



## PROTOCOL CONVERTER

### ET- 485, ET- 485-24

## OPERATING MANUAL

*Quality control system on the development and production complies with requirements  
ISO 9001:2015*

### **Dear customer,**

Company NOVATEK-ELECTRO LTD thanks you for purchasing our devices.  
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.

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IMPORTANT! ALL REQUIREMENTS OF THE OPERATING MANUAL SHALL BE DEEMED COMPULSORY!



TO ENSURE THE DEVICE SAFE OPERATION, THE FOLLOWING SHALL BE ABSOLUTELY FORBIDDEN:

- PERFORM INSTALLATION WORK AND MAINTENANCE, IF THE DEVICE IS NOT DEENERGISED - the device components can be powered from the network;
- OPEN OR REPAIR THE DEVICE;
- OPERATE THE DEVICE WITH MECHANICALLY DAMAGED CASE.

DO NOT ALLOW WATER TO GET ON TERMINALS OR INTERIOR PARTS OF THE DEVICE.

During operation and maintenance, it is necessary to comply with the requirements of regulatory documents:

- "Rules for Technical Operation of Consumers' Electrical Installations",
- "Safety Rules for the Operation of Consumers' Electrical Installations ",
- "Labor Protection during Operation of Electrical Installations".

The connection, adjustment and maintenance of the device must be carried out by qualified personnel that have read these Operating Instructions.

If the operating rules are followed, the device is safe to use.

This Operating Manual is intended to familiarize you with the design, the requirements for safety, operation and maintenance procedures of the Protocol converter ET-485 and ET-485-24 (hereinafter referred to as the "device"; ET-485; the abbreviation ET-485-24 is used separately when the power characteristics are different).

**The device meets the requirements of the following:**

EN 60947-1, EN 60947-6-2; EN 55011; EN 61000-4-2.

**Terms and abbreviations:**

- **10Base-T** means Ethernet standard for twisted pairs communication at 10 Mbit/s;
- **100Base-T** means Ethernet standard for 100 Mbit/s for twisted pairs communication;
- **8P8C/RJ45** means a unified connector used for connections in networks according to 10Base-T/100Base-T standard
- **Twisted pair** means a pair of insulated conductors in a cable twisted together to reduce distortion of transmitted signals;
- **Firmware** means the firmware of the device that gets started up when the power is applied;
- **Indicator** means single LED indicator;
- **Client** means a device that accesses another device (server) with a request to perform certain functions;
- **Packet** means a block of data for transmission between devices;
- **Server** means a device that performs certain functions at the request of other devices;
- **DHCP** means a protocol that allows network nodes to automatically receive TCP/IP parameters (IP address);
- **Ethernet** means a standard for the packet network communication and data transfer between devices (for example, personal computers);
- **HTTP** means a protocol for transmitting Web pages and other data using the "client-server" technology;
- **Internet** means a worldwide network of devices for storing and transmitting information;
- **IP (protocol)** means a routable protocol for transmission over Ethernet included in TCP/IP and used in the Internet;
- **IP (address)** means the address of a node that is unique within a single network that operates over the IP protocol;
- **IPv4** means a four-byte IP address;
- **MAC (address)** means the address used in network transmissions to identify devices. As a rule, it has a globally unique value;
- **MAC-48** means a six-byte MAC address;
- **MODBUS** means an open packet communication protocol based on the master-slave architecture intended for industrial electronic devices;
- **MODBUS RTU** means a device communication protocol, over which the packet is transmitted byte-by-byte;
- **MODBUS ASCII** means device communication protocol, over which the packet is transmitted in the form of ASCII characters;
- **MODBUS TCP** means a protocol for transmitting MODBUS packets over the TCP/IP standard;
- **RS-485/EIA-485** means a physical layer standard for an asynchronous interface used for transmission over a twisted pair of wires;
- **TCP/IP** means a standard, a set of protocols for data transmission on networks with delivery control;
- **WEB** means a system for accessing documents on servers used in the Internet;
- **WEB page** means a document, file or resource available on a WEB server;
- **WEB browser** means a WEB server client intended for accessing WEB pages, usually using the HTTP protocol.

## 1. PURPOSE

### 1.1 PURPOSE OF THE DEVICE

ET-485 is a microprocessor device.

The device is designed to provide data exchange between the equipment, connected to Ethernet 10BASE-T and 100BASE-T network, and the equipment, supplied with RS-485 interface and forming MODBUS network. The examples of network topology with application of ET-485 are shown in appendix C.

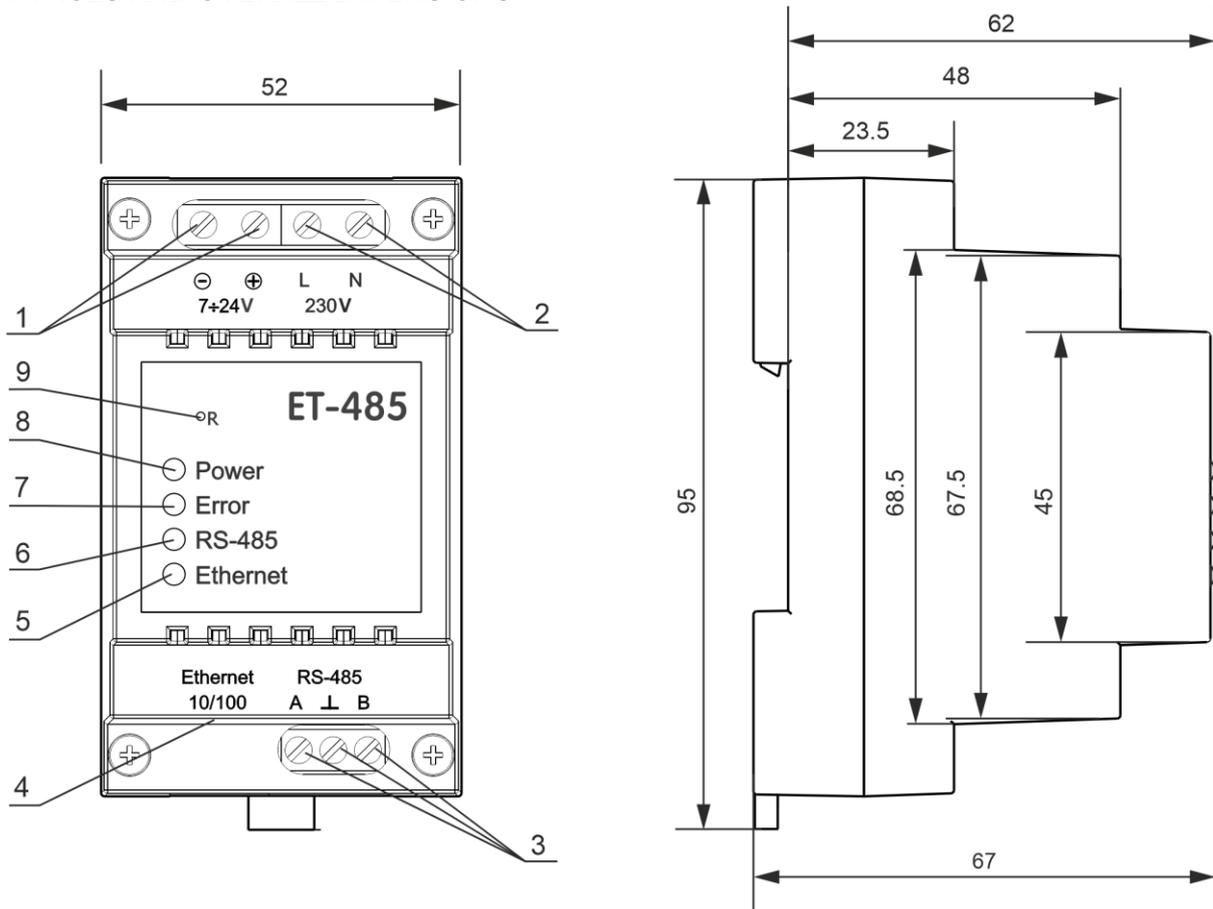
In the RS-485 master mode, the device redirects MODBUS-queries from the clients in Ethernet network to the devices in MODBUS network and returns the answers from the devices to the clients. In the query redirection to remote server mode, the device maintains the connection to MODBUS TCP server in Ethernet network and in addition directs client queries to this server. In the RS-485 slave mode, the device in addition accepts RS-485 queries from a MODBUS-client within MODBUS network.

ET-485 has:

- Flexible Ethernet addressing (MAC address override, and static or dynamic IP address);
- Protection of access via the Ethernet network (configuration mode password, IP address filter for configuration or for connection to the MODBUS network);
- Various modes of exchange over the MODBUS network (RTU or ASCII, with parity checking for even and odd or without checking, a wide range of transmission rates, and configurable delay).
- access to MODBUS via HTTP API (JSON or XML).

Changes in the ET-485 specifications and operation depending on version are described in appendix A.

## 1.2 CONTROLS AND OVERALL DIMENSIONS



- 1 – For ET-485-24, the terminals «7+24V» are designed for connection of backup power supply from 7 to 24V DC or AC;  
 2 – Terminals «230V» for connection to 220-240V AC power supply;  
 3 – Terminals "A", "↓" and "B" are used for connecting to the RS-485 bus;  
 4 – Connector for Ethernet connection;  
 5 – Indicator «Ethernet» is activated when connected to the Ethernet network; is flashing while data exchange over the Ethernet network;  
 6 – Indicator «RS-485» is activated while waiting a reply from the device in the MODBUS network; is flashing while data exchange over the MODBUS network;  
 7 – Error indicator «Error» warns about errors (to include format errors incoming data packages);  
 8 – Power indicator «Power» is activated if supply voltage is available;  
 9 – Reset button «R» (is under the body and accessible for pressing through the opening in the body) is designed to restart the device or factory reset.

**Figure 1** – Controls and overall dimensions of the device

### 1.3 OPERATION CONDITIONS

The device is designed for operation in the following conditions:

- Ambient temperature: from minus 35 to +55°C;
- Atmospheric pressure: from 84 to 106.7 kPa;
- Relative air humidity (at temperature of +25°C): 30 ... 80%.

*If the temperature of the device after transportation or storage differs from the ambient temperature at which it is supposed to be operated, then before connecting to the mains keep the device under the operating conditions within two hours (because of condensation may be on the device elements).*

**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.).

## 2. TECHNICAL SPECIFICATIONS

Main specifications are resulted in Table 1.

