



MD12003 RS485 to Ethernet PoE Converter (EN)



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Description

Industrial RS485 to Ethernet Bus Converter with PoE Support

The **MODIG RS485-ETHERNET PoE** is a versatile and easy-to-use converter that bridges an RS485 serial bus with an Ethernet network interface. The device is equipped with a Power over Ethernet (PoE) subsystem, allowing it to integrate seamlessly into modern network infrastructures where a single cable provides both DC power and local network connectivity. Its compact form factor combined with auxiliary power options (via USB-C or an external DC power supply) makes the MODIG converter highly adaptable across various industrial installation types.

Basic Features and Parameters

- RS485 Interface: Terminals: A+, B-, GND, and TERM via Phoenix Contact MC 3.81 mm connector
- Termination Resistor: Integrated 120 Ω bus terminator (configurable)
- RS485 Circuit Protection: 1 kV galvanic isolation and integrated surge protection
- RS485 Baud Rate: Supports any custom value from 200 bps to 1,000,000 bps (1 Mbps)
- RS485 Serial Parameters: Data bits: 7/8; Parity: None/Even/Odd; Stop bits: 1/1.5/2; Half-Duplex
- Network Capacity: Supports up to 64 nodes on the RS485 bus
- Buffer Size: Maximum RS485 data frame length of 4 kB (4096 bytes)
- Network Interface: RJ45 port, 10/100 Mbps Base-T Full Duplex
- Network Addressing: Configurable MAC address; IPv4 support with Static IP or DHCP assignment
- Operational Modes: TCP Server, TCP Client, Concurrent UDP, and UDP Broadcast
- Device Configuration: Password-protected, built-in Web-UI (HTTP)
- Diagnostics: Operational status readout via USB or Web-UI
- Main Input: Power over Ethernet (PoE) compliant with IEEE 802.3af/at Class 0 standard
- Auxiliary Inputs: Optional power delivery via USB-C (5 V / 0.2 A) or DC power jack (7-38 V DC / 0.2 A)
- Enclosure: Industrial rugged aluminum housing; Dimensions: 92 mm x 80 mm x 25 mm
- Operating Temperature Range: -20°C to +50°C
- Status Indicators: Diagnostic LEDs
- Firmware Upgrade: Supported via USB interface

Standard Equipment

Product Code	Description
MODIG RS485-ETHERNET PoE Converter	• Fully assembled, programmed, and tested converter module
USB Cable	• USB connectivity cable with USB-A to USB-C connectors

Applications

The MODIG RS485-ETHERNET PoE converter enables bidirectional data routing between an RS485 bus and an Ethernet network. Communication can be established transparently between two MODIG RS485-ETHERNET PoE modules or integrated

with any third-party device that supports standard TCP and/or UDP protocols. The native PoE power supply simplifies deployment in modern network systems.

Serial data frames from the RS485 bus are packed and converted into Ethernet TCP/UDP packets. For large payloads (exceeding 1.5 kB up to the 4 kB maximum), an internal fragmentation mechanism splits the payload into smaller network frames. At the receiving destination node, the original RS485 data format is fully reconstructed, ensuring completely transparent communication across the network layer.

Typical application diagram for the MODIG RS485-ETHERNET PoE converter:

RS485 Interface

The RS485 interface is accessible via a 4-pin Phoenix Contact MC 3.81 mm screw terminal block.

Pin Number	Label	Function
1	T	Activates the internal 120 Ω line termination resistor. The resistor is engaged when pin T is shorted to pin A+.
2	A+	RS485 differential line A (Non-inverting / Positive potential)
3	B-	RS485 differential line B (Inverting / Negative potential)
4		Signal Ground (GND) for the RS485 bus

The MODIG converter can be connected to an RS485 bus containing up to 64 devices (including the converter itself). Devices must be daisy-chained to avoid stub lines or bus branches; any necessary drop lines must be kept as short as possible. 120 Ω impedance matching termination resistors should be placed at both physical ends of the bus line.

The MODIG converter includes an on-board termination resistor, which can be enabled by bridging terminal **A+** and terminal **T**.

The diagram below shows a simplified wiring schematic of the RS485 bus network, terminated with a standard 120 Ω resistor on one end, and the converter's internal termination on the other. It also illustrates the correct daisy-chain connection method versus incorrect topology:

ETHERNET Interface and PoE Power Supply

The MODIG converter features a 10/100 Mbps Ethernet port utilizing a standard RJ45 connector labeled ETH PoE. This allows the converter to join a Local Area Network (LAN). The **LNK** LED indicates a valid network link, while a flashing **ACT** LED signals active data traffic over the Ethernet interface.

Power can be delivered directly through the ETH PoE connector. The integrated PoE controller complies with IEEE 802.3af (Powered Devices Type-1) and IEEE 802.3at (Powered Devices Type-2) standards and is pre-configured as a Class 0 device, specifying a power footprint between 0.5 W and 13 W. PoE operations require a compatible network installation that includes standard PSE (Power Sourcing Equipment), such as a PoE network switch or midspan injector compliant with IEEE 802.3af/at. Active PoE power delivery is indicated by the solid green **STA** LED.

