



CONV485E

RS485 / 10BaseT Ethernet LAN Converter

USER'S MANUAL

Version: 190528EN

 This User's Manual is available also in digital version on CD-ROM.

Safety Information

! To ensure the recorder is installed and used safely, follow all instructions stated in this Manual.

Incorrect installation of the recorder may cause serious health hazard and can be life threatening.

The recorder has been manufactured according to the requirements of relevant EU directives.

The recorder must not be installed in explosive environments

Information from the Manufacturer

All functions of the recorder are subject to modifications for the benefit of technical progress.



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1. APPLICATION SCOPE

1.1. Purpose

CONV485E converter allows data exchange between:

- master system running on a LAN with TCP/IP and devices with serial RS485 ports (*Server mode*),
- master system running on the network RS485 and devices with an Ethernet port (*Client mode*).

The device can operate in two protocols:

- *Ethernet TCP/IP ↔ RS485* – any data string is sent and received from the LAN to the RS485 network and vice versa,
- *Modbus TCP ↔ RTU* - converter receives data from the device running the Modbus TCP protocol, converts the frame to the Modbus RTU protocol and transmits the data to the RS485 networks operating in this standard, and vice versa.

Converter can handle up to 6 simultaneous TCP/IP connections. The converter has a 300 B buffer for outgoing and incoming data for each client.

Converter is designed for indoor use, for the laboratories and industrial systems, to be installed in cabinets with a clip for the TS-35 rail or as a stand-alone. The device have a plastic (ABS) casing.