**Table 1** – Main specifications of the device

Parameters	ET-485	ET-485-24
Operating supply voltage: - alternating current - direct current - voltage of DC backup power	100 – 250 V 140 – 350 V –	100 – 250 V 140 – 350 V 7 – 24 V
Supply frequency	47 – 63 Hz	
Data Exchange Interface over the Ethernet network	10BASE-T/100BASE-T (twisted pair)	
Supported Ethernet protocols	MODBUS TCP, HTTP	
Maximum number of connections over the MODBUS TCP protocol	4	
Integrated servers	MODBUS-server, HTTP-server	
Data Exchange Interface over the MODBUS network	RS-485	
Supported MODBUS protocols	MODBUS RTU, MODBUS ASCII	
Output short-circuit current of the RS-485 driver (limit at the bus voltage of 12 V)	200 mA	
Integrated terminator resistance	300 hOm	1600 hOm
Recommend number of connected devices within the MODBUS network: -when receivers input current of RS-485 bus is doesn't more 0.125 mA -when receivers input current of RS-485 bus is doesn't more 1 mA	256 32	
Indication	LEDs	
Readiness time upon switching the device to the mains	≤ 1 s	
Rower consumption	2.2 W	1.2 W
Weight	≤ 0.200 kg	
Dimensions	95 x 52 x 67 mm	
Device purpose	Control and distribution device	
Nominal operation condition	continuous	
Cross section of terminals connection wires	0.3 – 2.5 mm <sup>2</sup>	
Terminal screws	0.4 N*m	
Level of device protection	IP 20	
Protection class against electrical shock	II	
Permissible pollution density	II	
Overvoltage category	II	
Rated insulation voltage	450 V	
Rated impulse withstand voltage	2.5 kV	
Operating position	arbitrary	
Rated voltage of galvanic isolation, kV – main power supply terminals – backup power supply terminals – RS-485 – Ethernet	1.5 kV – – 1.5 kV	
Mounting (assembling) on a standard 35 mm DIN rail		
The device maintains its serviceability in any position in the space		
Material of the body frame - self-extinguishing plastic		

**3 USE AS INTENDED****3.1 PREPARATION FOR USE****3.1.1 Preparation for connection:**

- unpack and check the device for damage after transportation; in case of their detection, contact the supplier or manufacturer;
- carefully study the Operation Manual (pay a special attention to the power supply circuits of the device);
- if you have any questions about the installation of the device, please contact the manufacturer over the telephone number indicated at the end of the Operation Manual.

**3.1.2 Connecting the ET-485****ALL CONNECTIONS MUST BE PERFORMED WITH THE DEVICE BEING DEENERGIZED.**

**An error in installation work may result in damage of the device and instruments connected to it.**

To ensure reliability of electrical connections, flexible (multi-wire) conductors should be used with insulation for voltage of at least 450 V, the ends of which must be stripped of insulation by 5±0.5 mm and crimped with bushings. It is recommended to use a wire with a cross-section of at least 1 mm<sup>2</sup>. When connecting to the RS-485 bus, use a Cat. 1 or higher twisted pair cable. It is better to use a shielded cable, in which case it should be grounded.

Fixing the wires must prevent mechanical damage to, twisting and abrading of the wires insulation.

DO NOT LEAVE BARE SPOTS OF WIRE EXTENDING OUTSIDE THE TERMINAL.

**For reliable contact, it is necessary to tighten the terminal block screws with the force specified in Table 1.**

If the tightening torque decreases the connection site heats up, the terminal board may melt and the wire may flame up. With an increase in the tightening torque, there may be breakage in the thread of the terminal block screws or pinching in the connected wire.

**To improve the performance of the ET-485, it is recommended to install a fuse F1 and F2 (fuses insert) or their equivalents in the ET-485 power supply circuit for a current of 1 A.**

**3.1.2.1** The connection of ET-485 is made according to the scheme shown in Figure 2, in the following order:

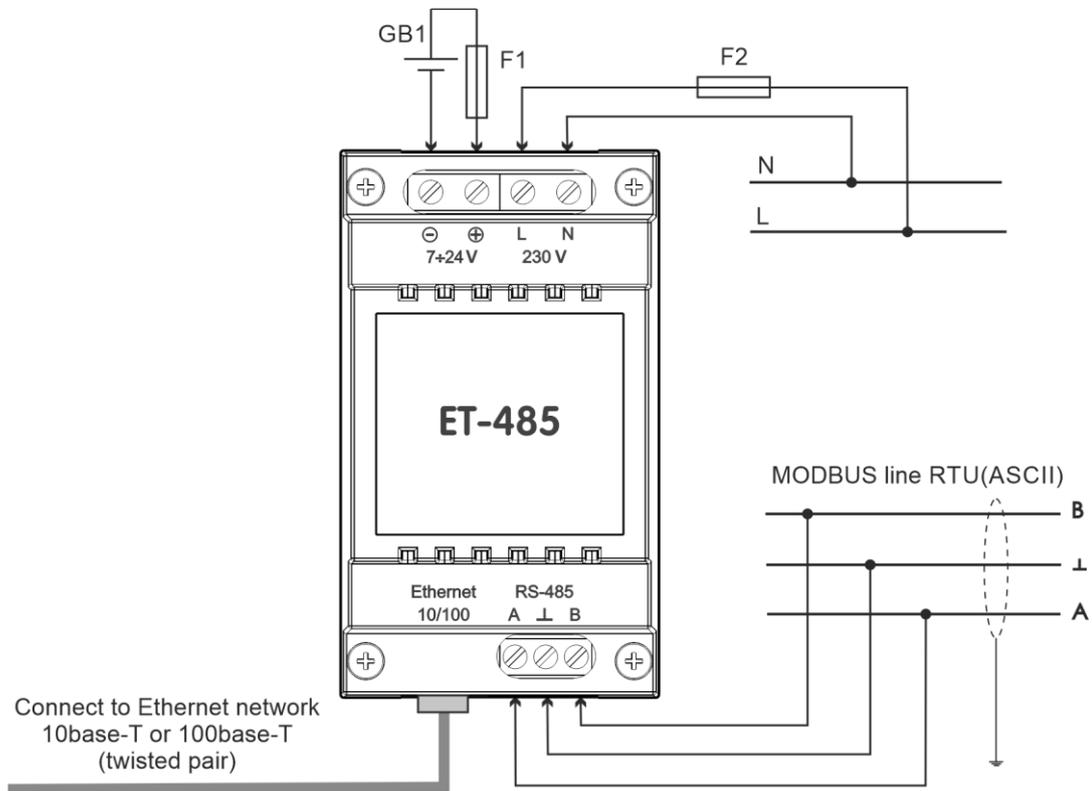
1. Connect the connection cable to the RS-485 bus (Cat 1. twisted pair cable) to terminals “A”, “L” and “B” and to the RS-485 bus (or directly to the device with the RS-485 interface).

*Note: contact “A” serves for transmitting a non-inverted signal, and contact “B” – for an inverted signal.*

2. Connect the Ethernet connection cable (Cat.5 or higher twisted pair cable with 8P8C/RJ45 connector) to the “Ethernet” connector and Ethernet network. The connection features depending on the type of network are described in Appendix B.

3. In case of using mains supply, connect the cable to the mains (the cable with copper stranded wires of section of at least 0.75 mm<sup>2</sup> and maximum operating voltage of at least 400 V) to the connector “230V” and to the mains.

4. For ET-485-24, in case of using the backup power or primary power supply with voltage up to 24 V DC, connect the cable to the backup power supply (the cable with copper stranded wires of section of at least 0.75 mm<sup>2</sup> and maximum operating voltage of at least 50 V) to the connector “7÷24V” and to the backup power source corresponding to the device specifications.



GB1 – DC backup power source of 7÷24 V, 1.2 W;  
 F1, F2 – fuses or their analogues of up to 1 A current.

**Figure 2** – Device connection diagram

**3.1.3 Operation ET-485**

A 32-bit RISC processor with ARM architecture routes data between a MODBUS RTU/ASCII network (RS-485) and the Ethernet network (10Base-T/100Base-T). The speed and availability of direct memory access channels allow you to operate with high-speed data streams. The indicators show the status of the connections and the data flow over the MODBUS and Ethernet networks.

The "R" button allows you to restart the ET-485 without disconnecting it from the network, or reset the settings to factory values.

The device is equipped with a memory for storing settings. Each device receives a globally unique MAC address during manufacturing and can connect to local networks that have a secure Internet connection.

## 3.2 USE OF ET-485

### 3.2.1 General Information

After power is applied, the "Error" and "RS-485" indicators light up, and ET-485 initializes the transceivers. After that, both lights go out in 0.5 seconds, and the device starts performing server functions (the connection to the Ethernet network may take longer depending on the settings of the device and other devices connected to the network).



**IMPORTANT! IF THE "ERROR" INDICATOR IS CONSTANTLY LIT IN RED OR FLASHES PERIODICALLY, AFTER SWITCHING ON THE ET-485, CONTACT THE PLACE OF PURCHASE OR THE MANUFACTURER OF THE DEVICE.**

The ET-485 is waiting for an Ethernet connection. If the "**Ethernet**" indicator lights up, the network connection has been successful. The flashing "**Ethernet**" indicator shows that data is passing through the network.

### 3.2.2 Operating ET-485 over the HTTP protocol

ET-485 is waiting for an HTTP Ethernet connection to port 80. Connection from a PC can be made using a WEB browser.

When the client is connected to port 80, the device expects requests from the client to receive HTML pages. Parameters can be specified in the request. In response to the correct request, the parameters are processed, and the text of the selected page is transmitted to the client in HTML format (or in JSON or XML format for API requests, see Appendix D). If the request does not specify an existing page, the title page will be returned. After the page is passed, the device disconnects the client and waits for the connection again.

### 3.2.3 Operation of ET-485 via the MODBUS protocol

During operation, ET-485 is waiting for an Ethernet connection over the MODBUS TCP protocol to port 502. The MODBUS TCP connection port can be changed by the user. The connection from a PC can be made using any programs – MODBUS TCP clients. The application "MODBUS TCP client" is available for download on the manufacturer's website [novatek-electro.com](http://novatek-electro.com). An additional port for MODBUS RTU or MODBUS ASCII connections over TCP can also be specified in the settings.

When requesting a client connection to a MODBUS port, ET-485 checks the list of available connections. If all connections are busy, the connection is rejected; otherwise, it is added to the internal list of serviced clients (no more than the number of clients specified in the technical specifications).

When the client connection is established, ET-485 expects a MODBUS request from the client. In slave mode, requests over the MODBUS network from the master device are also received over the RS-485 interface.

When a request is received from a client, it is analyzed and, depending on the code of the requested function and the current rights of the client, it is either processed or blocked. When blocking a request, ET-485 can generate and transmit to the client a user-specified MODBUS exception code (by default, code 1). The client's rights are determined by the passwords entered after the connection.

If the request is addressed to ET-485, the device does not redirect the request, but processes it and transmits the response to the client.

In the master mode via the RS-485 interface, requests to other devices are redirected to the MODBUS network, and a response is expected from the device in the MODBUS network – the "RS-485" indicator lights up. If the data is received or the waiting time has expired, the "RS-485" indicator goes out.

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

**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 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, if the connection to the remote MODBUS TCP server was terminated), ET-485 can generate and transmit to the client the user-specified MODBUS exception code (by default, code 10).

If there is no response, ET-485 can generate and transmit the user-specified MODBUS exception code (by default, code 11) to the client.

If a response to the request has been received, ET-485 transmits it to the client that sent the request.

## 3.3 SETTING UP

### 3.3.1. General Information

The configurable parameters are described in section 3.3.2. The parameters are saved when the power is turned off.

There are two ways to configure the device:

- Via the WEB interface as shown in paragraph 3.3.3;
- Via the MODBUS interface as described in paragraph 3.3.4.

**IMPORTANT! WHEN CHANGING THE DEVICE PARAMETERS, VALUES CAN BE SET THAT IMPEDE OR BLOCK THE CONNECTION TO THE DEVICE OVER THE NETWORK. IN THIS CASE, THE PARAMETERS SHOULD BE RESET SO THAT THEY COMPLY WITH THE FACTORY VALUES.**

Restarting the device or resetting the settings to make them comply with the factory values is performed using

the "R" button accessible through the hole on the front panel. The button must be pressed by a thin non-conductive object.

**To reset the device settings for their values to coincide with the factory ones:**

- Press and hold the reset button "R" for at least 8 seconds (after 2 seconds of holding the button, the indicator "Error" will light up), after 8 seconds, the device will get restarted, the indicators will flash and go out;
- Release the "R" button.

**To restart the device with the user's settings saved:**

- Press and hold the reset button "R" for 2 to 8 seconds;
- After the "Error" indicator lights up, release the "R" button.

