ECD series

MODBUS TCP MODBUS RTU CONVERTER

INSTRUCTIONS FOR USE
Ver. 01 (EN) – 12/22

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INTRODUCTION

This manual contains the information necessary for the correct installation and the instructions for use and maintenance of the product. It is, therefore, recommended to read it carefully and preserve it.

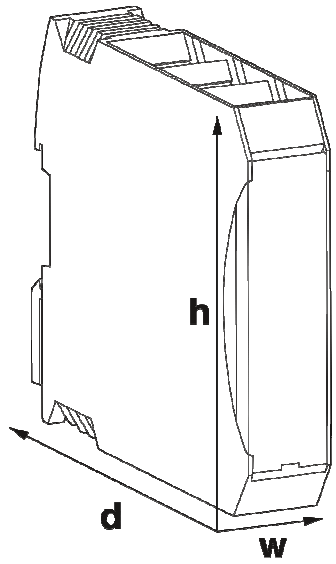
EL.CO. S.R.L. reserves the right to make aesthetic and functional changes at any time and without notice.

If a malfunction or failure of the device could create dangerous or harmful situations for people, things or animals, remember that the system must be set up with additional devices capable of guaranteeing safety.

EL.CO. S.R.L. and its legal representatives do not consider themselves responsible in any way for any damage to people, things or animals deriving from tampering, improper or incorrect use or in any case not in compliance with the characteristics of the device.

1 – DIMENSIONS (mm)

1.1 – ECD MODULE FOR DIN RAIL ASSEMBLY



w = 22.5 mm
h = 100 mm
d = 113.65 mm

2 - DEVICE DESCRIPTION

2.1 - GENERAL DESCRIPTION

ECD is a TCP modbus to RTU modbus converter. There are two RTU modbus master ports: one on the screw terminal where up to 256 devices can be connected and one on the bus below the device where up to 32 devices can be connected.

3 - SMART-CONNECTION

3.1 – CONVERTER FUNCTION

The ECD series involves a strong innovation compared to similar products. ECD receives a request in TCP modbus and repeats it in the RTU modbus ports that act as master. ECD has an IP address and a modbus address. If a request is made via modbus IP, the device checks the modbus address and, if the address corresponds to the one programmed, ECD will respond appropriately on the IP modbus port; otherwise, it replies the packet on the RTU modbus ports and then replicates any response on the IP modbus port.

3.2 – COMMUNICATION VIA RS485 MODBUS

3.2.1 - DESCRIPTION

The communication speeds adopted for RTU modbus range from 1200 to 38400 baudrates and allow very satisfactory performances, while remaining well below the limits set by the RS485 standard. This allows the wiring of the line to be made using a medium quality twisted and shielded pair: it is sufficient that the total capacitance of the line does not exceed 200nF.

For the connection of devices with RS485 serial communication via the bus and the terminal, refer to paragraph 4.4.

To maintain the line in rest conditions, the use of an end resistor of 120 Ohm is required. The device does not mount this resistor. The end of the RS485 line with the 120 Ohm resistor can be done through the terminal supplied as an accessory (see Section 10.6)

⚠**The poll speed during programming and during normal use must not be less than 50ms.**

⚠**The maximum length of an RS485 transmission is 400 meters.**

3.2.2 – COMMUNICATION PROTOCOL DESCRIPTION

The protocol is a subset of the widely used RTU MODBUS protocol. This choice ensures ease of connection to many commercial devices.

The default MODBUS address is 50.

The functions of the RTU MODBUS protocol implemented in ECD are as follows:

function 3 - reading n words
function 6 - writing a word

Each message contains four fields:

- slave address: values between 1 and 255 are valid; address 0 (zero) is reserved by RTU MODBUS for broadcasting messages, **but it is not adopted** in the ECD series due to the implicit unreliability of this type of communication;
- function code: it contains 3 or 6 depending on the specified function;
- information field: it contains the addresses or the value of the words, as required by the function used;
- control word: it contains a cyclic redundancy check (CRC) calculated according to the rules established for CRC16.

