User manual

ADA-13028LMG

2-WIRE Current Loop to ETHERNET converter with MODBUS GATEWAY

Contents

1. GENERAL INFORMATION

Thank you for your purchase of **CEL-MAR Company** product. This product has been produced and completely tested by us.

If any questions or problems arise during installation or use of this product, please do not hesitate to contact Technical Support at +48 41 362-12-46 or e-mail support@cel-mar.pl.

1.1. WARRANTED INFORMATION

The **ADA-13028LMG** converter is covered by a two year warranty from date of sale. In case of being damaged it will be repair or the damaged component will be replace. The warranty does not cover damage caused from improper use, materials consumption or any unauthorized changes. If the product does not function (is damaged), or not operate in accordance with the instructions, will be repaired.
All warranty and no warranty repairs must be returned with paid transport and insuring to the **CEL-MAR Company.**
CEL-MAR Company under no circumstances won't be responsible for ensuing damage from improper using the product or as a result of random causes: the lightning discharge, the flood, the fire and the like.
CEL-MAR Company is not be held responsible for damages and loss including: loss of profits, loss of data, pecuniary losses ensuing from using or the impossibility of using this product.
In specific cases **CEL-MAR Company** discontinue all warranties and in particular do not follow the user manual and do not accept terms of warranty by the user.

1.2. GENERAL CONDITIONS FOR SAFE USE

The device should be installed in a safe and stable places (eg, electroinstallation cabinet), the powering cable should be arranged so as not to be exposed to trampling, attaching, or pulling out of the circuit.
Do not put device on the wet surface.
Do not connect devices for nondescript powering sources,
Do not damage or crush powering wires.
Do not make connection with wet hands.
Do not adapt, open or make holes in casings of the device!
Do not immerse device in water or no other liquid.
Do not put the fire opened on device sources: candles, an oil lamps and the like.
Complete disable from the supply network is only after disconnecting the power supply circuit voltage.
Do not carry out the assembly or dis-assembly of the device if it is enabled. This may result to short circuit and damage the device.
The device can not be used for applications that determine human life and health (eg. Medical).

1.3. CE LABEL

CE

The CE symbol on the device CEL-MAR means compatibility with electromagnetic compatibility Electromagnetic Compatibility Directive **EMC 2014/30/WE.**
Declaration of Conformity is delivered with purchased converter.

1.4. ENVIRONMENTAL PRESERVATION

This sign on the device inform about putting expended device with other waste materials. Device should send to the recycling. (In accordance with the act about the Electronic Appliance Expended from day 29 of July 2005)

1.5. SERVICE AND MAINTENANCE

The ADA-13028LMG converter does not require the servicing and maintenance.
Technical support is available at number +48 41 362-12-46 in 8.00-16.00, from Monday to Friday or e-mail support@cel-mar.pl.

1.1. PACK CONTENTS

The ADA-13028LMG converter; user manual; CE declaration.

2. PRODUCT INFORMATION

2.1. PROPERTIES

- Operating on ETHERNET network- IEEE 802.3 standard,
- 10/100BaseT physical layer,
- Connecting via Rj45 connector,
- Baud rate 10/100Mbps (auto-sensing),
- Full duplex or half duplex (auto-sensing) operate modes,
- Protocols: TCP, UDP, DHCP, SNMP, SSL/TLS, Telnet, Rlogin, LPD, HTTP/HTTPS, SMTP, ICMP, IGMP, ARP,
- Integrated WWW sever for converter configuration,
- Configuration of net services according to user personal setting,
- Static or dynamic IP address (added by DHCP server),
- Diagnostics of serial and network port,
- Encoded transmission: DES (56-bit), 3DES (168-bit), AES (128/256-bit),
- Operating modes: virtual serial port, serial bridge TCP, serial bridge UDP, TCP sockets, UDP sockets, MODBUS Data Gateway,
- Operating on 2-wire line in current loop CLO standard,
- CLO baud rates (bps): 50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 14400, 19200,
- CLO data format - Number of data bits: 5, 6, 7, 8; Parity control: None, Odd, Even, Constantly 1, Constantly 0; Stop Bits: 1, 2.
- Transparent for all protocols, which the data format is compatible with the above specifications of CLO interface eg.: MODBUS-TCP/UDP, MODBUS-RTU, MODBUS-ASCII, MODBUS-SUNSPEC, DNP, PROFIBUS and other,
- Power supply 10 - 30 VDC stable min. 3W,
- ~ 3000V= optoizolation in signal channel between ETHERNET and Current Loop interfaces,

- 1000V= or 3000V= galvanic isolation between ETHERNET interface and power supply - depends on version,
- 1000V= or 3000V= galvanic isolation between Current Loop interface and power supply - depends on version,
- Connection current loop CLO interface via screw terminal block,
- Implemented short circuit protection and over-voltage protection on Current Loop lines,
- Protection against power supply reverse connection,
- DIN 43880 standard - mounting in typical electro-installation unit,
- Rail mounting according to DIN35 / TS35 standard,
- Dimensions (W x D x H) 53mm x 62mm x 90mm.

2.2. DESCRIPTION

The ADA-13028LMG converter is a device designed for data transmission between devices equipped with current loop CLO interface over LAN/WAN network. Operation in an ETHERNET network can be carried out in the following modes: Virtual Serial Port mode, TCP serial bridge mode, UDP serial bridge mode, TCP sockets, UDP sockets, MODBUS Data Gateway. The MODBUS Data Gateway converts MODBUS-RTU/ SUNSPEC master/slave and MODBUS-ASCII master/slave protocol to MODBUS-TCP/UDP and inversely. This allows for integrate MODBUS-RTU/ SUNSPEC/ ASCII with MODBUS-TCP/UDP devices within one network. The converter has a built-in web server that enables remote configuration and management via a web browser.
The ADA-13028LMG converter enables data transmission (without changing the data format) via the CLO current loop interface at baud rate of up to 19.2 kbps., using the CLO+, CLO-, Rd signals.
It is equipped with a screw terminal block for twisted-pair CLO current loop and power connections, as well as an RJ45 connector for ETHERNET network connection.
Up to four devices operating in half-duplex mode can be connected to a CLO bus built using the ADA-13028LMG.
The converter is designed to be powered from an external DC power source with a voltage range of 10V to 30V and a minimum power rating of 3W. It features reverse polarity protection for the power supply and surge protection on the CLO bus. The device offers galvanic isolation between the power supply and both the ETHERNET and CLO interfaces, as well as optoisolation between the CLO and ETHERNET interfaces. The converter is also equipped with low-energy internal surge protection for each CLO current loop interface line. However, for lightning protection of the connection, external surge protectors should be used.
Drivers for Windows and Linux operating systems are available on our website. In Windows (Win98/ ME/ 2000/ XP/ 2003/ Vista/ 7/ 8/ 8.1/ 10/ 11), after driver installation, an additional COM port is created.
This port (e.g., COM3) can be used like a standard COM port. However, it is not a physical port present in the computer but a virtual one created by the system. As a result, DOS-based applications that attempt to use this virtual COM port may not function correctly.

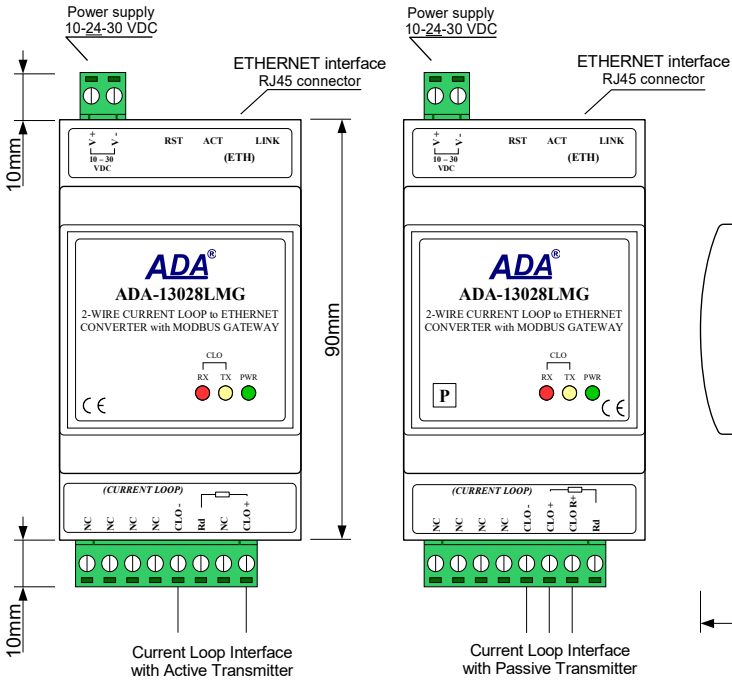

Fig. 1. The ADA-13028LMG view

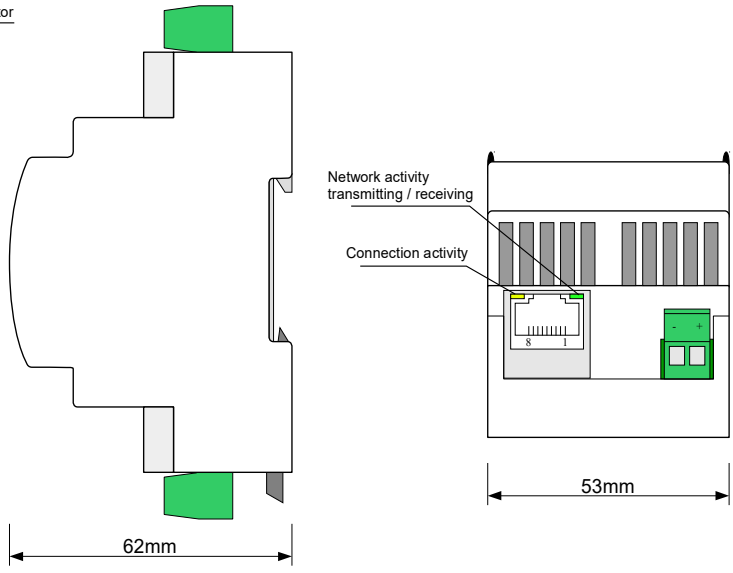

Fig. 2. View of ETHERNET connector and power supply

2.3. ETHERNET NETWORK COMMUNICATION

2.3.1. TCP/UDP SOCKET MODE COMMUNICATION

Communication in TCP/UDP socket mode allows an application (such as SCADA, MMI, etc.) to transmit data to the converter's serial port over the ETHERNET network using TCP/UDP sockets and client/server services.

2.3.2. VIRTUAL SERIAL PORT MODE (RealPort) COMMUNICATION

Communication in virtual serial port mode allows an application (such as SCADA, MMI, etc.) to transmit data to the converter's serial port over the ETHERNET network using a virtual serial port created in the operating system.

2.3.2.1. SUPPORTED OPERATING SYSTEMS

For the ADA-13028LMG converter operating in Virtual Serial Port mode, virtual serial port drivers are available for the following operating systems:
a/ Windows: 98, ME, NT, 2000, XP, Vista, 7, 8, 8.1, 10, 11;
b/ Windows Server: 2003, 2008-R2, 2012-R2, 2016, 2019, 2022;
c/ AIX 5.X and AIX 6.x 32bit/64 bit;
d/ HP-UX 10.20, 11.0, 11i, 11i v2 and 11i v3 for PA-RISC and Itanium;
e/ SCO OpenServer 6, UnixWare Release 7.x;
f/ Solaris 7, 8, 9 and 10 for SPARC 64/32bit and Intel/AMD 64/32bit;
g/ Linux supported kernel version 2.4.x and above (UP and SMP), tested on:
-Red Hat Enterprise Linux 7.x, 8.x, 9;
-Red Hat Linux 7.x, 8.x, 9;
-OpenSuSE Leap 15;
-Debian 9, 10, 11;
-Ubuntu 2020.04, 2022.04 LTS;

2.3.3. SERIAL BRIDGE MODE COMMUNICATION

Communication in serial bridge mode allows data transmission over the ETHERNET network between the serial ports of converters in a one-to-one or one-to-many topology, using TCP/UDP client and server services.

2.3.4. INDUSTRIAL AUTOMATION MODE (Modbus Gateway) COMMUNICATION

Communication in MODBUS Gateway (IA) mode enables conversion between MODBUS-RTU/SUNSPEC master/slave or MODBUS-ASCII master/slave protocols and the MODBUS-TCP/UDP protocol, and vice versa. This allows the integration of devices using MODBUS-RTU, MODBUS-SUNSPEC, or MODBUS-ASCII with devices using MODBUS-TCP/UDP within a single network.

2.3.5. OTHER TYPES OF COMMUNICATION

The ADA-13028LMG converter can be configured in other communication types, like:
– terminal mode,
– modem emulation mode,
– console mode,
– user mode.
However, in the case of the Current Loop converter, it will not be able to work properly in these modes, as they relate to the full RS232 interface.

2.4. CURRENT LOOP TRANSMITTER & RECEIVER

The ADA-13028LMG converter is available in versions with either an active or passive current loop transmitter.
The version with an active current loop transmitter features a transmitter based on a current source that generates a current value specified for the given model, and a passive receiver consisting of an optocoupler. The version with a passive current loop transmitter includes a transmitter based on a switching transistor that controls the loop current, along with a passive receiver consisting of an optocoupler.

2.5. ISOLATION

The ADA-13028LMG converter has 3-way galvanic isolation on the level 1kV= or 3kV= depend on version, described in section *VERSIONS*.

3-WAY ISOLATION

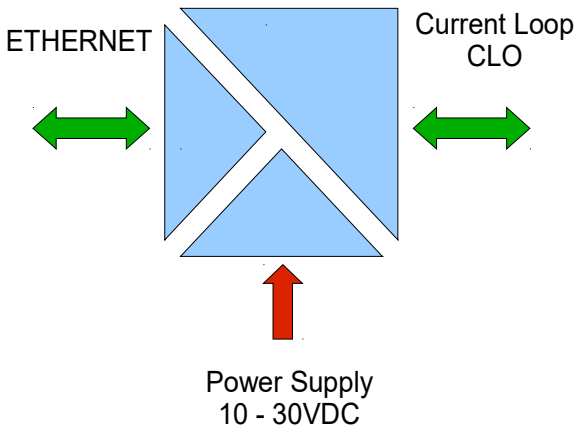

Fig. 3. Isolation structure

3. INSTALLATION

This chapter will show how to correctly connect the ADA-13028LMG to devices with a CLO current loop interface, a LAN/WAN network, and a power supply.

- To minimize the influence of external interference, the following guidelines are recommended:
- Use shielded multi-pair twisted-pair cables in the installation, and connect the shield to ground at one end only,
- Route signal cables at a distance of no less than 25 cm from power cables,
- Use power cables with an appropriate cross-section to minimize voltage drops,
- Apply EMI filters to the power supply of the converters,
- Do not power the converters from circuits that also supply devices generating high levels of impulse interference, such as relays, contactors, or frequency converters.

3.1. MOUNTING

The housing of the ADA-13028LMG converter is designed for mounting on a TS-35 (DIN35) rail.
To mount the device on the rail, first hook the upper part of the housing onto the TS-35 rail using the top latches. Then, press the lower part of the housing toward the rail and lock it in place by securing the bottom latch onto the rail.

ATTENTION!

The converter requires ventilation - air flow must be ensured at the installation site!.

3.2. ETHERNET NETWORK CONNECTION

For proper operation, the ADA-13028LMG must be connected to the ETHERNET network via a switch, hub, or directly to a computer's network interface card using a cable terminated with an RJ45 connector, plugged into the modular socket shown in Figure 2.
The wiring method for a straight-through cable used to connect the converter to a switch or hub is shown in the table below.

Table 1. Straight-through cable wiring for connecting the converter to a switch or hub

RJ45 Pin No.	Signal	Wire Color EIA/TIA 568B	Straight cable UTP 4x2x0,5	Wire Color EIA/TIA 568B	Signal	RJ45 Pin No.
1	TX+	White-Orange		White-Orange	TX+	1
2	TX-	Orange		Orange	TX-	2
3	RX+	White-Green		White-Green	RX+	3
4	Not used	Blue		Blue	Not used	4
5	Not used	White-Blue		White-Blue	Not used	5
6	RX-	Green		Green	RX-	6
7	Not used	White-Brown		White-Brown	Not used	7
8	Not used	Brown		Brown	Not used	8

The wiring method for a crossover cable used to connect the converter directly to a computer's network interface card or to another converter for point-to-point serial bridge operation is shown in the table below

Table 2. Crossover cable wiring for connecting the converter to a computer's network interface card or directly to another converter for point-to-point serial bridge operation

RJ45 Pin No.	Signal	Wire Color EIA/TIA 568B	Cross-Over Cable UTP 4x2x0,5	Wire Color EIA/TIA 568B	Signal	RJ45 Pin No.
1	TX+	White-Orange		White-Green	TX+	1
2	TX-	Orange		Green	TX-	2
3	RX+	White-Green		White-Orange	RX+	3
4	Not used.	Blue		Blue	Not used	4
5	Not used	White-Blue		White-Blue	Not used	5
6	RX-	Green		Orange	RX-	6
7	Not used	White-Brown		White-Brown	Not used	7
8	Not used	Brown		Brown	Not used	8

The modular ETHERNET interface socket of the converter includes two indicator LEDs (see Fig. 2):

- A **green ACT LED**, indicating data transmission or reception activity,
- An **orange LINK LED**, indicating an active network connection.