**3.3.2. ET-485 Parameters**

A collection of parameters available via MODBUS protocol is provided in Table 2. The inner structure of any collection of parameters is similar to the structure of collection, which is described in table 7, except for the start address.

The format for representing parameters in MODBUS registers is described in Table 3.

The device describing parameters are given in Table 4.

The device current mode parameters are available for reading and recording and specified in Table 5.

The current state parameters are read-only and are described in Table 6.

All parameters available in the configuration mode only are provided in Table 7.

Parameters of active connection to the client (ACC) are accessible only in the configuration mode or using ACC and are described in Tables 8 and 9.

The user registers are available for reading and recording and they are given in Table 10.

The virtual registers are available for reading and recording and they are given in Table 11.

**Table 2. Parameter Sets Available via the MODBUS Protocol**

Setting	Description	Access	Addresses
Alterable settings	The parameters listed in Table 7 that can be changed and enabled as described in paragraphs 3.3.3 and 3.3.4	Only in setup, read or write mode	300 – 799, 5250 – 5499
Current settings	The parameters used at the moment	In any mode, read-only	2300 – 2799, 5500 – 5749
Saved settings	The set is saved regardless of whether the power is available and is used at startup	Only in setting mode, read-only	3300 – 3799, 5750 – 5999

**Table 3. Format for Representing Parameters in MODBUS Registers**

Parameter	Range of values	Description	Number of Registers
Number	0 – 65535	Integer (16 bits) in a standard range of MODBUS register	1
Number	0 – 4294967295 in two registers, upper part – first	Integer number, which cannot exceed the limit for MODBUS register (65535)	2
Character string	In every register number from 0 to 255 – ASCII character code or 0 (end of string)	The set of values, each one of which is equal to code 1 of one a symbol in ASCII code. If the string is shorter than maximum length, last character is followed by the code 0	Maximum length of the string for the given parameter
IP-address (IP-mask)	In every register – one byte (0-255)	A set of four bytes IPv4 address, from left to right	4
MAC-address	In every register – one byte (0-255)	A set of six bytes MAC-48 address, from left to right	6

**Table 4. The Device Describing Parameters**

Parameter	Description	Address
Type of the device	The code determining the MODBUS device at the manufacturer's (12 – ET-485)	0
Software version	Version of the embedded software	1
Check code	CRC32 of the embedded software	2–3

**Table 5. Current Mode Parameters**

Parameter	Values range	Initial value	Description	Address
Password entry	String of characters	0	When entering a valid password, the client is granted the appropriate permission (registers 510 – 549). When entering an empty string, the client's rights are reset to the level of rights at the time of connection	100–119
Control order	0 – 444, Writing in the setup mode	0	0: No action; 1: "Restart" means ET-485 restart; 2: "Save" means saving the altered settings; 3: "Apply" means to apply settings without restart (accessible only for MODBUS parameters and user's ones); 4: "Save and apply" means the same as orders 2 and 3 sent one after another; 6: "Export" means read the saved settings and write them into the file; 7: "Import" means read the settings from the file and save them in the internal memory; 9: "Cancel" means read the saved settings; 51: "Apply for MODBUS" means apply the settings to the MODBUS network and MODBUS TCP; 59: "Apply to user's" means apply the settings to the user's register area; 444: "Restore factory settings" means reset the settings to their factory values	120

**Table 6. Parameters to determine the current condition of the device**

Parameter	Description	Address
Mode (more detailed see register 122)	0: User mode; 1: Configuration mode	121
Access mode flags	Bit 0 The ability for the connected client to obtain permission (using a password) for requests to get reading functions of devices via MODBUS: 0: permission cannot be obtained; 1: permission is issued upon the password is provided	122
	Bit 1 Permission for the connected client to request device read functions via MODBUS: 0: no permission; 1: permission is given	
	Bit 2 The ability for the connected client to obtain permission (using a password) for requests for write and device management functions via MODBUS: 0: permission cannot be obtained; 1: permission is issued upon the password is provided	
	Bit 3 Permission for the connected client to request for write and device management functions via MODBUS: 0: no permission; 1: there is a permission	
	Bit 4 The ability for the connected client to obtain permission (using a password) to access the ET-485 registers, except for the registers of version, password, mode, and access flags: 0: permission cannot be obtained; 1: permission is issued after the password is provided	
	Bit 5 The ability for the connected client to obtain permission (using a password) to access the ET-485 registers, except for the registers of version, password, mode, and access flags: 0: no permission; 1: permission is issued	
	Bit 6 Always 1	
	Bit 7 Permission for the connected client to configure ET-485 (similar to register 121): 0: no permission; 1: there is a permission	
Time, minutes	Number of minutes after start-up	123 – 124
MODBUS TCP clients number	Number of MODBUS TCP busy connections	125
MODBUS TCP clients limit	Total number of MODBUS TCP possible clients	126

Table 6 (continued)

Parameter	Description	Address
Load RS-485, requests/s	Number of requests sent via RS-485 per second	127
RS-485 useful load, requests/s	Number of answers without errors via RS-485 per second	128
RS-485 load per second, %	RS-485 business within the last second in consideration of the RS-485 rated speed and silence time	129
RS-485 load during a minute, %	RS-485 business within the last minute	130
RS-485 load during 5 minutes, %	RS-485 business with the last five minutes	131
MODBUS TCP load, requests/s	Number of requests received from the clients via MODBUS TCP per second	132
MODBUS TCP useful load, requests/s	Number of answers without errors sent to clients via MODBUS TCP per second	133
Non-used parameter	The parameter has been reserved for compliance	134
Ethernet load, 100 kB/s	Wire channel load with the Ethernet switched on	135
Maximum MODBUS TCP clients	The maximum number of simultaneously MODBUS TCP connected clients from the moment of start-up	136
Maximum MODBUS TCP load, requests/s	The maximum number of requests received from clients via MODBUS TCP within one second from the start-up moment	137
Maximum RS-485 load, %	The maximum RS-485 load during 5 minutes after start-up	138
Non-used parameter	The parameter has been reserved for compliance	139
Ethernet current IP-address	IP-address, at which ET-485 is accessible on the Ethernet network	140 – 143
Ethernet current MAC-address	MAC-address, at which ET-485 is identified on the Ethernet network	144 – 149
Non-used parameter	The parameter has been reserved for compliance	150 – 164
Time before connection to the data collection server, s	0: connection with the data collection server is established; 1: connecting to the data collection server; 2 – 65534: the number of seconds prior to reconnection; 65535: connection to the server is not used	165
Number of programmed restarts	The number of restarts according to the user's set-up during the whole time of operation	166
Number of critical errors	The number of noted errors (malfunctions) that caused the ET-485 restart during the whole time of operation	167
Total time of work, min	Number of the ET-485 operating minutes during the whole time of operation	168 – 169
Time, s	Number of seconds from start-up	170 – 171
Non-used parameter	The parameter has been reserved for compliance	172 – 175
Time prior to connection to the MODBUS TCP 1 <sup>st</sup> remote server, s	0: connection with the remote server is established; 1: connecting to a remote server; 2: 65534: number of seconds prior to reconnection; 65535: MODBUS TCP connection to the server is not used	176
State of connection to the MODBUS TCP 1 <sup>st</sup> remote server	0: no connection; 1: Ethernet connection is established	177
Non-used parameter	The parameter has been reserved for compliance	178 – 239
Time prior to connection to the MODBUS TCP 2 <sup>st</sup> remote server, s	Like 176	240
State of connection to the MODBUS TCP 2 <sup>st</sup> remote server	Like 177	241
Time prior to connection to the MODBUS TCP 3 <sup>st</sup> remote server, s	Like 176	242
State of connection to the MODBUS TCP 3 <sup>st</sup> remote server	Like 177	243
Time prior to connection to the MODBUS TCP 4 <sup>st</sup> remote server, s	Like 176	244
State of connection to the MODBUS TCP 4 <sup>st</sup> remote server	Like 177	245
Time prior to connection to the MODBUS TCP 5 <sup>st</sup> remote server, s	Like 176	246
State of connection to the MODBUS TCP 5 <sup>st</sup> remote server	Like 177	247

Table 7. Device configuration settings

Parameter	Values range	Factory value	Description	Address
<b>Ethernet network</b>				
Static IP address	IP-address	192.168.0.111	If the dynamic addressing is disabled or inaccessible, the IP address on the Ethernet network is equal to this value	300 – 303
Subnet mask	IP mask	255.255.255.0	This is used only together with the static IP address	304 – 307
Gateway	IP address	192.168.0.1	This is used only together with the static IP address for the connection with other networks or as the address of DNS/DHCP servers	308 – 311
DHCP dynamic addressing mode	0 – 2	1	0: the specified values of the gateway, mask, and static IP address are used for addressing in Ethernet; 1: The device uses the network's DHCP server to determine the gateway, mask, and masked part of the IP address that denotes the network. The remaining part of the address is used from the specified static address. If the server is unavailable, static addressing values are used; 2: The device uses the DHCP server to determine the gateway, mask and IP address	312
Switch on the IP address filter of the DHCP server	0 – 1	0	This is used for dynamic addressing. 0: receiving the addressing data from the DHCP server that answered first; 1: receiving the data of addressing only from the DHCP server with the IP address of the gateway	313
Switch on the use of the gateway DNS server	0 – 1	1	This is used, if DHCP is inaccessible (switched off). 0: Gateway DNS is not used; 1: Gateway DNS is used to identify IP addresses of other servers, if they are set by host names	314
IP address of DNS server	IP address	8.8.8.8	This is used, if DHCP is inaccessible (switched off). When it is switched on and the gateway DNS server is used, the IP-address of the DNS additional server is set	315 – 318
IP address of the DNS additional server	IP address	0.0.0.0	This is used, if DHCP is inaccessible (disabled). 0.0.0.0: is not used	319 – 322
Switch on the MAC address redefinition	0 – 1	0	0: the value unique for each device is used as the MAC address; 1: the manually set MAC address is used	323
Ethernet MAC address set manually	MAC address	Unique for each device	This is used when MAC manual address is on for identification of the device on the Ethernet network	324 – 329
The parameter is not used	0	0	This is not used, for attaining compliance, it must be equal to 0	330 – 334
<b>MODBUS network</b>				
MODBUS RTU/ASCII connection port via TCP	0 – 65535	0	This is used for external connection to ET-485 using the Ethernet for exchanging with the use of MODBUS RTU protocol or MODBUS ASCII. The protocol coincides with RS-485 (reg. 463) applied to the interface. Only packets containing whole MODBUS frames are processed, and when TCP packets are fragmented, the connection is closed. 0: the connection is not used	335
The parameter is not used	0	0	This is not used as for coinciding it must be equal to 0	336 – 449
Connection port via MODBUS TCP	1 – 65535	502	This is used for external connection to ET-485 via Ethernet for exchanging with the use of MODBUS TCP protocol	450
Disconnect inactive clients	0 – 1	1	0: connecting via MODBUS TCP is supported irrespective of the time between the client's requests; 1: disconnect the clients, from whom no requests have been received longer than the set time	451

Table 7 (continued)

