

USER GUIDE

ecco MODBUS



Declaration of compliance



1 SAFETY (Article 3.1a of the 1999/5/EC Directive)
NF EN60950-1 Ed. 2006/A1:2010/A11:2009/A12:2011 (health)
EN62479: 2010 (power <20mW) or EN62311:2008 (power > 20mW)

2 Electromagnetic Compatibility (Article 3.1b of the 1999/5/EC Directive)
EN 301489-3 v1.4.1, EN 301489-1 V1.9.2

3 Efficient use of the radio frequency spectrum (Art.3.2 of the 1999/5/EC Directive)
ETSI EN300 220-2 v2.4.1 and EN300 220-1 v2.4.1

Disclaimer

The information contained in this document is subject to change without warning and does not represent a commitment on the part of NETROTTER

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Environmental recommendations

a. Environment

Respect the temperature ranges for storage and operation of all products. Failing to respect these guidelines could disrupt device operation or damage the equipment.

Follow the instructions and warnings provided below to ensure your own safety and that of the environment and to protect your device from any potential damage.

 **General hazard** : Failure to follow the instructions presents a risk of equipment damage.

 **Electrical hazard** : Failure to follow the instructions presents a risk of electrocution and physical injury.

 **WARNING**: do not install this equipment near any source of heat or any source of humidity.

 **WARNING**: for your safety, it is essential that this equipment be switched off and disconnected from mains power before carrying out any technical operation on it.

 **WARNING**: the safe operation of this product is ensured only when it is operated in accordance with its intended use. Maintenance may only be performed by qualified personnel.



Waste disposal by users in private households within the European Union. This symbol appears on a product or its packaging to indicate that the product may not be discarded with other household waste. Rather, it is your responsibility to dispose of this product by bringing it to a designated collection point for the recycling of electrical and electronic devices. Collection and recycling waste separately at the time you dispose of it helps to conserve natural resources and ensure a recycling process that respects human health and the environment. For more information on the recycling center closest to your home, contact your closest local government office, your local waste management service or the business from which you purchased the product.