The ADA-13028LMG converter can operate in the ETHERNET network in the following modes:

- **Virtual serial port [RealPort]**,
- **TCP serial bridge**,
- **UDP serial bridge**,
- **MODBUS protocol converter**: MODBUS-TCP/UDP to MODBUS-RTU, MODBUS-SUNSPEC, MODBUS-ASCII (Modbus Gateway).

Detailed information on connecting to the ETHERNET network is provided in the following sections.

3.2.1. CONNECTING TO A PC NETWORK INTERFACE CARD

If a switch or hub is not available, the ADA-13028LMG converter can be connected directly to a computer's network interface card using a crossover cable, as shown in Figure 4. The cable specification is provided in Table 2. This type of connection can be used for configuring the converter.

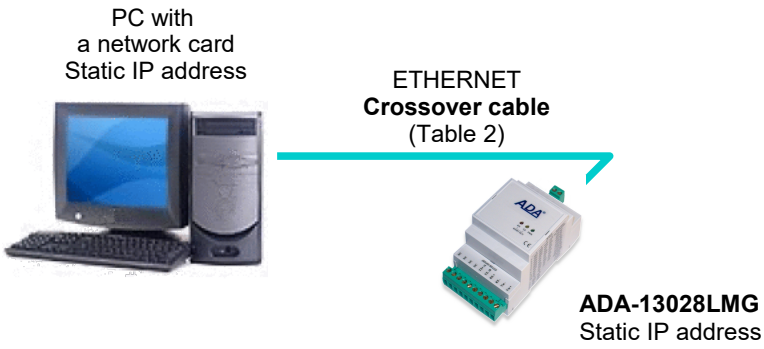

Fig. 4. Direct connection to the computer's network card.

3.2.2. CONNECTION FOR RealPort MODE OPERATION

Figure 4 (above) and Figures 5 and 6 (below) show how to correctly connect the ADA-13028LMG converter to a LAN, WAN, or PC in order to operate in virtual serial port mode (RealPort). When connecting the converter directly to the computer's network card, the connection should be made according to section 3.2.1. If the converter is connected to network devices such as switches or hubs, a straight-through cable as described in Table 1 must be used.

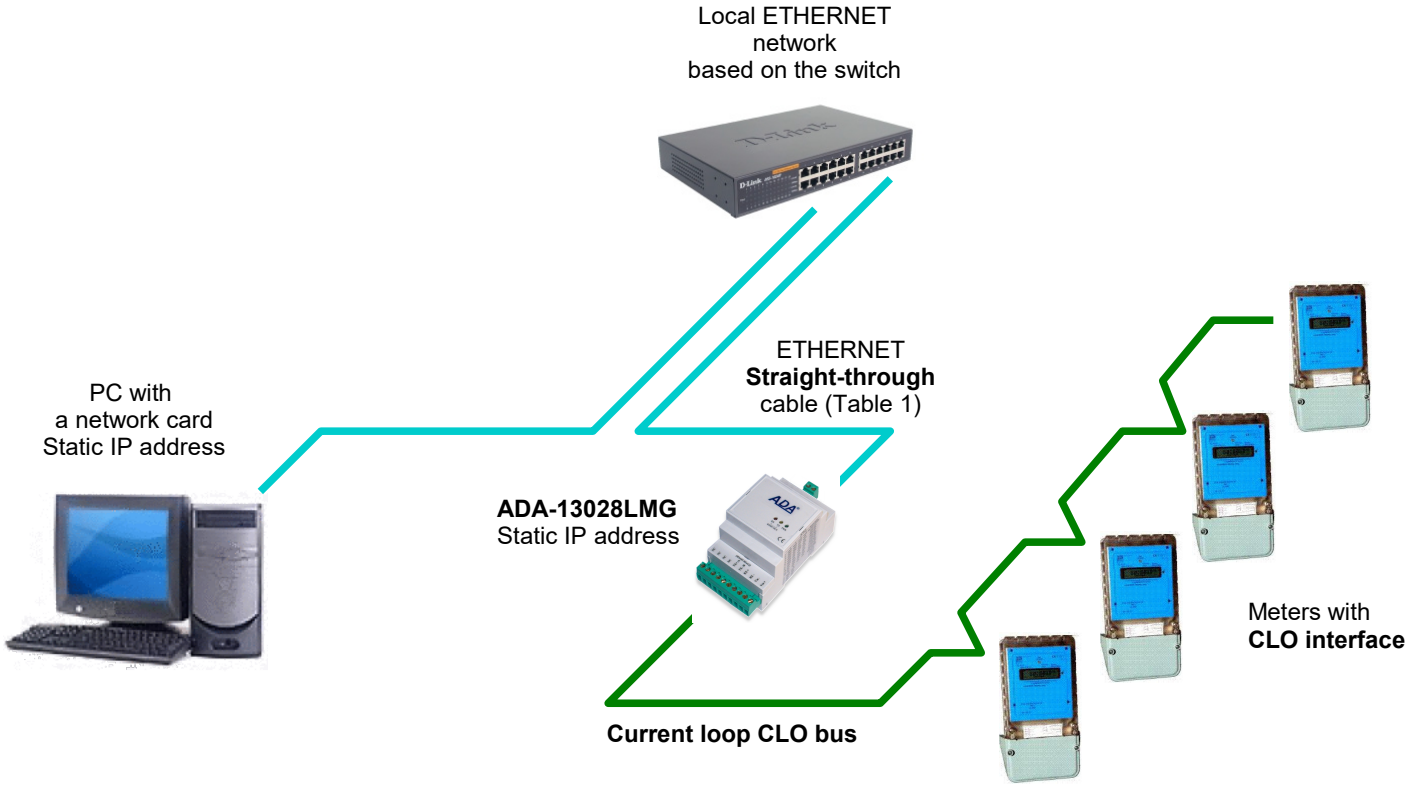

Fig. 5. Connection for RealPort mode operation via switch/hub for LAN network.

3.2.3. CONNECTION FOR TCP & UDP SERIAL BRIDGE MODE OPERATION

Figures 7 and 8 (below) show how to correctly connect the ADA-13028LMG converter to an ETHERNET network in order to operate in TCP and UDP serial bridge mode.
If the converters are connected to network devices such as switches or hubs, a straight-through cable as described in Table 1 must be used.

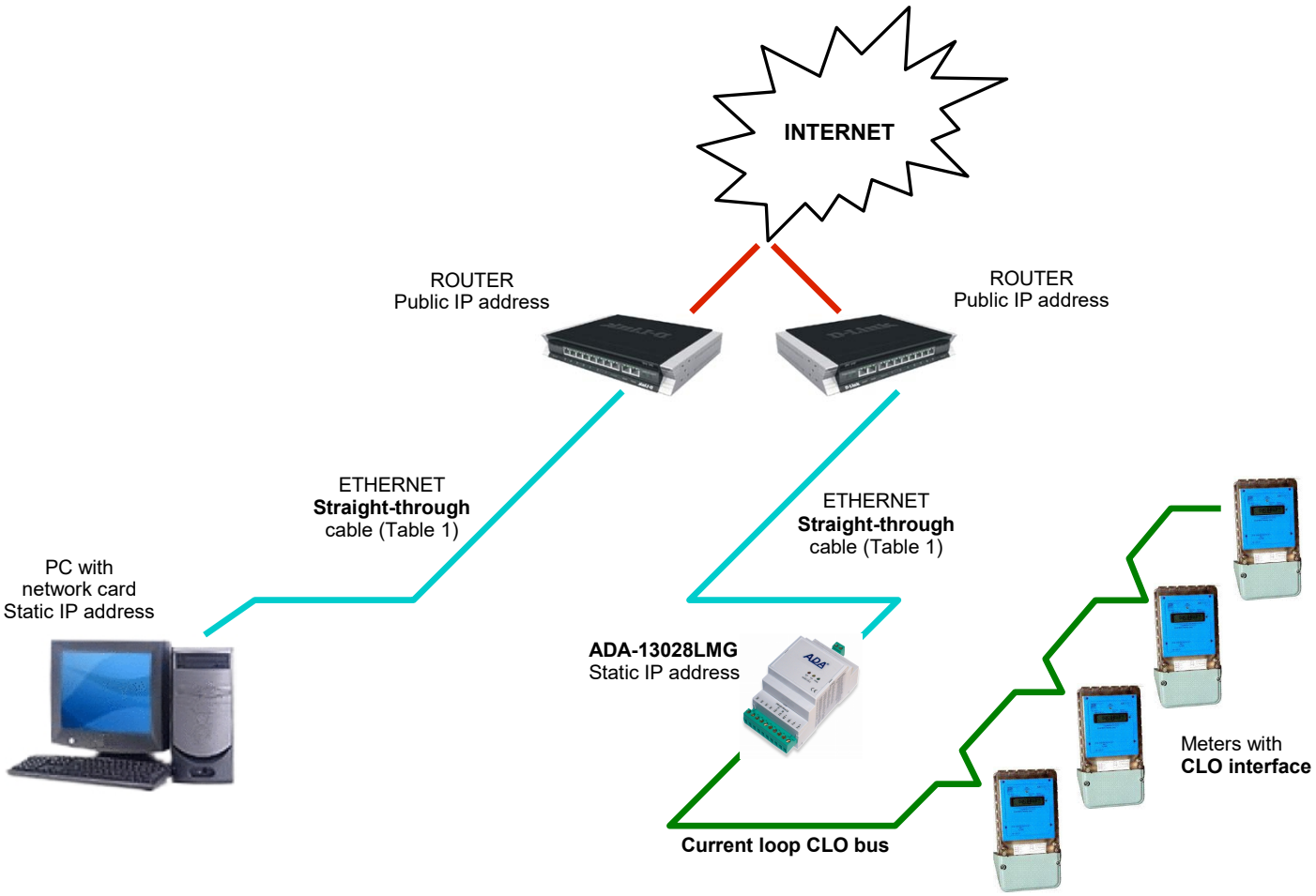

Fig. 6. Connection for RealPort mode operation for WAN network.

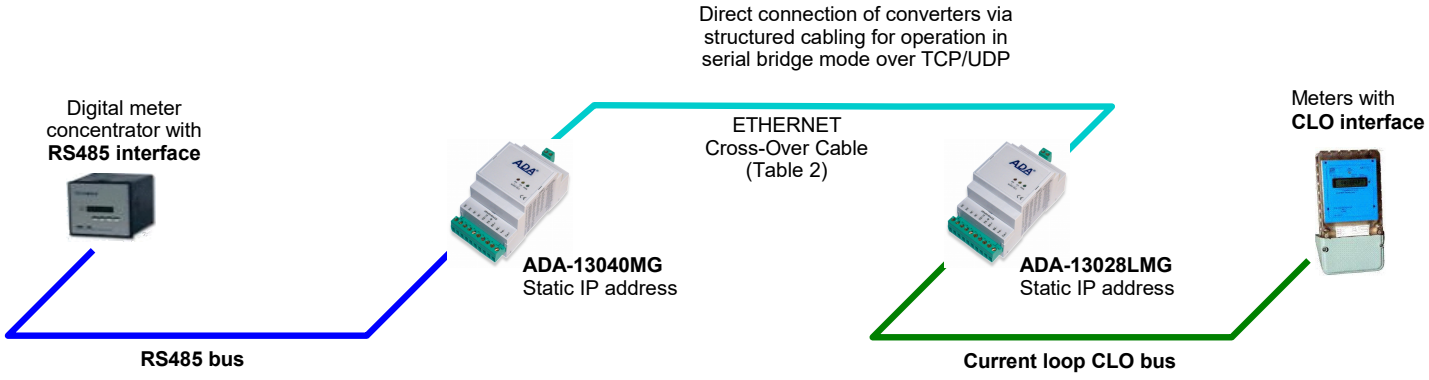

Fig. 7. Connection for TCP/UDP serial bridge mode one-to-one in a LAN network.

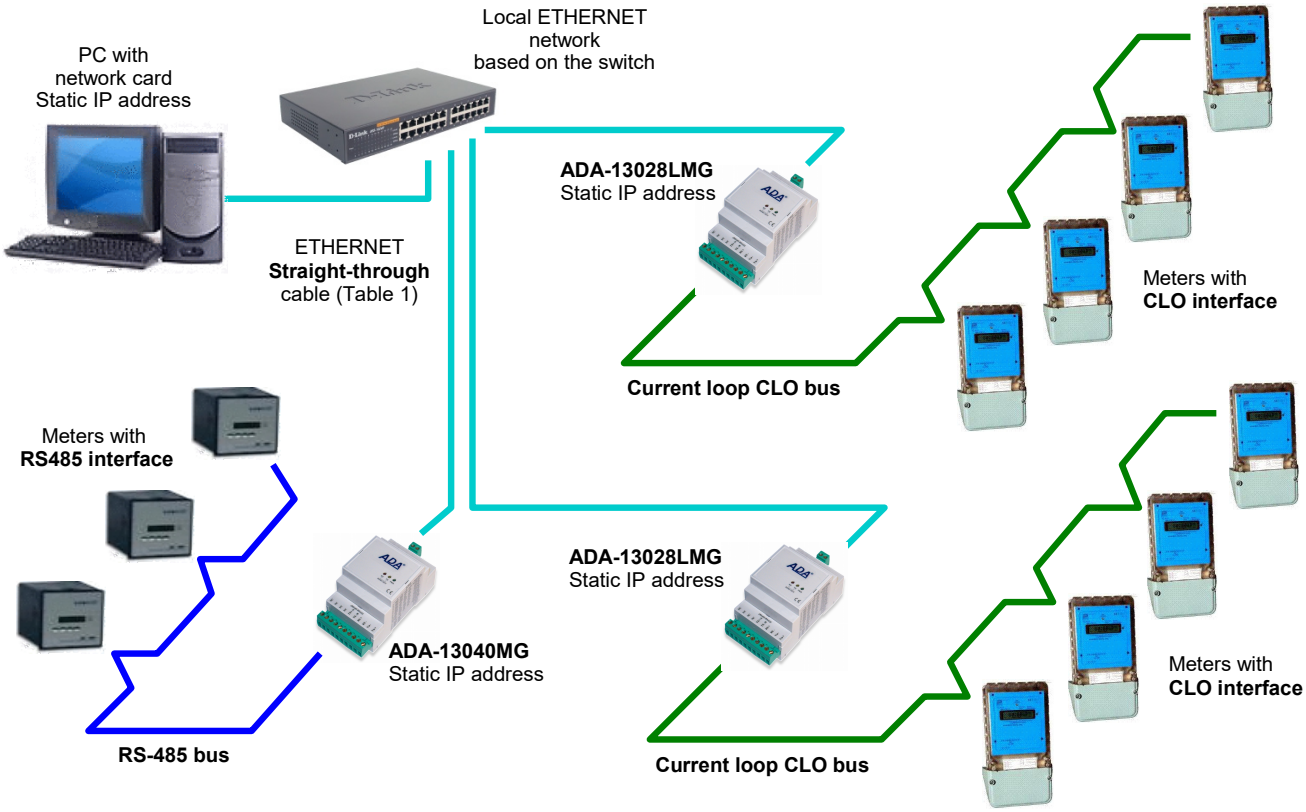

Fig. 8. Connection for UDP serial bridge mode one-to-many in a LAN network.

3.2.4. CONNECTION OF CONVERTERS AS MODBUS GATEWAY

Figure 9 shows how to connect ADA-13028LMG converters to an ETHERNET (LAN) network to operate in Industrial **Automation mode (MODBUS Gateway)**. The **MODBUS Gateway** mode allows the integration of MODBUS-TCP and MODBUS-RTU/ASCII devices into a single network.

