

CONV485E
(version 2.14)



CONV485E

RS-485 to 10BaseT Ethernet LAN Converter

USER MANUAL

Document version: 2010-07-22

 This manual is available on CD

Safety notes

! Safe install and operation of the converter can only be achieved if all hints and warnings in this operating manual are thoroughly read and followed.

The unit could be dangerous if installed or used incorrectly.

The unit is manufactured in compliance with the respective EU regulations.

Converter can not be installed and used in hazardous areas.

Manufacturer notes

The manufacturer reserves the right to improve and update the technical details in connection with continuously upgrading device functionality.

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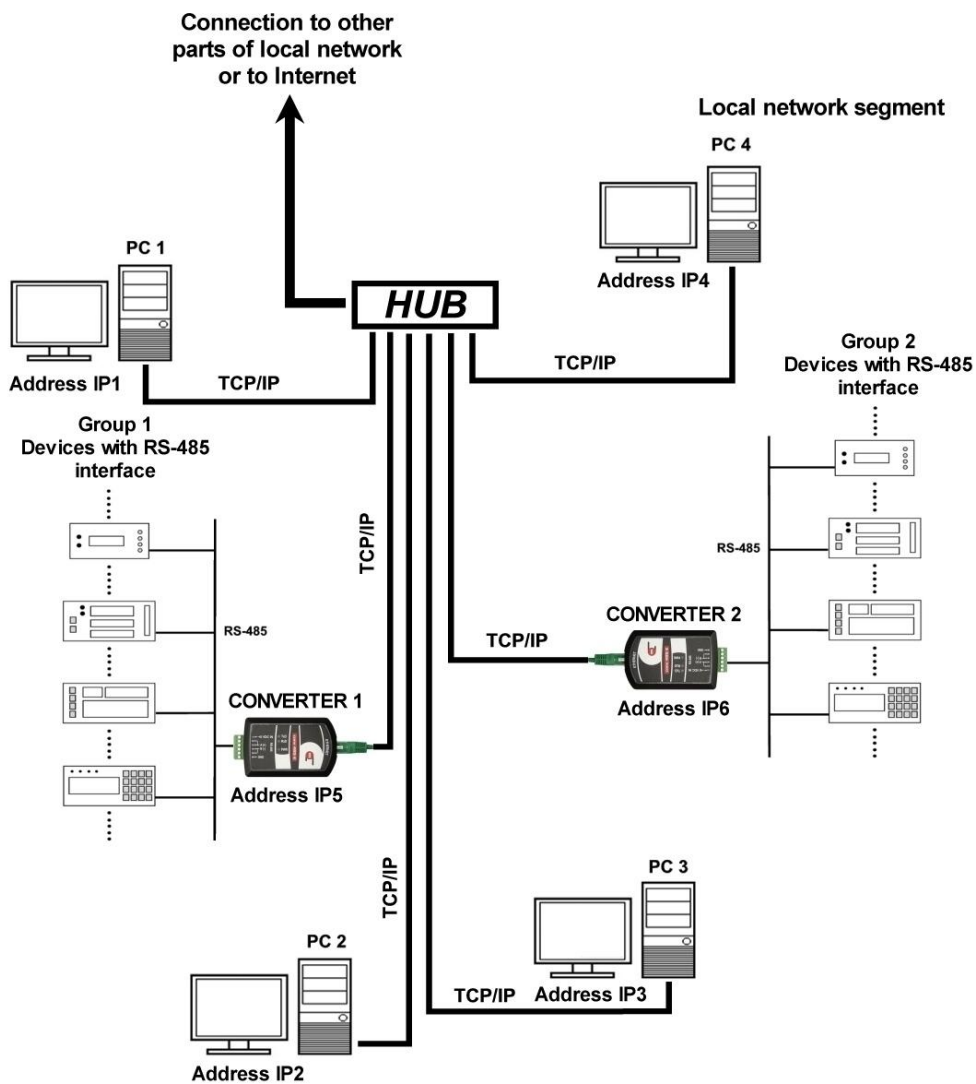
1. PURPOSE

1.1. Purpose

Converter CONV 485E allows data transfer between master system (PC computer, PLC controller) which works in LAN network with TCP/IP communication protocol and devices with RS-485 serial port. Converter can serve up to four connections. Every client can connect with converter using its IP address and port number set during device configuration. Two work modes are available:

- “Transparent” (“Ethernet TCP/IP <-> RS-485”) – converter receive character string from LAN network and send it to RS-485 network and vice versa,
- “Modbus TCP <-> RTU” – converter receive data from master device working with Modbus TCP protocol, converts data frame into Modbus RTU protocol and send it to RS-485 network and vice versa.