Parameter	Values range	Factory value	Description	Address
The longest request wait time	0 – 600 000	90	This is used, is the disconnection of inactive clients is selected	452 – 453
Enable queue for the last busy MODBUS TCP connection	0 – 1	0	0: MODBUS TCP connection is supported regardless of the connection hold time; 1: If all MODBUS TCP connections are busy, the new client requesting a connection can be connected instead of the last connected client if the connection hold time is longer than the specified one	454
Maximum hold time for the last MODBUS TCP connection, ms	0 – 600 000	60 000	This is used, if the queue for the last MODBUS TCP connection is enabled	455 – 456
Native MODBUS Identifier ET-485	0 – 247	111	0: All MODBUS TCP requests are forwarded to the MODBUS network, the device registers are not available via MODBUS TCP; 1-247: The device responds to MODBUS TCP requests with this MODBUS ID without forwarding them to the MODBUS network	457
RS-485 data transfer rate, bit/s	75 – 281250	9600	This is used when exchanging with devices via RS-485, the same value for devices on the same bus	458 – 459
Enable byte format selection in RS-485 transmissions	0 – 1	1	This is used when exchanging with devices via RS-485, the same value for devices on the same bus. 0: This is not used, the byte ends with 2 stop bits; 1: The byte format is selected from register 461	460
Byte format in RS-485 transmissions	0 – 5	5	This is used when communicating with devices via 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 zero bit and 1 stop bit; 3: "1" ("MARK") – 1 single bit and 1 stop bit (similar to the mode with two stop bits); 4: "MISSING" – no parity bit, 1 stop bit; 5: "AUTO-STOP" – no parity bit, 2 stop bits in the sent bytes, 1 stop bit in the received ones (devices with 1 and 2 stop bits can be connected at the same time)	461
Wait time for the start of the MODBUS RTU response, ms	0 – 60 000	200	This is used for MODBUS transmissions in RTU mode. After sending the request, if the first byte of the response was not received within this time interval, the waiting for the response is terminated. The response is always expected to be at least the time of silence between frames (the time of silence depends on the transfer rate and is equal to the transfer time of 3.5 bytes or 1.75 ms for speeds over 19200 bit/s)	462
Enable ASCII exchange mode in the MODBUS network	0 – 6	2	MODBUS exchange mode, the same value for devices on the same bus. 0: <b>RTU</b> 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 in total); 1: <b>ASCII</b> exchange mode (format: 1 start bit, 7 data bits, 2 stop bits or parity bit, and stop bit – 10 bits in total). Non-standard byte formats (register 461, values 4 and 5) are not available, but the format 3 (2 stop bits) is used instead); 2: similar to "0", but with increased silence time between frames by 2 times; 3: similar to "2", but 4 times; 4: similar to "2", but 8 times; 5: similar to "2", but 16 times; 6: similar to "2", but 32 times	463

Table 7 (continued)

Parameter	Values range	Factory value	Description	Address
Waiting time for the next MODBUS ASCII character, ms	0 – 60 000	1000	Used for MODBUS transmissions in <b>ASCII</b> mode. When receiving a response, if the next byte of the response was not received during this time interval, the waiting for the response is terminated. The waiting time is always equal at least to the transmission time of one character (depends on the transmission speed)	464
<b>Connecting to the Data Collection Server</b>				
Data collection server connection mode	0 – 2	1	0: connection to the server is not used; 1: connection to the server is established and maintained through the specified server connection port (the port on the server side); 2: passive mode, the server is expected to connect via the specified server connection port (the port is on the ET-485 side)	465
Server connection port	0 – 65535	20502	The port that is accessed by the party establishing the connection between the ET-485 and the server (see register 465)	466
Waiting time for a response from the server, s	0 – 3600	120	0: server silence time is unlimited; 1-3600: the maximum server silence time, after which the connection will be terminated and must be re-established	467
Waiting time before reconnecting to the server, s	0 – 30 000	15	This is used when connecting to the server (except for the "2" mode). After the connection to the server is lost, the re-connection will be made after the specified waiting time (after starting the device, the first connection is made in fixed time – 5 seconds)	468
Enable setting the server address with a text string	0 – 1	1	This is used when connecting to the server (except for mode "2"). 0: the connection is made to the server with a fixed IP address given in registers 470-473; 1: the connection is made to the server with the name specified in registers 474-509	469
Server IP address	IP address	0.0.0.0	This is used when connecting to the server (except for the mode "2"), if setting the server address with a text string is disabled. The IP address of the remote server, connection to which is supported	470 – 473
Server address	String of characters	modbus. overvis.com	This is used when connecting to the server (except for mode "2"), if setting the server address with a text string is enabled. The address of the remote server, connection to which is supported. The address can be a string up to 36 characters long. There can be no spaces in the string	474 – 509
<b>Protection</b>				
The specified password for entering the setup mode	String of characters	11111	This is used to access the configuration mode. The password can be a string of 5 to 10 characters long. There should be no spaces in the string	510 – 519
Parameter is not used	0	0	This is not used, for compatibility; it must be set to 0	520 – 549
The set password for allowing MODBUS writing to devices via RS-485	String of characters		This is used to access devices connected to ET-485 to request the write or control functions that can change the state of these devices. The password can be a string up to 10 characters long. There should be no spaces in the string	550 – 559
The set password for the MODBUS read permission	String of characters		This is used to access devices connected to ET-485 to request read functions or to access ET-485 registers other than version, password, mode, and flag registers. The password can be a string up to 10 characters long. There should be no spaces in the string	560 – 569

Table 7 (continued)

Parameter	Values range	Factory value	Description	Address
The parameter is not used	0	0	This is not used, for compatibility; it should be set to 0	570 – 571
Enable MODBUS write protection mode	0 – 1	0	0: write protection is controlled by other parameters (password) or disabled; 1: any function requests other than MODBUS functions 1, 2, 3, 4, 7, 17, 20 are blocked	572
Enable MODBUS read protection mode	0 – 1	0	0: read protection is adjusted using other parameters (password) or disabled; 1: requests for MODBUS functions 1, 2, 3, 4, 7, 17 and 20 are blocked, except for read by function 3 of registers of the version, mode and flags	573
The parameter is not used	0	0	This is not used, for compatibility; it should be set to 0	574
<b>Miscellaneous</b>				
The parameter is not used	0	0	This is not used, for compatibility; it should be set to 0	575 – 629
Enable the ET-485 automatic restart	0 – 1	1	0: periodical restart is disabled; 1: the device gets restarted in a set period of time	630
Restart period, min.	5 – 7200	120	This is used, if the automatic restart is enabled	631
Enable restart mode automatically only when there are no connections	0 – 1	1	This is used, if the automatic restart is enabled. 0: the device is restarted after a set period of time from the start-up; 1: the device is restarted after a set 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, no response is returned to the client; 1 – 255: if access is denied to the client that sent the request, this exception code is returned	633
MODBUS exception code generated when there is no answer	0 – 255	11	0: if there is no response from the request recipient (Gateway Timeout), 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
The parameter is not used	0	0	This is not used, for compatibility; it must be set to 0	635
MODBUS exception code generated when there is no connection to the request destination	0 – 255	10	0: when there is no connection to the request destination (Gateway Path Unavailable), no response is returned to the client; 1 - 255: when there is no 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 to receive requests from an additional client	637
First MODBUS-identifier RS-485	1 – 255	1	The parameters define the range of MODBUS identifiers used on RS-485.	638
Last MODBUS-identifier RS-485	1 – 255	255	In master mode, requests with addresses in this range (as well as broadcasts with address 0) are routed via RS-485. In slave mode, requests with addresses in this range (as well as broadcast and ET-485 requests) are received over RS-485	639
<b>Connecting to the First MODBUS TCP Remote Server</b>				
IP address of the remote server	IP address	192.168.0.112	This is used when redirecting requests to a remote MODBUS TCP server is enabled. This is the IP address of the remote server, to which the connection is supported	640 – 643

Table 7 (continued)

Parameter	Values range	Factory value	Description	Address
Remote server connection port	0 – 65535	502	This is used when redirecting requests to a remote server. The remote server port for connecting via MODBUS TCP	644
Wait time for a response from the remote server, ms	0 – 60000	1000	This is 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 the reconnection to the remote server, ms	0 – 240	20	This is used when redirecting requests to a remote server. After the connection with the server is lost, the reconnection will occur in the set wait time	646
Remote server connection mode	0 – 2	0	0: the remote server is not used by MODBUS TCP; 1: connect to the server via Ethernet; 2: similar to 1 with virtual identifiers*	647
The first MODBUS-identifier of the remote server	1 – 255	1	This is used when redirecting requests to the remote server. The range of the MODBUS identifiers is used on the remote server. Requests with addresses in this range (and broadcasts with address 0) are sent to the MODBUS TCP remote server	648
The last MODBUS identifier of the remote server	1 – 255	255		649
The parameter is not used	0	0	This is not used, it shall be set to 0 for compliance	650 – 759
<b>Connecting to the Second MODBUS TCP Remote Server</b>				
Similar to 640–649. the factory value of the remote server IP address being 192.168.0.113				760 – 769
<b>Connecting to the Third MODBUS TCP Remote Server</b>				
Similar to 640–649 the factory value of the remote server IP address being 192.168.0.114				770 – 779
<b>Connecting to the Fourth MODBUS TCP Remote Server</b>				
Similar to 640–649 the factory value of the remote server IP address being 192.168.0.115				780 – 789
<b>Connecting to the Fifth MODBUS TCP Remote Server</b>				
Similar to 640–649 the factory value of the remote server IP address being 192.168.0.116				790 – 799
* In virtual IDs mode, before redirecting a request to a remote server, the virtual ID of the destination from the request is replaced with the real one so that the numbering in the server range starts with 1. For example, for the range 15-17, the virtual ID 16 will be replaced with the real one 2. The broadcast ID 0 is processed without changes.				

Table 8. State of device identification for ACC

Parameter	Description	Address
Device type	see register 0	1000
Firmware version	see register 1	1001
Unique MAC address	Globally unique MAC address of the device, which can be used for identification by the client	1002–1007
ACC state flags	Bit 0 0: error of unique MAC address reading 1: registers 1002–1007 contain globally unique MAC address	1008
	Bit 1 0: 0: activation code on the data collection server is not set 1: activation code on the data collection server is set	
	Bit 2 0: ET-485 doesn't require new activation code from server 1: ET-485 requires new activation code from server	
	Bit 3 0: connection is not activated by the data collection server 1: connection is activated by the data collection server	

Table 9. Device identification control for ACC

Parameter	Min.–Max.	Initial value	Description	Address
Activation code on the data collection server	10 000 000 – 100 000 000 or 0	100 000 000	Code, transferred from data collection server and displayed on the device setting page through WEB interface (p. 7.3). When user enters the code on the data collection server, the device and ACC connection become available to this user. 0 – connection is activated; 10 000 000 – 99 999 999: activation code; 100 000 000: code is not assigned	1009 – 1010

**Table 10. User registers**

Parameter	Min. – Max.	Initial value	Description	Address
Parameters of user for the current condition	0 – 65535	0	These registers are stored in RAM and are not used by ET-485. In case of reset takes on a value 0. The registers can be used at the discretion of the user	5000–5249
User's settings and stored values	0 – 65535	0	May be used for storing any identification or other data	5250 – 5499

**Table 11. Virtual registers**

Parameter	Description	Address
Virtual	When accessing these registers ET-485 transmits the request to the other device. The real identifier of MODBUS and address of the registers depends on the address of the virtual register: <Virtual register address> = 5000 + 1000 * <MODBUS identifier> + <real address of the register>	6000 – 37999

**3.3.3 Configuring ET-485 via the WEB interface**

The configuration via the WEB interface is performed using a WEB browser.

Write the IP address of the device in the address bar of the browser (the factory value is 192.168.0.111) and select the transition to the specified address.

**Note: If the browser is configured to use a proxy server, then to access the device on the local network, you must add its IP address to the exceptions in accordance with the documentation for the browser.**

The main page will be displayed with the tab titles for switching over to other modes.