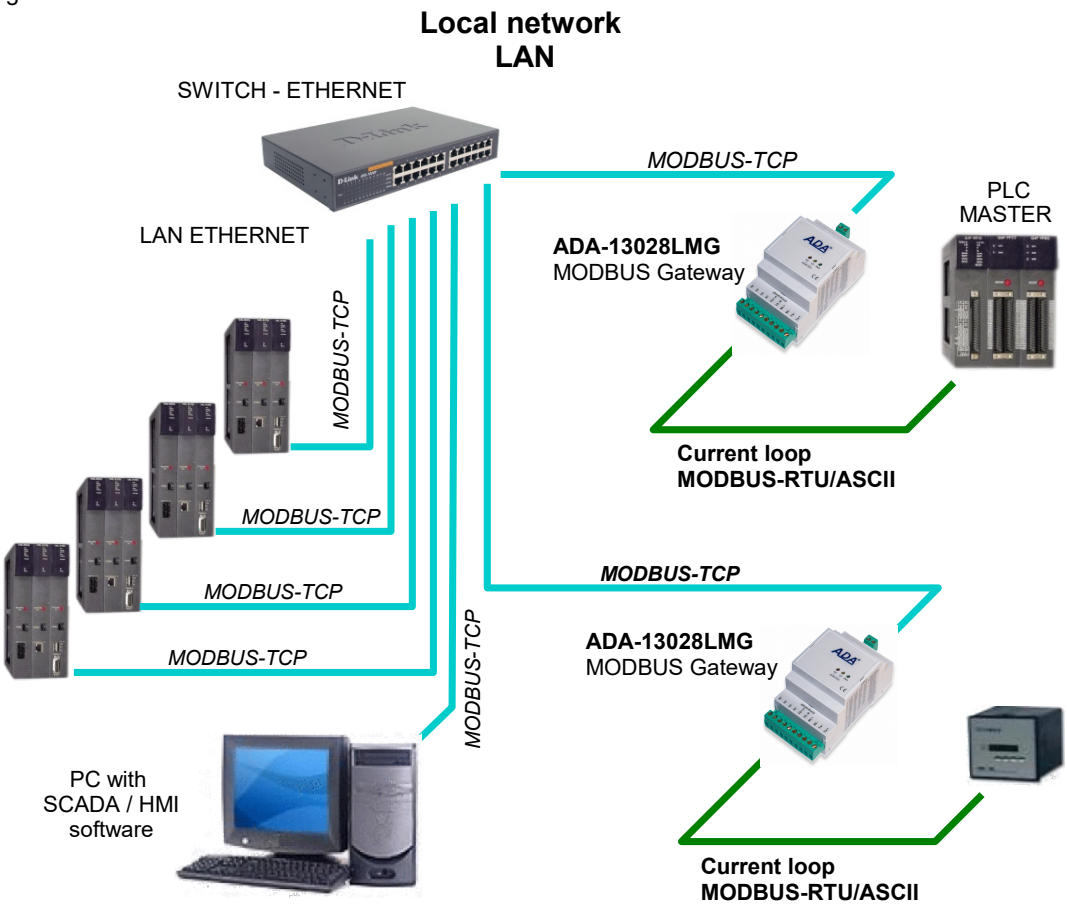

Fig. 9. Integration of MODBUS-TCP with MODBUS-RTU/ASCII into a single network using the ADA-13020MG with MODBUS Gateway

3.3. CONNECTION OF DEVICES WITH CURRENT LOOP (CLO) INTERFACE

The Current Loop (CLO) interface in the ADA-13028LMG converter is available on a terminal block with screw terminals labeled as follows: ***CLO+, CLO–, Rd***.
The Rd terminal is used to connect an additional resistor between the Rd – CLO+ terminals to set the sensitivity of the CLO loop receiver (see section 4.1).

3.3.1. CONNECTION OF DEVICES WITH PASSIVE CLO INTERFACE

Figure below shows how to connect devices with passive CLO interface to the converter.

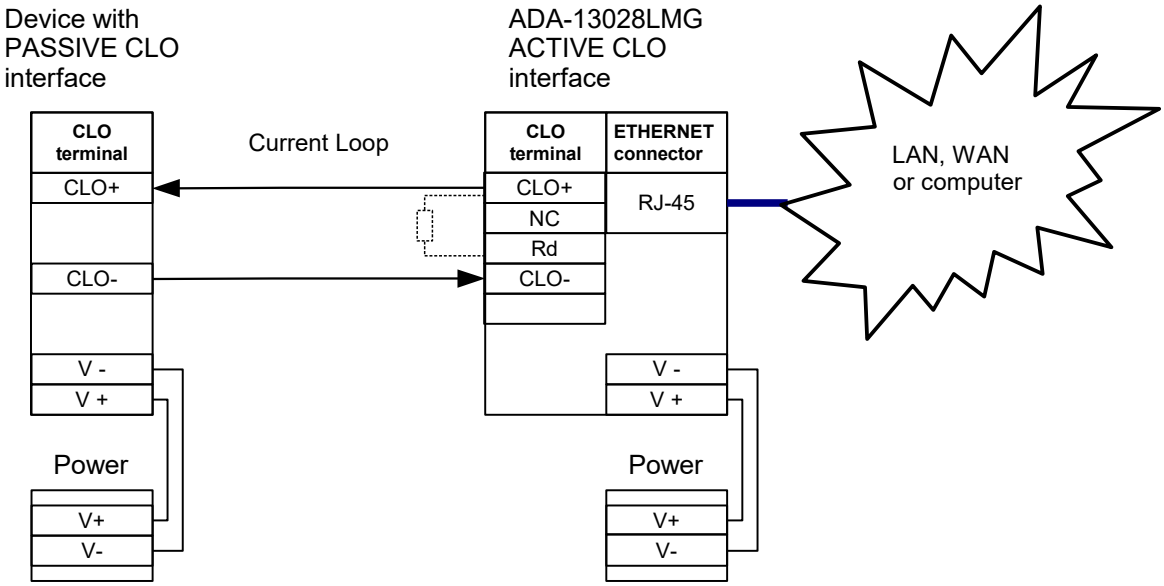

Fig. 10a. Example connection of a device with passive CLO interface to the ADA-13028LMG.

3.3.2. CONNECTION OF DEVICES WITH ACTIVE CLO INTERFACE

Figure below shows how to connect devices with active CLO interface to the converter.

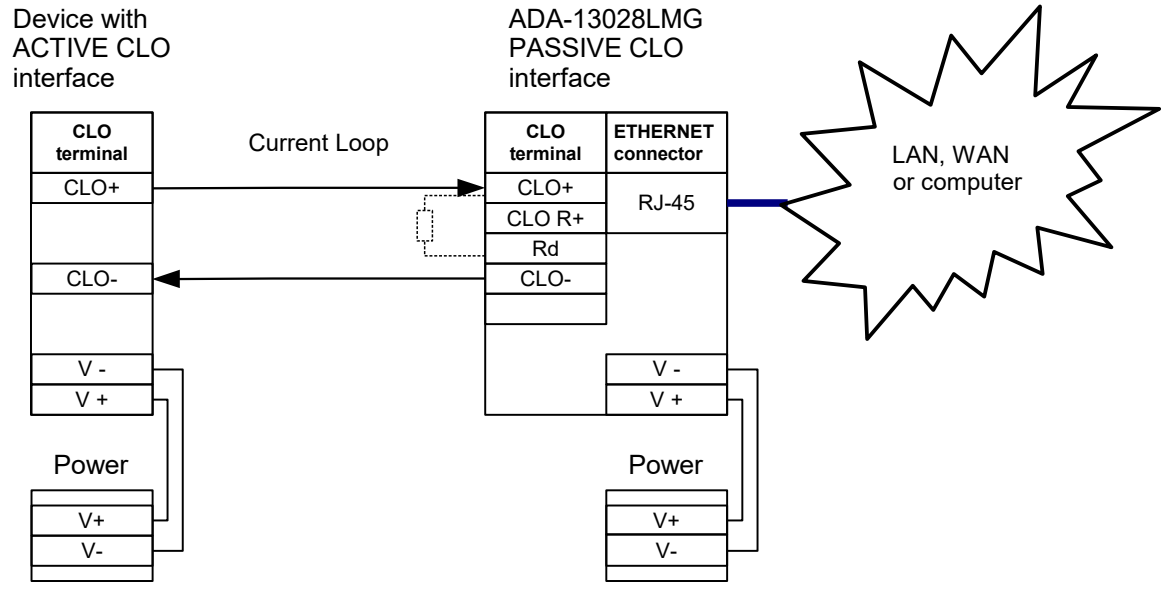

Fig. 10b. Example connection of a device with active CLO interface to the ADA-13028LMG.

3.3.3. CONNECTION OF AN ELECTRICITY METER WITH A CLO INTERFACE (IEC 62056-21)

Figure below shows how to connect an electricity meter with a CLO interface (IEC 62056-21) to ADA-13028LMG-1-1-1-A-2-3.

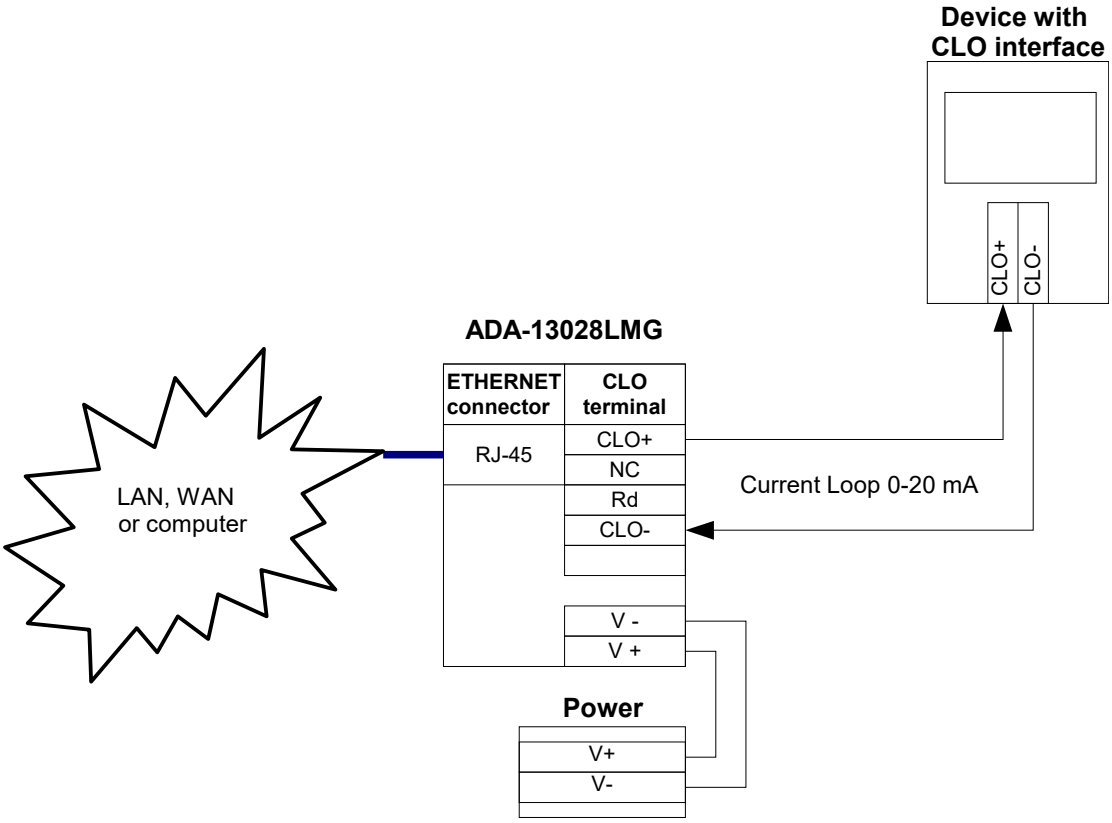

Fig. 10c. Example connection of an electricity meter with a CLO interface to ADA-13028LMG-1-1-1-A-2-3

3.3.4. CONNECTION OF FOUR ELECTRICITY METERS WITH A CLO INTERFACE (IEC 62056-21)

Figure below shows how to connect four electricity meters with a CLO interface (IEC 62056-21) to ADA-13028LMG-1-1-1-A-2-3.

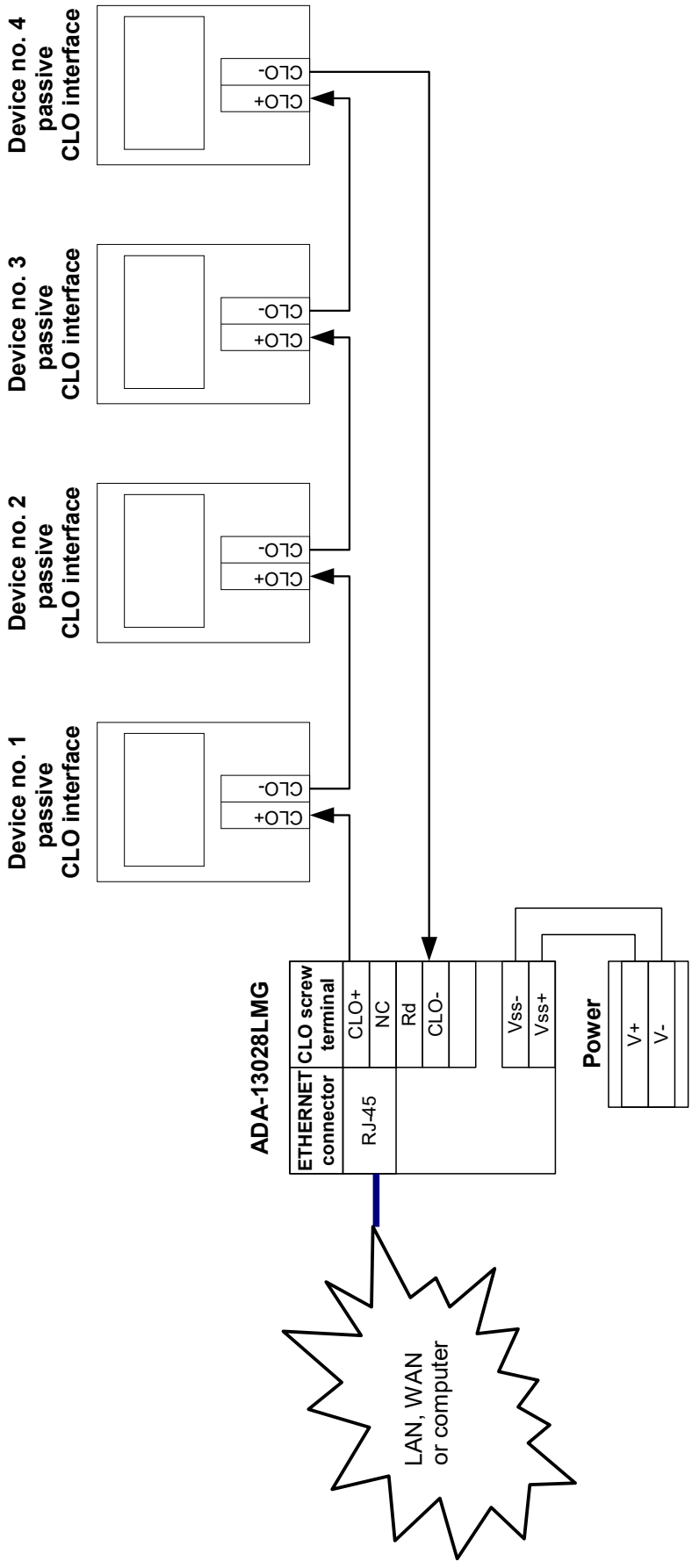

Fig. 10d. Example connection of four electricity meters with CLO interface (IEC 62056-21) to ADA-13028LMG-1-1-1-A-2-3

3.4. POWER SUPPLY CONNECTION

To connect power to the converter, use a regulated power supply with a voltage range from 10 VDC to 30 VDC and a power rating of 3W, e.g., HDR-15-24. The length of the power cable from the power supply to the device must not exceed 3 meters.
Connect V+ from the power supply to the V+ terminal, and V− to the V− terminal on the terminal block.
The ADA-13028LMG converter is protected against reverse polarity of the power supply voltage.

4. STARTUP

After correctly completing the installation according to the above instructions, power can be switched on.
If connected properly, the green PWR LED on the front panel of the converter should light up. If the LED does not light, check the polarity of the connected power supply. During data transmission through the converter, the RX and TX LEDs, as well as the LEDs on the RJ45 Ethernet interface connector, should blink. These LEDs indicate the following, respectively:

LED	***Description***
Current loop interface & power supply	
PWR	Power presence indication
RX	Data reception indication by the ADA-13028LMG converter from the CLO current loop port
TX	Data transmission indication from the ADA-13028LMG converter via the CLO current loop port
ETHERNET interface	
Yellow	Network link indicator
Green	Data transmission indication

4.1. SETTING THE CLO CURRENT LOOP RECEIVER SENSITIVITY

Devices with a passive CLO interface may have different current values in the logical zero state. Therefore, it is necessary to set the sensitivity of the receiver in the ADA-13028LMG converter. Incorrect sensitivity settings can be identified when the RX LED does not light up during data reception from the connected device (e.g. electricity meter), even though the converter is correctly connected. The receiver sensitivity is adjusted by connecting an additional resistor to terminals Rd – CLO+. When the correct resistor value is selected, the RX LED will blink while receiving data from the connected device (electricity meter). By default, the converter is supplied with the following resistors: Rd = **220Ω / 0,25W** and **120Ω / 0,25W**.