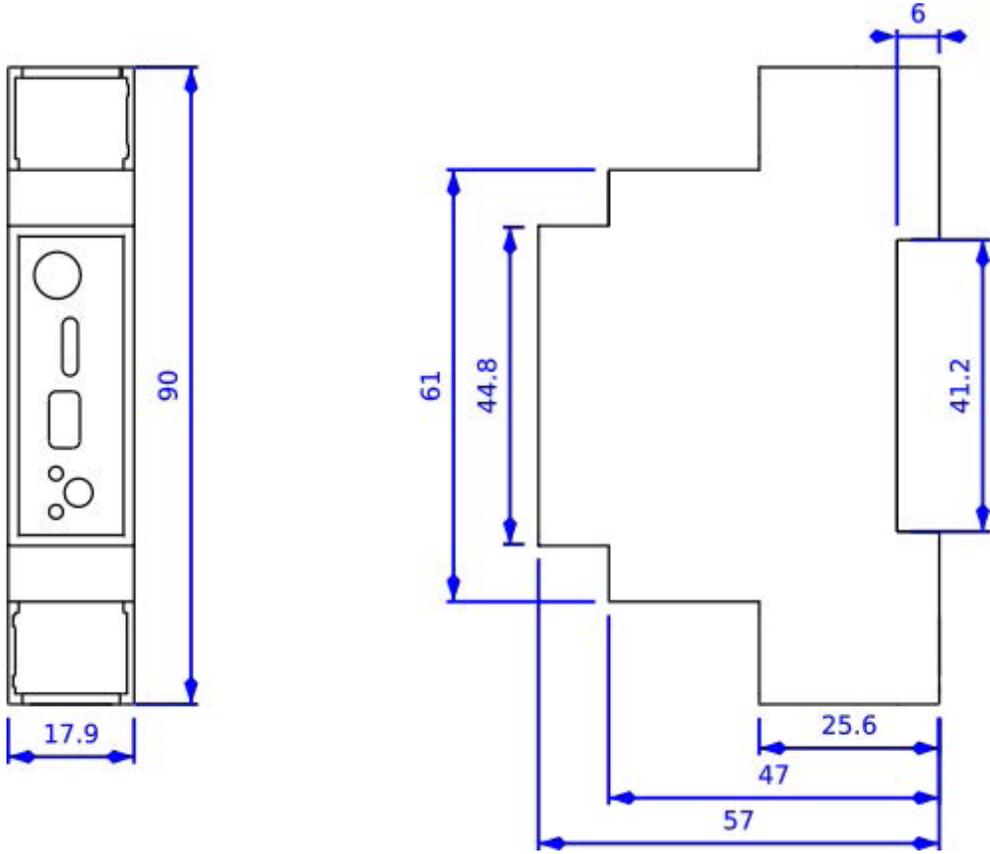
b. Radio

Modem in the ecco MODBUS is a radio-communication modem that use the ISM (industrial, scientific and medical) bands, which may be used freely (at no cost and with no authorization required) for industrial, scientific and medical applications.

Technical specifications

Dimensions	90 x 57 x 17.9 mm
Antenna	External via SMA connector
Temperature	-20 C to +55 C (operation) / -40 C to +70 C (storage)
Mounts to	DIN rail
Power supply	1x power supply, 8 - 30 V DC 200 mA MAX
Frequency	865 – 870 MHz
Power	25 mW (14 dBm)

Space requirements and mounting



Dimensions indicated in mm.

Modems are mounted on a DIN rail

Installation

a. Positioning

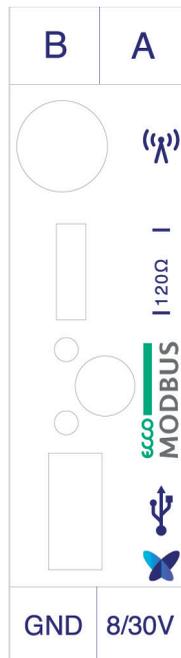
This version was designed for installation in an electrical box made of PVC or metal. The antenna must be firmly screwed onto the SMA connector and positioned vertically, preferably pointing upward.

b. Connecting the modem

If a metal box is used, the antenna must be positioned outside the box in order to ensure good radio performance and avoid the 'Faraday cage' effect.

For optimal results, we recommend that the antenna be positioned high up and at least 1 metre away from all metallic objects.

Terminal blocks:



Name	Description	In / Out
B	RS485 B	Bidirectional/differential
A	RS485 A	Bidirectional/differential
GND	Earth/Ground (Gnd)	Earth
8/30V	Power supply between 8V and 30V	Input (power supply)
NC	Not connected	/

Antenna (SMA):

Before connecting the product to mains power, connect the antenna.

Power supply (bottom terminal block):

The ecco MODBUS must be supplied with a DC power supply between 8 V and 30 V that can provide a minimum current of 100 mA.

RS485 (top terminal block):

The maximum cable length will depend on the type of serial link and the baud rate in use. A maximum length of 1 meter is appropriate for all use cases.

For an RS485 connection, you have the option to activate the 120Ω termination resistor:

- up (SMA side): resistor deactivated
- down (USB side): resistor activated

USB:

The USB connector allows you to configure the ACW with a PC and a USB cable. See section “**Configuration via USB**” for more details. To configure the device, it must be connected to power at 8/30 V DC.

c. Push button

The push button located on the front panel of the housing can be used to test the Modbus configuration and radio connectivity. If no Modbus frame is configured, a ‘keep-alive’ frame will be sent.

d. Interpreting the indicator lights

The indicator lights are used to display the state of operation of the device.

USB connection or radio activity:

When a radio message is sent over the network, the top LED light ON while it is being sent. This may last for up to one minute. This light flashes when the product is connected via USB.

Normal start-up behavior

When Ecco Modbus is switched on, after a brief delay, the bottom LED ON to indicate that the device has started up correctly. The periodic frame is then sent out, based on the statement period specified in the settings. If a USB cable is connected to the Ecco Modbus, the top LED will flash as long as that connection is in place.

Parameter settings and configuration

a. Parameter settings

Serial link parameters:

The RS serial link can be configured with different parameters. Not all parameter settings are compatible with one another.

The configurable parameters are as follows: 8N1, 8N2, 8E1, 8O1, 7N2, 7O1, 7O2, 7E1, 7E2.

Type of serial link:

- Only RS485

Serial link baud rate:

- 600 bps
- 2400 bps
- 4800 bps
- 9600 bps
- 19200 bps (default value)
- 38400 bps
- 57600 bps
- 115200 bps

Serial link parity:

- No parity (default): N
- Even: E
- Odd: O

Number of bits for the serial link:

- 7 bits
- 8 bits (default)

Number of stop bits for the serial link:

- 1 bit (default)
- 2 bits

Frame period:

A complete radio cycle is composed of two phases: 1/ sending requests to one or several Modbus slave(s), 2/ broadcasting retrieved Modbus data via radio communication.