Converter is dedicated to work in industrial or laboratory systems, in electric or control cabinets or inside control rooms as standalone device or mounted on DIN rail (version with locking clip).



Typical application

1.2. Protocol modes

Converter can work in two modes: “Transparent” mode (“Ethernet TCP/IP <-> RS-485” mode) and “Modbus TCP <-> RTU” mode. In “Transparent” mode received data string (ASCII or binary format) from Ethernet network is transferred to RS-485 port without any changes. Similarly, received data string from RS-485 port is transferred to master device but only when network connection with converter is open.

In “Modbus TCP <-> RTU” mode Modbus TCP data frame is converted to Modbus RTU frame. Modbus RTU is standard protocol for control and measurement devices equipped with RS-485 port.

Converter has got internal buffer 300 B for receive and 300 B for send data. For RS-485 port user have to configure transmission speed and parity in compliance with device configuration.

1.2.1. “Transparent” mode

In this mode there are three typical types of communication between master system and device available. User have to be sure to setup proper value for Response Timeout for his type of communication.

1. Master – Slave communication.

Converter receives from Ethernet client a query, sends it to the device via RS-485 port and starts Response Timeout timer. If response appear before the timeout end then it is send to the client which sent query. When the response appear after the timeout end then it is send to all connected clients. If a new queries (from other clients or from actual client) comes during Response Timeout timer it is set into queue and keep in data buffer (up to 4 queries). In case when converter does not receive any response after timeout ends next query from buffer is served. So it is important to setup enough long value of Response Timeout to secure serve next command before receive response for the first one.

2. One-way communication, master system sends data string and no device response is expected.

Converter receives data string from Ethernet client and sends it to the device. Device does not sends any response to client. In this case it is important to setup short Response Timeout to allow next data string fast transfer.

3. One-way communication, device sends data string in sequence without any query from client.

Converter receives data string from the device on RS-485 port and sends it to all connected clients on Ethernet. In this case short Response Timeout should be set. The Connection Timeout have to be set enough long to guarantee opened connection for the maximum time break between two data strings.

User have to set also proper configuration for RS-485 port for speed of transmission and parity control in accord to the device settings.

1.2.2. “Modbus TCP <-> RTU” mode

According to Modbus protocol data transmission can carry on in two modes: normal Query – Response or Broadcast mode (for 0 device address).

1. Query – Response communication.

Converter receive Query from client in Modbus TCP mode then converts the frame to Modbus RTU, sends it to the device and starts the Response Timeout timer. If it

receives the response before the end of timeout in next step it converts the frame to Modbus TCP and sends it back to the proper client. If on RS-485 side no response appear to the end of Response Timeout then converter sends to client data frame with error code Exception Response 0B (gateway target device failed to respond). Similar like in "Transparent" mode there is possible a queue up to 4 queries (for up to 4 clients maximum). If the Response Timeout occurs then the next query from the queue is processed.

2. Broadcast communication.

Broadcast, in compliance with Modbus documentation, means command send with address 0. When Ethernet client send Query with address 0 converter detects it and transmit this query to the device on RS-485 port, but does not wait for response and is able to immediately send next query. The Response Timeout timer is automatically disabled.

Proper transmission speed and parity control for RS-485 port is required in accord to the device settings.

1.3. Versions

Converter is available in three versions with different power supply. Each version can have casing with clip to mount on DIN rail.

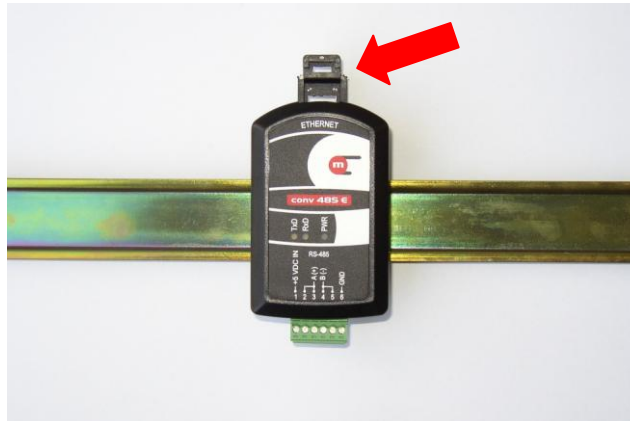
CONV485E	-x	
	-1	24 V DC/AC – power supply
	-2	5 V DC – power supply
	-3	PoE (Power over Ethernet)

CONV485E	-x	/ *	
	-x		Standalone version
	-x	/TS35	Version with clip for DIN rail

2. INSTALLATION

2.1. Mechanical installation

Version with locking clip allows to install converter on DIN rail. Element showed on the picture below allows easy removal converter from the DIN rail.



