FI» indicator lights up, the connection to the network was successful. The «WI-FI» indicator blinking every three seconds indicates the process of connecting to the network. The «WI-FI» and

«SRV» indicators flashing alternately indicate that the Wi-Fi setup mode (access point) is enabled.

MODES OF OPERATION

CONNECTING TO THE SERVER

EM-482 establishes and maintains the connection to the server specified in the settings. The exchange with the server is carried out using the MODBUS TCP Protocol or the modified MODBUS TCP.

COMMUNICATION OF DEVICES IN THE RS-485 MODBUS NETWORK WITH CLIENTS AND SERVERS IN TCP NETWORKS

EM-482 functions as a MODBUS gateway and waits for the connection to port 502 over the MODBUS TCP Protocol. The MODBUS TCP connection port can be changed by the user. Connection with a PC can be made using any clients' MODBUS TCP software. The client's version for Windows is available for download on the NOVATEK-ELECTRO website www.novatek-electro.com.

When the client requests connection to the MODBUS TCP port, EM-482 checks the list of available connections. If all connections are busy, the connection is rejected, otherwise it is added to the internal list of served clients (no more than four clients).

When the client is connected, the EM-482 waits for the MODBUS request from the client. In RS-485 Slave mode, the requests are also accepted from the MODBUS network Master device over RS-485.

On receipt of the client's request, the latter is analyzed and either processed or blocked depending on the requested function code and the current rights of the client. When the request is blocked, EM-482 can generate and transmit the user-specified MODBUS exception code to the client (by default, code 1). The client's rights are determined by the passwords entered after the connection.

If the request is addressed to EM-482, the Product does not redirect the request, but processes it and transmits the response to the client.

In the RS-485 Master mode, requests to the other devices are redirected to the RS-485 MODBUS network, and a response is expected from the device over RS-485, the «485» indicator being lit up. If the data is received or the waiting time has expired, the «485» indicator turns off.

In the remote server redirection mode, if the connection to the remote MODBUS TCP server is established, requests to other devices are also sent to this server, and a response is expected from it.

NOTE: Circular redirects should be avoided (e.g. sending to the address of the Product itself or to another EM-482 that redirects requests to the first Product). Requests in this configuration can cause delays and eventually loss of communication.

Requests are accepted from all clients at the same time, and are processed on the first-come, first-served basis. While waiting for a response to the request, other requests received from this and the other clients are waiting in the queue.

NOTE: The response is received from the first responding addressee, so there should not be devices with the same MODBUS addresses (IDs) in the MODBUS RS-485 network and among the addressees accessible via the remote MODBUS TCP server.

If the request could not be redirected (for example, in the Slave mode over RS-485, if the connection to the remote MODBUS TCP server was terminated), EM-482 can generate and transmit to the client the user-specified MODBUS exception code (by default, code 10).

If there is no response, EM-482 can generate and transmit to the client the user-specified MODBUS exception code (by default, code 11).

If a response to the request is received, EM-482 transmits it to the client that sent the request.

SETTING UP

EM-482 connections are configured over MODBUS TCP Protocol. The basic communication parameters can be configured using the HTTP Protocol in Wi-Fi setup mode: the mode and baudrate of

-3- RS-485, the selected Wi-Fi network, and the addresses of the servers to which the EM-482 connects automatically.

You can enter Wi-Fi setup mode, restart the product, or reset the settings to Manufacturer's defaults using the «R» button on the front panel.

To reset the Product to the Manufacturer's defaults:

- Press and hold the reset button «R» for at least 8 seconds (after 2 seconds of holding the button, the «PWR» indicator will turn red), and after 8 seconds, the Product will reset;
- Release the «R» button.

To switch to or from Wi-Fi setup mode:

- Press and hold the reset button «R» for 2 to 8 seconds; after the «PWR» indicator turns red, release the «R» button;
- If you have entered the Wi-Fi setup mode, make sure that the «WI-FI» and «SRV» indicators are flashing alternately; connect to the «EM482_XXXXXX» network (where XXXXXX are the last 6 characters of the Product's MAC address indicated on the product label) using the client device with Wi-Fi connectivity (phone).

To restart the Product and save the user settings - press and release the reset button «R». The Product will restart.