During requesting phase, up to 49 Modbus request frames are sent through serial link to slave Modbus equipment, which return data requested by the ecco MODBUS.

During radio emission phase, Modbus registers or bits retrieved by ecco MODBUS are broadcast under one or several frames according to the configuration.

The interval for this cycle is once per hour by default but can be configured for intervals ranging from 10 minutes to 28 days, in increments of 1 minute.

Modbus timeout:

During Modbus communication, if a slave does not respond during the specified time, an error will be reported. This period is set to 1 second by default and can be set to values from 100 milliseconds to 65 seconds, in increments of 100 milliseconds.

Parameter settings for Modbus and radio frames:

You can configure up to 49 Modbus frames and a certain number of radio frames, depending on your statement period. A radio frame is defined by the parameters from the Modbus frames.

Therefore, you must configure the following parameters:

Modbus function code

The following function codes are available:

Function code	Name
0x01	Read Coils
0x02	Read Discrete Inputs
0x03	Read Holding Registers
0x04	Read Input Registers

Slave address:

Indicates the address of the Modbus slave device.

Register or bit address:

Indicates the address of the first register or bit to be read.

Radio header:

The radio header is a value that is used to identify the type of radio frame. You must choose the correct value in order to identify what data are included in the frame. When concatenation is used, only the header of the first frame will be used.

Number of registers or bits to read:

A frame is considered as unused if this value is equal to 0. Depending on the function code you have selected and the number of frame concatenations, you can indicate the number of registers or bits that you want to read. Keep in mind that a Sigfox radio frame cannot contain more than 10 bytes of data, i.e. 5 Modbus registers.

b. Configuration via USB

Tool version: NETTROTTER IoTtools v.1.0

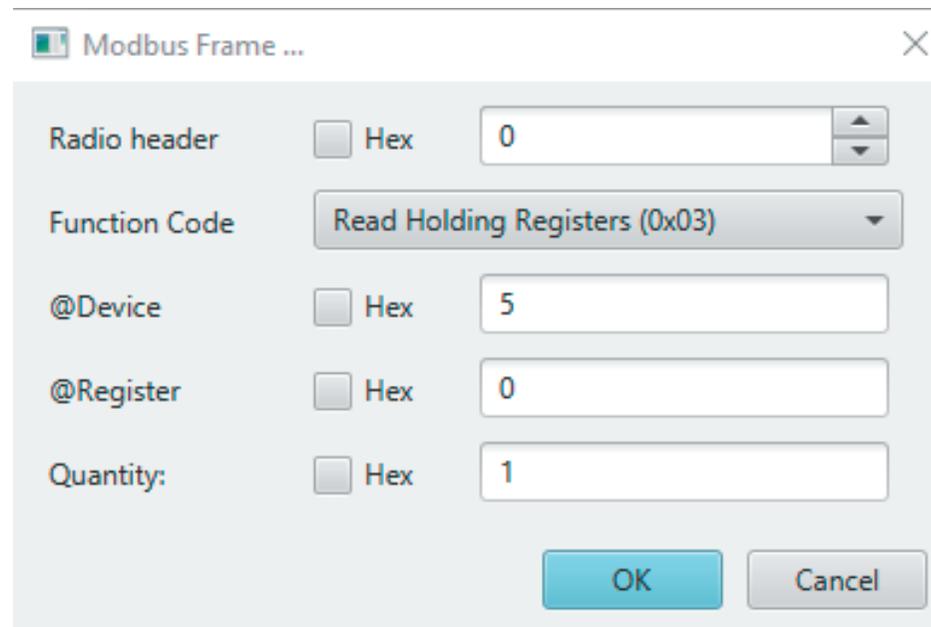
Download and install the configuration tool at: <https://netrotter.solutions/>

Four major sections can be distinguished here. The 'RS485 parameters' section is at the top left, 'Scheduling parameters' at the center left, the Modbus configuration section at the right and the debugging area at the bottom.

Parameter settings for Radio and Modbus frames

In the Modbus section at the right, you can add radio (network) and Modbus frames, add a Modbus frame to a radio (network) frame, edit a Modbus frame as well as delete and test Modbus frames. Clicking "New" will add a new network frame.