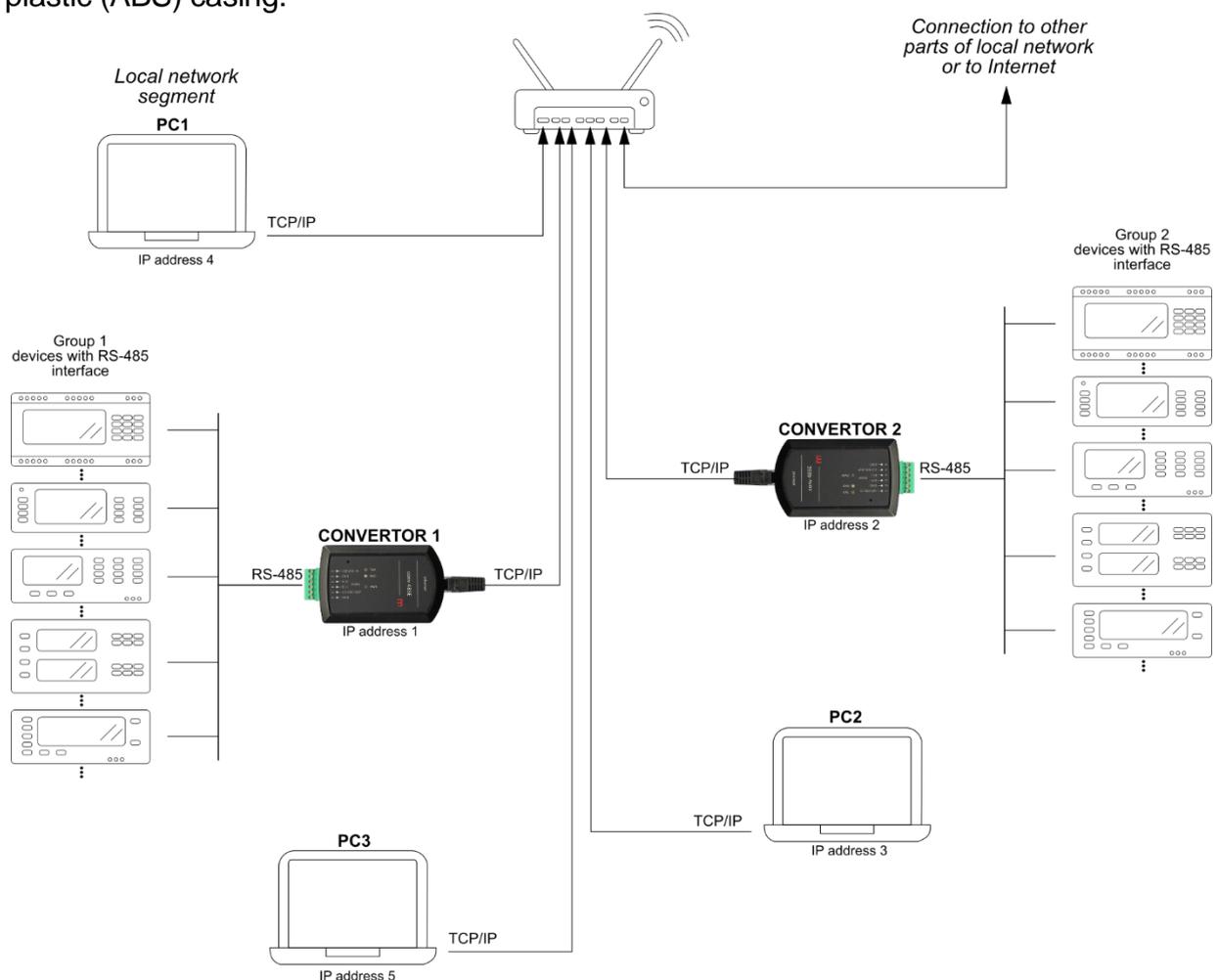


Figure 1.1 Example of application

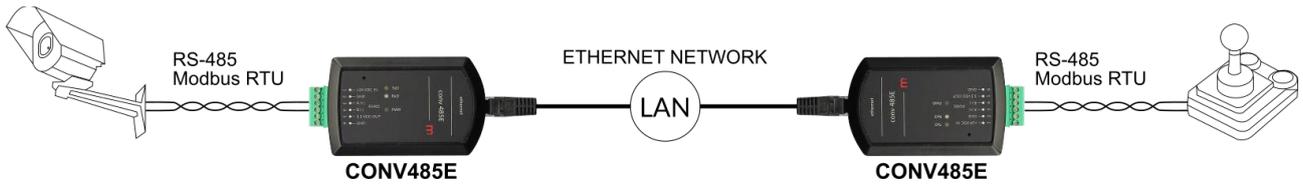


Figure 1.2 Example of application (use of CONV485E in controlling the monitoring camera)

1.2. Mode

The device can operate in two modes set in *Profile* menu:

- **Server mode** – the converter operates as a TCP/IP server. Enables communication between the master system (PC, PLC) running on the LAN and the devices equipped with serial RS485 port.

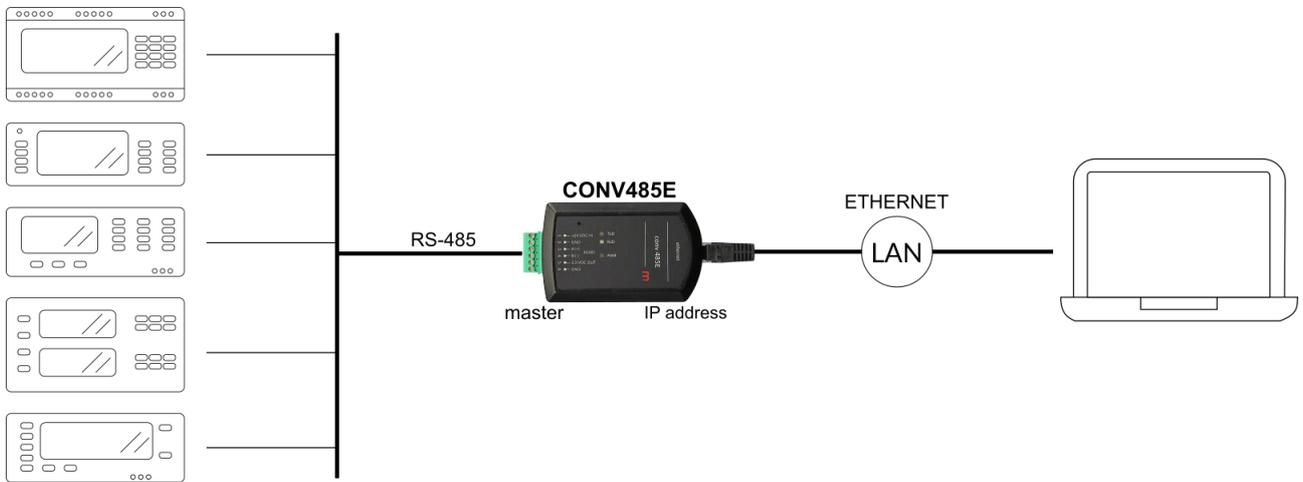


Figure 1.3 Server mode – example application

- **Client mode** – the converter operates as a TCP/IP client, opens the connection to TCP/IP server. Enables communication between the master device on the RS485 and slave devices on the LAN side (up to 6 simultaneous TCP/IP connections).