The characteristics of asynchronous communication are as follows: 8 bits, no parity, one stop bit.

3.2.3 – DATA EXCHANGE

The exchanged data consists of a 16-bit word. All readable and writable data appears as 16-bit words allocated in the device's memory.
The working and configuration parameters of the device can be read and written via serial communication.

The parameters that can be configured in ECD are listed in Paragraph 6.

4 - WARNINGS FOR INSTALLATION AND USE

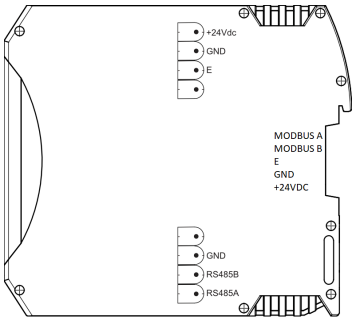
4.1 - PERMITTED USE

The device was designed as a measuring and adjusting item in compliance with the EN60947-4-2 standard for operation at altitudes up to 2000 m. The use of the device in applications not expressly envisaged by the above-mentioned standard must provide for all the adequate protection measures. The device CANNOT be used in environments with a dangerous (flammable or explosive) atmosphere without adequate protection. Remember that the installer must make sure that the standards relating to electromagnetic compatibility are complied with even after installing the device, possibly using special filters. If a breakdown or failure of the device could create dangerous or harmful situations for people, things or animals, remember that the system must be set up with additional electromechanical devices to ensure safety.

4.2 - MECHANICAL ASSEMBLY

ECD must be installed on DIN rail guide. Avoid placing the inside of the device in places subject to high humidity or dirt that may cause condensation or introduction into the device of conductive parts or substances. Make sure that the device has adequate ventilation and avoid installation in containers where there are tools that can cause the device to work outside the declared temperature limits. Install the device as far as possible from sources that can generate electromagnetic disturbances such as motors, contactors, relays, solenoid valves, etc.
Keep in mind that once the ECD has been installed on the DIN bar, its only accessible part will be the front panel.
An installation that does not comply with the provisions listed in this paragraph could compromise the declared levels of protection.

4.3 - ECD WIRING DIAGRAM



+24VDC
GND
RS485A Modbus, 250 nodes
RS485B
MODBUS A Modbus, 32 nodes
MODBUS B
E passing-through item

4.4 – CONNECTION FROM ONE DEVICE TO ANOTHER ONE

The devices of the ECD series can connect to other devices via the e bus connector (code BC-5P) supplied as an accessory.

For connect to the modbus line, there are the appropriate connection terminals (TC-5PL, TC-5PR).

⚠**A battery of devices connected to the bus must consist of a maximum of 32 devices. TC-5PL and TC-5PR cannot be mounted on ECD at the same time.**

4.5 – SUPPLY METOD

The direct power supply of the modules is foreseen through the connection of the 24VDC source to each of the terminals

4.5.1 – SMART-SUPPLY FOR OTHER DEVICES

The Smart-Supply system is instead based on the use of the bus connector. Up to 32 modules, the power distribution via bus takes place by powering a single module.
In this way, it is sufficient to power ECD to power all the other compatible devices connected on the bus.

5 – OPERATION

5.1 - DESCRIPTION

ECD has the function of receiving an IP modbus packet via the Ethernet port, thus replicating it on the RTU 485 modbus ports and, in case of response, replicating it on the IP modbus.
The product is powered in 24Vdc. The lower part of the device has 1 terminal relating to the RTU modbus serial with the possibility of having up to 32 nodes.

+24Vdc: Voltage 24V DC
GND: Common for voltage

The LEDs arranged on the front are:
Explanation: A = LED off, E = LED on with constant light, L = flash.

State	Description	POWER	LINK/ACT
OFF	Device off	A	A
ON	Device on	E	A
ON	Device on and passage implemented	E	L

Input E is present on the power supply terminal, which is a connection to E on the BUS connector. From here it is possible to pass the enabling signal to other devices that have this setup.

6 - TABLE OF PROGRAMMABLE PARAMETERS

All the parameters with which the device can be equipped are described below.