To configure the device parameters, select the "Settings" tab.

You will be prompted for a password to access the settings (the factory value is 11111).

After entering the password and pressing the "Login" button, if the password is specified correctly, access to the configuration mode must be allowed. The settings page appears. If the password is incorrect, you will be prompted for the password again.

The settings on the settings page are grouped by purpose and divided into bookmarks. Non-configurable parameters and measurements are available on the Status tab. The settings on the other tabs are listed in Table 7.

After making changes to the parameters, click the "Save" button. In this case, the entered parameters will be checked. If there are no errors in the parameter values, the parameters will be stored in the ET-485 memory (the new parameters will take effect after the next parameter application or restart). If errors are found in the parameters when clicking the "Save" button, none of the parameters are saved, and the names of the erroneous parameters are highlighted in red.

To apply the parameters without restarting the device, click the "Apply" button at the bottom of the page. In this case, the entered parameters will be checked. If there are no errors in the parameter values, the parameters will be stored in the ET-485 memory and will take effect. Only MODBUS and custom parameters can be applied without restarting.

When you click on the "Return to Factory" button, all parameters take their factory values.

When the "Restart" button is clicked, all connections and incoming/outgoing operations are interrupted, and the ET-485 is restarted. If changes in the parameters have been made and stored in the device's memory before, these changes will take effect.

**Note: If the address settings on the Ethernet network (MAC addresses, IP addresses, DHCP settings) have been changed and saved, the browser may not load the page in response to clicking the "Restart" button. This is caused by the browser accessing the previous address. In this case, the connection should be made again.**

When you click on the "Exit" button, the setup mode is closed, and the password request is displayed again.

**3.3.4 Configuring the ET-485 via the MODBUS interface**

Configuration via the MODBUS interface is performed when connecting to the device using a MODBUS client IP address (factory value – 192.168.0.111) specifying the MODBUS identifier ET-485 (factory value-111).

To configure the parameters, write the password string into the password input parameter (Table 5). The factory password value is 11111, i.e. to write the factory password into registers 0 to 4, write the number 49 – the ASCII code of the device. If the password is specified correctly, the mode register (see Table 6) will take the value "1" – the setting mode.

In the setup mode, the control command parameter is available for recording (see Table 5), as well as the setup parameters (listed in Table 7). After writing the desired values into the configuration parameters registers, write the value "2" – the "Save" command to the control command parameter. The correctness of the saved parameters values can be checked by comparing the sets of configurable parameters and the saved parameters. If the sets match, the new settings have been accepted and saved.

To apply parameters without restarting the device, write the value "4" into the control command parameter – the "Save and Apply" command. Only MODBUS and custom parameters can be applied without restarting the device.

The correctness of the saved parameters values can be checked by comparing the sets of configurable parameters and the current parameters. If the sets match, the new settings have been accepted and saved.

To cancel changes in the parameters before saving them, write the value "9" in the control command parameter – the "**Cancel**" command. In this case, the configurable parameters take the values of the saved ones.

To reset the saved parameters to the factory values in the setup mode, write the value "444" in the control command parameter – the "**Return to Factory**" command.

In order for the stored parameter values to take effect, the device must be restarted. Via the MODBUS interface, the restart is performed by writing the value "1" to the control command parameter – the "**Restart**" command.

To exit the setup mode, write 0 to the first register of the password input parameter. In this case, all the password input registers and the control command register are cleared (they take the value "0").

#### 4 COMPLETE SET

ET-485 is supplied with:

- ET-485 protocol converter ..... 1 piece
- Operating manual ..... 1 piece
- Cable for Ethernet connection ..... 1 piece
- Shipping box ..... 1 piece

#### 5 MAINTENANCE

##### 5.1 SAFETY PRECAUTIONS



**THE TERMINALS AND THE DEVICE INTERNAL ELEMENTS CONTAINS POTENTIALLY LETHAL VOLTAGE.**

**DURING MAINTENANCE IT IS NECESSARY TO DISABLE THE DEVICE AND CONNECTED DEVICES FROM THE MAINS.**

5.2 Maintenance of the device must be performed by the skilled professionals.

5.3 Recommended frequency of maintenance is **every six months**.

##### 5.4 MAINTENANCE PROCEDURE:

- 1) Check the connection reliability of the wires, if necessary, clamp with the force specified in Table 1;
- 2) Visually check the integrity of the housing, in case of detection of cracks and damages take the device out of service and send for repair;
- 3) If necessary, wipe the front panel and the housing of the device with cloth.

**Do not use abrasives and solvents for cleaning.**

#### 6 SERVICE LIFE AND MANUFACTURER WARRANTY

6.1 The lifetime of the device is 10 years. Upon expiration of the service life, contact the manufacturer.

6.2 Shelf life is 3 years.

6.3 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 OPERATION MANUAL, BUYER WILL FORFEIT THE RIGHT TO WARRANTY SERVICE.**

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

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

6.6 Before sending for repair, the device should be packed in the original or other packing excluding mechanical damage.

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

#### 7 TRANSPORTATION AND STORAGE

ET- 485 in the shipping box should be stored indoors at a temperature of -50 to +60 °C and relative humidity of no more than 80% with no vapors available in the air, capable of producing harmful effect on the shipping box and device materials. When transporting ET- 485, the user should provide some protection against mechanical damage.

#### 8 DATA ON CLAIMS

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## APPENDIX A (obligatory)

### Versions and changes

Firmware versions and changes are listed in table A.1.

Hardware versions are listed in table A.2.

**Table A.1** – Firmware versions and changes

Version	Release date	Remarks
7	10/11/2013	<ul style="list-style-type: none"> <li>• First released version</li> </ul>
9	12/24/2013	<ul style="list-style-type: none"> <li>• Changes in some Ethernet modes (added optional powering the device with unplugged Ethernet cable, hot disconnection/reconnection of the cable)</li> </ul>
10	3/24/2014	<ul style="list-style-type: none"> <li>• Added events/errors counters;</li> <li>• Added device periodical reset option</li> </ul>
11	4/22/2014	<ul style="list-style-type: none"> <li>• Additional mode “RS-485 Slave + MODBUS TCP client”;</li> <li>• Added option for MODBUS write protection</li> </ul>
12	5/14/2014	<ul style="list-style-type: none"> <li>• Additional mode “MODBUS TCP client (redirection)” is made as separate option;</li> <li>• Added security settings (MODBUS read/write passwords, TCP ports filters);</li> <li>• Automatic restart can be programmed to trigger only when idle for specified time</li> </ul>
13	5/21/2014	<ul style="list-style-type: none"> <li>• Device additional modes options are available in HTTP interface</li> </ul>
15	6/6/2014	<ul style="list-style-type: none"> <li>• Added TCP redirection in RS-485 Master mode</li> <li>• Added firmware version number to HTTP interface home page</li> </ul>
16	8/7/2014	<ul style="list-style-type: none"> <li>• Added active connection to client (ACC) mode for switching to device with dynamic IP address (e.g. from Overvis);</li> <li>• New HTTP interface to view state and setup options of the device via WEB browser;</li> <li>• Improved crashproofness when functioning for a long time without restarts</li> </ul>
17	9/2/2014	<ul style="list-style-type: none"> <li>• Changed password test (added possibility to set multiple passwords which are alike)</li> </ul>
18	10/16/2014	<ul style="list-style-type: none"> <li>• Changed MODBUS clients sessions policy (password-granted rights are kept active for set period of time, for clients accessing not ET-485 but other MODBUS devices)</li> </ul>
20	22/01/2015	<ul style="list-style-type: none"> <li>• The option of updating the integral Software has been added</li> </ul>
23	20/02/2016	<ul style="list-style-type: none"> <li>• The non-standard byte formats are added when data exchanging via RS-485;</li> <li>• The user register field is added;</li> <li>• The virtual register field is added;</li> <li>• The passive mode to connect to the redirecting server for MODBUS is added</li> </ul>
25	30/03/2018	<ul style="list-style-type: none"> <li>• The fail-safe feature is improved in busy Ethernet networks</li> </ul>
27	01/08/2018	<ul style="list-style-type: none"> <li>• The fault tolerance is improved in case of electromagnetic interference</li> <li>• DHCP Dynamic Subnet mode is added</li> </ul>
29	03/28/2019	<ul style="list-style-type: none"> <li>• Improvements for setup mode via WEB browser</li> </ul>
31	10/10/2022	<ul style="list-style-type: none"> <li>• Number of remote servers for redirection increased to 5</li> <li>• Added support for non-standard delays in MODBUS RTU mode</li> <li>• Added import and export of settings file</li> <li>• Added access to MODBUS via HTTP API (JSON or XML)</li> </ul>

**Table A.2** – firmware versions and changes

Version	Release date	Comments
1	10/11/2013	<ul style="list-style-type: none"> <li>• First released version</li> </ul>
2	4/12/2014	<ul style="list-style-type: none"> <li>• Changed RS-485 driver to increase number of connected devices;</li> <li>• Changed labeling (added contacts “L” and “N” labeling)</li> </ul>
3	22/01/2015	<ul style="list-style-type: none"> <li>• The brightness of signal “Power” has been reduced;</li> <li>• The option of saving the files of integral Software updating has been added.</li> </ul>
4	15.12.2016	<ul style="list-style-type: none"> <li>• ET-485-24 version</li> </ul>

**APPENDIX B  
(recommended)**

**SWITCHING TO ETHERNET**



**WARNING!** Switching the device to Ethernet network requires mutual coordination of settings on the connected devices. Connecting the misconfigured device to the network may affect the communication level of other devices on the network. As a rule, all connections to a network of more than 2 devices are carried out by the qualified personnel (network administrator) only.

**1. IP-ADDRESSING**

When devices are communicating over Ethernet network using TCP/IP protocol, every device is using a set of IP-addressing settings to identify the sender and receiver of the data. The device memory contains a personal and unique, within a single subnet, IP-address (four bytes are written as four integers, separated by dots, in the range of 0 – 255), subnet mask, which is the same for all devices within the subnet (written similar to IP-address), and IP-address of the gateway, which is used to communicate with other networks. Proper communication between devices of a subnet is possible under several conditions:

- 1) All devices of a subnet have similar mask. Most of small LANs are using 255.255.255.0 mask.
- 2) Mask starts with a group of bits set to 1, followed by a group of bits turned to 0.
- 3) All bits set to 1 in the mask are similar for all the IP-addresses of devices in subnet and indicate the subnet address. 192.168 is most frequently used address in LANs for the mask 255.255.255.0. The third byte may be used as a subnet number in a complex LAN. In smaller LANs, the third byte is usually equal to 0.
- 4) A set of bits in IP-address of the device, which is set to 0 in the mask, is unique to each device within the same subnet.
- 5) In most cases, the device like router, which is already communicating with other networks, is switched to the network. This device often gets the following address 192.168.0.1, 192.168.0.100 or 192.168.0.101. In this case, other devices in the network shall have this IP-address of the device as the gateway address. This address is not necessary for communication between devices in a subnet, and is only used to connect devices of one subnet to devices of other networks.

Factory addressing settings for ET-485 Interface Converter are listed in Table B.1.