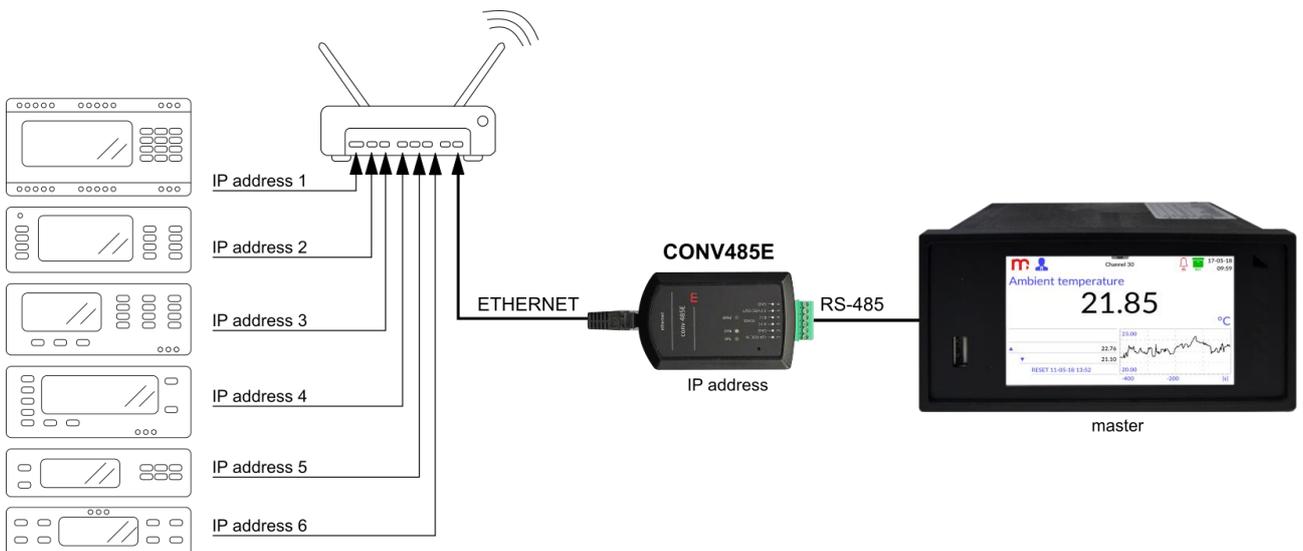


Figure 1.4 Client mode – example application

1.3. Protocols

Converter can operate in one of two protocols selected in *Profile* menu: *Ethernet TCP/IP ↔ RS485* and *Modbus TCP ↔ RTU*.

In *Ethernet TCP/IP ↔ RS485* mode received from LAN string (ASCII or binary) is sent without any change to RS485 port. Similarly, a string received from to RS485 port is forwarded to the LAN.

In *Modbus TCP ↔ RTU* mode the Modbus TCP frame is converted to Modbus RTU frame (and vice versa).

The converter has a buffer of 300 B for incoming and outgoing data for each client.

1.4. Mode: Server, Protocol: *Ethernet TCP/IP ↔ RS485*

Client (eg PLC, PC) opens the connection to the converter on the IP address and port set in converter *Profile*. Data (usually command) sent from client is transferred, and sent to RS485 network. The *Response Timeout* counter is started. If the data from RS485 network is received before *Response Timeout* elapse, then data is transferred back to client.

If more clients open the connection, then the first one sending data is privilege. Data from other clients is buffered and wait until *Response Timeout* elapse.

If more clients open the connection and *Response Timeout* elapsed, data send from RS485 network is sent to all clients. (This function allows to send data only in one direction, from RS485 network to active clients. It requires short *Response Timeout* and long *Connection Timeout*).

1.5. Mode: Server, Protocol: *Modbus TCP ↔ RTU*

According to Modbus specification data exchange can be done in two ways: *Query – Response* or *Broadcast*.

1. *Query – Response*

Client (PLC, PC, ...) opens the connection to the converter on the IP address and port set in converter *Profile*. Query sent from client is converted to Modbus RTU frame, and sent to RS485 network. The *Response Timeout* counter is started. If the Response from RS485 network is received before *Response Timeout* elapse, then data is converted to Modbus TCP frame and sent back to client.

If the *Response Timeout* elapse, then Exception Response (code 0B - gateway target device failed to respond) will be sent back to client.

If more clients open the connection, then the first one sending data is privilege. Data from other clients is buffered.

2. *Broadcast*

Broadcast is a command sent with address 0, and all devices that support this command does not send a response. If address 0 is detected in converter then the *Response Timeout* is automatically disabled. Next query can be send immediately.

Connection Timeout should be properly selected so the time between data packets was correspondingly longer.

1.6. Mode: *Client*, Protocol: *Ethernet TCP/IP* ↔ *RS485*

Master device via the RS485 network sends to the converter data string (question or command). If the converter has not yet established a connection to the server (or servers), than it opens connections and sends the string to every declared servers (see Chapter 3). If one of the servers sends response data string before the *Response Timeout* time elapses, this connection becomes privileged (and timeout counter starts again):

- responses from other servers are cached, and transmitted to the RS485 network only when the *Response Timeout* time elapses for privileged connection,
- if a new data string (next question) comes from the RS485 network before the *Response Timeout* time elapse, then it is transferred only to the privileged server (not to all involved servers).

But if *Response Timeout* time elapse, the next command will be sent again to all involved servers.

The *Connection Timeout* should be selected longer than time interval between data packets to avoid unexpected closing of the connection.

1.7. Mode: *Client*, Protocol: *Modbus TCP* ↔ *RTU*

Master device sends to the converter Modbus RTU query via the RS485 network. Converter compares the destination device address to the address table (see Chapter 3). In the table there are up to 6 Modbus RTU device addresses assigned to IP addresses. If the device address matches one of the table address then the TCP/IP connection is opened. The Modbus RTU query is converted to Modbus TCP frame and data is sent. The response is expected in time below *Response Timeout*. Response on Modbus TCP is converted to Modbus RTU and sent back via RS485 network. If *Response Timeout* elapses then the error code response is sent back (Exception Response, code 0B - gateway target device failed to respond), according to Modbus specification.