5. CONFIGURATION

For proper operation, the ADA-13028LMG converter, like other network devices, requires configuration of network settings and network services. The following steps will guide you through the installation of the software and configuration of the converter's network settings.

5.1. INITIAL CONFIGURATION USING ADAFinder SOFTWARE

5.1.1. ADAFINDER SOFTWARE INSTALLATION

Initial configuration of the ETHERNET network settings in the converter can be done using the ***ADAFinder*** or ***ADAWiz*** software, which should be download from website of the **ADA-13028LMG** converter (www.cel-mar.pl/en/ethernet_currentloop_clo_13028lmg.htm), tab ***Download***, and then extract software.zip file and run ADANetSetup.exe.
After installation, the ADAFinder and ADAWiz are available in: ***Start > Programs > CEL-MAR > ADANet***.

5.1.2. NETWORK SETTINGS CONFIGURATION

The ADAFinder is used to configure the converter's network settings.
Before launching ADAFinder, make sure to disable the Windows Firewall.
Once launched, the program scans the local network and, if the ADA-13028LMG is detected, it will appear in the list of available converters **[Device List]**, Fig. 11.
To change the network settings of the ADA-13028LMG converter:
- Select the converter from the **[Devices:]** and click **[Configure IP Settings]**.
- In the **[Set IP Address]** dialog box, choose: ***[Automatically obtain network settings via DHCP]*** (default setting) or ***[Manually configure network setting].*** For manual configuration, enter the converter's IP Address, Subnet Mask, Default Gateway, and the administrator password (default: dbps) to authorize the changes.
- Click **[Apply]** – the configuration will be saved, and the converter will restart. After the message "Operation made successfully" appears, click **[Refresh List]** in the main ADAFinder window. The program will re-scan the network and update the list of **[Devices:]**.

Other buttons in the main window of ADAFinder after selecting the converter from the list of **[Devices:]**:
- **[Reboot Device]** - restarts the converter to activate new network settings.
- **[Device Info]** - displays a window with information about the current converter settings.
- **[Open Web Interface]** - launches a web browser and opens the converter's configuration web page.

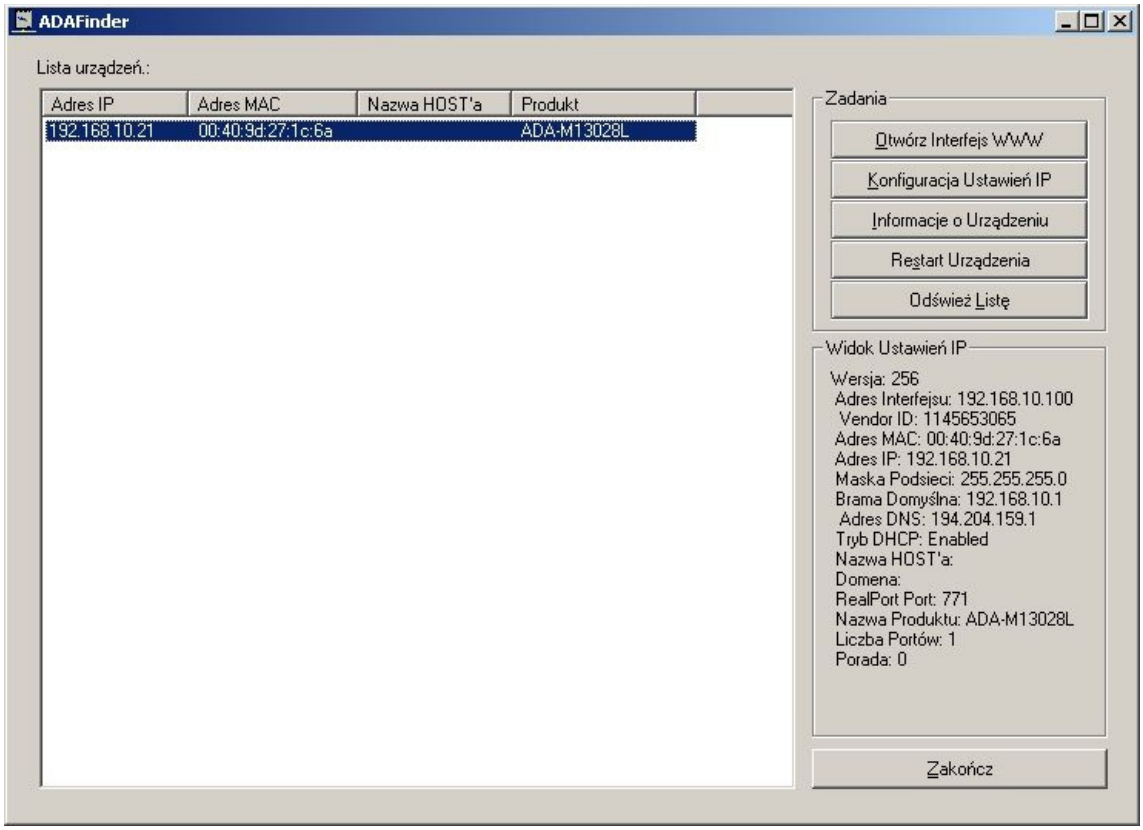

Fig. 11. Basic Network setup with ADAFinder

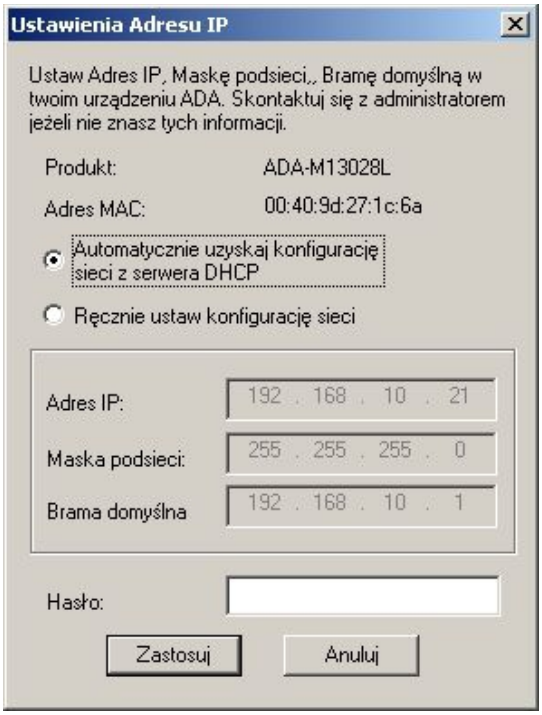

Fig. 12. IP address setup with ADAFinder

5.2. CONFIGURATION AND MANAGEMENT OF THE CONVERTER VIA WEB BROWSER

The built-in web server of the ADA-13028LMG converter allows convenient configuration and diagnostics of the device within both LAN and WAN networks using a web browser.
To configure the ADA-13028LMG converter, start by opening a web browser and entering the following address in the address bar: http://<converter-ip-address>/admin/administration.htm This will open the login page.
Enter the User name and Password as shown below:

User name: root

Password: unique password located on the converter's label

If the entered user name and password are correct, the configuration and management interface of the converter will appear, as shown in the figure below.

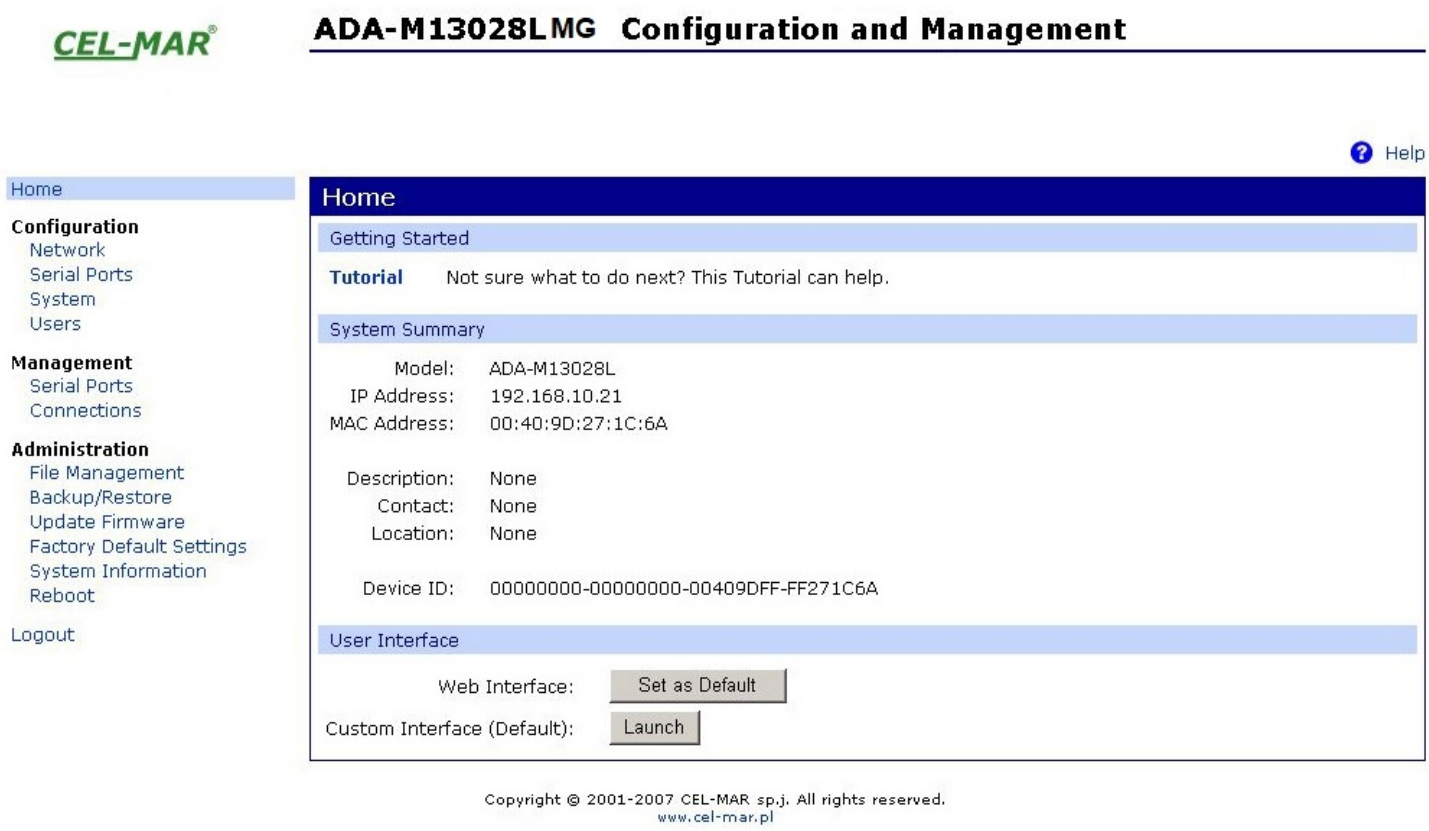

Fig. 13. Web Interface for Configuration and Management of the ADA-13028LMG Converter.

5.2.1. NETWORK CONFIGURATION

To change of default setting or new configuration of the ADA-13028LMG, select on left panel **Configuration -> Network** and then on right **[IP Settings]** (Fig.14) and make the selection: ***Obtain an IP address automatically using DHCP*** or ***Use the following IP address*** (in this option, enter I**P Address** of the converter, **Subnet Mask**, **Default Gateway**), press **[Apply]** for save. After the message **Changes have been saved successfully**, from left menu select **Administrator -> Reboot** on right press **[Reboot]**, will be programmable reset of the converter and new configuration of network setting will be activated.

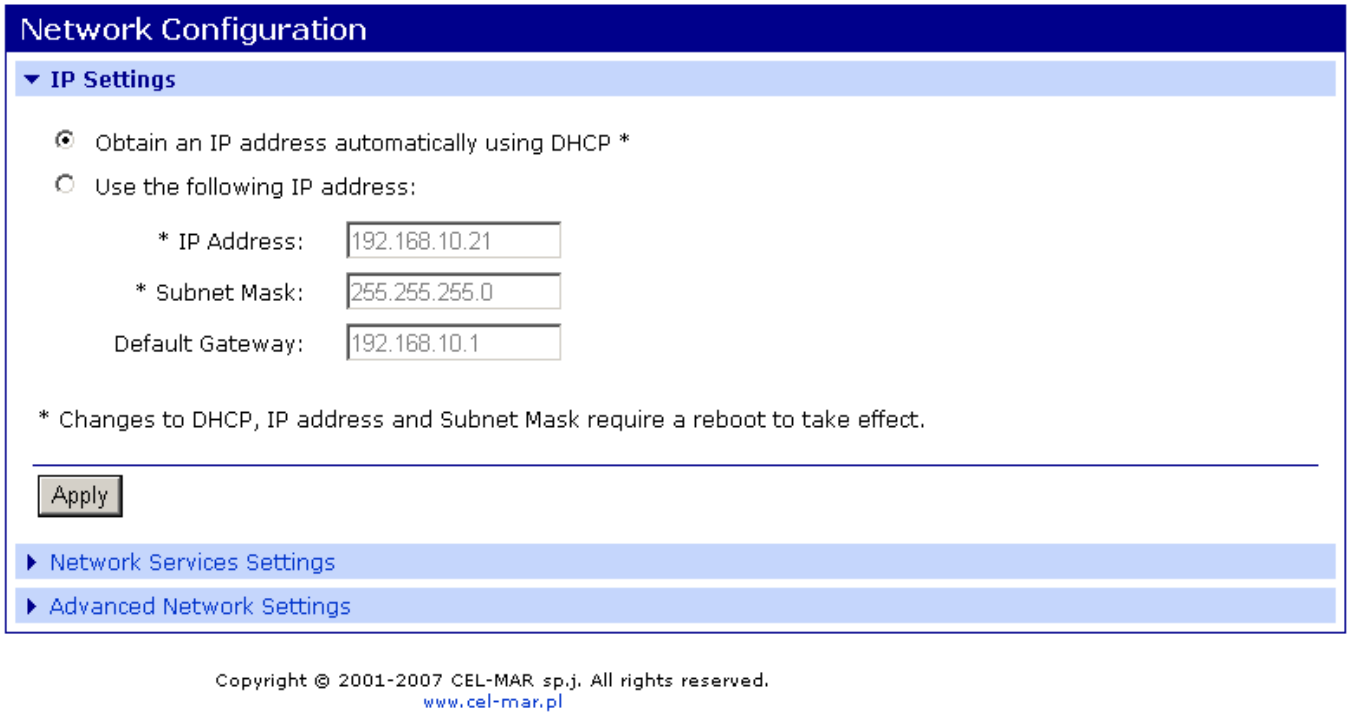

Fig. 14. The web page for network configuration of ADA-13028LMG

5.2.2. SERIAL PORT SETTINGS CONFIGURATION

Serial Port Configuration of the ADA-13028LMG Converter includes port description, port profile selection (i.e., operating mode), and serial communication parameters setup (baud rate, number of data bits, parity bit, and stop bits).
Select on left panel **Configuration -> Serial Ports** and then on a page **Serial Port Configuration** select **[Port 1]**, will open the configuration details page, includes:
– Port Profile Settings,
– Basic Serial Settings,
– Advanced Serial Settings.

5.2.2.1. SERIAL PORT PROFILE CONFIGURATION (OPERATING MODE)

Select on right panel **Serial Port Configuration -> Port Profile Settings** and then press **Change Profile...** will open the **Select Port Profile** page for selection of available port profiles (fig. 15).
The ADA-13028LMG operates properly in profiles as follows:
– RealPort,
– TCP Sockets,
– UDP Sockets,
– Serial Bridge,
– Industrial Automation (Modbus Gateway converts MODBUS-TCP/UDP protocol to MODBUS-RTU/ SUNSPEC/ ASCII protocol).
Configuration of profiles will be presented in next chapters.