**Table B.1** – Factory settings for ET-485 addressing

Parameter	Value
Dynamic addressing mode with DHCP	dynamic subnet
IP-address	192.168.0.111
Subnet mask	255.255.255.0
Gateway	192.168.0.1

With the factory settings of ET-485, there are 2 possible ways to communicate with it via Ethernet:

- a) A router or another DHCP-server is used in the network, which assigns IP-addresses to new devices. In this case it is enough to connect ET-485 to this network and after some time the device will receive the address, the beginning of which is similar to the addresses of other devices in the router's subnet and the end - "111" according to the settings of the device. To get the address of the device, determine the address of any of the devices in the subnet, and then replace its ending;
- b) there is no possibility to use DHCP in the network, ET-485 is either connected directly to the computer (or another client device in the same subnet). In this case the ET-485 will switch to static addressing after some time (20-60 seconds) after starting. The client device must use a mask 255.255.255.0 and the address beginning with 192.168.0. The fourth byte of the address can be anything in the range 1-255 except 111. If the connection is not made directly between the ET-485 and the client device, but in a network with several devices, the address also cannot be equal to any of the addresses of other devices in the subnet. In case several devices are used in the network, whose mask and the first three bytes of the IP-address differ from those specified in Table A.1, or the factory IP-address of ET-485 is occupied, it is recommended to temporarily disconnect the device being set from the network in order to establish connection of this device with ET-485 directly in order to avoid addressing conflicts. This will allow configuring the device and ET-485 for direct communication or for including the device in the network.

**2. CONFIGURING THE CLIENT DEVICE**

The device addressing is set according to documents and software it uses.

Below is an example of configuring the personal computer (PC) on Windows XP/7/8/10 to communicate directly with the ET-485 on factory settings.

Open the list of OS network connections to configure the network address in Windows. To do this, follow the steps below (mind the OS version):

• **For Windows XP:**

- 1) Log in as administrator.
- 2) Select "Start-Control Panel".

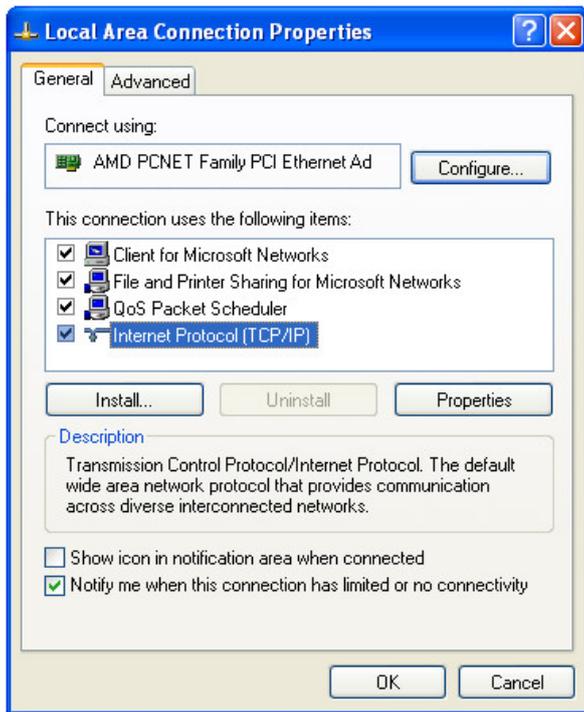
- 3) If control panel items are divided into categories, select "Network and Internet Connections".
- 4) Go to "Network Connections".

• **For Windows 7/8/10:**

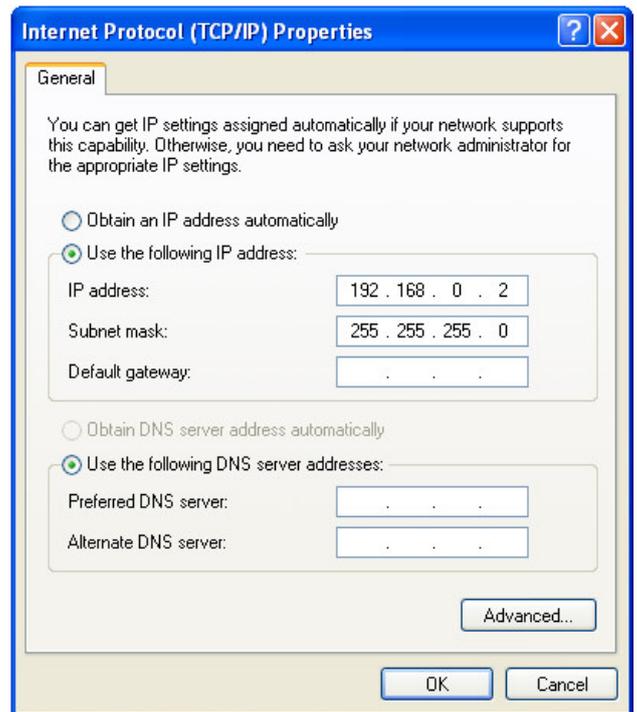
- 1) Log in as administrator.
- 2) Select "Start-Control Panel".
- 3) If control panel items are divided into categories, select "Network and Internet".
- 4) Go to "Control Center Network and Sharing Center".
- 5) In the task bar (on the left), select "Change adapter settings".

Next, perform the following steps:

- 1) In the Connections window, select the desired connection via an adapter with the addressing that you want to change. Many computers have only one adapter and one connection, which will be displayed in this window. If the window shows several connections, select the connection you want, using the adapter name in the information on connection or contact your system administrator.
- 2) Click the icon of the connection with the right button, and select "**Properties**" in the drop-down menu. The Properties window opens (see Fig. B.1).
- 3) Select "Internet Protocol (TCP/IP)" from the list of connection components in the open window (for OS Windows 7/8/10 – "Internet Protocol version 4 (TCP/IPv4)". Make sure that the component is enabled (flagged in the list). Click "Properties". The TCP/IP properties window opens (see Fig. B.2).
- 4) Select "Use the following IP- address".
- 5) Specify the address in the "IP- address" field within the range from 192.168.0.1 to 192.168.0.255 (except for 192.168.0.111, which is used by ET-485).
- 6) Specify "255.255.255.0" in the "Subnet Mask" field.
- 7) The fields "Default Gateway", "Preferred DNS-server", and "Alternative DNS- server" should be left blank.
- 8) Press "OK" to close the Protocol Settings window.
- 9) Press "OK" to close the Connections Settings window.
- 10) If prompted by the OS to restart the PC after closing the windows, answer yes.



**Figure B.1** – Connection properties window in Windows OS



**Figure B.2** – TCP/IP properties window in Windows OS

### 3. SWITCHING TO INTERNET



**WARNING!** The user is strongly recommended to connect the device to Internet under the supervision of the LAN system administrator and/or representative of Internet service provider.

Use the following guidelines to connect the device to Internet:

- acquire a dedicated line with a static IP-address from your Internet Service Provider (hereinafter referred to as – ISP; for connection with dynamic IP address it is necessary to use active connection to the client). If the static IP is not available, some functions (direct connection via MODBUS or WEB-interface) may not be available from the Internet. In this case the connection to the server in the active mode can be used;
- direct connection of the device to the ISP cable is not recommended. In case of a router connection, the ISP cable is connected to the "Uplink" socket on the router (It is usually marked with color and has no numbers. The

marking depends on the router manufacturer, see the router documentation). The straight-through (supplied) Ethernet cable is used for connecting device to the router. Set the router for Internet connection as per ISP recommendations using the router documentation. The router settings should also provide for the redirection of requests, which are coming to static IP-address provided by the ISP, to the device IP-address (factory setting - 192.168.0.111). If for a dedicated line the static IP address is fixed in Internet, and direct access from Internet to WEB (HTTP) and MODBUS TCP interfaces is required, then in settings of a router it is required to specify ports of redirection (forwarding) – for a local IP address of a device on which redirection is set up, it is necessary to specify port 80 (for access on HTTP to the WEB INTERFACE) and port 502 (for access on MODBUS TCP). It will also be necessary to disable the use of DHCP in the ET-485 settings, or to configure the router to provide the ET-485 with always the same IP address via DHCP.

- verify if the Internet connection is protected by standard means (see below);
- when referring the device via Internet, use IP-address provided by your ISP.

#### 4. PROTECTION OF CONNECTION

ET-485 has basic means of protection against unauthorized access via Ethernet.

- device settings can be changed remotely only after entering a password (at least 5 characters). Repetition of incorrect passwords in order to find the correct value is blocked by the device.
- access passwords can be set to restrict writing and/or reading via MODBUS;
- when a password is entered, the access is granted only to the given client via the given protocol. If there is no request from the client for a long time, the access to the settings is blocked.

**ATTENTION! ALL CONNECTIONS SEND PASSWORDS IN UNENCRYPTED FORM, IF THE PASSWORD IS ENTERED CORRECTLY, ACCESS IS OPENED IN AN UNSECURED CONNECTION.**

- the access protection means built into the device are not intended against malicious network attacks (especially attacks, the purpose of which is not access to the device, but blocking of access);
- in complex and branched networks (especially when providing access to ET-485 via Internet), it is recommended to separate the device from insecure networks by standard protection means (router configured for transmission filtering, Firewall, etc.).

#### 5. ACTIVE CONNECTION TO THE CLIENT (DATA COLLECTION SERVER)

This mode is used when connection to ET-485 with specifying an IP address is difficult or impossible (ET-485 address is assigned by means of DHCP, ET-485 is connected to the Internet without static IP address etc.). The mode allows establishing one ET-485 connection to one client, which has a static IP address and a registered host name (herewith, each client can be simultaneously connected to many ET-485 devices).

In this mode, ET-485 automatically maintains connection to the client. After connection ET-485 shall transfer MAC address as MODBUS response (herewith, query is not sent by the client). Then ET-485 awaits queries from clients as well as from other MODBUS TCP clients. Since ACC mode is based on MODBUS TCP with some changes (ET-485 connects the client and then functions as MODBUS server), the client should maintain ACC mode. For example, Overvis system (Internet address "**overvis.com**") can be used to access ET-485.

*Overvis is a system for monitoring and remote control of technological processes. Overvis allows you to read data and manage devices including ET-485 when connected to them save data and then convert and view them in a convenient form, receive alerts about accidents in the form of SMS or E-Mail.*

##### **The factory settings of ET-485 are prepared for connection to Overvis**

The Overvis system supports a special identification method used in the device. In this case, the devices are recognized by a unique MAC address, which is transmitted to the server each time you connect. There are two ways to register the device for the user of the Overvis system:

- a) if the device has a sticker with a QR code, read the code and click on the link or enter the link from the sticker manually and then follow the instructions of the server;
- b) specify the activation code in the Overvis user account. The code is a number of 8 characters displayed on the status page of the device WEB interface after connecting to the server. When you enter the code, the ET-485 "links" to the user account.

