

NMEA talker to Modbus Slave converter

# SGW1-MB-NM

User's manual



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# 1 Introduction

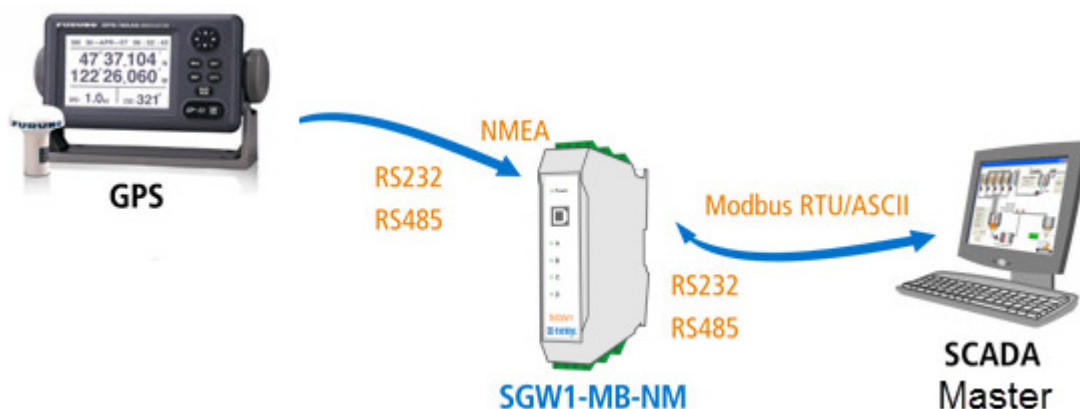
## 1.1 User Manual purpose

The purpose of this manual is to provide the instructions to quickly and simply install and operate the SGW1-MB-NM

## 1.2 Product Overview

The SGW1-IA3-MB-NM is a protocol converter that will convert the values send from a NMEA 0183 talker to Modbus registers. On the Modbus side it's a slave that can be connected to a Modbus master.

The supported NMEA statements are: GGA, VTG, MWV, XDR, ROT, VBW, DPT, HDM, HDT, RMC, RMB, APB, DBT, MTW, MTA, RSA, VDO.



## 1.3 Ordering Code

The ordering code is: ***SGW1-2B0-00-IA3-MB-NM***

This code, replaces the old version: *SGW1-2100-IA-MB-NM*

## 1.4 Technical Specifications

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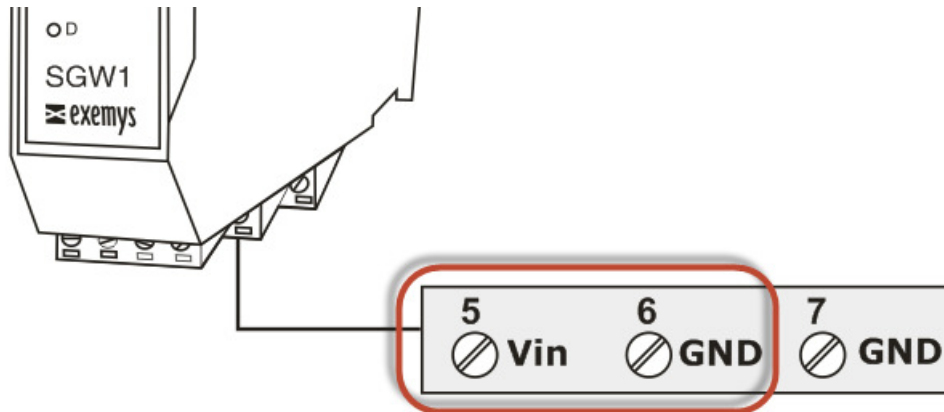
<b>Communication Protocols</b>	Modbus RTU, Modbus ASCII, NMEA 0183
<b>Communication Port</b>	2 RS232 / RS485, 1 USB type B
<b>Configuration</b>	USB Console
<b>Firmware Upgrade</b>	Via RS232
<b>LED Indicators</b>	Power, NMEA data, Modbus data
<b>Dimensions</b>	100 mm x 22,5 mm x 112 mm (Height x Width x Length)
<b>Power Supply</b>	10 a 30 Vdc, 70 mA @ 12 Vdc, 40 mA @ 12 Vdc
<b>Temperatures</b>	Operation: -15 a 65 °C Storage: -40 a 75 °C
<b>Warranty</b>	1 Year, technical support included