The hex address is used exclusively for the series. The decimal address is also available to better use the reading.

RO: It indicates "Read Only"
RW: It indicates "Write and Read"
WO: It indicates "Write Only"

Description		Range	Def.	Hex-dec address
CP1 (RO)	1st field of the product code	'E' (in ascii)	E	0x01-1
CP2 (RO)	2nd field of the product code	'C' (in ascii)	C	0x02-2
CP3 (RO)	3rd field of the product code	'D' (in ascii)	D	0x03-3
CP4 (RO)	4th field of the product code	' ' (in ascii)		0x04-4
CP5 (RO)	5th field of the product code	' ' (in ascii)		0x05-5

Modbus speed (RW)	Modbus speed	1200 2400 9600 19200 38400	9600	0x21-33
Address (RW)	Modbus address	1 – 255	50	0x22-34
IP1 (RW)	IP address	1-255	50	0x23-35
IP2 (RW)	IP address	0-255	10	0x24-36
IP3 (RW)	IP address	0-255	10	0x25-37
IP4 (RW)	IP address	0-255	10	0x26-38
SUB1 (RW)	Subnet mask	0-255	0	0x27-39
SUB2 (RW)	Subnet mask	0-255	255	0x28-40
SUB3 (RW)	Subnet mask	0-255	255	0x29-41
SUB4 (RW)	Subnet mask	0-255	255	0x2A-42
GAT1 (RW)	Gateway	0-255	0	0x2B-43
GAT2 (RW)	Gateway	0-255	0	0x2C-44
GAT3 (RW)	Gateway	0-255	0	0x2D-45
GAT4 (RW)	Gateway	0-255	0	0x2E-46

7 - FUNCTIONS OF THE MODBUS IP / RS485 TRANSMISSION PROTOCOL

7.1 – MODBUS 485 RTU PACKAGE STRUCTURE

7.1.1 – FUNCTION 3 – READING N WORDS

The number of words to read must be less than or equal to twenty-eight.

The request has the following structure:

Slave number	Function number	Address of the first word MSB	LSB	Number of words MSB	LSB	CRC LSB	MSB
byte 0	byte 1= 0x03	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7

The response has the following structure:

Number of slave	Function number	NB Number of bytes read	Value of the first word MSB	LSB	Subsequent words	CRC LSB	MSB
byte 0	byte 1= 0x03	byte 2	byte 3	byte 4	byte 5	byte NB+2	byte NB+3

7.1.2 – FUNCTION 6 – WRITING A WORDS

The request has the following structure:

Slave number	Function number	Address of the first word MSB	LSB	Value to write MSB	LSB	CRC LSB	MSB
byte 0	byte 1= 0x06	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7

The normal response is purely an echo of the request message:

Slave number	Function number	Address of the first word MSB	LSB	Value to write MSB	LSB	CRC MSB	LSB
byte 0	byte 1= 0x06	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7

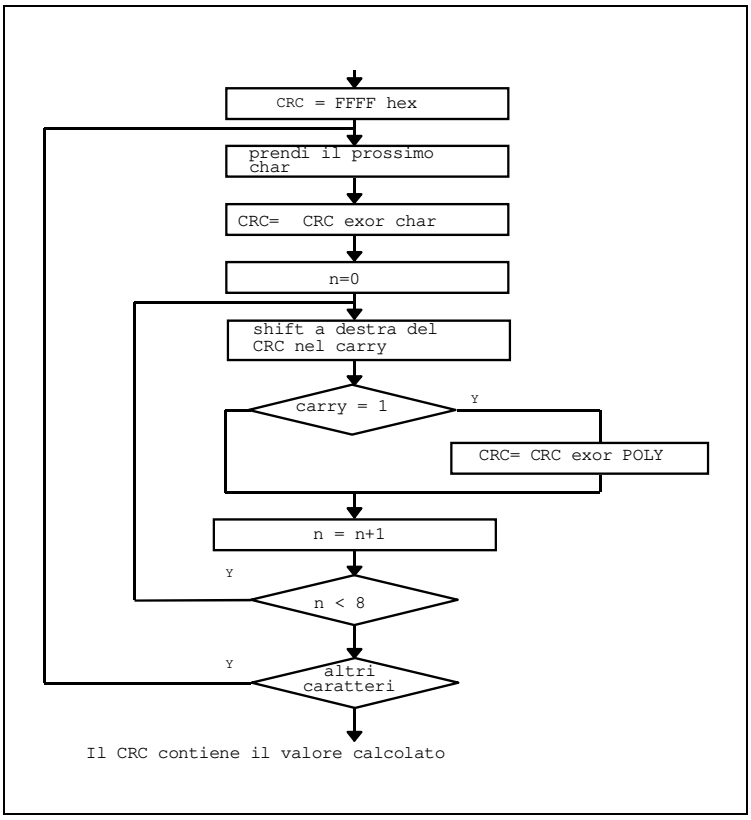
7.1.3 – CYCLIC REDUNDANCY CHECK (CRC)