To connect a new device to the Overvis system using an activation code, you must:

- connect the ET-485 to the Internet using one of the above methods;
- make sure (on the device WEB interface status parameters page, in the "Data Collection Server" field) that the connection to the server is established and the activation code is received;

**If a device, which is being reconnected to Overvis, displays information that the connection has been activated or that the connection has no code, then for security reasons, click the "Restart Activation" button at the bottom of the status page, in the settings adjustment via the WEB interface, to remove the device from Overvis. This ensures that ET-485 will only be used by eligible users.**

- Using the instructions on the Overvis website connect to ET-485 with the activation code; after activation, the status page will display the message "Active";

For connection to other clients in ACC mode use the following recommendations:

- the client should have a static IP address or a registered host name;

- the client should open a familiar port which is not used by other applications (factory setting ET-485 – 20502, other port can be used) in order to receive ACC from ET-485 devices;

- the client can be simultaneously connected with several ET-485 devices, whose IP addresses and ports can be used for identification during connection only for a limited time. Therefore, identification should be performed another way, for example, according to one of the following ways:

- a) unique MAC address is used for identification. The client saves MAC address of each connected device, and when the device is required it either acts according to the program, set for each MAC address, or requires the user to give MAC address which should be worked with, etc.;

- b) client uses unique MAC address of the device for its identification. In order to provide the access for the user, the unique activation code is given to each device (herewith, MODBUS write protection mode should be disabled). The user is offered once to enter the activation code of the necessary device. The code is available for reading while ET-485 is being set through WEB interface. After the user enters a code, an appropriate device is added to the list of user's devices. This way provides extra safety in the multiuser system;

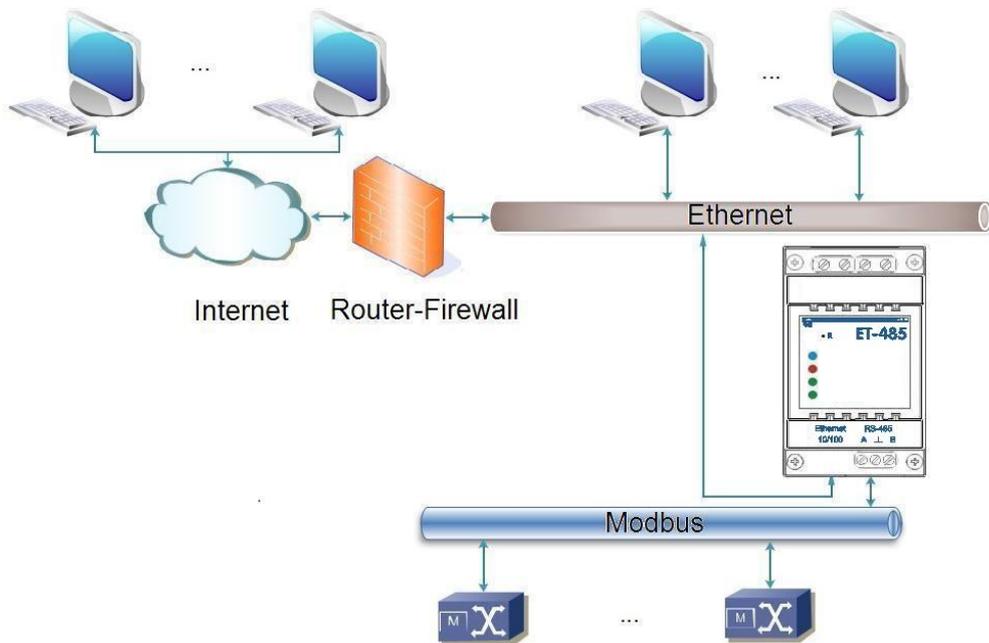
- as ACC protocol is based on MODBUS TCP, the client should use MODBUS address of ET-485 device, in order to perform identification. MODBUS address of ET-485 can be identified by automatic sending of MAC address to the ACC client is used. The client receives MODBUS response with MAC address of the device after its connection, herewith, MODBUS address is also contained in this response. This way speeds up and simplifies address identification;

- after the device identification, the client transfers activation code 0 to the device, which means activation and readiness for operation (herewith, MODBUS write protection mode should be disabled).

**APPENDIX C  
(recommended)**

**EXAMPLES OF NETWORKS TOPOLOGY**

**1. ACCESS TO RS-485 NETWORK FROM ETHERNET NETWORK**

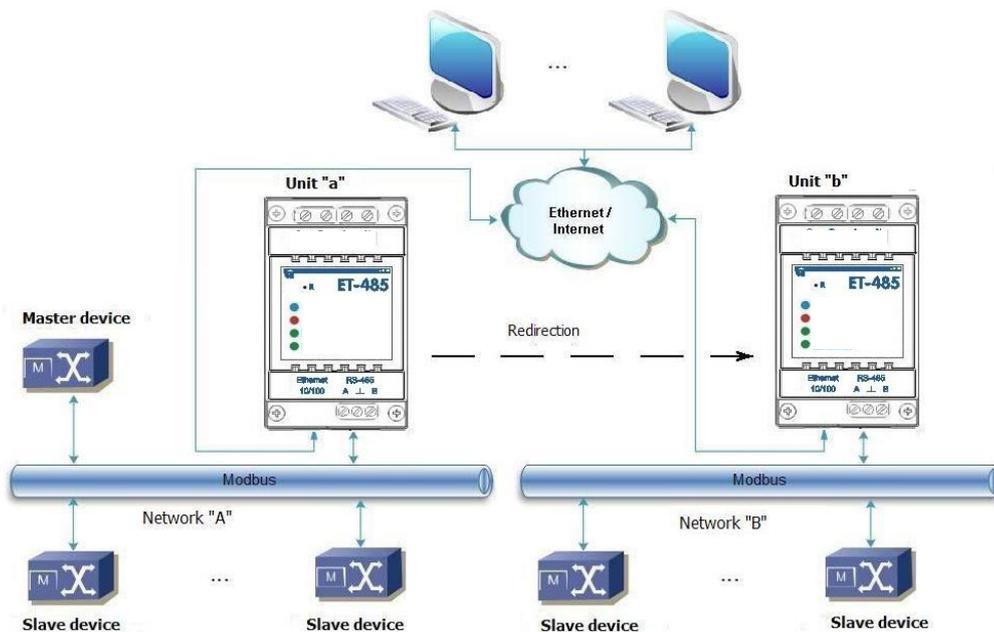


**Figure C.1** – Access to RS-485 network (MODBUS) via Ethernet network

ET-485 is used in the RS-485 master mode, receiving queries from clients in Ethernet or Internet network. The queries are sent to MODBUS network. Redirection to remote server is not used.

**2. MODBUS NETWORK EXTENSION**

Two ET-485 devices are used, connected as shown in Figure C.2.



**Figure C.2** – Extension of RS-485 network

ET-485 “a” is connected in the slave mode to RS-485 MODBUS “A” network (with a master device). ET-485 “b” is connected in the master mode with a static IP address to MODBUS “B” network (with slave devices). Both devices are connected into one Ethernet network or connected by means of routers via Internet so that device “a” can be connected to device “b”.

Device “a” is set for query redirection to the remote server with MODBUS TCP address and port, which device “b” has. All MODBUS devices, including both ET-485 devices and devices in both MODBUS networks, must have different MODBUS addresses (identifiers.) The queries, sent by the master device in “A” network, are redirected by device “a” to device “b”. Device “b” sends them to the devices in “B” network.

**Note – One should avoid cyclic redirection of queries. If the device, whereto the queries are redirected, is set to such redirection that the query will be transferred to its initial sender, the queries will be transferred nonstop, which will cause slowdown and then shutdown of query processing by these devices.**

If some other devices, besides the master device and ET-485 device “a”, are connected in “A” network, the exception code generation must be disabled in the settings of ET-485 devices, if there is no answer and no connection. Otherwise, while the master device is sending queries to other slave devices in “A” network, ET-485 device “a” can generate or transfer an exception code, received from device “b”, simultaneously with transferring a correct answer from another device, which will result in network collision.

**3. INCREASE OF THE NUMBER OF SIMULTANEOUSLY CONNECTED DEVICES**

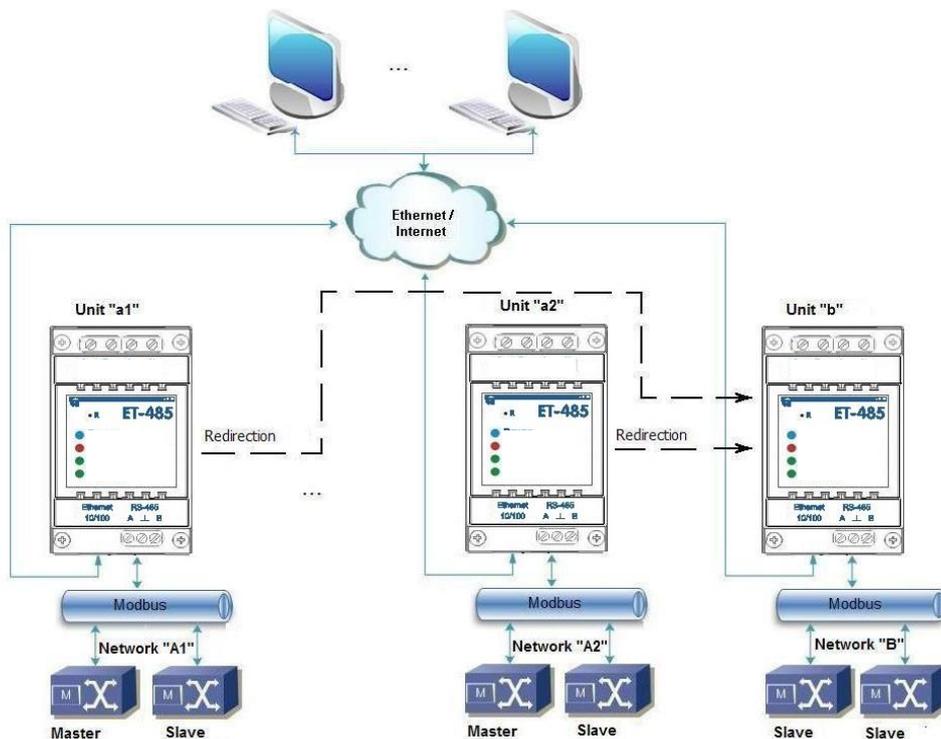
The diagram in Figure C.2 allows connecting to “A” and “B” network the number of devices, specified in the technical characteristics, giving the opportunity to double the number of devices, available to the master device.

**4. MATCHING OF MODBUS NETWORKS**

The diagram in Figure C.2 also allows connecting two MODBUS networks with different characteristics: MODBUS RTU network and ASCII network, networks with different exchange rates etc. Herewith, each ET-485 device is set for the corresponding characteristics of its MODBUS network, and sufficient delays for passing and processing of queries and answers are chosen for both devices.

**5. CONNECTION OF SEVERAL MASTER DEVICES VIA RS-485**

The diagram in Figure C.2 is not limited to two networks. As it is shown in Figure C.3, a few ET-485 devices with similar redirection settings can be independently connected to device “b”, each one allowing to connect MODBUS TCP clients and one master client via RS-485. Herewith, MODBUS networks, where to these devices are connected (e.g. “A1” and “A2”), are invisible to each other. Therefore, the devices in these networks can have same MODBUS addresses (identifiers). I.e. an address in “A1” network can also be used in “A2” network, but cannot be repeated in “A1” network or “B” network.



**Figure C.3 – Connection of two independent MODBUS networks to the third network**

**6. EXTENSION OF THE NUMBER OF CONNECTED CLIENTS**

Several ET-485 devices are used.

Each device can work both in master or in slave mode via RS-485, and at the same time be set for redirection of queries to other ET-485 device. The order of redirection can be different: the more redirections a query goes through, the longer is the answer delay and the more MODBUS devices can be available for the client.

At consecutive “chain” redirection, as shown in Figure C.4, every new ET-485 device is set for redirection to the last added ET-485 device in the chain (in the settings of which, in its turn, a new device can be specified as the main client). It allows increasing the number of RS-485-connected devices and simultaneously connected MODBUS TCP clients by 10 for every additional ET-485.

Each of the devices can work in the slave mode via RS-485, allowing the master device from MODBUS network to address the chain section, whereto the given ET-485 device readdresses the queries.

The client's addressing the last device in the chain via RS-485 or Ethernet causes sending of a query in turn through each of the devices to each MODBUS network. Therefore, all MODBUS addresses (identifiers) must be different in all MODBUS networks. Addressing the interim devices in the chain accelerates query processing by means of limitation of available devices.

In every new ET-485 device, which is added into the chain, the answer awaiting delay from the remote server must be chosen long enough for the query to go from the last ET-485 device to the first one in the chain and for the reverse answer from it.