CONFIGURING THE EM-482 IN THE WI-FI SETUP MODE VIA THE WEB-INTERFACE

Configuration via the WEB-interface is performed using a WEB-browser:

- 1) Switch the Product to the WI-FI setup mode and connect to it.
- 2) Write the address of the EM-482 setting in the browser's address bar («em.com» or «192.168.4.1») and choose to go to the specified address. The Product parameters page will be displayed.
- 3) After making changes to the parameters, click the «Save» button. The entered parameters will be checked. If there are no errors in the parameter values, the parameters will be stored in the EM-482 memory (the new parameters will take effect after the Product is restarted). If errors are found in the parameters when you click the «Save» button, none of the parameters will be saved, and the names of the erroneous parameters will be highlighted in red.
- 4) When you click on the «Reset to defaults» button, all parameters take their Manufacturer's values.
- 5) When you click the «Restart» button, all connections and incoming/outgoing operations are interrupted, EM-482 exits the WI-FI setup mode and restarts. If you have previously made changes to the parameters and saved them in memory, these changes will take effect.

NOTE: The browser does not load the page in response to the «Restart» button.

CONFIGURING EM-482 VIA THE MODBUS-INTERFACE

Configuration via the MODBUS-interface is performed by any MODBUS TCP client connecting to the EM-482 IP address (for this purpose, the IP address must be fixed either in the settings of the DHCP issuing the network server address, or in the Product settings), specifying its MODBUS-identifier (factory value – 111).

To configure the parameters, write the password string in the password input parameter. The factory password value is «11111», so to write it – write the code «49» – the ASCII code of the digit one – to registers from 100 to 104. If the password is correct, the mode parameter is read as 1 – setting mode.

In setup mode, the write is available for the control command parameter, as well as the settings parameters. After recording the desired values in the configuration parameter registers, write the value «2» – the «Save» command – to the control command parameter. You can check whether the saved parameter values are correct by comparing sets of custom parameters and saved parameters. If the sets match, the new settings are accepted and saved.

To reset the saved parameters to their factory values, in the setup mode, write the value «444» in the control command parameter – «Reset to defaults» command.

In order for the saved parameter values to take effect, the Product must be restarted. Through the MODBUS-interface, the restart is performed by writing the value «1» – the «Restart» command – to the

parameter of the control command.

To exit the setup mode, write «0» in the first register of the password input parameter. In this case, all password input registers and the control command register are cleared (read as «0»).

EM-482 PARAMETERS

THE PRODUCT DESCRIBING PARAMETERS

| Parameter | Description | Address |
|---------------------|---|---------|
| Type of the Product | The code determining the MODBUS Product at the Manufacturer's (31 – EM-482) | 0 |
| Firmware version | The embedded software update version | 1 |
| Check code | CRC32 of the embedded software update version | 2 - 3 |

PARAMETER SETS AVAILABLE VIA THE MODBUS PROTOCOL

The parameter sets available over the MODBUS Protocol are listed below. The internal structure of all parameter sets is similar to that of the set described in «Settings», except for the initial address.

| Set | Description | Access | Addresses |
|---------------------|---|--|--------------------------|
| Changeable settings | Parameters listed in «Settings», that may be changed and included as described in paragraphs «Configuring the EM-482 in the WI-FI setup mode via the WEB-interface» and «Configuring EM-482 via the MODBUS-interface» | Only in the setting mode, reading or writing | 300 – 799, 5250 – 5499 |
| Current settings | Settings used now | In any mode – read-only | 2300 – 2799, 5500 – 5749 |
| Saved settings | The set preserves irrespective of the power supply availability and is used at startup | Only in the setting mode, read-only | 3300 – 3799, 5750 – 5999 |

THE FORMAT OF PARAMETER PRESENTATION IN THE MODBUS REGISTERS

| Parameter | Value range | Description | Number of occupied registers |
|----------------------|--|--|---|
| Number | 0 – 65535 | Integer (16 bits) in the standard range of MODBUS register values | 1 |
| Number | 0 – 4294967295 in two registers, the senior part is the first | Integer which value may exceed the limit for MODBUS register (65535) | 2 |
| Character string | In each register, a number from 0 to 255 is the ASCII code of the character or 0 (end of string) | A set of values, each of which is equal to the code of a single ASCII character. If the string is shorter than the maximum length, the code 0 is placed after the last character | Maximum string length for the given parameter |
| IP address (IP mask) | Each register has one byte (0 – 255) | A set of four bytes of an IPv4 address, from left to right | 4 |
| MAC address | Each register has one byte (0 – 255) | A set of six bytes of an MAC-48 address, from left to right | 6 |