If Modbus RTU destination device address does not exist in the address table then no action is performed. If there is no data exchange between the server and the converter during the time set in the *Connection Timeout*, the connection is closed. This is to avoid unnecessary blocking of opened connections when transmission fails.

2. INSTALLATION

2.1. Mechanical installation

Converter can be latched on TS-35 rail.

2.2. Electrical connection

Converter has two slots: LAN RJ-45 and the six position terminal (plug type) for connecting power supply and RS485 network. Maximum 1,5 mm² cross-section wires can be used for the terminal.

Pin No.	Description	Additional information
Ethernet		
-	Ethernet	RJ45 socket
RS485 and power supply		
1	+24 VDC IN	Power supply (+)
2	GND	“ground” for power supply
3	A (+)	RS485 bus
4	B (-)	
5	3.3 VDC OUT	3.3 VDC output (service)
6	GND	“ground” for RS485 line

2.2.1. Power supply connection

Power supply should be connected (24 VDC e.g. voltage from power supply unit 230 VAC / 24 VDC) to pins 1 and 2.

2.2.2. Connecting to RS485 network

RS485 bus signal wires should be connect to terminals A(+) (3 pin) and B(-) (4 pin), the common wire should be connect to 6 pin. For industrial environment a shielded twisted pair is strongly recommended. Shield should be grounded at least at both end sides. It is a cable for digital data transmission recommended, especially for large distance and higher transmission speeds. RS485 standard allows to connect up to 32 devices and 1200 m maximum line length. Converter has internal termination, switched on with a dip switch situated on the left side of the RS485 terminal block. Proper work of terminator needs to set both switches to the same position on or off. Terminator should be turned on only when converter is on the one end of the bus. RS485 bus cannot make star connection.



Figure 2.1 Termination switch location

2.2.3. Connecting to LAN

There is a UTP twisted pair cable in converter kit.

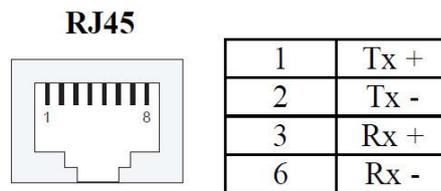


Figure 2.2 RJ-45 pins description

3. SETTINGS AND CONFIGURATION

Configuration should be done using standard Internet Web browser. Working of WWW server has tested with Internet Explorer, Opera, Mozilla Firefox and Safari Internet Web browsers.

3.1. First configuration

Normally LAN network configuration cause that converter with default settings is not “visible” in network. During first configuration converter should be first connected to PC computer. Computer should have network configuration setup to dynamic host configuration. For configuration properties it is no need to connect RS485 bus but power supply have to be connected.

Default setting for LAN network are as follow:

IP address: 192.168.0.10
Port: 502
Subnet mask: 255.255.255.0
Default gateway: 192.168.0.10
Server DHCP: ON
Connection timeout: 60 s

In a Web Browser in address bar 192.168.0.10 the IP address should be typed in. On the converter home page in the menu bar there are four tab-sheets available for groups of parameters: *ethernet*, *rs485*, *profile* and *password*.

! If the LAN Network parameters are changed, manually refresh the Web Browser may be necessary.

Menu *ethernet* includes:

- *IP Address*
- *Subnet Mask*
- *Default Gateway*
- *DHCP Server*

and

- *MAC Address*

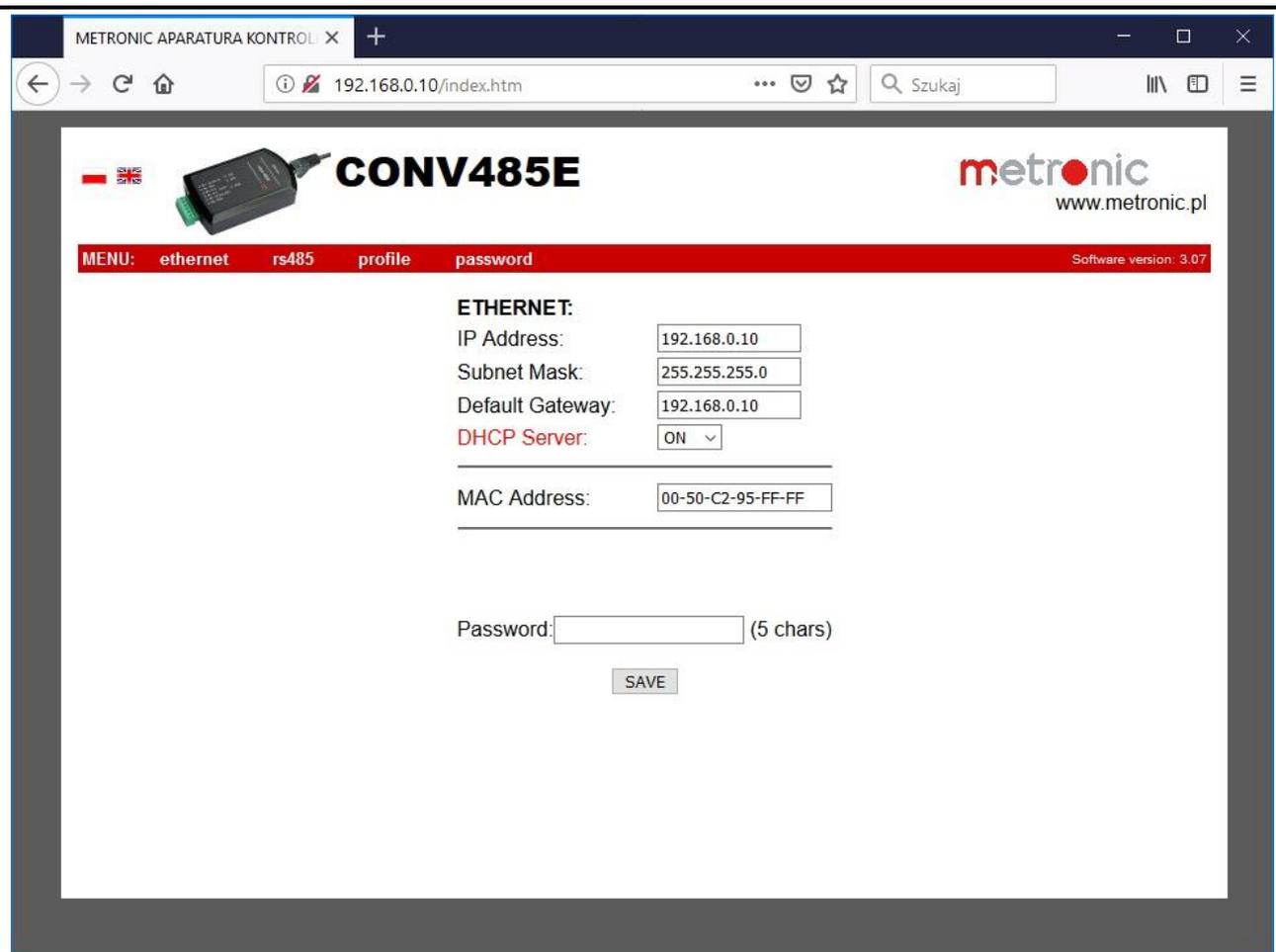


Figure 3.1 „ethernet” page

Any change have to be confirmed with password and then button *SAVE*.

! ■ Default password is: 12345

During first configuration following parameters should be filled up: IP address, subnet mask, default gateway in accord with network where it will be use. DHCP server should be turned off. In default settings it is turned on for communication between converter and computer during first configuration.

Menu *rs485* includes parameters for RS485 serial port:

- *Baud Rate* (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200)
- *Parity* (NONE+1STOP, NONE+2STOP, EVEN, ODD)

Parameters of serial port should be configured according with settings of device to data exchange. Any change have to be confirmed with password and then button *SAVE*.

Moreover, it is possible testing of TxD and RxD LED diodes.