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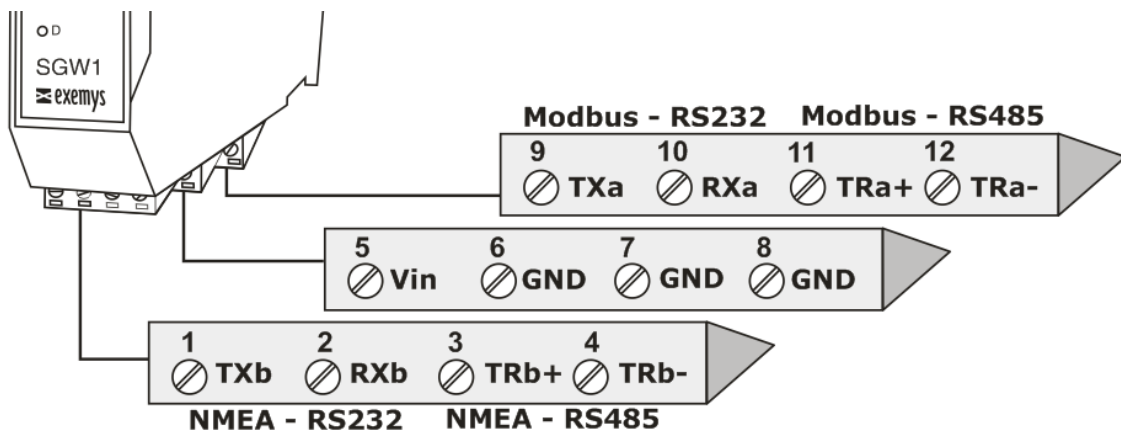
## 2 Installation

### 2.1 Power Supply connection

The SGW1-IA3-MB-NM accepts a power supply in the range of +10 to 30 VDC. The positive must be connected to terminal #5 and the negative to terminal #6, as can be seen in the following image:



### 2.2 Serial Ports Connections



RS232 ports are DTE type. That means, data is transmitted through the TX terminal and is received on the RX terminal. If you want to connect another DTE device you must cross the Tx and Rx terminals.

### 2.3 Led Indicators

The SGW1-IA3-MB-NM has three LED indicators. One of them indicates that the device is energized (Power). While the other two are each linked to the activity on the serial ports - Modbus (A) and NMEA (B).

## 3 Configuration

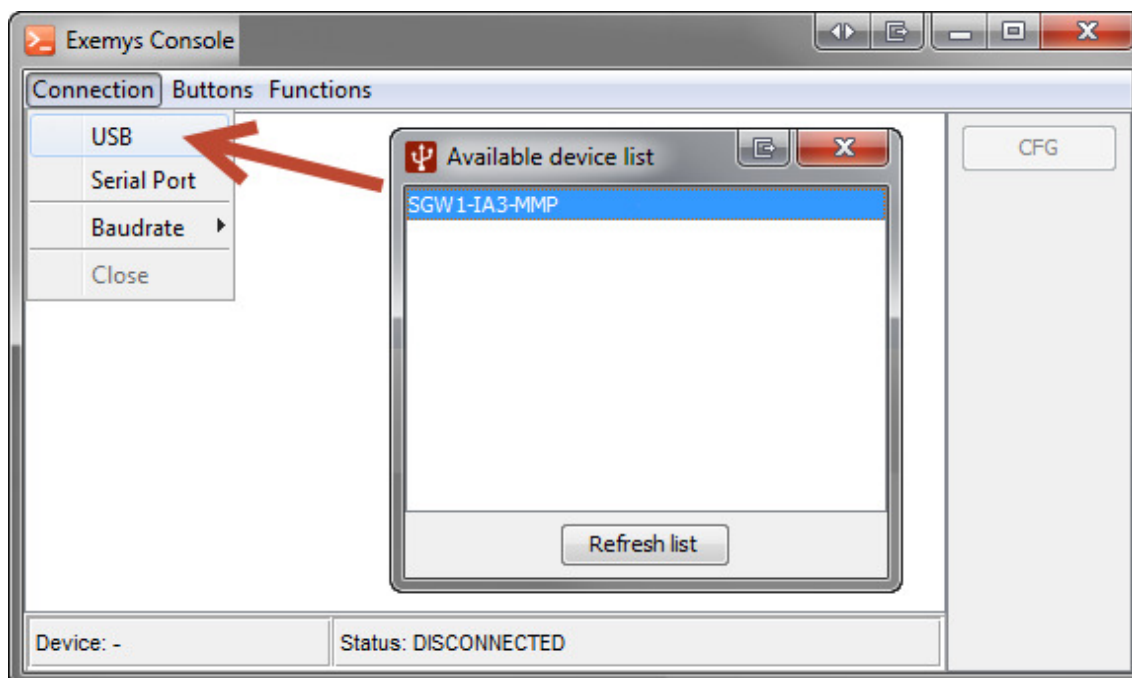
The SGW1-IA3-MB-NM provides a command console for configuration via USB port.