WARNING: PoE installations carry operational voltages up to 60 VDC. All servicing and wiring on active networks must be performed with caution adhering to standard electrical safety protocols.

USB and DC Power Supply Options

The MODIG converter can be powered via the USB-C port labeled USB. The external source must deliver 5 VDC $\pm 10\%$ with a minimum capacity of 0.2 A. This requirement is met by standard USB chargers, PC ports, or Single Board Computers (SBCs).

Alternatively, the device can be powered by applying a steady DC voltage to the barrel jack labeled DC 7-38V. This is a standard 2.1/5.5 mm power jack used by common commercial power adapters. The input voltage must fall within the range of 7 V to 38 VDC with a minimum current of 0.2 A, utilizing a center-positive pin configuration.

The MODIG converter supports simultaneous connections across all power inputs (PoE, USB, and DC). The internal power management system automatically locks onto the optimal voltage source.

Status LED Indicators

The operation of the MODIG RS485-ETHERNET PoE converter is monitored using 3 diagnostic LEDs.

LED Indicator	Status Meaning
STA (green)	Blinking at a steady interval indicates the system logic is correctly powered, regardless of the active power source. A solid green light indicates a valid Ethernet network link and a successfully leased IP address.
ETH (blue)	Blinking indicates active transmission or reception of TCP/UDP packets. A solid blue light indicates an active, established TCP Server-Client connection.
RS (red)	Blinking signals data transmission (TX) or reception (RX) activity on the RS485 serial bus.

RES Function Button

The hardware function button allows the user to trigger a full system reboot or perform a complete factory reset. To actuate the button, gently insert the end of a paperclip into the small pinhole labeled RES until a tactile click is felt.

A system reboot is triggered on an active device by holding the RES button down for approximately 5 seconds and then releasing it. During this action, the red RS LED will flash 4 times shortly followed by a single long illumination lasting 1 second. The button must be released during this long 1-second flash. The MODIG converter will then perform a clean hardware system restart.

A factory reset is executed on an active device by holding the RES button down for approximately 10 seconds before releasing it. This sequence triggers 4 short red flashes on the RS LED, a 1-second long flash, a 4-second delay, and finally a second long illumination. The button must be released during this second long flash. This action purges all custom configurations (wiping network setups, serial parameters, Web-UI access passwords, etc.) and restores the converter to its factory defaults.

USB Diagnostics Interface

The USB-C interface labeled USB serves as an auxiliary power input and doubles as a diagnostic bridge to track real-time runtime parameters. Connecting the converter to a PC registers a Virtual COM Port inside the host OS (e.g., listed as COM5).

Any standard serial terminal emulation software (e.g., PuTTY, BrayTerminal, etc.) can be opened to listen on the allocated Virtual COM Port. The port communication profile must be set to: 115200 bps, 8 data bits, No parity, 1 stop bit (115200, 8, N, 1). The terminal window will stream active diagnostic readouts from the MODIG converter:

This feed provides a quick method to check the leased IP address assigned to the converter, along with critical parameters including DHCP lease status, MAC address, and active TCP/UDP configurations.

Firmware Upgrade Procedure

Flashing a new firmware version requires a Windows PC equipped with the official STM32Cube Programmer application, an available USB port, and a standard USB-A to USB-C link cable.

The STM32Cube Programmer application can be obtained from the official STMicroelectronics portal:

<https://www.st.com/en/development-tools/stm32cubeprog.html>

Select the appropriate installer for your desktop operating system, run the installation package, and follow the setup wizard.

To put the MODIG converter into Device Firmware Upgrade (DFU) mode, follow these steps:

1. Disconnect the converter from the Ethernet network, the RS485 bus, and all external power lines.
2. While the device is fully unpowered, press and hold down the internal RES button using a paperclip.
3. Keeping the RES button compressed, connect the USB cable from the PC to the USB-C port labeled USB on the MODIG converter.

The status LEDs will remain completely dark, confirming that the internal bootloader has entered DFU mode. The host PC device manager will list a new hardware device:

Launch the STM32Cube Programmer software, change the interface connection type to USB, and click Connect.

Click on Open File, browse to the directory containing the compiled firmware binary (e.g., Modig_3_0.elf), select it, and click Download. A confirmation dialog will pop up upon completion; click OK.

Finally, click Disconnect within the utility and unplug the USB-C cable from the converter. Reconnecting the USB cable normally (without pressing the RES button) will cycle the power, and the MODIG converter will initialize running the newly flashed firmware.

Converter Configuration

All hardware and communication parameters of the MODIG RS485-ETHERNET PoE converter are managed using the embedded web configuration engine.

Open a web browser on a PC or smartphone connected to the same Local Area Network (LAN) as the MODIG converter, and

type the device's current IP address into the address bar. The active IP address can be found using the live serial diagnostic stream over USB (see the "USB Diagnostics Interface" section) or via the network router's DHCP lease table.

User Authentication (Login)

Navigating to the correct IP address brings up the MODIG Web-UI dashboard challenge screen. Accessing the configuration backend requires entering the security password; the factory default value is "1234".