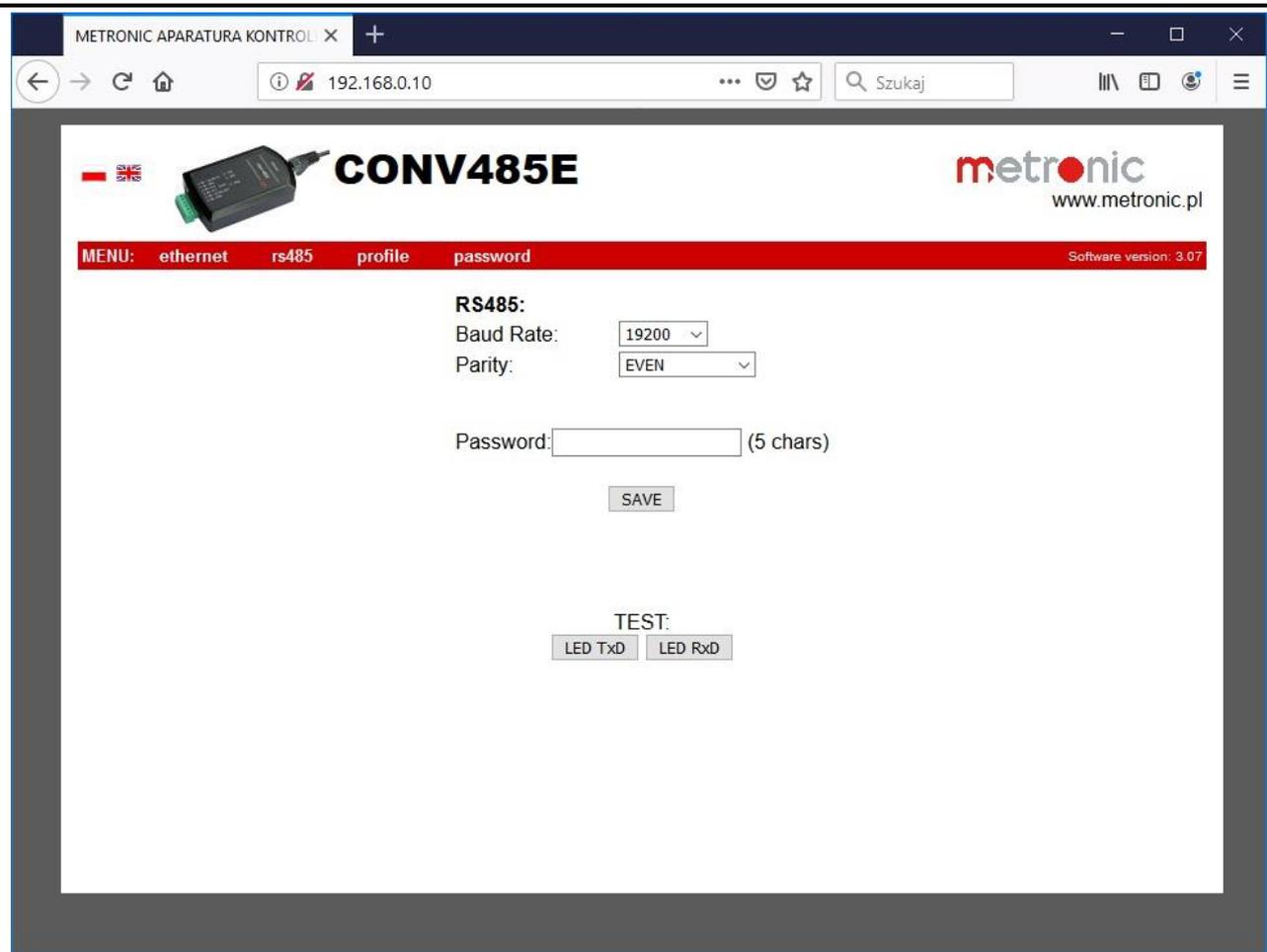


Figure 3.2 "rs485" page

In menu *profile* user selects the mode:

- Server,
 - Client,
- and protocol for data exchange:
- Ethernet TCP/IP ↔ RS485,
 - Modbus TCP ↔ RTU.

In Server mode only *IP Address*, *Port*, *Connection Timeout* and *Response Timeout* have to be set. Any change have to be confirmed with password and then button *SAVE*.