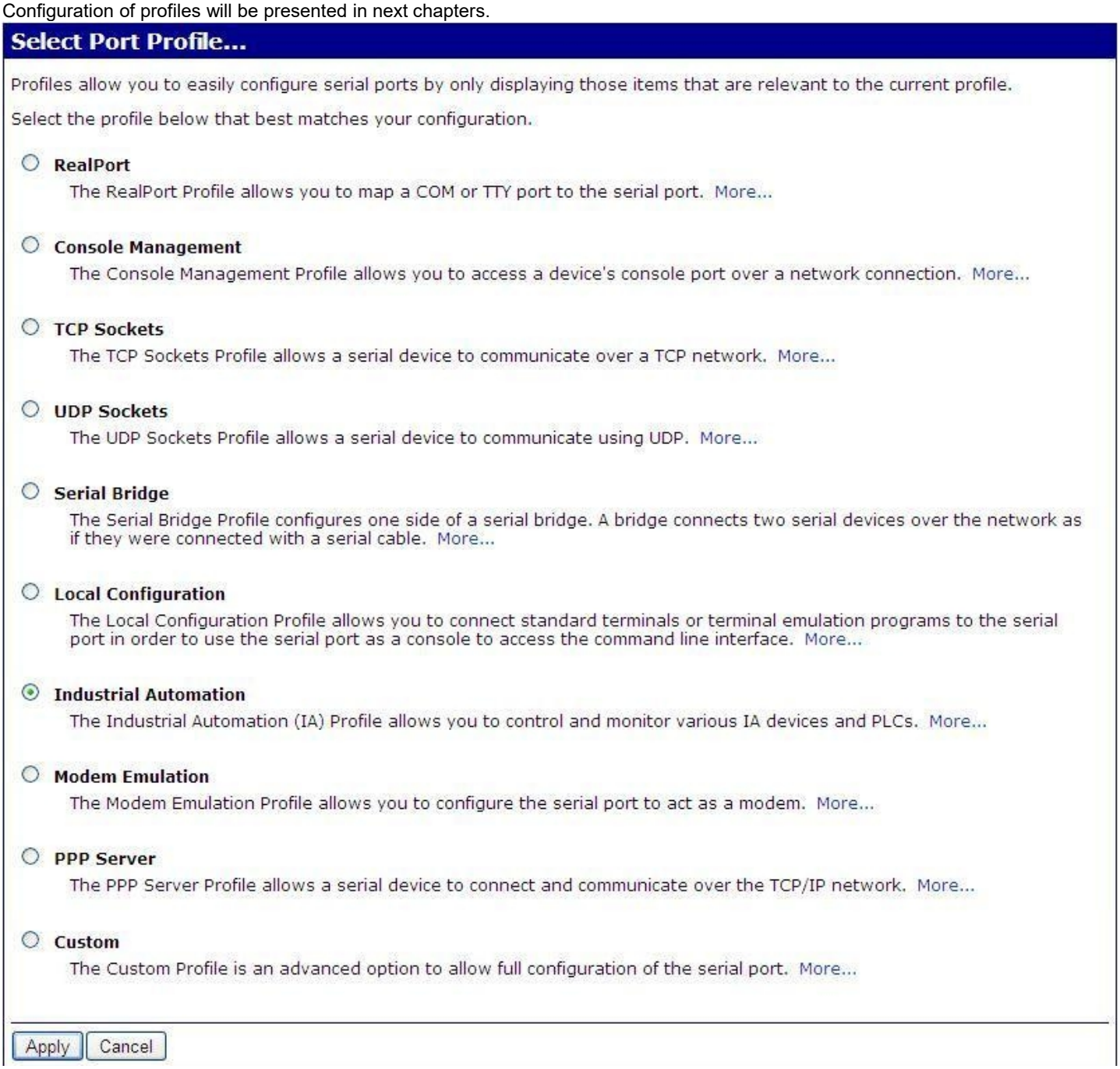

Fig. 15. The web page for Serial Port Profile selection

5.2.2.1.1. REALPORT (VIRTUAL PORT) PROFILE CONFIGURATION

By selecting **RealPort** profile (Virtual Port, Fig. 15) is configured the serial port of the ADA-13028LMG to communicate with virtual port COM of computer. Click **[Apply]** for saving. Once the RealPort driver for the virtual COM port is installed in the operating system (see section 6), any data sent by applications to that COM port will be transmitted over the LAN/WAN network to the ADA-13028LMG converter and output through its serial port. The RealPort driver installation is described in section 6.
By default, the RealPort service allows only one Ethernet connection between the computer and the converter. Connection attempts from other computers will be rejected and an error message will be displayed.

5.2.2.1.2. TCP SOCKETS PROFILE CONFIGURATION

By selecting the TCP Sockets profile is configured the serial port of the ADA-13028LMG converter for direct communication with a PC using TCP sockets. Data sent to the TCP socket by applications is transmitted over the LAN/WAN to the ADA-13028LMG converter and output through its serial port. To save the selected configuration, click **[Apply]** button.

5.2.2.1.2.1. TCP SERVER & CLIENT CONFIGURATION

After saving the profile configuration, in the **TCP Server Settings** section, configure the TCP server operation parameters — for example, as shown in the figure below — by enabling the appropriate services and specifying the ports on which they operate. Additionally, there is the possibility of selectig the **Enable TCP Keep Alive** option, which ensures that the connection remains active even when no data is being transmitted over the network.

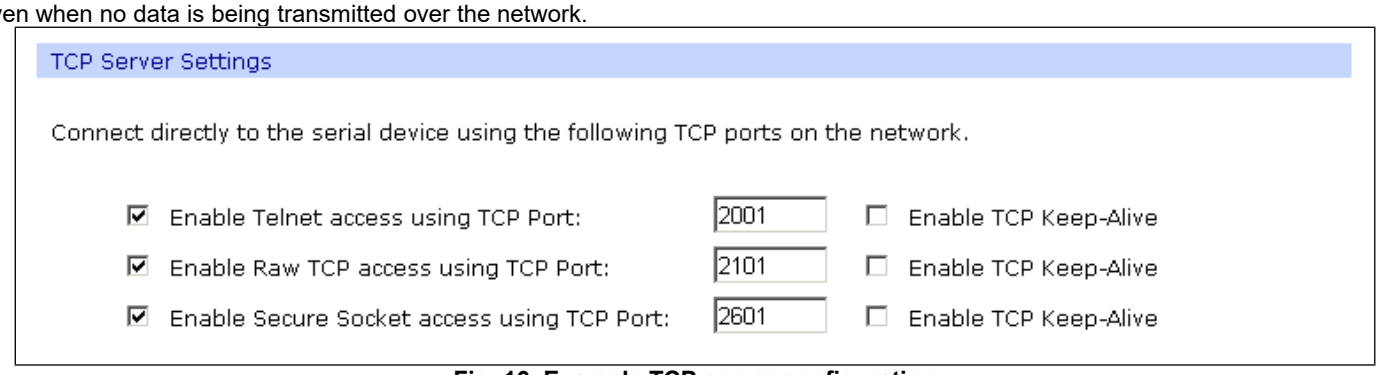

Fig. 16. Example TCP server configuration

To configure the **TCP Client Settings** (Figure 17), select ***Automatically establish TCP connections***, which means that the connection between the TCP client and server will be established automatically. Next, choose the option ***Always connect and maintain connection***, and in the section **Establish connection to the following network service**, enter the IP address of the device to which the TCP client should send data, the service, and the port number. There is also possible to select an option ***Enable TCP Keep Alive***, which means the connection will be maintained even if no data is being transmitted over the network.
To save the configuration of the TCP client & TCP server, click the **[Apply]** button.

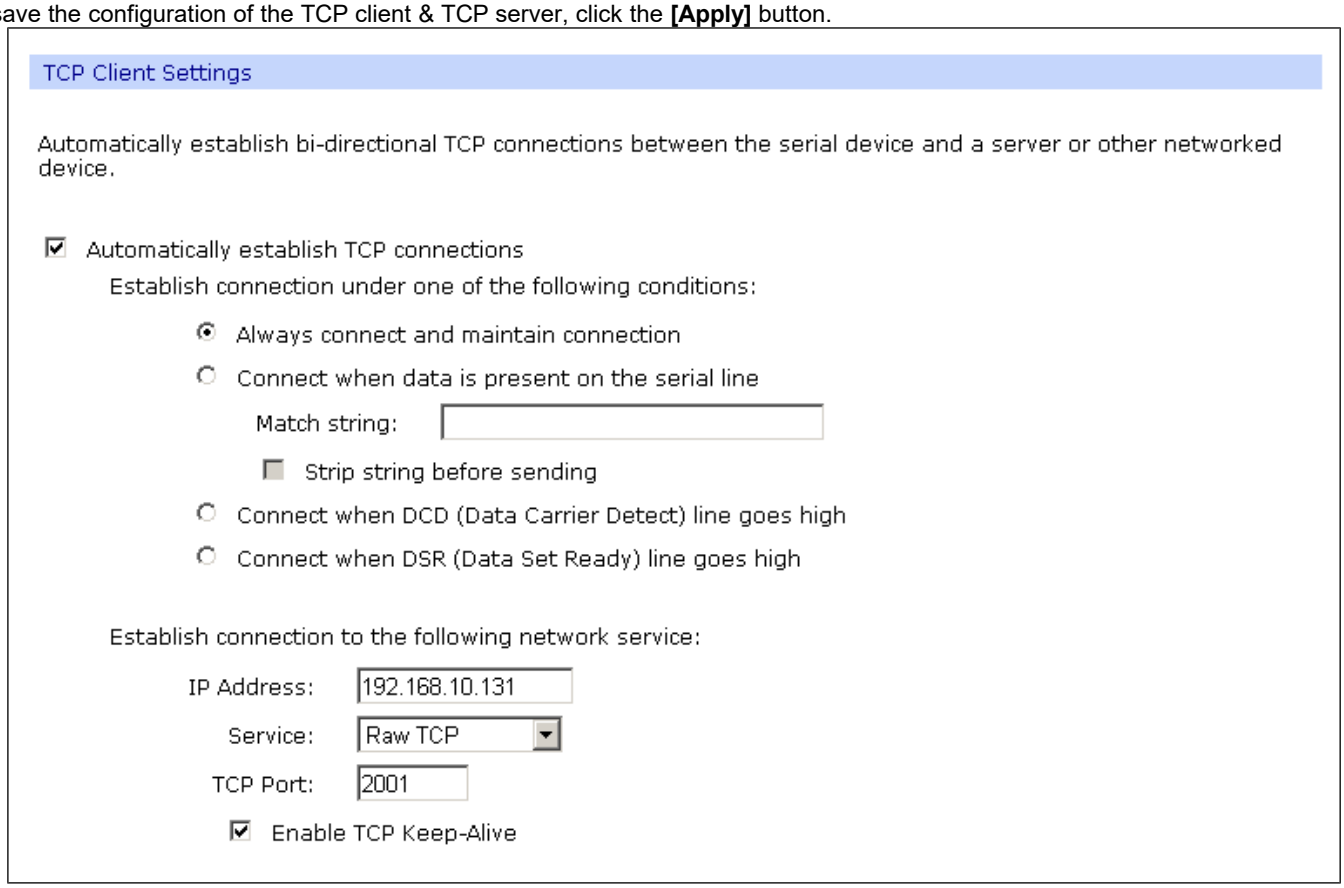

Fig. 17. TCP client configuration

ATTENTION !
Default port for serial port service is 2101.
If there is a conflict on the local network with another network service using the same port, change the port number in the converter's configuration to a different one for both the server and client services.

5.2.2.1.2.2. 'ENABLE TCP KEEP-ALIVE' OPTION CONFIGURATION

The **Enable TCP Keep-Alive** option allows the connection between the server and client to be maintained even if no data is transmitted over the network, as well as to re-establish the connection if it is interrupted.
The configuration of this option is performed in the section **Configuration > Network > Advanced Network Settings > TCP Keep-Alive Settings**, where the following parameters are set:
– **Idle Time** – set in hours/minutes/seconds (range: 10 sec – 24 hrs), after which the converter will start attempting to re-establish the connection,
– **Probe Interval** – interval between connection attempts in seconds (range: 10 – 75 sec),
– **Probe Count** – number of connection attempts (range: 5 – 30 attempts).

5.2.2.1.2.3. SERIAL PORT TRANSMISSION PARAMETERS CONFIGURATION

For proper operation of the ADA-13028LMG with a device connected to its serial port (Current Loop), the same transmission parameters must be set on both devices. Select **Basic Serial Settings** tab and fill in the fields: **Baud Rate, Data Bits, Parity, Stop Bits, -** with values that match the transmission settings of the device connected to the converter's serial port.

5.2.2.1.3. UDP SOCKETS PROFILE CONFIGURATION

By selecting the **UDP Sockets** profile, the serial port of the ADA-13028LMG converter is configured for direct communication with a PC or other devices connected to the network via UDP sockets. Data sent to the UDP socket by an application or another device is transmitted over the LAN/WAN network to the ADA-13028LMG converter and output through its serial port. To save the selected configuration, click the **[Apply]** button.

5.2.2.1.3.1. UDP SERVER & CLIENT CONFIGURATION IN THE CONVERTER CONNECTED TO A MASTER DEVICE

After saving the profile configuration, go to the **UDP Server Settings** section to set the operating parameters of the UDP server, e.g., as shown in the figure below. Enable access to the UDP server, for example, on port 2101. Then, in the **UDP Client Settings**, select **Automatically send serial data**, which means that data received by the converter's serial port will be automatically sent via the UDP client service to SLAVE devices connected to the LAN/WAN network through converters such as ADA-13020MG, ADA-13021MG, ADA-13028LMG, ADA-13040MG, ADA-13110MG.
The IP addresses and ports of the target network devices are specified in the **Send data to the following network services** list. In the fields:
– **Description** – enter, e.g. the location of the converter and the SLAVE device,
– **Send To** – enter the IP address of the converter connected to the SLAVE device,
– **UDP Port** – enter the UDP Server port of the converter connected to the SLAVE device, then click the **[Add]** button.
The conditions for sending data are defined in the **Send data under any of the following conditions** section. The default settings, as shown in the figure below, are recommended. To save the configuration of the UDP server and client for the MASTER device, click the **[Apply]** button.

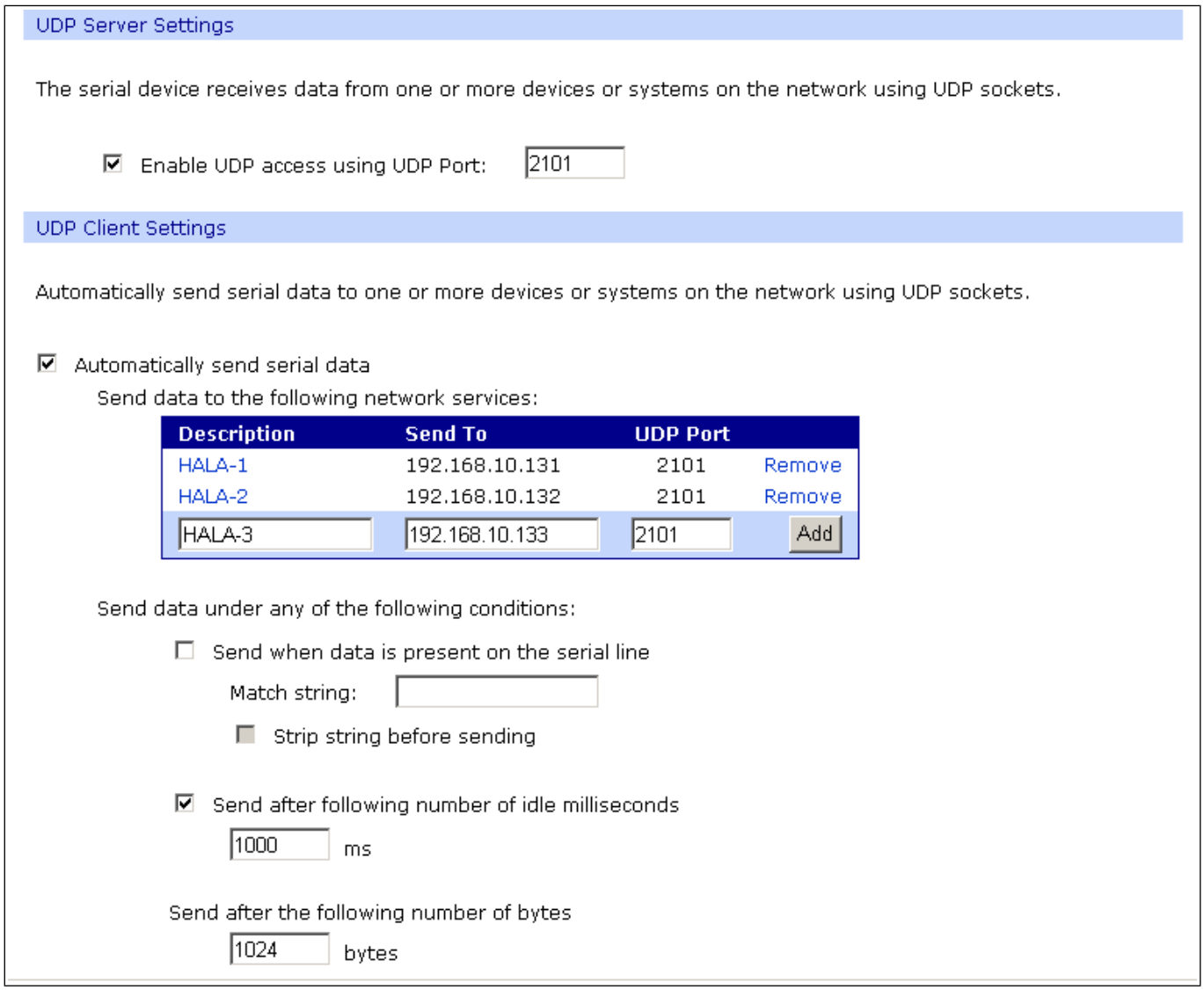

Fig. 18. UDP server & client configuration in the converter connected to a MASTER device

5.2.2.1.3.2. UDP SERVER & CLIENT CONFIGURATION IN THE CONVERTER CONNECTED TO A SLAVE DEVICE

In the converter connected to the SLAVE device, the UDP server operating parameters are set, e.g. as shown in the figure below. Enable access to the UDP server, for example, on port 2101. Then, in the **UDP Client Settings**, select **Automatically send serial data**, which means that data received by the converter's serial port will be automatically sent via the UDP client service to MASTER devices connected to the LAN/WAN network through converters such as ADA-13020MG, ADA-13021MG, ADA-13028LMG, ADA-13040MG, ADA-13110MG.
The IP addresses and ports of the target network devices are specified in the **Send data to the following network services** list. In the fields:
– **Description** – enter, e.g. the location of the converter and the MASTER device,
– **Send To** – enter the IP address of the converter connected to the MASTER device,
– **UDP Port** – enter the UDP Server port of the converter connected to the MASTER device, then click the **[Add]** button.
The conditions for sending data are defined in the **Send data under any of the following conditions** section. The default settings, as shown in the figure below, are recommended. To save the configuration of the UDP server and client for the SLAVE device, click the **[Apply]** button.