When adding or editing a Modbus frame, a window like the one below will appear. Use this window to configure all the parameters for your Modbus frame.



The image shows a dialog box titled "Modbus Frame ...". It contains the following fields and controls:

- Radio header:** A checkbox labeled "Hex" is unchecked. To its right is a numeric input field containing the value "0".
- Function Code:** A dropdown menu is open, showing "Read Holding Registers (0x03)".
- @Device:** A checkbox labeled "Hex" is unchecked. To its right is a numeric input field containing the value "5".
- @Register:** A checkbox labeled "Hex" is unchecked. To its right is a numeric input field containing the value "0".
- Quantity:** A checkbox labeled "Hex" is unchecked. To its right is a numeric input field containing the value "1".

At the bottom right of the dialog box are two buttons: "OK" (highlighted in blue) and "Cancel".

The number of Modbus and radio (network) frames is limited. Just above the frame configuration area in the main window, you will see a summary of the number of frames that you have used and the total number that you can use. You can configure one frame every ten minutes for a maximum of 6 frame every hour. When the configuration finished, click "OK" to see the main window with the new frame added.

NETTROTTER IoTools

NETTROTTER
CONNECTING THINGS

Connect Disconnect Open Save Setting

ECCO MODBUS

RS485 Set Parameters Get Parameters Radio Message 1 di 1 Modbus Frame 1 di 49 Delete All New

Radio Header	Function Code	@Device	@Reg	Quantity	Action
▼ 0	Byte used: 2/10 Read Holding Registers (0x03)	5	0	1	...

Baudrates: 9600 bps
Parity: None
Data bits: 8 bits
Stop bits: 1 stop bit
Timeout: 1.0 s

Period: 0 H 10 Min

Function: Read Holding Registers (0x03)
@Device: Hex 0
@Reg: Hex 0
Quantity: Hex 0

Command

EccoModbus Ver 1.0 ID: 01FB7B48

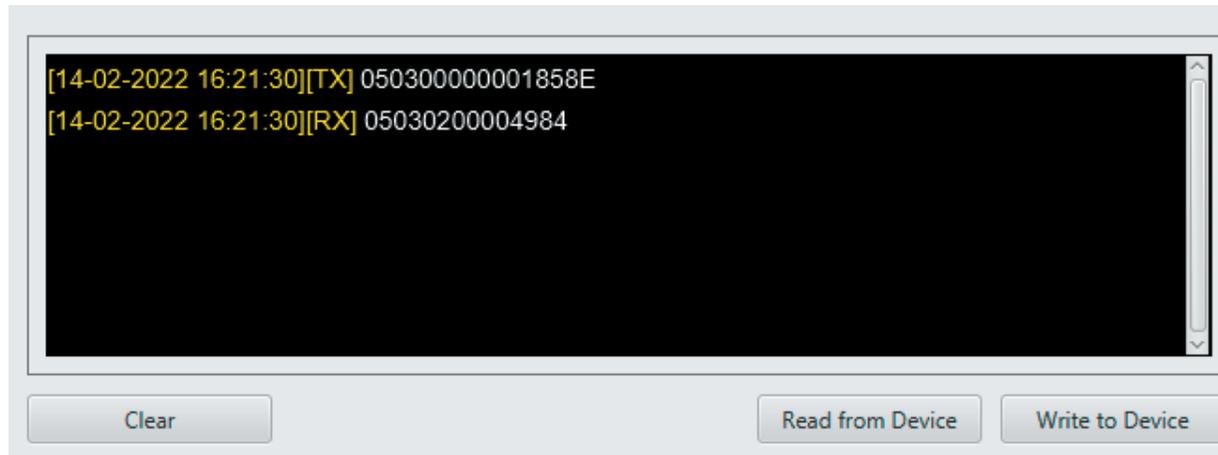
Clear Read from Device Write to Device

TEST FRAME BUTTON

In the column "Function Code" you can see the Bytes used on SigFox payload, it is possible to use up to 10 bytes for each message.

Testing Modbus frames

Before testing a Modbus frame, you must connect the Ecco Modbus to your Modbus slave device. Next, configure the parameters for the serial link and click "Set Parameters" to apply the serial parameters. After that is possible to click the "Test Frame Button" to send the frame directly to the Modbus Slave device. In the Log window will be possible to see the TX message and the RX message from slave device



Both messages are displayed in Modbus standard.