Entering an invalid password will display an authentication failure alert.

Main Menu Dashboard

A successful login session opens the core configuration panel. The bottom area of the layout displays foundational device info and real-time operational variables.

Once modifications to the operating parameters are complete, terminate the session by clicking the *LOGOUT* button. This explicit action writes the updated parameters into the device's non-volatile EEPROM configuration storage block.

If a user fails to log out manually, the active Web-UI session will time out automatically after 5 minutes of inactivity. Any uncommitted parameter adjustments are saved to the non-volatile memory block after 1 minute of inactivity on the configuration portal.

Device Management Profile (DEVICE)

Device Name — A custom string identifier defined by the user to label the hardware unit. To change this value, input the string into the text box adjacent to the *Device Name* field and commit the modification by clicking the *Apply* button below.

Access Password Management

The configuration portal is locked behind a password challenge. Authentication is bound to the requesting client's IP address and remains valid for a sliding window of 5 minutes. The countdown resets with each action taken within the Web-UI; 5 minutes of total idle time drops the token and forces an automatic session logout.

To provision a new access token, input the desired value into the *New Password* and *Repeat new password* text boxes, then commit the change using the corresponding *Apply* button.

A successful write update will show the following success confirmation message:

Network Parameter Configuration (NETWORK)

The networking section handles the low-level identity profiles, including the hardware address (*Device MAC*) and the IP block topology. When the network automation flag is set to *DHCP - ENABLE*, the RS485-ETHERNET PoE converter requests an operational IP setup from the local network gateway or DHCP server. Conversely, flipping this setting to *DISABLE* switches the stack over to static configurations, requiring manual entries for the target IP address (*Device static IP*) and the corresponding subnet mask (*Subnet mask*).

Modifying the hardware MAC address requires a hard system reboot to reinitialize the network controller chip; this can be done by clicking the *RESTART* button. Updating static IP variables requires recycling the Ethernet interface stack, which can be done by clicking the *RECONNECT* button.

Executing either operation terminates the active browser session, logs the user out, and restarts the physical Ethernet interface. Depending on the newly committed settings, the web management panel will map onto a different network endpoint address.

Network Operational Profile (MODE)

The MODIG converter routes data payloads across the IP network using independent TCP and UDP protocol engines running concurrently.

The TCP engine operates under a strict Server-Client model, requiring a destination IP pointer indicating where serial payloads should be forwarded, paired with a target socket port number constrained within the user range of 1024 to 65535.

The UDP engine functions without maintaining fixed sessions or connection states. It requires a target destination IP pointer along with an unprivileged port assignment within the 1024 to 65535 range. Setting the destination address to the broadcast IP 255.255.255.255 switches the socket engine over to broad-network transmission (*broadcasting*), mirroring serial payloads to every active listening node on the local subnet.

Serial Interface Tuning (RS485)

The adjustable physical parameters governing the integrated RS485 UART serial interface include:

- Communication Speed (*Baudrate*): Supports values from 200 bps up to 1,000,000 bps (1 Mbps)
- Serial Frame Size (*Data bits*): Configurable to 7 or 8 bits
- Bit Parity Verification (*Parity*): None, Even, or Odd
- Serial Framing End-Marker (*Stop bits*): 1, 1.5, or 2 bits

The UART parameters configured inside the MODIG converter must match the serial properties of all peripheral target nodes attached to the RS485 line. Save new variables using the *Apply* button below the menu fields.

Data payloads routed over the physical RS485 bus are formatted into packets (frames), capped by an end-of-packet character sequence or a designated duration of line quietness. The converter packages serial data streams and drops them onto the network stack as unified blocks; frames missing proper completion markers are held in the serial buffer and will not pass onto the network layer.

The MODIG engine can monitor for frame completion by parsing for a programmable sequence of 1 to 4 characters (e.g., the keyword string "END", a series of byte markers like "0xFF 0xFF 0xFF 0xFF", or standard text line-end delimiters like CR LF —

Carriage Return, Line Feed). The parsing sequence must be formatted as hexadecimal notation values corresponding to the standard ASCII map, prefixed by an 'x' identifier; for example, the string "END" must be input as "x45 x4E x44". Leaving this field empty disables character-based frame parsing.

The firmware can also evaluate frame boundaries by measuring silent periods on the physical bus. Bus quietness is calculated as equivalent character transmission windows relative to the active baud rate. Input a valid threshold scale from 0 to 255 inside the *Packet complete idle characters* field. Setting this value to 0 turns off the timer; a value of 1 instructs the engine to close the active buffer as soon as the line remains idle for the duration of a single character slot.

Both frame demarcation methods can run concurrently.

Embedded Testing Tools (TOOLS)

The web interface features basic testing utilities to inject raw test payloads directly onto the physical bus lines. The input field labeled *Remote RS485 message* transmits short text segments directly to the remote IP endpoints assigned within the network configuration panels (MODE) over open TCP or UDP sockets. Click *Send* to fire the payload.

The utility labeled *Local RS485 message* allows operators to transmit manual command strings from the active interface directly out of the local converter's RS485 transceiver. Click *Send* to execute the serial transmission.



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