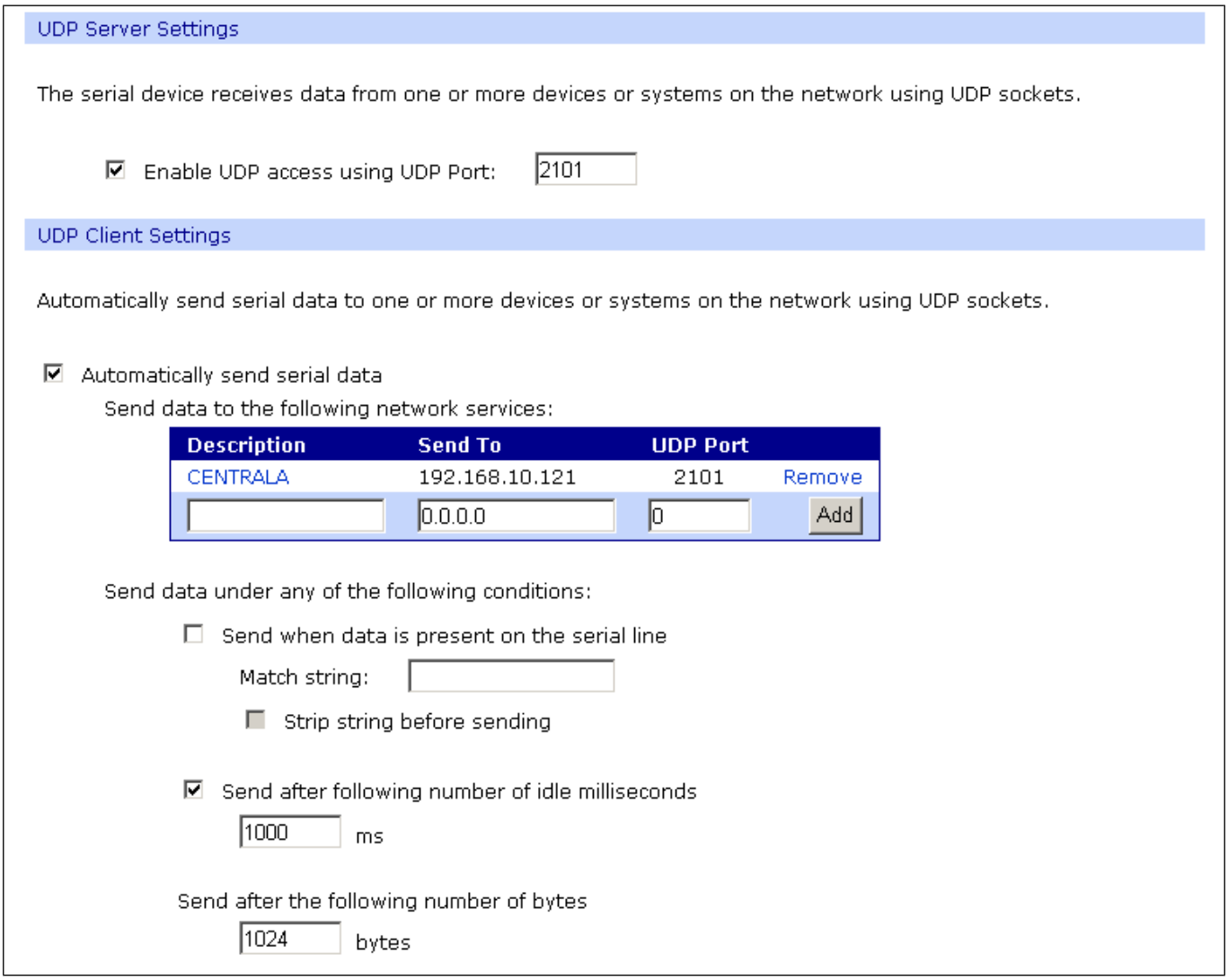

Fig. 19. UDP server & client configuration in the converter connected to a SLAVE device

ATTENTION !
Default port for serial port service is 2101.
If there is a conflict on the local network with another network service using the same port, change the port number in the converter's configuration to a different one for both the server and client services.

5.2.2.1.3.3. SERIAL PORT TRANSMISSION PARAMETERS CONFIGURATION

For proper operation of the ADA-13028LMG with a device connected to its serial port (Current Loop), the same transmission parameters must be set on both devices. Select **Basic Serial Settings** tab and fill in the fields: Baud Rate, Data Bits, Parity, Stop Bits, - with values that match the transmission settings of the device connected to the converter's serial port.

5.2.2.1.4. SERIAL BRIDGE PROFILE CONFIGURATION

By selecting Serial Bridge profile, we enable two devices connected to ADA-13028LMG converters to exchange data over a LAN/WAN network. Properly configured converters automatically establish communication with each other. To save the selected configuration, click the **[Apply]** button.
To configure the serial bridge (Fig. 20), in the **Serial Bridge Settings** section, select the option **Initiate serial bridge to the following device**, and enter the IP address and port 2101 of the converter to which the serial bridge should be established over the network. It is also possible to select the option **Enable TCP Keep-Alive**, which means the connection will be maintained even if no data is being transmitted. Additionally, select the option **Allow other devices to initiate serial bridge**, then specify port 2101, on which another converter will automatically establish the connection. It is also possible to select the option **Enable TCP Keep-Alive** here, meaning the connection will be maintained even without data being sent over the network.

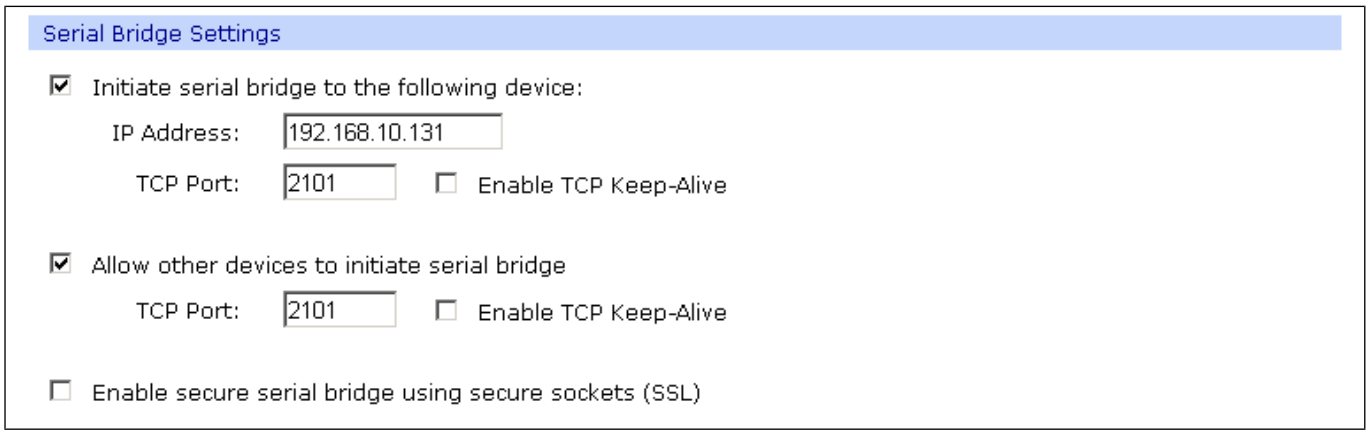

Fig. 20. TCP Serial Bridge configuration

ATTENTION !
Default port for serial port service is 2101.
If there is a conflict on the local network with another network service using the same port, change the port number in the converter's configuration to a different one for both the server and client services.

5.2.2.1.4.1. SERIAL PORT TRANSMISSION PARAMETERS CONFIGURATION

For proper operation of the ADA-13028LMG with a device connected to its serial port (Current Loop), the same transmission parameters must be set on both devices. Select **Basic Serial Settings** tab and fill in the fields: Baud Rate, Data Bits, Parity, Stop Bits, - with values that match the transmission settings of the device connected to the converter's serial port.

5.2.2.1.5. INDUSTRIAL AUTOMATION (Modbus Gateway) PROFILE CONFIGURATION

By selecting the **Industrial Automation** (Modbus Gateway, Fig.16), the serial port of the ADA-13028LMG converter is configured for communication using the MODBUS-RTU master/slave or MODBUS-ASCII master/slave protocol with connected devices.
The ADA-13028LMG converts MODBUS-RTU/ASCII protocol frames into MODBUS-TCP protocol frames and transmits them over a WLAN/LAN/WAN network to devices with the MODBUS-TCP protocol implemented, or to converters such as ADA-13021MG, ADA-13110MG, and ADA-13040MG operating in **Industrial Automation** (MODBUS Gateway) mode, to which devices using MODBUS-RTU/ASCII are connected. To save the selected configuration, click the **[Apply]** button.

5.2.2.1.5.1. CONFIGURATION FOR COMMUNICATION WITH A MODBUS-MASTER TYPE DEVICE (CLO)

After saving the profile configuration in the **Industrial Automation Settings** section, click the **[Change Protocol]** link.
Next, in **Select IA Protocol** (see figure below), select the type of device connected to the serial port of the ADA-13028LMG converter as **Serial Master**, and choose the MODBUS-RTU or MODBUS-ASCII protocol used by the connected devices.
To save the configuration, click the **[Apply]** button.

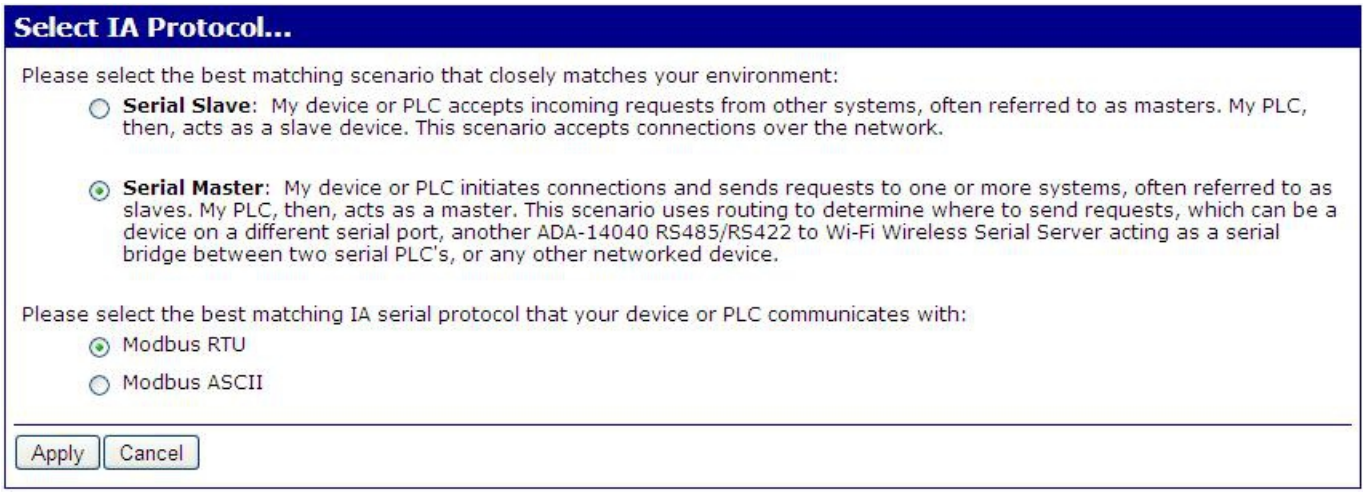

Fig. 21. Example configuration of the converter for communication with a MODBUS-MASTER device – selecting device type and protocol

In the **Modbus RTU Settings** section, configure the options as shown in the figure below.
Click the **[Apply]** button.

Fig. 22. Example configuration of the converter for communication with a MODBUS-MASTER device – Modbus RTU settings

Proceed to the **Slave Destinations (Packet Routing)** section (figure below).
In this section, click the **[Add]** button to add to the table the IP addresses of **Slave-type** devices to which the **Master** will send requests and receive responses.

Fig. 23. Example configuration of the converter for communication with a MODBUS-MASTER device – Slave devices table configuration

On the **Destination Settings** page (below), define the options for forwarding **Master** device queries to **Slave** devices by filling in the fields:
- Host name - enter the IP address of the **Slave** device(s).
- Protocol - specify the protocol to be forwarded to the **Slave** device; in this case, it is Modbus/TCP.
- Transport - specify the protocol as TCP.
- Network port - set the port to 502.
To save the **Destination Settings** configuration, click the **[Apply]** button.
Then, on the **Slave Destinations (Packet Routing)** page, after entering all **Slave** device locations, save the settings again by clicking the **[Apply]** button.

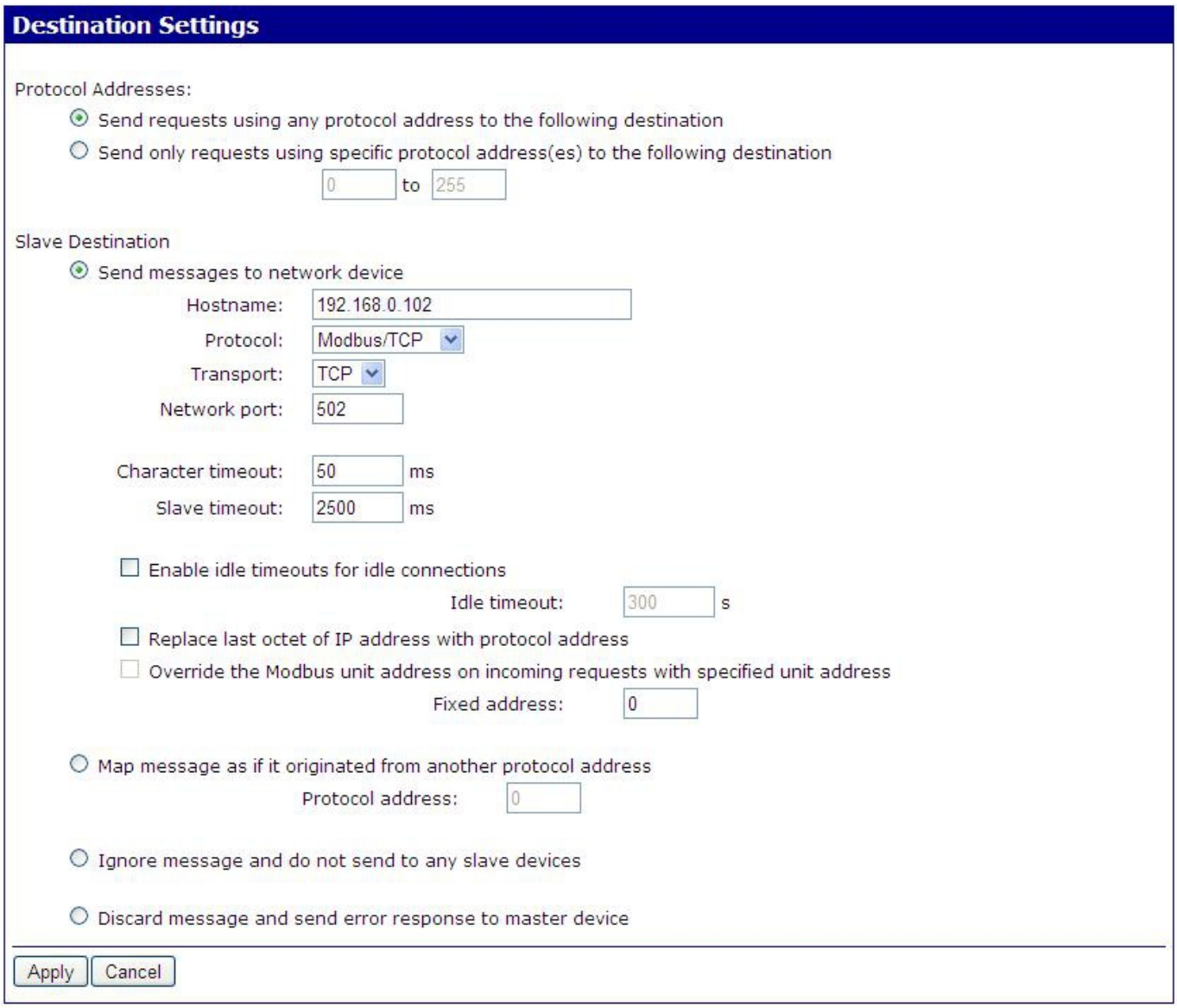

Fig. 24. Example configuration of the converter for communication with a MODBUS-MASTER device – table entry configuration for a SLAVE-type device.