Converter installed on DIN rail

2.2. Electrical installation

Converter has got two sockets. One for connection to LAN network. Second one is six positions screw terminal to connect to RS-485 bus and to power supply. Maximal cross-section of the single wire for one pin is 1.5 mm².

Pin No.	Description	Additional information
Ethernet		
-	Ethernet	RJ45 socket
RS-485 and power supply		
1	+24 V AC/DC +5 VDC IN	Power supply, depending of version: 5 V or 24 V
2	A (+)	RS-485 bus
3	A (+)	
4	B (-)	
5	B (-)	
6	GND	"ground" for power supply and RS-485 line

2.2.1. Power supply connection

Depending of version (CONV485E-1 or CONV485E-2) proper power supply should be connected (24 V AC/DC e.g. voltage from transformer 230 VAC / 24 VAC or 5 VDC stabilized voltage) to pins 1 and 6. In version CONV485-E-3 converter should be powered

from Ethernet network, in this case pins 1 and 6 have to be left not connected. Power supply from Ethernet needs PoE network (Power over Ethernet).

2.2.2. RS-485 connection

RS-485 bus wires should be connect to terminals A(+) (2 or 3 pin) and B(-) (4 or 5 pin). For industrial environment a shielded twisted pair is strongly recommended. Shield should be grounded at least at one point. It is a cable for digital data transmission recommended, especially for large distance and higher transmission speeds. RS-485 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 RS-485 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. RS-485 bus can not make star connection.



Terminator location

2.2.3. LAN network connection

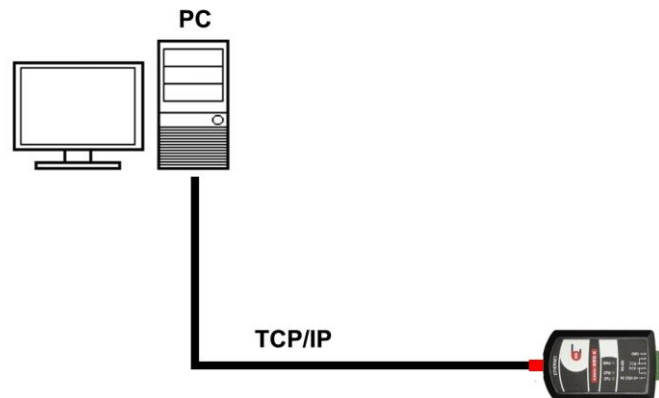
In converter kit there are two cables: UTP twisted pair cable (green) and cross-over (black with red boots). Normally in LAN network UTP cable (green) should be used. Cross-over cable should be used to connect converter with computer directly.

3. SETTINGS AND CONFIGURATION

A PC computer have to be used to make proper configuration. It should be done through LAN network using standard Internet Web browser. Working of WWW server has tested with Internet Explorer, Opera, Mozilla Firefox, Chrome 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 for versions CONV485E-1 and CONV485E-2 converter should be first connected to PC computer using cross-over cable (black with red boots). Computer should have network configuration setup to dynamic host configuration. For configuration properties it is no need to connect RS-485 bus but power supply have to be connected.