The CRC is a control word that allows you to verify the integrity of a message.
Each message, which is sent or received, contains the CRC word in the last two characters.

After receiving a request, the controller verifies the validity of the received message, thus comparing the CRC contained in the message with the one calculated during reception.

During transmission, the controller calculates the CRC and places the two characters at the end of the message.
The calculation of the CRC is performed on each character of the message excluding the last two.

Being ECD compatible with the RTU MODBUS (JBUS) protocol, they use the same algorithm for calculating the CRC.



The polynomial adopted by the RTU MODBUS (JBUS) is 1010 0000 0000 0001.

Note: the first character transmitted of the CRC is the least significant of the two calculated.

7.2 – IP MODBUS PACKAGE STRUCTURE

The IP modbus packet structure is an encapsulation of the 485RTU modbus packet without checksum. The package fields are as follows:

· header: 2 bytes of unique identification code
· control: 2 bytes always at 0
· length: 2 bytes packet length excluding the first 6 bytes
· slave address: values between 1 and 255 are valid; address 0 (zero) is reserved by RTU MODBUS for the broadcasting messages, but **it is not adopted** given the implicit unreliability of this type of communication;
· function code: it contains 3 or 6 depending on the specified function;
· information field: it contains the addresses or the value of words, as required by the function used.

9 - TECHNICAL DATA

9.1 - ELECTRICAL CHARACTERISTICS

Supply: 24VDC+-10%,
Max. comsumation: 100 mA

9.2 - MECHANICAL FEATURES

Container: Self-extinguishing plastic UL 94 V0
Dimensions: 22.5 x 100 x 113.65mm
Weight: 100g
Installation: Omega DIN rail
Connections: screw terminals and extractable bus on din bar
Frontal protection degree: IP 20
Degree of pollution: 2
Usage environment: indoor.
Working ambient temperature: -25 ... 70°C
Working ambient humidity: 30 ... 95 RH% non-condensing
Transport and storage temperature: -40 ... 80°C

9.3 - DEVICE CODING

ECD

9.4 – ACCESSORIES (Not supplied)

BC-5P = bus connector for busbar connection

TC-5PR = connector for female RS485 line termination resistor

TC-5PL = connector for male RS485 line termination resistor

TC-5PR and TC-5PL terminals are used to start the RS485 line of the product.

11 - PROBLEMS, MAINTENANCE AND WARRANTY

11.1 - CLEANING

It is recommended to clean the device only with a cloth lightly soaked in water or a non-abrasive cleaner that does not contain solvents.

11.2 - WARRANTY AND REPAIRS

The device is guaranteed against manufacture defects or defects found within 12 months from the delivery date.
The warranty is limited to the repair or replacement of the product.
Any opening of the container, tampering with the device or non-compliant use and installation of the product will automatically invalidate the warranty.
In the event of a defective product within or outside the warranty period, contact the EL.CO. Sales Department to obtain authorization to ship.
The defective product, therefore, accompanied by the indications of the defect found, must arrive carriage paid at the EL.CO. factory unless otherwise agreed.