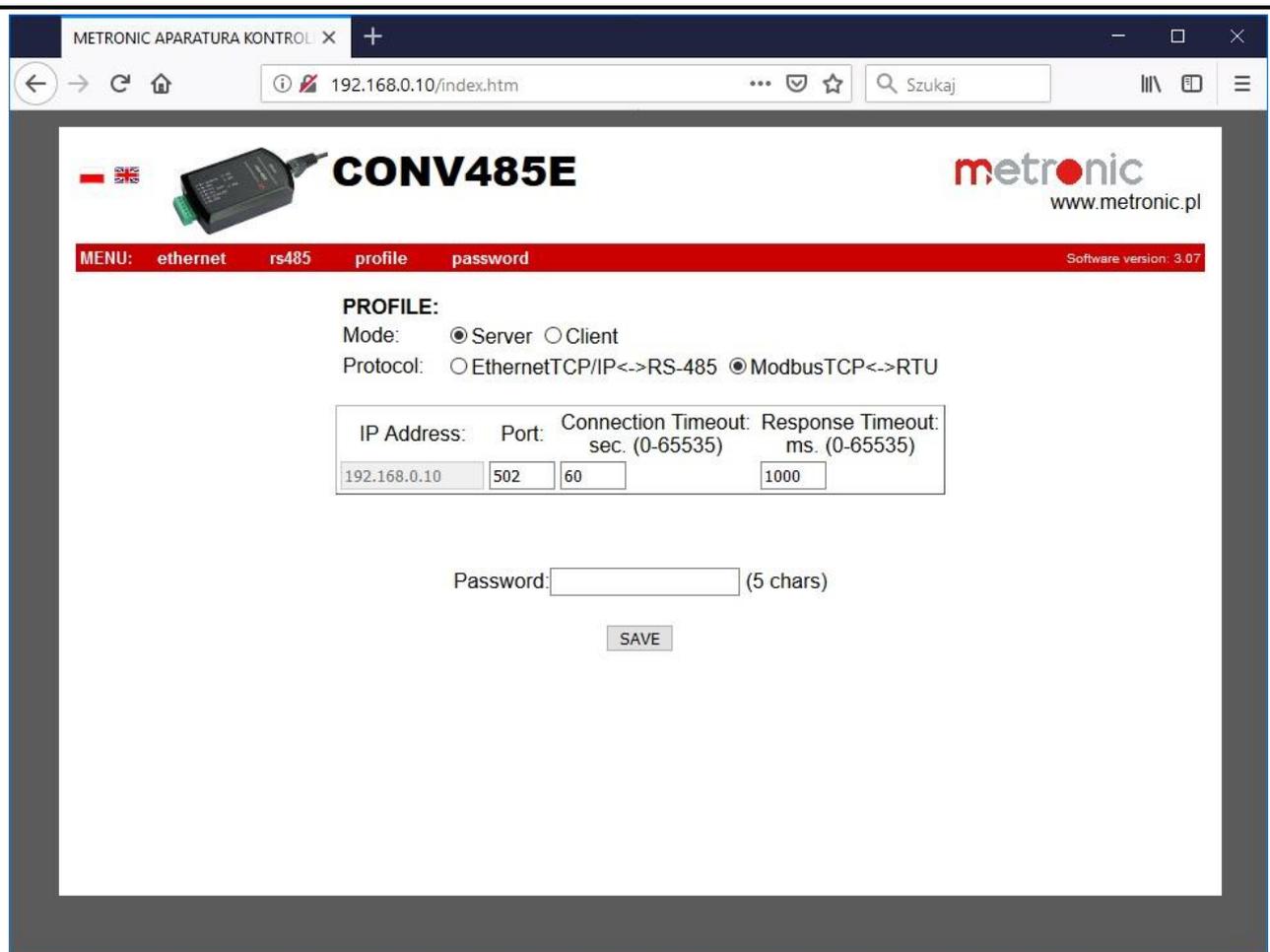


Figure 3.3 Profile page for Server mode

In Client mode up to six servers can be set. Each server needs to have his *IP Address*, *Port*, *Connection Timeout* and *Response Timeout*. For *Modbus TCP ↔ RTU* protocol also destination address have to be set. Every active server has to be declared in the checkbox with a mark . Any change have to be confirmed with password and then button *SAVE*.