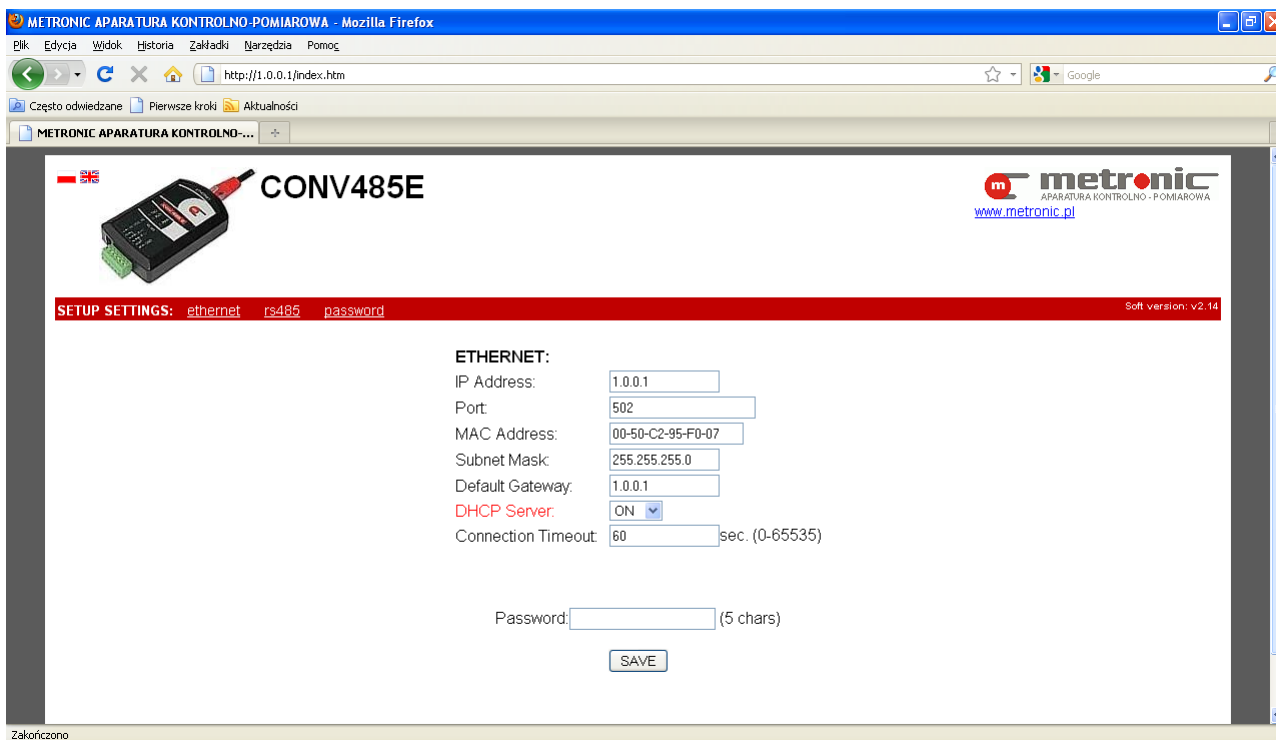
Converter direct connection to PC computer

For version CONV485E-3 (with PoE power supply) first configuration have to be done using PoE Switch to power the converter. Switch configuration must allow access to the device. In this case PoE Switch and the converter must be connected using UTP cable (green one).

Default setting for LAN network are as follow:

- IP address: 1.0.0.1
- Port: 502
- Subnet mask: 255.255.255.0
- Default gateway: 1.0.0.1
- Server DHCP: ON
- Connection timeout: 60 s

Using a Web Browser in address bar converter IP address should be typed in: 1.0.0.1. After that a following configuration screen appears:



Configuration window

There are three tabs in menu: “Ethernet”, “rs485” and “password”.

In “ethernet” tab are networks settings:

- IP address,
- Port,
- MAC Address,
- Subnet Mask,
- Default Gateway,
- DHCP Server,
- Connection Timeout

and 5 characters password. **Default password is ‘12345’** and it is necessary to be entered to accept any changes.

In “RS-485” tab are serial port settings and the same password have to be used. In “password” tab user can change password and set LED diodes TxD and RxD on and off for test.

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. Changing of MAC address is acceptable only in a special situations. Using port 502 is not recommended when converter is working in “Transparent” mode (this port is dedicated to Modbus TCP). According to IANA (*Internet Assigned Numbers Authority*) recommendation user should use port from range 49152 ÷ 65535. Connection Timeout is maximal time without exchange of data with master system and have to be set properly according to user application. Acceding the Connection Timeout causes client connection close.

“rs485” tab contains parameters of serial port:

- Mode (Modbus TCP<->RTU, Ethernet TCP/IP <-> RS-485),
- Baud Rate (2400, 4800, 9600, 19200, 38400, 57600, 115200),
- Parity (NONE+1STOP, NONE+2STOP, EVEN, ODD),
- Response Timeout

and password to changing parameters (password is the same as for ethernet parameters).

Parameters of serial port should be configured according with settings of device to data exchange. Response Timeout is the time of converter`s waiting for response after sending a query to RS-485-linked device.