To access it, the SGW1-IA3-MB-NM must be connected to a USB port on a PC and it must have the Exemys branded terminal program called Exemys Console.

The driver for the USB can be downloaded from here: [www.exemys.com/rmsrmdriver](http://www.exemys.com/rmsrmdriver)

The terminal type program can be downloaded from here: [www.exemys.com/console](http://www.exemys.com/console)

Once the driver and the terminal type program have been installed, the terminal must be run, connect the SGW1-IA3- MB-NM to a USB port on the PC and go to the Connection -> USB menu, a window will open with the description of all the Exemys products with USB found. Select with double click the product to be configured and pressing ENTER will show a ">" sign indicating that you can enter the configuration commands listed below.



### 3.1 Modbus Configuration.

Command	Description
<b>MBBAUD</b> (1200 ... 115200)	<p>Modbus Port Baud rate</p> <ul style="list-style-type: none"> <li>Values: 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600 or 115200.</li> </ul> <p>Example: <code>MBBAUD : 115200</code></p>
<b>MBBITS</b> (7 8)	<p>Modbus port stop bits. 7 bits can only be selected, when the "PROTOCOL" is Modbus ASCII.</p> <ul style="list-style-type: none"> <li>Values: 7 or 8</li> </ul> <p>Example: <code>MBBITS : 8</code></p>
<b>MBPARITY</b> (N E O)	<p>Modbus Port Parity.</p> <ul style="list-style-type: none"> <li><b>N</b> = without parity / <b>E</b> = Even parity / <b>O</b> = Odd parity</li> </ul> <p>Exmple: <code>MBPARITY : E</code></p>
<b>MBSTOP</b> (1 2)	<p>Modbus Port Stop Bits</p> <ul style="list-style-type: none"> <li>Values: 1 or 2</li> </ul> <p>Example: <code>MBSTOP : 2</code></p>
<b>MBPROTOCOL</b> (R A)	<p>Modbus type</p> <ul style="list-style-type: none"> <li><b>R</b> = Modbus RTU / <b>A</b> = Modbus ASCII</li> </ul> <p>Example: <code>MBPROTOCOL : R</code></p>
<b>MBPKTTOUT</b> (3...50)	<p>Modbus RTU packet expiration time</p> <ul style="list-style-type: none"> <li>Values: 3 to 50 [byte times]</li> </ul> <p>Example: <code>MBPKTTOUT : 4</code></p>
<b>MBEXCEPTION</b> (E D)	<p>Modbus port exceptions</p> <ul style="list-style-type: none"> <li><b>E</b> = Enabled / <b>D</b> = Disabled</li> </ul> <p>Example: <code>MBEXCEPTION : D</code></p>
<b>MBID</b> (1...254)	<p>Modbus slave ID for internal registers memory.</p> <ul style="list-style-type: none"> <li>Values: 1 to 254</li> </ul> <p>Example: <code>MBID : 110</code></p>

- `MBEXCEPTION` - Enables or disables exceptions for the Modbus Port. If the option is disabled the SGW1-IA3-MB-NM will respond to errors with silence, otherwise it will return an exception code.