On the **Advanced Protocol Settings** page (see below), define the timeout values by filling in the following fields:
- Character timeout – specify in [ms] the maximum gap between frame bytes, typically 20 ms.
- Message timeout – specify in [ms] the maximum gap between frames, typically 2500 ms – this time must be shorter than the Timeout value configured in MODBUS-RTU SLAVE and MASTER devices.
To save the **Advanced Protocol Settings** configuration, press the **[Apply]** button.

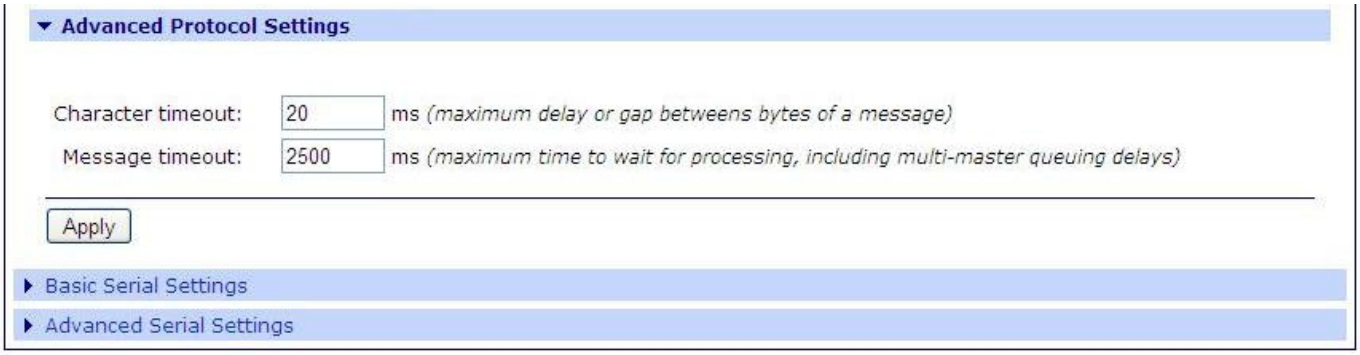

Fig. 25. Example configuration of the converter for communication with a MODBUS-MASTER device – timeout parameters configuration for a MASTER-type device.

5.2.2.1.5.2. CONFIGURATION OF THE CONVERTER FOR COMMUNICATION WITH A MODBUS-SLAVE CLO DEVICE

After saving the profile configuration in the **Industrial Automation Settings** section, click the **[Change Protocol]** link.
Then, in **Select IA Protocol** (see figure below), select the type of device connected to the serial port of the ADA-13028LMG converter as **Serial Slave** and choose either MODBUS-RTU or MODBUS-ASCII, depending on the communication protocol of the connected devices.
To save the configuration, press the **[Apply]** button.

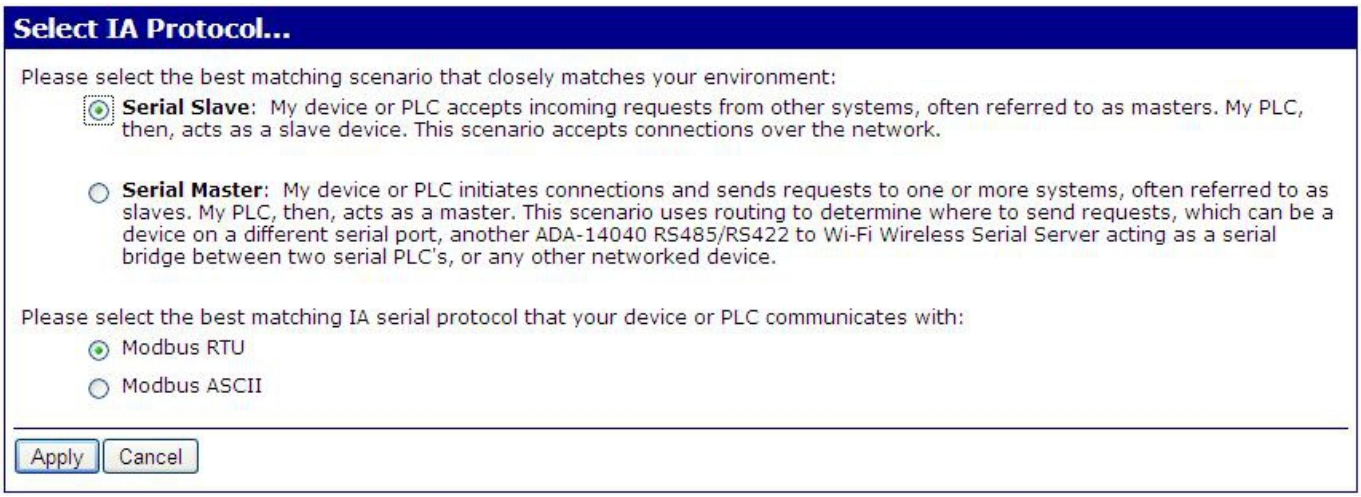

Fig. 26. Example configuration of the converter for communication with a MODBUS-SLAVE device – device type and protocol selection.

In the **[Modbus RTU Settings]** section, configure the options as shown in the example figure below.
Press the **[Apply]** button.

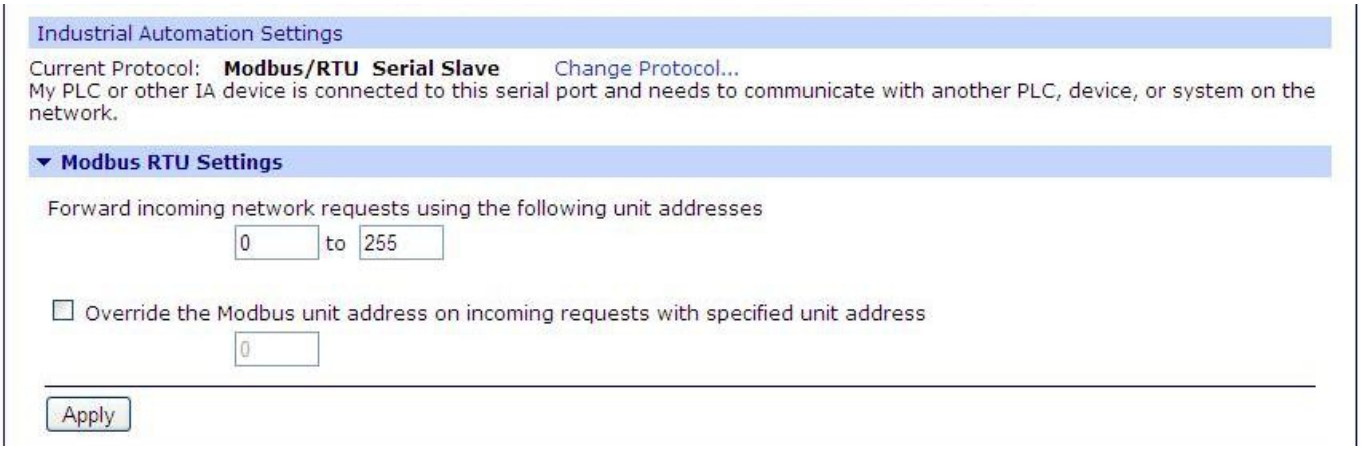

Fig. 27. Example configuration of the converter for communication with a MODBUS-SLAVE device – Modbus RTU settings.

Go to the **Modbus/TCP Network Settings [Global]** section and configure the options as shown in the figure below.
To save the configuration, press the **[Apply]** button.

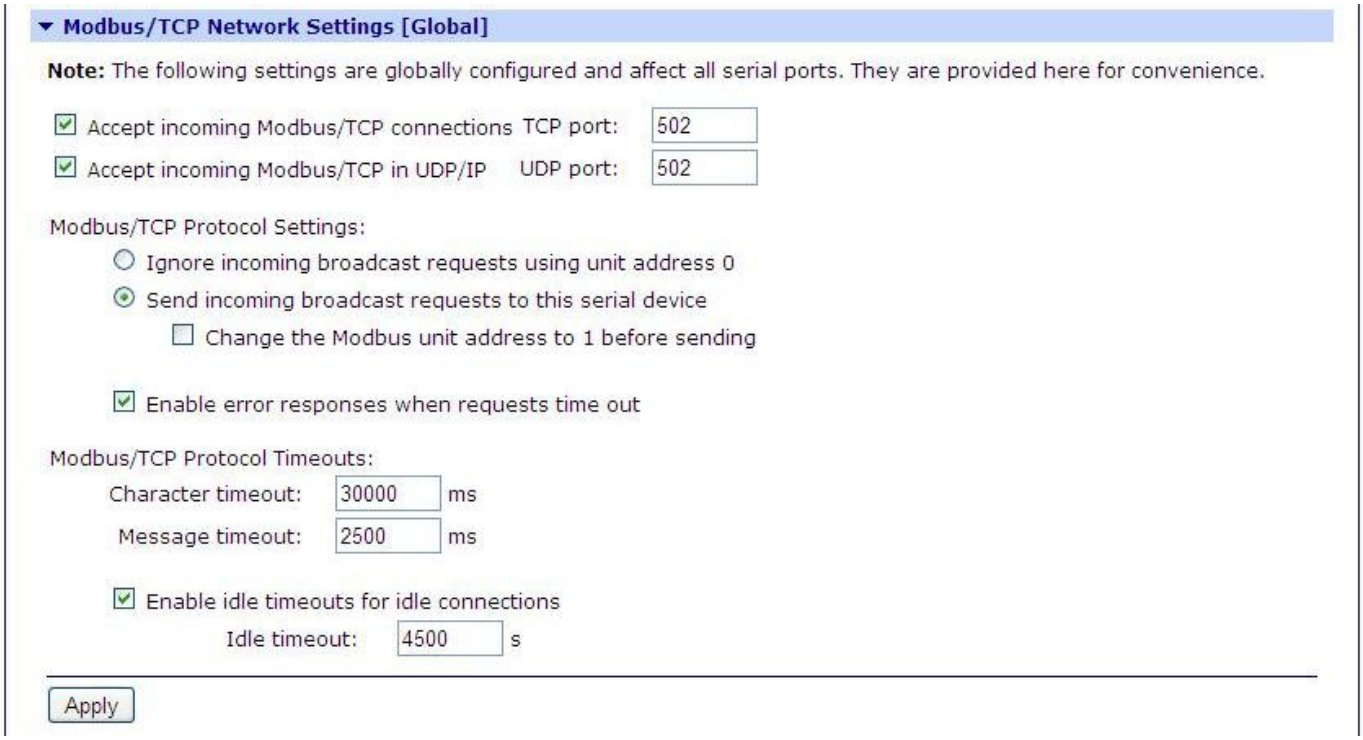

Fig. 28. Example configuration of the converter for communication with a MODBUS-SLAVE device.

ATTENTION !
The default port for the Industrial Automation (Modbus Gateway) service is 502.
If a conflict occurs in the local network with another service using the same port, the port number must be changed in the server port configuration for both server and client services.

On the **Advanced Protocol Settings** page (see below), define the timeout values by filling in the following fields:
-Character timeout – specify in [ms] the maximum gap between frame bytes, typically 20 ms.
-Message timeout – specify in [ms] the maximum gap between frames, typically 2500 ms. This parameter must not be shorter than the timeout parameter of the MODBUS MASTER device or SCADA/HMI software.
To save the **Advanced Protocol Settings** configuration, press the **[Apply]** button.

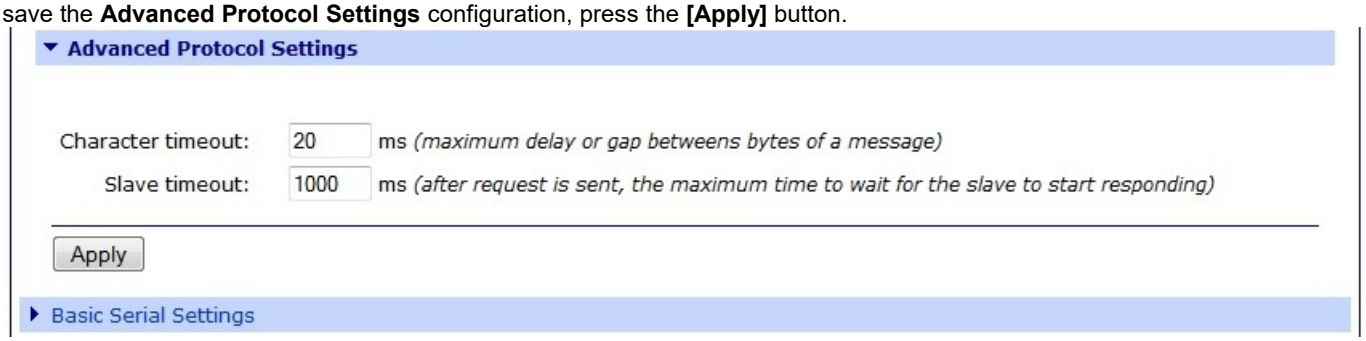

Fig. 29. Example configuration of the converter for communication with a MODBUS-MASTER device – timeout parameters configuration for a SLAVE-type device.

5.2.2.1.5.3. CONFIGURATION OF SERIAL PORT TRANSMISSION PARAMETERS

The ADA- 13028LMG converter will properly communicate with a Modbus-Master or Modbus-Slave device connected to its serial port provided that transmission parameters are set correctly.
To do this, go to the **Basic Serial Settings** tab and configure the following fields in accordance with the transmission parameters of the connected device: **Baud Rate**, **Data Bits**, **Parity**, **Stop Bits**.

5.2.3. SYSTEM SETTINGS

On the **System** configuration page, there are two sections:
- **Device Identity Settings** - allows assigning a name to the converter, describe its location, and set an identification number.
- **Simple Network Management Protocol Settings (SNMP)** - enables SNMP protocol configuration.

5.2.4. USERS AND ACCESS RIGHTS

On the **Users** configuration page, there are two sections:
- **Users** - allows configuring login methods for the ADA-13028LMG. Enabling **Enable user logins** means that when entering http://<converter-ip-address>/admin/administration.htm in a web browser, a login window will appear, requiring a username and password.
- **Configure Users** - allows adding new users, changing existing passwords, configuring converter access, and assigning permissions for each defined user.

5.2.4.1. CHANGING THE ROOT USERNAME AND PASSWORD

To change the root username and password:

1. From the **Configuration** menu, select **Users**.
2. Select the **root** user.
3. Change the username and password.
4. Confirm the changes by pressing **[Apply]**.

5.2.4.2. ADDING A NEW USER WITH LIMITED CONFIGURATION OR MANAGEMENT RIGHTS

To add an additional user with limited configuration or management rights for the ADA-13028LMG converter:

1. From the **Configuration** menu, select **Users**.
2. In the **Configure Users** section, press **[New...]**.
3. On the Add New User page, fill in the fields:

User Name – e.g., **admin**
New Password – new user password,
Confirm Password – re-enter password.

4. Confirm by pressing **[Apply]**.
5. **The Users Configuration** page will appear, showing the newly added user in the **Configure Users** section.

After adding a new user, can be configured their access rights and permissions for the converter.
Configuration of access to converter:

1. From the **Configuration** menu, select **Users**.
2. In the **Configure Users** section, select added user e.g. **admin**.
3. After the **User Configuration** – admin page appears, there is access the following section:

A/ **User Configuration** – possibility of rename user and password,
B/ **User Access** - method of access to converter from the network:
Allow command line access – access using the Command Line Interface - **telnet**,
Allow web interface access – access using the internet browser.
C/ **User Permissions** - user permissions to configuration and management of the ADA-13028LMG converter, where are options:
None - no permission
Read – permission to read,
Read Self – permission to read own settings, but not other users.
Read/Write - full permission to read and write the setting.
Read/Write Self - permission to read and write own setting, but not other users.
Read All/Write Self - permission to read the setting for all users and modify only own setting (not other users).
Execute - permission to execute (start).