PARAMETERS OF THE CURRENT MODE

| Parameter | Value range | Initial value | Description | Address |
|-------------------|---|---------------|--|-----------|
| Password entering | Character string | 0 | When entering the current password, the client is given the appropriate permission (see registers 510 – 569). When entering an empty string, the client's rights are reset to the level of rights at the time of connection | 100 - 119 |
| Control command | 0–65407, the record in the setting mode | 0 | 0: no action; 1: «Restart» – reset EM-482; 2: «Save» – save the setting modifications; 3: «Apply» – apply the settings without restart (accessible only for MODBUS and user's parameters); 4: «Save and Apply» – similar to commands 2 and 3 sent one after another; 9: «Cancel» – read the saved settings; | 120 |

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| Parameter | Value range | Initial value | Description | Address |
|-----------|-------------|---------------|--|---------|
| | | | 51: «Apply to MODBUS» – apply the settings to MODBUS network and RS-485; 59: «Apply to user's» – apply the settings to the user's section of registers; 444: «Reset the defaults» – reset to the Manufacturer's defaults; 64893: «Download updates» – start downloading the latest firmware version from the cloud server to the downloaded firmware file, see reg. 2004; 65397: «Update firmware» – program from downloaded file; 65407: «Return firmware» – program from factory file | |

CURRENT PARAMETERS

| Parameter | Description | Address |
|-------------------------------------|---|---------|
| Mode (for details, see reg. 122) | 0: User's mode; 1: Setting mode | 121 |
| Access mode flags | Bit 0: Ability for the connected client to get permission (using a password) to request device reading functions over RS-485: 0 – permission cannot be obtained; 1 - permission can be obtained with password | 122 |
| | Bit 1: Allowing the connected client to request device reading functions over RS-485: 0 – no permission; 1 – permitted | |
| | Bit 2: Ability for the connected client to get permission (using a password) to request write and device management functions over RS-485: 0 – permission cannot be obtained 1 – permission can be obtained by password | |
| | Bit 3: Allowing the connected client to request write and device management functions over RS-485: 0 – no permission; 1 – permitted | |
| | Bit 4: Ability for a connected client to get permission (using a password) to access EM-482 registers other than version, password, mode, and access flags: 0 – permission cannot be obtained; 1 – permission can be obtained with the password | |
| | Bit 5: Allowing the connected client to access EM-482 registers other than version, password, mode, and access flags: 0 – no permission; 1 – permitted | |
| | Bit 6: Always 1 | |
| | Bit 7: Allowing the connected client to configure EM-482 (similar to register 121): 0 – no permission; 1 – permitted | |
| | Bit 8: Always 0 | |
| | Bit 9: Always 1 | |
| Time, min. | Number of minutes since launch | 123-124 |
| MODBUS TCP clients number | The number of MODBUS TCP occupied connections | 125 |
| MODBUS TCP clients limit | Total number of possible MODBUS TCP clients | 126 |
| Load of RS-485, requests/sec | The number of requests sent over RS-485 per second | 127 |
| Useful load of RS-485, requests/sec | The number of errorless responses over RS-485 per second | 128 |
| Load of RS-485 per second, % | RS-485 engaged condition for the last second taking into account the RS-485 set speed and silence time | 129 |
| RS-485 load per minute, % | RS-485 engaged condition for the last minute | 130 |
| RS-485 load per 5 minutes, % | RS-485 engaged condition for the last five minutes | 131 |
| MODBUS TCP load, requests/sec | The number of requests received from clients over MODBUS TCP per second | 132 |