Add More Register in the same payload

It is possible to add more Modbus registers in the same Sigfox payload. To do this, select main message when do you want to add more registers in the Modbus section and left click, a new window like this will appear. Click "Add" to add a new register.

Radio Header	Function Code	@Device	@Reg	Quantity	Action
▼ 0	Byte used: 2/10				
	Read Holding Registers (0x03)	5	0	1	...

- Add
- Edit
- Delete

The new Modbus frame parameter can be set, except for the Radio header that will be the same of the first message created.

Modbus Frame ...
✕

Radio header Hex

Function Code

@Device Hex

@Register Hex

Quantity: Hex

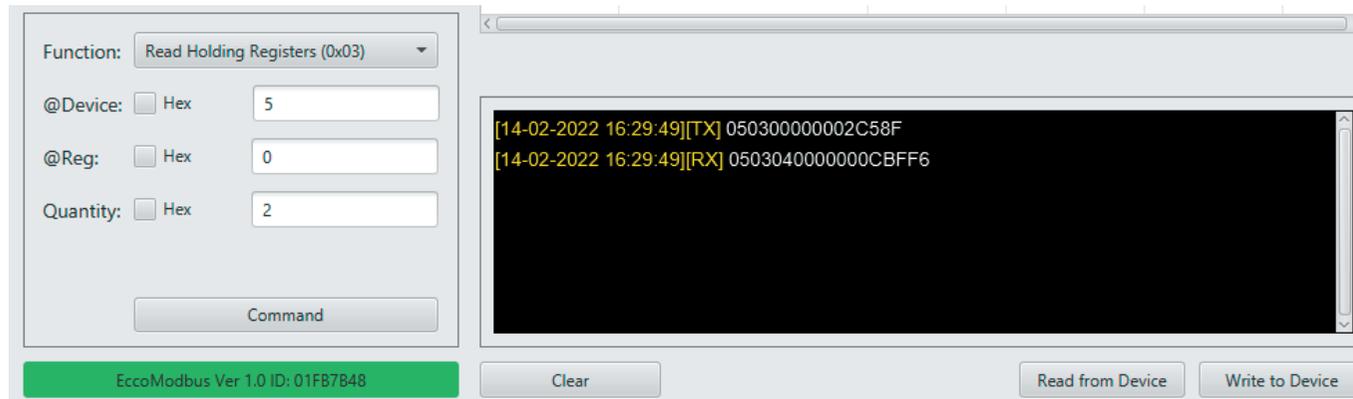
Click "OK" to add the new message in the Sigfox payload.

Radio Header	Function Code	@Device	@Reg	Quantity	Action
▼ 0	Byte used: 4/10				
	Read Holding Registers (0x03)	5	0	1	...
	Read Holding Registers (0x03)	5	2	1	...

Now the Modbus section display the message with radio header "0", with the two Modbus request for Slave device "5". At the top of the Function code column is possible to see how many bytes are used for the selected Sigfox message, in the example 4 of 10 bytes. This mean that can be add more register to arrive a 10 of 10 bytes

Test the RS485 Communication

Is it possible to test the communication between the Ecco Modbus and the Slave device without program any messages. To do this, set the RS485 parameters and click "Set Parameters". After that is it possible to use the form on the bottom left to configure a message and send to slave clicking "Command" button. In the Log Window will appear the TX message and the RX message from Slave in the Modbus format.



Transmitting information on IoT networks (Sigfox/LoRaWAN)

This frame is sent to the network instead of the periodic frames if no Modbus frame is configured. Frame format:

Byte	1	2	3,4 ...
Data	0x03	Header	Values of Modbus registers and/or bits read from the slave(s)

The header is a configurable parameter and must be set correctly in order to decode the frame. Modbus registers are sent in a 2-byte format in MSB order.

a. Keep-alive frame

This frame is sent to the network instead of the periodic frames if no Modbus frame is configured. Frame format:

Byte	1	2	3	4	5	6
Data	0x0a	0x00	0x00	0x00	0x00	0x00

b. Periodic frame (or triggered by pressing button)

This frame is sent to the network at a regular, configurable interval (the statement period). Frame format:

Byte	1	2	3, 4 ...
Data	0x03	Header	Values of Modbus registers and/or bits read from the slave(s)

The header is a configurable parameter and must be set correctly in order to decode the frame. Modbus registers are sent in a 2-byte format in MSB order.



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