4. All changes are saved by pressing **[Apply]**.

5.2.5. MANAGEMENT

In the **Management** menu, there are two sections:
- **Serial Ports**
- **Connections**

5.2.5.1. SERIAL PORT MANAGEMENT

The **Serial Ports** allow identification and disconnection of network connections to the serial port of the ADA-13028LMG converter.

5.2.5.2. CONNECTIONS MANAGEMENT

The **Connections** allow identification and disconnection of network connections to the converter itself.

5.2.6. ADMINISTRATION

The **Administration** menu allows to:
– delete/upload files with Java applet,
– backup/restore configuration of converter,
– update Firmware,
– restore the factory default settings,
– display system details information,
– reboot the converter.

5.2.6.1. FILE MANAGEMENT

The **File Management** option allows uploading and deleting Web pages and Java Applets provided by the manufacturer.
Uploading the file index.htm or index.html enables the automatic launch of the manufacturer-supplied web page in a browser after entering the address http://<converter-ip-address>/FS/WEB/index.htm and logging into the ADA-13028LMG converter.

5.2.6.2. BACKUP AND RESTORE CONFIGURATION

The **Backup/Restore** option allows saving the converter configuration settings to a file and restoring them from a file created by the user.

5.2.6.3. FIRMWARE UPDATE

The **Update Firmware** option enables updating the converter firmware from a file stored on disk.
The POST software must be updated first, followed by the FIRMWARE.

5.2.6.4. RESTORE FACTORY DEFAULT SETTINGS

For correct operation, the manufacturer has set a factory configuration for the converter.
If the user modifies the configuration settings, they may revert to factory defaults by selecting the **Factory Default Settings** menu option. After executing **Factory Default Settings**, the converter will automatically restart.

5.2.6.5. SYSTEM INFORMATION

Selecting **System Information** provides access to the following:
General tab – device model, MAC address, firmware version, Boot version, POST version, etc.
GPIO tab – not implemented in the ADA-13028LMG converter.
Serial tab – port description, current serial port configuration, status of control lines, and transmission statistics for the serial port.
Network tab – detailed statistics of the ETHERNET interface for IP, TCP, UDP, and ICM protocols.

5.2.6.6. REBOOT CONVERTER

The **Reboot** option allows performing a software restart of the ADA-13028LMG converter.
When the **[Reboot]** button is pressed, the restart process will take approximately 1 minute.

5.2.6.7. LOGOUT – ENDING CONFIGURATION AND MANAGEMENT

After completing configuration or administrative operations, should be pressing **Logout** on left panel – log out of the ADA-13028LMG converter's web server.

6. USING THE VIRTUAL PORT SERVICE [RealPort]

6.1. INSTALLATION OF THE VIRTUAL PORT DRIVER [RealPort] IN WINDOWS XP

From the ADA-13028LMG converter website (www.cel-mar.pl/en/ethernet_currentloop_clo_13028lmg.htm), in the ***Downloads*** section), download and extract the ada_net.zip file.
The virtual serial port drivers should be installed by selecting the folder:

- Drivers/Win-98-ME, for Windows 98, Windows 98SE, Windows ME,
- Drivers/Win-2000, for Windows2000,
- Drivers/Win Server-2003-2008-2012 for Windows Server 2003, 2008, 2012,
- Drivers/Win-Vista for Windows Vista.
- Drivers\Windows\Win XP-7-8-8.1-10 for Windows XP, 7, 8.x, 10.

Installation of Virtual serial port drivers is as follows:

1. Connect ADA-13028LMG to ETHERNET (see p. 3.2.1 – 3.2.2) and power.
2. Press [**Start**] and select [**Run...**],
3. In the dialog window [**Run**] press [**Browse**],
4. Select „**My computer**" and then selecting the location of the extracted ada_net.zip file with the ada_net directory,
5. Select catalog **Drivers/WinXP2003Vista_x86_x64,**
6. Select file „**Setup32.exe**" for 32-bits system or „**Setup64.exe**" for 64-bits and press [**Open**],
7. When the installation window will appear press [**Next**],
8. Will start the searching for converters in the network, found devices will be added to the list.
9. Select the converter from the list for installation of virtual port driver and press [**Next**].
10. In window Describe the device select or not the Starting Com port and press [**Finish**]. The driver will be installed.

The Virtual Serial Port Drivers can be installed without connection of ADA-13028LMG to ETHERNET and it is as follows:

1. Press [**Start**] button, select [**Run...**]
2. In the dialog window [**Run**] press [**Browse**]
3. Select „**My computer**" and then selecting the location of the extracted ada_net.zip file with the ada_net directory.
4. Select catalog **Drivers/WinXP2003Vista_x86_x64**.
5. Select file „**Setup32.exe**" for 32-bits system or „**Setup64.exe**" for 64-bits and press [**Open**].
6. When the installation window will appear press [**Next**] .
7. Will start the searching for converters in the network.
8. If no devices were not found press [**Next**].
9. Should be set in the window Describe the device:
– IP address for converter,
– number of installing COM port (No. Ports)
– Starting COM
and press [**Finish**]. The driver will be installed.

In this way installed virtual port can require the configuration in case of connecting the converter to network.

6.2. REALPORT CONFIGURATION IN WINDOWS XP

After installation of RealPort drivers, can be done configuration by the use the Device Manager of Windows and it is as follows:
1. Press [**Start**], select [**Properties/Setting**], press [**Control Panel**].
2. Double click icon [**Administrative Tools**] and [**Device Manager**]
3. Press [**Ports (COM & LPT)**]. On fig. 28 is shown available serial ports COM1, COM2 and **COM3** marked as **ADA-13028LMG** which was created after installation of RealPort driver.
4. Then select [**Multi-port Serial Adapter**], there will be the name **ADA-13028LMG**.
5. Double click the name and the window [**Properties**] will appear.
6. Select [**Advanced**] and press [**Properties**].

7. Enter **new name of virtual port for converter**. In the window [**Advanced Properties**] click [**ADA-13028LMG**] and then select [**Properties**], press [**Rename Ports**], now it is possible to change the name of virtual port driver for example COM5, COM11 etc. To accept the changes press [**OK**].
8. **Select IP address, MAC, DNS server for communication with virtual port driver**. In the window [**Advanced Properties**] click [**ADA-13028LMG**] and then select [**Network**] (Fig. 27), and set the **IP address**, **MAC Address** or **DNS name** of converter for communication with virtual port driver.
9. In the next window press [**OK**] to accept the changes.

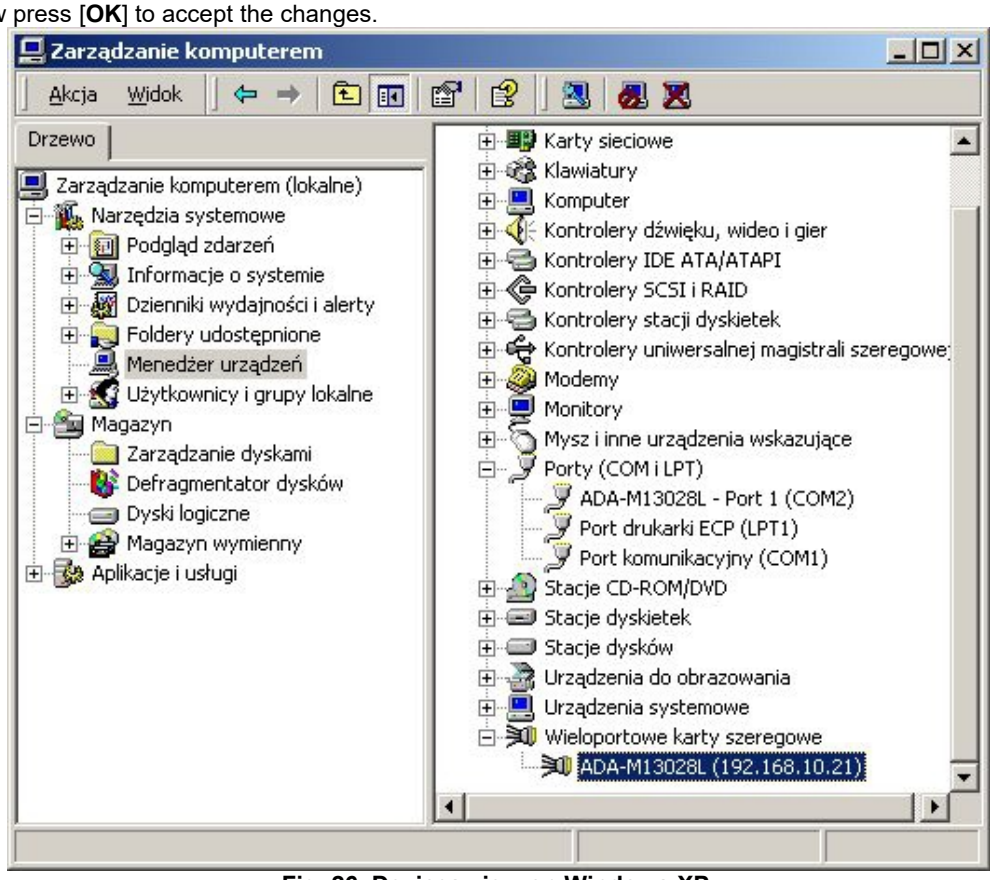

Fig. 26. Devices view on Windows XP.

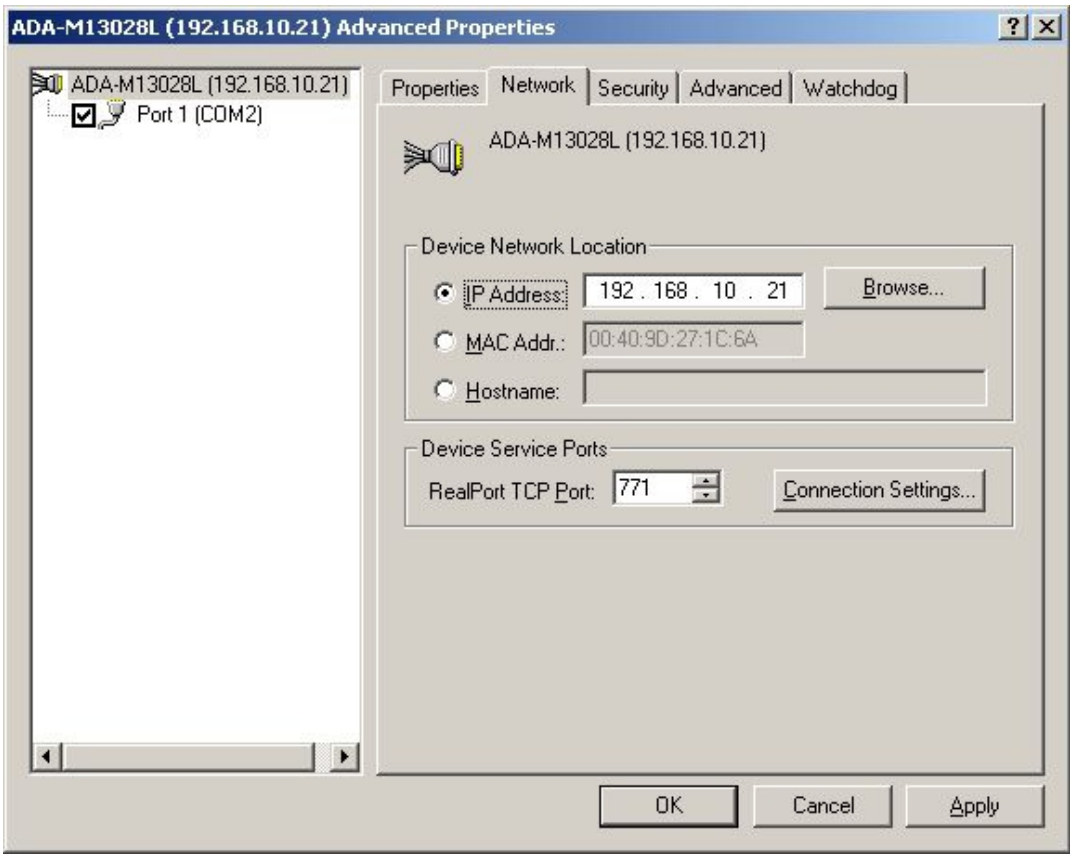

Fig. 27. Example configuration of multi-port serial adapter.

7. FACTORY DEFAULT

Parameter	*Value*
User name	root
Password	unique password on the converter label
IP address	Obtain an IP address automatically using DHCP
Operating mode	RealPort
Bout rate[bits/sec]	9600
Number of data bits	8
Parity Control	no
Number of stop bits	1
Flow Control	no

8. TROUBLESHOOTING

Problem	*Solution*
I forgot the password.	Restoring Default Settings according to steps below: 1. Disconnect the power of the converter, 2. Remove the cover of ETHERNET connector, 3. Press RESET “RST” and holding the button, connect the power of the converter, 4. Release the button after 20 sec. when the converter will start with default settings. Restoring Default Settings deletes existing configuration and the proper configuration should be loaded to the converter from the backup.
I changed the configuration and the converter is not working.	1. Enter in the Internet browser http://converter-ip-address, 2. Select the menu **[Factory Default Settings]** press **[Restore]**.

9. VERSIONS

ADA-13028LMG - [ ] - [ ] - [ ] - [ ] [ ] [ ]

Electronic versions:
Standard **1**

Current Loop Voltage:
24VDC **1**
12VDC **2**

Current Loop Current:
0 – 20 mA (standard version) **1**
0 – 30 mA **2**
0 – 45 mA **3**

Current Loop Type:
Active **A**
Passive **P**

Galvanic isolation:
1kV= 3-way **2**
3kV= 3-way **3**

Type of connectors:
Screw connector, **1**
Plug-in screw connector, **3**

Order example for an energy meter with a CLO interface (IEC 62056-21):

Product symbol:
ADA-13028LMG-1-1-1-A-2-3

1 – standard electronics version,
1 – current loop voltage 24VDC,
1 – current loop current 0-20mA,
A – Current Loop Type: Active,
2 – galvanic isolation 1kV=,
3 – plug-in screw connector.

10. SPECIFICATION

TECHNICAL DATA		
Transmission Parameters		
Interfaces	**ETHERNET**	**Current Loop**
Connector	RJ45	Screw terminal, wire max. Ø 2,5mm^2.
Max. Line length	LAN up to 150m	Depend on baud rate, up to few kilometres
Max. number of connected device	Depend on addressing type in network	1 point-to-point or 4 in Current Loop CLO network
Max. baud rate	10/100 Mbit/s	19,2 kbps (depend on current loop CLO line length)
Transmission line	4-pair twisted cable, UTP 4x2x0,5 (24AWG), shield inside large interferences STP 4x2x0,5 (24AWG)).	2-pair twisted cable 24AWG, shield inside large interferences
Standards	IEEE 802.3	IEC 62056-21
Transmission type	Asynchronous transmission half duplex or full duplex.	
Optical Signalization	•PWR – green LED power supply, •RX - red LED data receiving from Current Loop CLO side, •TX - yellow LED data transmission through Current Loop CLO interface.	
Electrical Parameters		
Power requirements	10 - 24 – 30 V DC	
Power Cable	Recommended length – up to 3m	
Power	3W	
Protection from reverse power polarization	Yes	
Galvanic Isolation	•1kVDC or 3kVDC - between power circuit and Current Loop CLO signal line •1kVDC or 3kVDC - between power circuit and ETHERNET signal line	
Optoisolation	~3kV DC - between Current Loop CLO signal line and ETHERNET	
Electromagnetic compatibility	Resistance to disruptions PN-EN 55024. Emission of disruptions PN-EN 55022.	
Safety requiring	According to the PN-EN60950 norm.	
Environment	Commercial and light industrial.	
Environmental Parameters		
Operating temperature	-30 ÷ 60 °C	
Humidity	5 ÷ 95% - non-condensing	
Storage temperature	-40 ÷ 70°C	
Casing		
Dimensions	53mm x 90mm x 62mm,	
Material	PC/ABS	
Degree of casing protection	IP40	
Degree of terminal protection	IP20	
Weight	0,10 kg	
According to standards	DIN EN50022, DIN EN43880	
Location during work	Free	
Mounting	Rail mounting according to DIN35 standard / TS35.	

Dear Customer,

Thank you for purchasing **CEL-MAR Company** product and we hope that this user manual helped connect and starting the **ADA-13028LMG converter with MODBUS GATEWAY.**

We would also like to inform you that we manufacture one of the largest ranges of serial data transmission devices.
We encourage you to check out our full production offer on our website **www.cel-mar.pl**
We are waiting for your opinion about the product you purchased.

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