SETTING PARAMETERS

| Parameter | Description | | Address |
|--|---|---|-------------|
| MODBUS TCP effective load, requests/sec | The number of errorless responses sent to the clients over MODBUS TCP per second | | 133 |
| Wi-Fi load, kB/sec | The Wi-Fi radio channel load | | 134 |
| Parameter is not used | This parameter is reserved for compatibility and is set to 0 | | 135 |
| Maximum of MODBUS TCP clients | The maximum number of clients simultaneously connected via MODBUS TCP – from the moment of launch | | 136 |
| MODBUS TCP maximum load, requests/sec | The maximum number of requests received per second from clients over MODBUS TCP – since launch | | 137 |
| RS-485 maximum load, % | The maximum load of RS-485 for 5 minutes – from the start | | 138 |
| Wi-Fi maximum load, kB/sec | Maximum Wi-Fi load – since launch | | 139 |
| Wi-Fi current IP address | The IP address at which EM-482 is available on the network | | 140 - 143 |
| Current MAC address for Wi-Fi | The MAC address, by which EM-482 is identified on the network | | 144 - 149 |
| Parameter is not used | This parameter is reserved for compatibility and is set to 0 | | 150 - 164 |
| Time before connection to the data collection server | 0 – connection to the data collection server is established; 1 – connecting to the data collection server; 2 – 65534: number of seconds before reconnecting; 65535: connection to the server is not used | | 165 |
| The programmed number of restarts | The number of restarts according to the user's settings, for the entire time of operation | | 166 |
| Number of critical errors | The number of marked errors (failures) that caused the Product to restart – for the entire time of operation | | 167 |
| Total operating time, min | The Product operation, minutes, for the entire time of operation | | 168 - 169 |
| Parameter is not used | This parameter is reserved for compatibility and is set to 0 | | 170 - 174 |
| Supply voltage, mV | Voltage at the product power supply terminals | | 175 |
| Time before connecting to a remote MODBUS TCP server | 0 – connection to the remote server has been established; 1 – connecting to a remote server; 2 – 65534: number of seconds before reconnecting; 65535: connection to the MODBUS TCP server is not used | | 176 |
| Connection status to a remote MODBUS TCP server | 0 – connection is not established; 1 – connection has been established | | 177 |
| Firmware update download status | Bit 1 | Busy indication: 0 – waiting for command; 1 – receiving file | 2004 |
| | Bit 2 | Receiving updates error: 0 – no stop with error; 1 – error | |
| | Bit 3 | Connection to the server: 0 – no connection with the server; 1 – connection established | |
| | Bit 4 | Retrieving file data: 0 – no file data; 1 – data downloaded | |
| | Bit 6 | File download completion: 0 – file has not been downloaded; 1 – file has been completely downloaded | |
| | Bit 7 | File correctness: 0 – no confirmation; 1 – file is correct | |
| Firmware file download progress, · 0.01% | Downloaded part of the full file size 10000 – file is completely downloaded | | 2005 |
| Title of the downloaded firmware file | Version identifier string, e.g. "EM-482, ver.10" Empty string – file not checked or incorrect | | 2030 – 2061 |
| User's state parameters | Reset to 0 at restart. Can be used by MODBUS clients to send data to the server | | 5000 - 5249 |

| Parameter | Value range | Manufacturer's value | Description | Address |
|---|------------------|----------------------|--|-----------|
| Wi-Fi network | | | | |
| Static IP address* | IP address | 192.168.0.111 | If dynamic addressing is disabled, the IP address on the Wi-Fi access point network is equal to this value | 300 - 303 |
| Subnet mask* | IP mask | 255.255.255.0 | This is only used with the static IP address | 304 - 307 |
| Gateway* | IP address | 192.168.0.1 | This is only used with the static IP address for connection to other networks | 308 - 311 |
| Enable dynamic addressing with the help of DHCP* | 0 – 1 | 1 | 0 – for addressing on Wi-Fi access point network, the set values of IP address, mask and gateway are used; 1 – if the DHCP server is accessible on the network, IP address, mask and gateway are received from the server | 312 |
| Parameter is not used | 0 | 0 | This is not used, should be 0 for compatibility | 313 |
| Enable the use of the gateway DNS server | 0 – 1 | 1 | 0 – gateway DNS is not used; 1 – gateway DNS is used to determine IP addresses of other servers, if they are set according to host names | 314 |
| DNS server IP address | IP address | 8.8.8.8 | The set IP addresses of DNS extension servers. | 315 - 318 |
| Secondary DNS server IP address | IP address | 0.0.0.0 | 0.0.0.0 – the server is not used | 319 - 322 |
| Parameter is not used | 0 | 0 | This is not used, should be 0 for compatibility | 323 - 339 |
| SSID - Wi-Fi access point* | Character string | | EM-482 is connected to the given access point. Up to 32 characters | 340-371 |
| Wi-Fi access point password* | Character string | | Up to 24 characters | 372-395 |
| Parameter is not used | 0 | 0 | This is not used, should be 0 for compatibility | 396-449 |
| MODBUS TCP Clients | | | | |
| MODBUS TCP connection port TCP | 1 – 65535 | 502 | This is used for external connection to EM-482 to exchange by the MODBUS TCP Protocol | 450 |
| Enable the replacement of inactive clients | 0 – 1 | 1 | 0 – connection over MODBUS TCP will be maintained irrespective of the time between the client's requests; 1 – if all connections over MODBUS TCP are engaged, the new client requesting connection can be included instead of the client which remained silent for the set time | 451 |
| Maximum time of waiting for a request, sec | 0 – 600 000 | 90 | This is used, if the replacement of inactive clients is enabled | 452-453 |
| Enable the queue for the last engaged MODBUS TCP connection | 0 – 1 | 0 | 0 – Connection over MODBUS TCP will be maintained irrespective of the connection retention time; 1 – If all MODBUS TCP connections are engaged, the new client requesting connection can be connected instead of the last connected client, should the time of the connection retention exceeds the set one | 454 |