- **MBPKTTOUT** - Modbus RTU packet expiration time: Modbus RTU packets are separated from each other by a time interval. This parameter allows you to change the maximum time, counting after the last byte of the packet, during which the SGW1-IA3-MB-NM will assume that the packet has not yet been terminated. After this maximum time, the SGW1-IA3-MB-NM will assume that the packet has finished arriving. The time is entered in one-byte time units, with a minimum of 3 units. (Don't change this value unless you know exactly what it means)

### 3.2 NMEA Configuration

Command	Description
<b>NMEABAUD</b> (1200 ... 115200)	NMEA Port Baud rate <ul style="list-style-type: none"> <li>• Values: 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600 ó 115200.</li> </ul> Example: <code>NMEABAUD : 115200</code>
<b>NMEABITS</b> (7 8)	NMEA Port data bits <ul style="list-style-type: none"> <li>• Values: 7 or 8.</li> </ul> Example: <code>NMEABITS : 8</code>
<b>NMEAPARITY</b> (N E O)	NMEA Port Parity. <ul style="list-style-type: none"> <li>• <b>N</b> = NONE / <b>E</b> = EVEN / <b>O</b> = ODD</li> </ul> Example: <code>NMEAPARITY : E</code>
<b>NMEASTOP</b> (1 2)	NMEA Port stop bits <ul style="list-style-type: none"> <li>• Values: 1 or 2.</li> </ul> Example: <code>NMEASTOP : 1</code>
<b>NMEASEND</b>	Sends a message from the USB console directly to the NMEA port. It can be used to configure the NMEA device in case it's needed. Example: <code>NMEASEND : \$PGRMO, GPRMC, 1</code>
<b>NMEALISTEN</b>	It configures the SGW1 to the USB console everything that comes from the NMEA port. It can used to verify the connection to the NMEA talker and see which sentences are being received
<b>NMEAVerb</b>	It configures the SGW1 to send to the USB console details of the NMEA sentences received on the NMEA port.

### 3.3 Other commands

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Command	Description
<b>LIST</b>	Lists the current configuration.
<b>HELP</b>	Displays the list of all available commands with syntax and descriptive text.
<b>FACTRESET</b>	Restart the device factory settings.

## 4 Modbus Registers

The following table shows how to map each NMEA statement in Modbus registers. If your NMEA talker does not send any of the statements listed here, values will be read out at 0.

### Notes:

- Where two Modbus registers are indicated to represent a value of 32 bits, the first register contains the upper part and the second the lower part of the represented value.
- Where clarifications such as "x10" are specified, it means that the value obtained from the NMEA device is multiplied by the corresponding factor to achieve a higher degree of resolution in the indicated value.
- Where "ASCII" is specified, it means that the value read is the numerical representation according to the ASCII coding of the letter obtained by the device that delivers the NMEA frame.
- Where "ddmmyyy" is specified, it means that the value indicated for this case is 2 digits representing the day, 2 the month and 4 the year. Thus the decimal number 05112012, refers to the date November 5, 2012.
- Where "hhmmss" is specified, it means that the value indicated for this case is 2 digits representing the hour, 2 minutes and 2 seconds. Thus the decimal number 123045, refers to the time 12:30:45.
- In the registers where Latitude and Longitude are expressed, the arithmetic that must be done to decode the information is the following:

$$(\text{SSSS} / 3600) \times 10,000,000$$

### Example:

***LAT: 48 ° 43'14.9224"N.***

$48 + (43/60) + (14.9224 / 3600) = 48.7208118$  °, then multiply x 10,000,000 to obtain exactly the value that is observed in the Modbus register = 487.208.117