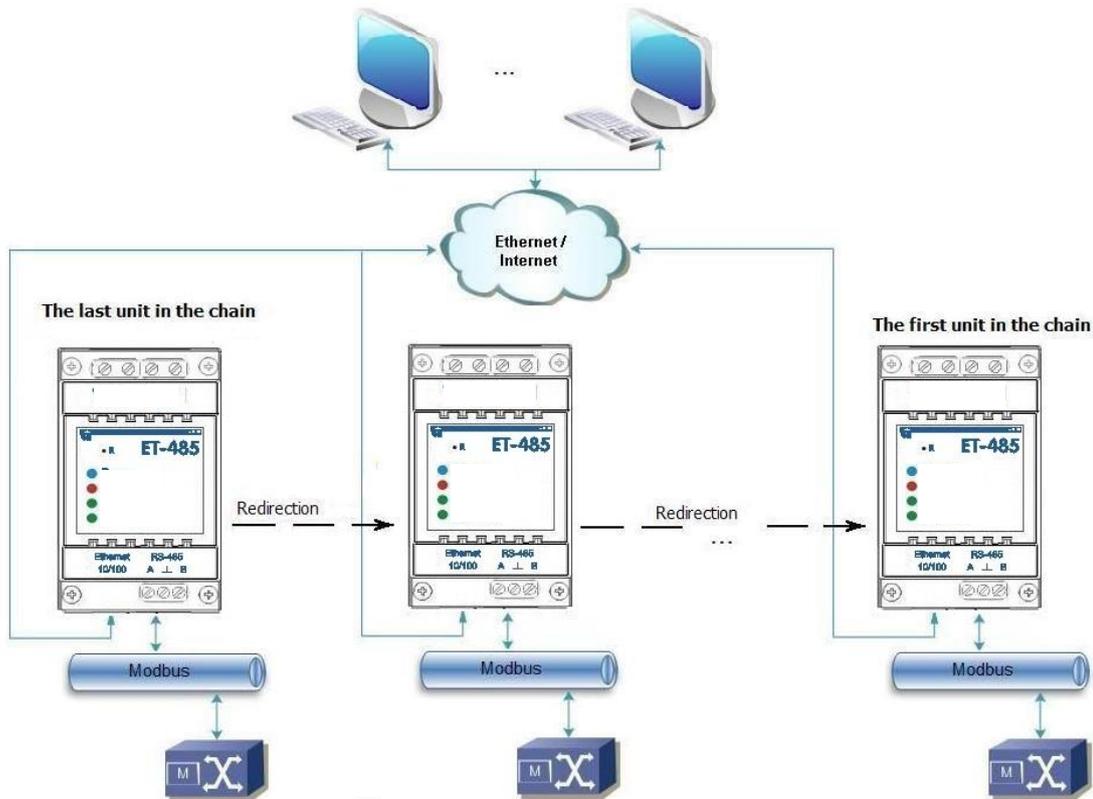


Figure C.4 – Consecutive readdressing

**Appendix D  
(recommended)**

**WEB Interfaces**

To access the device using a browser, ET-485 waits for an Ethernet connection to port 80 and for HTTP protocol transfers. To make a connection, call the IP address of the device (the factory setting is 192.168.0.111) from the browser's address bar. The browser displays WEB pages that allow you to read the device status, configure parameters, call the MODBUS functions, and perform file operations.

In addition, the HTTP connection can be used by other applications to automatically call the MODBUS functions using API.

ET-485 supports API in two formats: JSON and XML. For example, if the IP address of the device is "192.168.0.111", then the JSON API request without parameters will look like "192.168.0.111/api.json", and the XML API will look like "192.168.0.111/api.xml" (in the examples below, each request starts with one of these lines, and this beginning is designated as "<API call>"). An example of the response to the request is given in Table D.1. The description of the Response Fields is given in Table D.2.

**Table D.1. A Sample of Answer to API Request without Parameters**

JSON	XML
<pre>{   "type": "ET-485 API",   "version": "1.1",   "device": "ET-485",   "firmwareVersion": 31,   "loginChallenge":   92uJzC89fQEdB62JxOW75sGtNAmA " }</pre>	<pre>&lt;ApiReply&gt;   &lt;Type&gt;ET-485 API&lt;/Type&gt;   &lt;Version&gt;1.1&lt;/Version&gt;   &lt;Device&gt;ET-485&lt;/Device&gt;   &lt;FirmwareVersion&gt;31&lt;/FirmwareVersion&gt;   &lt;LoginChallenge&gt; 92uJzC89fQEdB62JxOW75sGtNAmA &lt;/LoginChallenge&gt; &lt;/ApiReply&gt;</pre>

**Table D.2. Description of Fields of an Answer to API Request without Parameters**

JSON	XML	Description
(No name)	ApiReply	Answer root element
type	Type	Answer type (always "ET-485 API")
version	Version	Answer version
device	Device	Device
firmwareVersion	FirmwareVersion	Firmware version
loginChallenge	LoginChallenge	Secure Authorization Offer (see below)

Access to MODBUS requires authorization, which can be performed in two ways:

1) by the unprotected password by sending an API request with the password string in the "plainpass" parameter;

2) with the SHA-1 protection using the authorization offer received in the "loginchallenge" field. To do this, calculate the standard SHA-1 hash of the string made up of the authorization offer and password, and then send an API request with the hash string (encoded in hexadecimal form or according to the BASE-64 standard) in the "lcanswer" parameter. For example, for the ET-485 factory password "11111" and the sentence in Table D.1, the hash of the composite string "92uJzC89fQEdB62JxOW75sGtNAmA11111" in hexadecimal form is "28457e7fc55a67bf59caf5f73e42fd168a5fe6a3".

Upon successful authorization, the device returns the response redirecting it to the session page, for example "/1c193447/api.xml" (further in the examples "<API session call>"), where "1c193447" is the temporary session code. If the application sending the request does not support redirection, then the requests should be called with the "redirects" parameter set to "0". Table D.3 shows the response to the request

"<API call>?lcanswer=28457e7fc55a67bf59caf5f73e42fd168a5fe6a3&redirects=0", if it was sent after the response in Table D.1. Table D.4 describes the additional response fields.

**Table D.3 Sample of Answer to the API Request for Authorization**

JSON	XML
<pre>{   ...   "session": "1c193447",   "status": "Ready" }</pre>	<pre>&lt;ApiReply&gt;   ...   &lt;Session&gt;1c193447&lt;/Session&gt;   &lt;Status&gt;Ready&lt;/Status&gt; &lt;/ApiReply&gt;</pre>

**Table D.4** Description of Fields of the Answer to the API Request for Authorization

JSON	XML	Description
session	Session	Session code. The absence of this element means that authorization is required. Authorized requests start with "< API session call>" with the specified code.
status	Status	Status of MODBUS calls: "Busy" means that the MODBUS call is being processed. Repeat the call without parameters to get the result or to send a new call; "Ready" means that a new MODBUS call can be sent

The parameters listed in Table D.5. are used to call MODBUS.

**Table D.5. Parameters for MODBUS Call**

Parameter	Range of values	Description
mbc_uid	0-255	ID of the destination device
mbc_func	1-6, 15-16	MODBUS function code. For write functions, only one value can be written including the same for multiple write functions (codes 15 and 16)
mbc_addr	0-65535	Register, flag, or digital input address
mbc_data	0-65535	For read functions – the number of values to be read (from 1 to 16) For write functions – the value to be written
dosend	0-65535	The presence of this parameter in the request with any value makes a MODBUS call with the specified parameters

The response to "< API session call>?mbc\_uid=111&mbc\_func=3&mbc\_addr=168&mbc\_data=2&dosend=1" (for the ET-485 own identifier value, which is equal to the factory one "111") is shown in Table D.6. Table D.7 describes additional response fields. The response fields for MODBUS errors and exceptions are described in Table D.8.

**Table D.6. Example of a Response to an API Request for a MODBUS Call (Reading the Operating Time)**

JSON	XML
<pre>{   "type": "ET-485 API",   ...   "status": "Ready",   "MODBUSQueries": [     {       "deviceID": 111,       "function": 3,       "address": 168,       "data": 2,       "response": {         "data": [           0,           408         ]       }     }   ] }</pre>	<pre>&lt;ApiReply&gt;   &lt;Type&gt;ET-485 API&lt;/Type&gt;   ...   &lt;Status&gt;Ready&lt;/Status&gt;    &lt;MODBUSQuery&gt;     &lt;DeviceID&gt;111&lt;/DeviceID&gt;     &lt;Function&gt;3&lt;/Function&gt;     &lt;Address&gt;168&lt;/Address&gt;     &lt;Data&gt;2&lt;/Data&gt;     &lt;Response&gt;       &lt;Data&gt;0&lt;/Data&gt;       &lt;Data&gt;408&lt;/Data&gt;     &lt;/Response&gt;   &lt;/MODBUSQuery&gt; &lt;/ApiReply&gt;</pre>

**Table D.7. Description of Fields of the Answer to an API Request for the Successful MODBUS Call**

JSON	XML	Description
MODBUSQueries	MODBUSQuery	MODBUS request
deviceID	DeviceID	ID of the destination device in the request
function	Function	MODBUS function code in the request
address	Address	Address of the register, flag, or quantized input in the request
response	Response	Response to the request
data	Data	In the request – the number of values to read or write, in the response – the data read or written

**Table D.8. Description of Fields of the Answer to an API Request with Errors in the MODBUS Call**

JSON	XML	Description
errorInQuery	ErrorInQuery	MODBUS request error (the field is in the request instead of the response field): Query device ID illegal – incorrect device ID; Query address illegal – invalid address; Query data illegal – invalid value.
errorInResponse	ErrorInResponse	MODBUS response error (the field is in the request instead of the response field): Response mismatch – the received response does not match the request.
exceptionCode	ExceptionCode	MODBUS exception code (the field is in the response instead of the data field).
exception	Exception	The MODBUS exception text corresponding to the code (the field is in the response instead of the data field) .

## APPENDIX E (recommended)

### Firmware Update

#### 1. General Information

ET-485 stores two update files in its memory:

- the file "ET485FW1.FUS" can be downloaded via the WEB interface;
- the file "ET485FW0.FUS" is downloaded by the manufacturer and cannot be replaced; in case of a failure during the update process (for example, power supply loss), the file is used for automatic recovery.

Any of these files can be obtained from the ET-485 memory (for loading into another device). The firmware can be updated from these files via the WEB interface.

#### 2. Transfer of ET-485 Update Files

Enter the ET-485 configuration mode via the WEB interface. Go to the "Files" tab. Select the file "ET485FW0.FUS" or "ET485FW1.FUS".

To upload a file to ET-485:

- click the file selection button;
- in the window that opens, select the update file (for example, "ET-485-4-2-31.FUS");
- click the "Send" button.

**Note. After downloading the file, make sure that you have downloaded the correct software update file to the correct version. The firmware title with the version number should be displayed next to the file name.**

To get a file from ET-485:

- click the "Receive" button;
- select the file name and the location where the file will be placed.

To erase the contents of the ET-485 file, click the "Erase" button.

#### 3. Updating the Firmware via the WEB Interface

Enter the ET-485 configuration mode via the WEB interface. Go to the "Files" tab. Select the file "ET485FW0.FUS" or "ET485FW1.FUS".

To update the firmware:

- press the "Program" button;
- after additional verification of the firmware file, the device will automatically restart and be put into update mode;
- wait for the software update, the process may take from 1 to 3 minutes;
- connect to ET-485 as described in paragraph 3.3.3 or 3.3.4;
- check the version number and make sure that the update was successful.