| Parameter | Value range | Manufacturer's value | Description | Address |
|---|--------------|----------------------|---|---------|
| Maximum time of retention of the last MODBUS TCP connection, msec | 0 – 600 000 | 60 000 | This is used when the queue for the last MODBUS TCP connection is enabled | 455-456 |
| MODBUS Network | | | | |
| EM-482 own MODBUS identifier* | 0 – 247 | 111 | 0 – MODBUS TCP sends all requests to the MODBUS network; The Product registers are inaccessible over MODBUS TCP; 1–247 – the Product responds to MODBUS TCP requests with a given MODBUS identifier without sending them to the MODBUS network | 457 |
| RS-485 baudrate, bit/sec.* | 75 – 921 600 | 9600 | This is used when exchanging with devices over RS-485, the same speed value for devices on the same bus | 458-459 |
| Enable byte format selection in RS-485 transmissions* | 0 – 1 | 1 | Used when exchanging with devices over RS-485, the same value for devices on the same bus. 0 – not used, bytes end with 2 stop bits; 1 – the byte format is selected in register 461 | 460 |
| The format of the byte in RS-485 transmissions* | 0 – 5 | 5 | Used when exchanging with devices over RS-485 only if byte format selection is enabled. The same value for devices on the same bus: 0 – «EVEN» – 1 parity bit and 1 stop bit; 1 – «ODD» – 1 parity bit and 1 stop bit; 2 – «0» ("SPACE") – 1 reset bit and 1 stop bit; 3 – «1» ("MARK") – 1 set bit and 1 stop bit (similar to the mode with two stop bits); 4 – «ABSENT» – no parity bit, 1 stop bit; 5 – «AUTO-STOP» – there is no parity bit, 2 stop bits in the sent bytes, 1 stop bit in the received bytes (devices with 1 and 2 stop bits can be connected at the same time) | 461 |
| MODBUS RTU response start waiting time, msec | 0 – 60 000 | 200 | Used for RS-485 transmissions in RTU mode. After sending the request, if the first byte of the response was not received during this period, the response wait is terminated. The response is always expected at least within the time of silence between frames (the silence time depends on the baudrate and is equal to the transfer time of 3.5 bytes, or 1.75 msec. for speeds over 19200 bps) | 462 |
| Enable ASCII exchange mode in the MODBUS network | 0 – 1 | 0 | RS-485 exchange mode, the same value for devices on the same bus. 0 – RTU exchange mode (format: 1 start bit, 8 data bits, 2 stop bits, parity bit and stop bit, or only 1 stop bit – 10 to 11 bits altogether); 1 – ASCII exchange mode (format: 1 start bit, 7 data bits, 2 stop bits, or parity bit and stop bit – 10 bits altogether). Non-standard byte formats (register 461, values 4 and 5) are not available, and the format 3 (2 stop bits) is used instead | 463 |