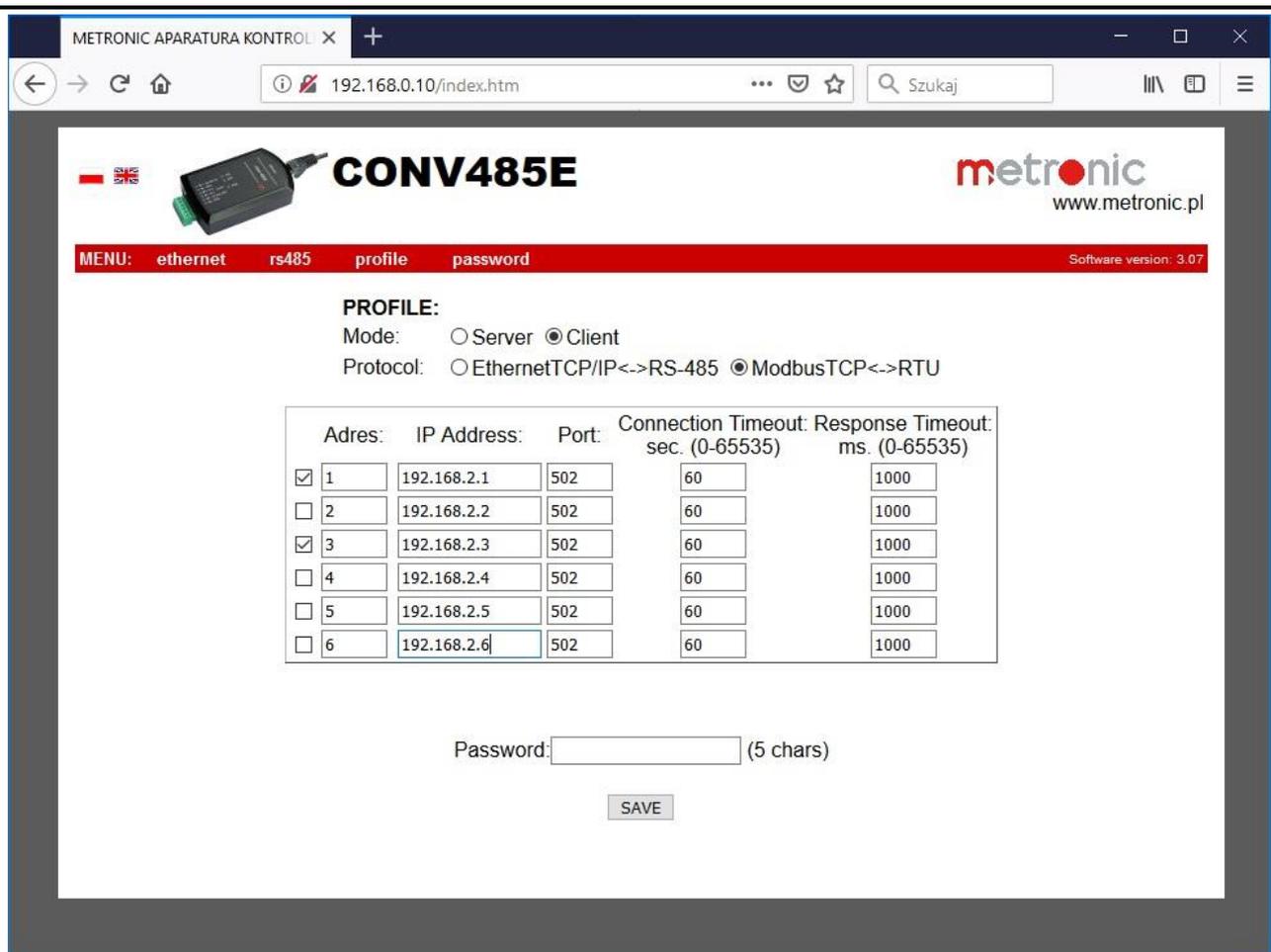


Figure 3.4 Profile page for Client mode

In menu *Password* user can change his password. It is recommended to change the default password. When the password is forgotten the converter has to be reset to his default state. All settings will be lost.

3.2. Changing the configuration

Any change of configuration can be done using PC computer in similar way like for first configuration. But there is no need to connect converter directly to the computer again. If converter is present in LAN network then user is able to start configuration with Web Browser using converter IP address.

! If the converter parameters are changed, manually refresh the Web Browser may be necessary.

3.3. Reset to default parameters

The RESET button can be accessed through a hole in the front of the converter.



Figure 3.5 RESET button location

Restoring factory settings is possible in two ways:

- by holding down the button during a power converter,
- press and hold (approximately 2 s) during normal operation.

TxD and RxD LEDs will alternately blink. After about 30 seconds over the process of writing the default settings the LEDs will stop flashing and the converter starts to operate normally.

4. LEDs

Converter has 5 LEDs allowing to monitor the converter status:

- PWR – green colour, signalling presence of power supply,
- TxD – yellow colour, signalling data transmission from RS485 port,
- RxD – blue colour, signalling data receive to RS485 port,
- LINK – diode located on RJ45 socket, green colour, signalling active connection to LAN network,
- ACT – diode located on RJ45 socket, yellow colour, signalling data transmission through the LAN port.

5. TECHNICAL DATA

ETHERNET INTERFACE	
Interface:	10BaseT Ethernet
Supported protocols:	TCP, ICMP (ping), DHCP server, http server
Data buffer:	300 B
Number of simultaneous open connections	Up to 6
Socket:	RJ45
LED diodes:	2, internal in RJ45 socket
RS485 SERIAL INTERFACE	
Baud rate:	1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, 115.2 kbps
Data frame:	1 start bit, 8 data b., 1 stop b. (1 or 2 stop b. for None)
Parity control:	Even, Odd, None1, None2
Data buffer:	300 B
Signals on terminal:	A(+), B(-), GND
Maximum load:	32 receivers / transmitters
Line terminator:	internal, switched with DIP SW
Minimum impedance for data transmission line:	54 Ω
Maximal line length:	1200 m
Maximal voltage on terminals A(+) and B(-)	-7 V .. +12 V
Minimal transmitter output signal:	1.5 V (for $R_0=54 \Omega$)
Minimal receiver sensitivity:	200 mV / $R_{WE}=12 \text{ k}\Omega$
Short-circuit / thermal protection:	Yes/Yes
LED diodes:	2, TxD (yellow colour) and RxD (blue colour) signalization
POWER SUPPLY	
Supply voltage:	24 VAC (+5% / -10%) / 1 VA 24 VDC (18-36 VDC) / 0.9 W
LED diodes:	1, presence of power supply, green colour
ENVIRONMENTS	
Work temperature / Store temperature:	-20 °C .. +60 °C / -30 °C .. +70 °C
Humidity:	5 .. 95% (without condensation)
MECHANICAL DIMENSIONS	
Dimension (length x width x height):	93 mm x 57 mm x 21 mm (without clip for TS-35 rail)
Casing degree of protection:	IP30
Weight:	ca. 0.06 kg



The device is in conformity with the essential requirements of European Union:

1. EMC Directive 2014/30/EU to the following standards and specifications:
 - 1.1. For EMC immunity for industrial environments according to EN 61326-1:2013 (Table 2).
 - 1.2. For EMC conductive and radiated emissions Class A equipment according to EN 61326-1:2013.



6. MANUFACTURER

Manufacturer: METRONIC AKP s.c.
PL 31-426 Kraków, Żmujdzka 3
Tel.: (+48) 12 312 16 80
www.metronic.pl

Vendor:



7. NOTES

ETHERNET	
IP address:	
Port number:	
MAC address:	
Subnet mask:	
Default gateway:	
DHCP server:	
Connection timeout:	
RS485	
Operation mode:	
Baud rate:	
Parity:	
Response timeout:	



Notes