<b>GGA Global Positioning System Fixed Data</b>			
4001:2	UTC Time	hhmmss	-
4003:4	Latitude	x10,000,000 signed	°
4005:6	Longitude	x10,000,000 signed	°
4007	GPS Quality	-	-
4008	Number of Satellites	-	-
4009	Horizontal Dilution	x10	-
4010:11	Altitude	x10	meters/feet
4012	Altitude Unit	ASCII	-
4013	Geoidal Separation	x10	meters/feet
4014	Geoidal Separation Units	ASCII	-
4015	Age of differential GPS data	x10	Seconds
<b>VTG Course Over Ground and Ground Speed</b>			
4016	True track made good	x10	°
4017	Magnetic track made good	x10	°
4018	Ground speed, knots	x10	knots
4019	Ground speed, Kilometers per hour	x10	kph
<b>MWV Wind Speed and Angle</b>			
4020	Wind angle	x10	°
4021	Reference	ASCII	-
4022	Wind speed	x10	kph/knots
4023	Wind speed units	ASCII	-
4024	Status	ASCII	-
<b>XDR Transducer Measurement</b>			
4025	Sensor type 1	ASCII	-
4026	Sensor reading 1	x10	-
4027	Sensor units 1	ASCII	-
4028	Sensor type 2	ASCII	-
4029	Sensor reading 2	x10	-
4030	Sensor units 1	ASCII	-
4031	Sensor type 3	ASCII	-
4032	Sensor reading 3	x10	-
4033	Sensor units 3	ASCII	-
<b>VHW Water speed and heading</b>			
4034	Degrees True	x10	°
4035	Degrees Magnetic	x10	°
4036	Speed	x10	knots
4037	Speed	x10	kph
<b>ROT Rate Of Turn</b>			
4038	Turn Velocity (*)	x10	° per minute
4039	State	ASCII	-

<b>VBW Dual Ground / Water Speed</b>			
40040	Longitudinal water speed (*)	x10	Nudos
40041	Transverse water speed (*)	x10	Nudos
40042	Status	ASCII	-
40043	Longitudinal ground speed (*)	x10	Nudos
40044	Transverse ground speed (*)	x10	Nudos
40045	Status	ASCII	-
40046	Stern longitudinal water speed (*)	x10	Nudos
40047	Status	ASCII	-
40048	Stern transverse water speed (*)	x10	knots
40049	Status	ASCII	-

<b>DPT Depth</b>			
40050	Water depth	x10	meters
40051	Offset	x10	meters

<b>HDM Heading, Magnetic</b>			
40052	Degrees magnetic	x10	°

<b>ZDA Time &amp; Date</b>			
40053:54	UTC Time	hhmmss	-
40055:56	UTC Date	ddmmyyyy	-
40057	Hours	-	hours
40058	Minutes	-	minutes

<b>HDT Heading, True</b>			
40059	Real degrees	x10	°

<b>RMC Recommended Min. Specific GNSS Data</b>			
40060:61	Time (UTC)	hhmmss	-
40062	Status	ASCII	-
40063:64	Latitude	x10,000,000 signed	°
40065:66	Longitude	x10,000,000 signed	°
40067	Speed over ground	x10	knots
40068	Track made good	x10	°
40069:70	Date (UTC)	ddmmyy	-
40071	Magnetic variation	x10	°
40072	Variation	ASCII	-
40073	Mode	ASCII	-

<b>RMB Recommended Min. Navigation Information</b>			
40074	Status	ASCII	-
40075	Cross Track Error	x10	miles
40076	Course	ASCII	-
40077:78	Destination Waypoint Latitude	x10,000,000 signed	°
40079:80	Destination Waypoint Longitude	x10,000,000 signed	°
40081	Range to destination	x10	miles
40082	Bearing to destination	x10	°