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| Parameter | Value range | Manufacturer's value | Description | Address |
|--|------------------|----------------------|---|-----------|
| Waiting time for the next MODBUS ASCII character, msec | 0 – 60 000 | 1000 | Used for RS-485 transmissions in the ASCII mode. When receiving a response, if the next byte of the response was not received during this period, the waiting for the response is terminated. The waiting time is always at least that of one character transmission (depending on the transfer rate) | 464 |
| Connection to the Data Collecting Server | | | | |
| Enable the connection to the data collection server* | 0 – 1 | 1 | 0 – connection to the server is not used; 1 – establish and maintain a connection to the data collection server | 465 |
| Server connection port | 0 – 65535 | 20502 | The port of the data collection server used to establish the connection | 466 |
| Waiting time for the server's response, sec | 0 – 3600 | 120 | 0 – The server's silence time is unlimited; 1–3600 – Maximum server silence time, after which the connection will be broken and will need to be established again | 467 |
| Waiting time before reconnection to the server, sec | 0 – 30 000 | 15 | This is used when connecting to the server. Upon losing the connection with the server, the reconnection will be possible in a set waiting time (after the Product is launched, the first connection can take place in a fixed time of 5 sec.) | 468 |
| Enable setting the server address with a text string* | 0 – 1 | 1 | This is used when connecting to the server. 0 – the connection is made to a server with a fixed IP address specified in registers 470-473; 1 - the connection is made to the server with the name specified in registers 474-509 | 469 |
| Server's IP address | IP address | 0.0.0.0 | This is used when connecting to the server, if setting the server's address with a text string is disabled. IP address of a remote server, with which the connection is maintained | 470-473 |
| Server's address* | Character string | modbus. overvis. com | This is used when connecting to the server, if the server's address setting with a text string is enabled. The remote server's address, with which the connection is maintained. A string of up to 36 characters long may be specified as the address. There must be no spaces in the string | 474-509 |
| Protection | | | | |
| Set password for entering the setting mode* | Character string | 11111 | This is used to access the MODBUS TCP configuration mode. A string of 5 to 10 characters can be specified as a password. There must be no spaces in the string | 510 - 519 |
| The parameter is not used | 0 | 0 | This is not used, should be 0 for compatibility | 520 - 549 |
| Set password to permit writing to MODBUS devices | Character string | | Used to access devices connected to EM-482 to request writing or management functions that can change the state of these devices. A string of up to 10 characters can be specified as a password. There must be no spaces in the string | 550 - 559 |
| Set password to permit MODBUS reading | Character string | | Used to access devices connected to EM-482 to request devices read functions or to access EM-482 registers other than the | 560 - 569 |

| Parameter | Value range | Manufacturer's value | Description | Address |
|--|-------------|----------------------|---|-----------|
| | | | version, password, mode, and flag registers. A string of up to 10 characters can be specified as a password. There must be no spaces in the string | |
| Parameter is not used | 0 | 0 | This is not used, should be 0 for compatibility | 570 - 571 |
| Enable Modbus write protection mode | 0 – 1 | 0 | 0 – write protection is adjusted using other parameters (password) or disabled; 1 – any function requests are blocked, except for MODBUS functions 1, 2, 3, 4, 7, 17 and 20 | 572 |
| Enable Modbus read protection mode | 0 – 1 | 0 | 0 – read protection is adjusted using other parameters (password) or disabled; 1 – any function requests are blocked, except for MODBUS functions 1, 2, 3, 4, 7, 17 and 20, except for read functions of the version 3 registers, mode and flags | 573 |
| Parameter is not used | 0 | 0 | This is not used, should be 0 for compatibility | 574 - 629 |
| Miscellaneous | | | | |
| Enable automatic restart of the Product | 0 – 1 | 1 | 0 – periodic restart is disabled 1 – the Product is restarted after a specified period of time | 630 |
| Restart time, min | 5 – 7200 | 120 | This is used, if the automatic restart is enabled | 631 |
| Enable restart mode automatically only in the absence of connections | 0 – 1 | 1 | This is used if automatic restart is enabled. 0 – the Product is restarted after a specified period of time from the start; 1 – the Product is restarted after a specified time interval from the last MODBUS transmission | 632 |
| MODBUS exception code generated when access is denied | 0 – 255 | 1 | 0 – if access to MODBUS registers is denied, the response is not returned to the client; 1-255 – If access is denied to the client that sent the request, this exception code is returned | 633 |
| MODBUS Gateway Target Failed to Respond exception code | 0 – 255 | 11 | 0 – if there is no response from the request recipient, the response is not returned to the client; 1-255 – if there is no response from the request recipient, this exception code is returned to the client | 634 |
| Parameter is not used | 0 | 0 | This is not used, should be 0 for compatibility | 635 |
| MODBUS Gateway Path Unavailable exception code | 0 – 255 | 10 | 0 – if there is no route/connection to the request destination, the response is not returned to the client; 1-255 – if there is no route/connection to the request destination, this exception code is returned to the client | 636 |
| Enable RS-485 Slave mode* | 0 – 1 | 0 | 0 – Master mode. RS-485 is used for sending requests; 1 – Slave mode. RS-485 is used for receiving requests from an additional client | 637 |
| The first MODBUS identifier RS-485 | 1 – 255 | 1 | The parameters define the range of MODBUS IDs used on the RS-485. In master mode, requests with addresses within the range (as well as broadcasts with address 0) are routed via RS-485. | 638 |
| The last MODBUS identifier RS-485 | 1 – 255 | 1 | In slave mode, requests with addresses within the range (as well as broadcasts and EM-482 requests) are received over RS-485 | 639 |