If device doesn`t response before timeout ends, the converter serve next query from TCP stack. Moreover, it is possible testing of TxD and RxD LED diodes.

In “password” tab user can change password.

! If converter`s parameters would be changed, refreshing the Web Browser manually **■** may be required.

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 window with Web Browser using converter IP address.

! If converter`s parameters would be changed, refreshing the Web Browser manually **■** may be required.

3.3. Restoring default settings

In some service cases a need to set up default settings may occur. Especially user have to do it in case when converter network parameters are forgotten. To make parameters reset to default first the converter housing case have to be removed using 4 screws on the bottom.

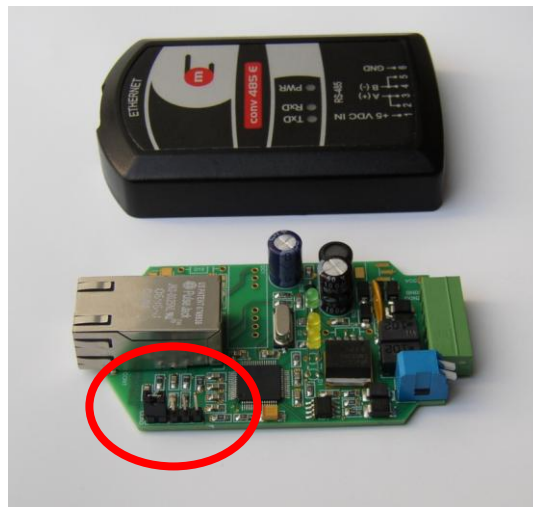


Case remove

Next pins 4 and 5 have to be connected with a jumper (picture below) followed by power on. TxD and RxD diodes should start blink. Then jumper on pins 4 and 5 should be removed and power should be turned off. Default settings are restored.



■ Short-circuit of other pins or components may permanently destroy converter.



*“Reset” jumper
Jumper on pins 4 and 5,
Two peripheral pins on left side*

4. LED DIODES

Converter has got 5 LED diodes allowing to monitor the converter status:

- PWR – green colour, signalling presence of power supply,
- TxD – yellow colour, signalling data transmission from RS-485 port,
- RxD – yellow colour, signalling data receive to RS-485 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
Socket:	RJ45
LED diodes:	2, internal in RJ45 socket
Modbus TCP protocol	
Number of simultaneous connections:	Up to 4
RS-485 SERIAL INTERFACE	
Baud rate:	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(-)
Maximum load:	32 receivers / transmitters
Line terminator:	internal, switched by relay
Minimum impedance for data transmission line:	54 Ω
Maximal line length:	1200 m
Maximal voltage on terminals A(+) and B(-)	- 8 V \div + 13 V
Minimal transmitter output signal:	1,5 V (for $R_0= 54 \Omega$)
Minimal receiver sensitivity:	200 mV / $R_{WE}= 12 k\Omega$
Short-circuit / thermal protection:	Yes
LED diodes:	2, TxD and RxD signalization, yellow colour
POWER SUPPLY	
CONV485E -1 (24 V DC/AC):	24 VAC (+5% / -10%) / 1 VA 24 VDC (8 \div 30 VDC) / 0,9 W
CONV485E -2 (5 V DC):	5 VDC (4,5 \div 5,5 VDC) / 0,9 W
CONV485E -3 (PoE):	PoE Class 1 (max 57 VDC, 0,44 \div 3,84 W)
LED diodes:	1, presence of power supply, green colour
ANVIROMENTS	
Work temperature / Store temperature:	-20° C \div +60° C / -30° C \div +70° C
Humidity:	5 \div 95% (without condensation)
MECHANICAL DIMENSIONS	
Dimension (length x width x height):	93 mm x 57 mm x 21 mm (without clip for DIN rail)
Casing degree of protection:	IP30
Weight:	about 0,06 kg



The device is compliant with the EMC requirements (electromagnetic compatibility of industrial devices), according to Directive 2004/108/EEC.

6. MANUFACTURER

Manufacturer: METRONIC Aparatura Kontrolno – Pomiarowa
31-261 Kraków, Wybickiego 7
Tel. / fax: +4812 6326977, +4812 6237599
www.metronic.pl

Vendor:

7. NOTES

ETHERNET	
IP address:	
Port number:	
MAC address:	
Subnet mask:	
Default gateway:	
DHCP server:	
Connection timeout:	
RS-485	
Operation mode:	
Baud rate:	
Parity:	
Response timeout:	