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, IDT

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

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 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

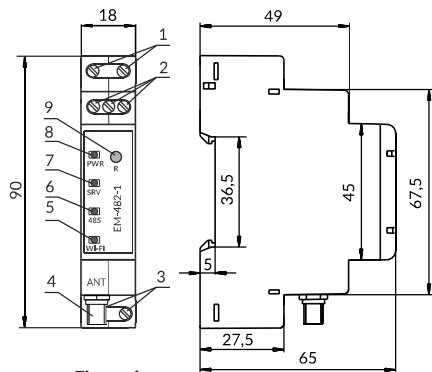The overall and mounting dimensions and controls of EM-482 are shown in Figure 1.

Figure 1

1 – The «+» and «-» terminals are designed for power supply connection (from 7 to 30 VDC).
2 – Terminals «A», «⊥» 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.

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

TECHNICAL SPECIFICATIONS

Power supply voltage DC, V	7 – 30
TCP networks link interface	Wi-Fi
Wi-Fi Module	ESP8266 (ESP-07)
Wi-Fi Frequency, GHz	2.4
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), mA	250

Number of devices connected to RS-485:
   - when the input current of the receivers on the line is 1 mA
   - when the input current of the receivers on the line is 0.25 mA
	
	Not less than 32
	Not less than 128

Built-in RS-485 terminator resistance, Ω	1 000
Ready time at power-up, s, no more than	2
Current consumption (at a supply voltage of 12 V), mA, no more than	110
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, mm^2	0.3 - 3.0
Tightening torque of the terminal screws of input contacts, N*m	0.4
Insulation rated voltage, V	450
Rated pulse withstand voltage, kV	2.5
Weight, kg, not over	0.08
Overall dimensions, HxBxL, mm	90x65x18
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	

OPERATION CONDITIONS

The product is intended for operation in the following conditions:
– Ambient temperature: from minus 35 to +55 °C;
– Atmospheric pressure: from 84 to 106.7 kPa;
– Relative humidity (at temperature of +25 °C): 30 ... 80 %.

ATTENTION! The device is not intended for operation in the following conditions:
– Significant vibration and shocks;
– High humidity;
– Aggressive environment with content in the air of acids, alkalis, etc., as well as severe contaminations (grease, oil, dust, etc.).

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 mm^2 (AWG17).

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.
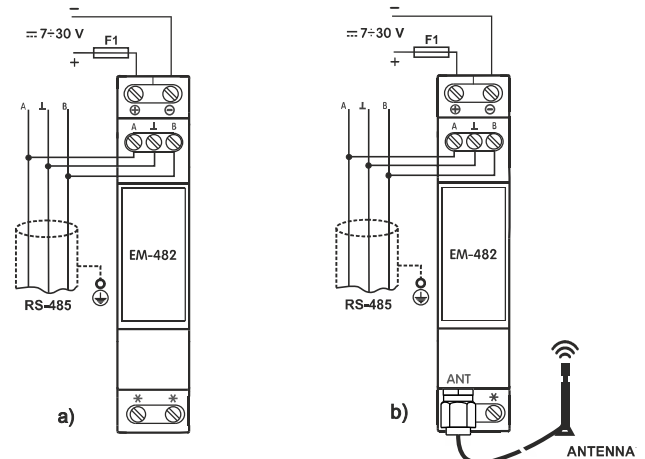
F1 – protective guard (fuse insert) for 0.5 A current.
Figure 2

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 (https://novatek-electro.com/en/software.html).

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 the 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 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	0–444, 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; 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	120

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	

Parameter		Description	Address
Access mode flags	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	122
	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
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
Unused parameter		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
Unused parameter		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
Unused parameter		This parameter is reserved for compatibility and is set to 0	170-175
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
User's state parameters		Reset to 0 at restart. Can be used by MODBUS clients to send data to the server	5000-5249

SETTINGS

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. 0.0.0.0 – the server is not used	315-318
Secondary DNS server IP address	IP address	0.0.0.0		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	Value range	Manufacturer's value	Description	Address
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
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 baud-rate, 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
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 (via the unencrypted channel)	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

Parameter	Value range	Manufacturer's value	Description	Address
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 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	560 - 569
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 of 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. In slave mode, requests with addresses within the range (as well as broadcasts and EM-482 requests) are received over RS-485	638
The last MODBUS identifier RS-485	1 – 255	1		639
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 to	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 - 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 via the WEB interface .

Transferring EM-482 Update Files
Enter the WI-FI setup mode. Connect to the Product. Select the «Files» section.
To send a file to EM-482:
– If another file has already been uploaded to EM-482, delete it by clicking the «Delete» button;
– Click the file selection button in the «User firmware» line;
– Select the update file, for example, «EM-482-1-1-8.FUS» in the window that opens;
– Click the «Upload» button in the «User firmware» line.
Note: After transferring the file, make sure you have uploaded the correct file for firmware update to the required version. The «User firmware» line should display the firmware header with the version number followed by «Tested».
To get a file from EM-482:
– Click the «Download» button in the file line;
– If the Save File dialog opens, select the file name and the location where the file should be placed.

Updating Firmware via WEB Interface
To update the firmware:
– Enter the Wi-Fi setup mode. Connect to the Product. Select the «Files» section.
– Click the «Program» button in the file update line;
– The Product will automatically restart and begin the update process;
– Wait for the firmware update completion, the process may take up to a minute;
– Connect to EM-482;
– Check the version number and make sure that the update was successful.

COMPLETE SET

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

SAFETY PRECAUTIONS

To ensure the product safe operation it is strictly forbidden the following:
– to carry out installation works and maintenance without disconnecting the product from the mains;
– to open and repair the product without any professional help;
– to operate the product with mechanical damages of the housing.
It is not allowed water penetration on terminals and internal elements of the product.
During operation and maintenance the regulatory document requirements must be met, namely:
Regulations for Operation of Consumer Electrical Installations;
Safety Rules for Operation of Consumer Electrical Installations;
Occupational Safety in Operation of Electrical Installations.

MAINTENANCE

Recommended frequency of maintenance is every six months.
Maintenance Procedure:
1) Check the connection reliability of the wires, if necessary, clamp;
2) Visually check the integrity of the housing, in case of detection of cracks and damages take the product out of service and send for repair;
3) If necessary, wipe the front panel and the housing of the product with cloth.
Do not use abrasives and solvents for cleaning.

SERVICE LIFE AND MANUFACTURER WARRANTY

The lifetime of the device is 10 years. Upon expiration of the service life, contact the manufacturer. Shelf life is 3 years.
Warranty period of the device operation is 5 years from the date of sale.
During the warranty period of operation (in the case of failure of the device) the manufacturer is responsible for free repair of the device.
ATTENTION! IF THE DEVICE 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 device.
Post-warranty service of the device is performed by the manufacturer at current rates.
Before sending for repair, the device should be packed in the original or other packing excluding mechanical damage.

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 %.

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

For all questions, please contact the manufacturer:
NOVATEK-ELECTRO Ltd,
59, Admiral Lazarev Str.;
Odessa, 65007, Ukraine.
Tel.: +38 (048)738-00-28,
Tel./fax: +38 (0482) 34-36-73
www.novatek-electro.com

Date of sale_____

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