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| Parameter | Value range | Manufacturer's value | Description | Address |
|--|------------------|----------------------|--|-------------|
| Connection to MODBUS TCP Remote Server | | | | |
| IP address of the remote server * | IP address | 192.168.0.112 | Used when redirecting requests to a remote MODBUS TCP server is enabled. IP address of the remote server to maintain the connection | 640 – 643 |
| Connection port of the remote server | 0 – 65535 | 502 | Used when redirecting requests to a remote server. Remote server port for MODBUS TCP connection | 644 |
| Waiting time for a response from a remote server, msec | 0 – 60 000 | 1000 | Used when redirecting requests to a remote server. After sending the request, if the correct response was not received during this time, the waiting for the response is terminated | 645 |
| Wait time before reconnecting to the remote server, msec | 0 – 240 | 20 | Used when redirecting requests to a remote server. After the connection to the server is lost, the reconnection will be possible after the specified timeout | 646 |
| Connect to the remote server mode* | 0 – 1 | 0 | 0 – remote MODBUS TCP server is not used; 1 – the connection to a remote MODBUS TCP server is established and automatically maintained | 647 |
| The first MODBUS ID of the remote server | 1 – 255 | 1 | Used when redirecting requests to a remote server. The parameters define the range of MODBUS IDs used on the remote server. | 648 |
| The last MODBUS ID of the remote server | 1 – 255 | 255 | Requests with addresses in this range (as well as broadcasts with address 0) are sent to the remote MODBUS TCP server | 649 |
| Parameter is not used | 0 | 0 | This is not used, should be 0 for compatibility | 650 - 729 |
| Period of search for the best Wi-Fi hotspot | 0 – 72 | 4 | 0 – not search for access points with a better signal and not switch between them until the connection is lost Other values – the number of hours until the search for the access point of the same name with better signal | 730 |
| Parameter is not used | 0 | 0 | This is not used, should be 0 for compatibility | 731 – 739 |
| Product Name | Character string | | Name to distinguish products from each other | 740 – 779 |
| Parameter is not used | 0 | 0 | This is not used, should be 0 for compatibility | 780 – 799 |
| User's Settings | | | | |
| User's settings and saved values | 0 – 65535 | 0 | They can be used for storing any product identification data, or filled in by MODBUS clients for storing and transmitting data to the server | 5250 - 5499 |

* – Parameters are available both over MODBUS and WEB in the Wi-Fi setup mode



FIRMWARE UPDATE

EM-482 stores two update files in its memory:

- User firmware – the file can be uploaded via the WEB-interface;
- Manufacturer firmware – the file is written by the Manufacturer and cannot be replaced. If the update fails (for example, due to power failure), the file is used for automatic recovery.

Any of these files can be retrieved from the EM-482 memory (to upload to another Product). Firmware can be updated from these files remotely by MODBUS, via the WEB-interface.

TRANSFERRING EM-482 UPDATE FILES

When downloading the file remotely, connection should be made to configure the product via MODBUS (see «Configuring EM-482 via

VN240320