40083	Destination closing velocity	x10	knots
40084	Arrival Status	ASCII	-
40085	Mode	ASCII	-
<b>APB Autopilot Sentence "B"</b>			
40086	Status 1	ASCII	-
40087	Status 2	ASCII	-
40088	Cross Track Error Magnitude	x10	miles
40089	Direction to steer	ASCII	-
40090	Status 3	ASCII	-
40091	Status 4	ASCII	-
40092	Bearing origin to destination	x10	°
40093	Magnetic/True	ASCII	-
40094	Bearing, present position to Destination	x10	°
40095	Magnetic/True	ASCII	-
40096	Heading to steer to destination waypoint	x10	
40097	Magnetic/True	ASCII	-
40098	Mode	ASCII	-
<b>DBT Depth Below Transducer</b>			
40099	Water depth	x10	feet
40100	Water depth	x10	Meters
40101	Water depth	x10	Fathoms
<b>MTW Water Temperature</b>			
40102	Water temperature	x10	°C
<b>MTA Air Temperature</b>			
40103	Air temperature	x10	°C
<b>RSA Rudder Sensor Angle</b>			
40104	Starboard rudder sensor (*)	x10	°
40105	Status	ASCII	-
40106	Port Rudder Sensor (*)	x10	°
40107	Status	ASCII	-
<b>VDO Message type 1 - Position Report</b>			
40108	Message type	-	-
40109	Repeat indicator	-	-
40110:11	User ID	-	-
40112	Navigation Status	-	-
40113	Rate of turn (ROT)	x10	°/min
40114	Velocity over ground (SOG)	x10	knots
40115	Position accuracy	-	-
40116:17	Longitude	x10,000,000 signed	°
40118:19	Latitude	x10,000,000 signed	°
40120	Course over ground (COG)	x10	°
40121	True Heading (HDG)	-	°

40122	Time (UTC)	-	-
40123	Receptor Integrity control (RAIM)	-	-

(\*) When a "-" is received from the NMEA device as a value, it will be indicated with the value 9999 on the Modbus map

(\*\*) The spin ratio (ROT) has three values of special character, which are:

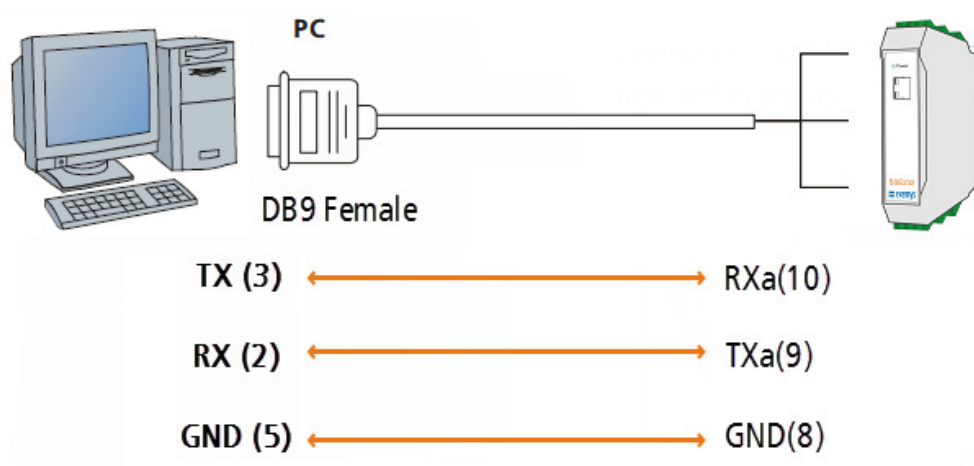
- 9999: This value is displayed when there is no information available on this field
- 713: This value is displayed when you are rotating clockwise to more than 5 degrees in 30 seconds
- -713: This value is displayed when you are turning counterclockwise to more than 5 degrees in 30 seconds

# Appendix A

## A. Firmware Upgrade

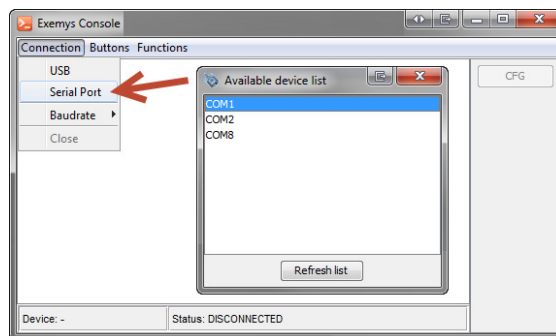
The firmware of the SGW1-MB-NM can be updated in case of new versions with improvements, by accessing the serial console intended for this purpose.

Connect an RS232 cable as follows between the computer and the SGW1 and follow the steps below



The terminal console program can be downloaded from here: [www.exemys.com/console](http://www.exemys.com/console)

1. Open an Exemys Console terminal type program in the COM of the corresponding computer and verify in the terminal that the Baudrate is in 9600.

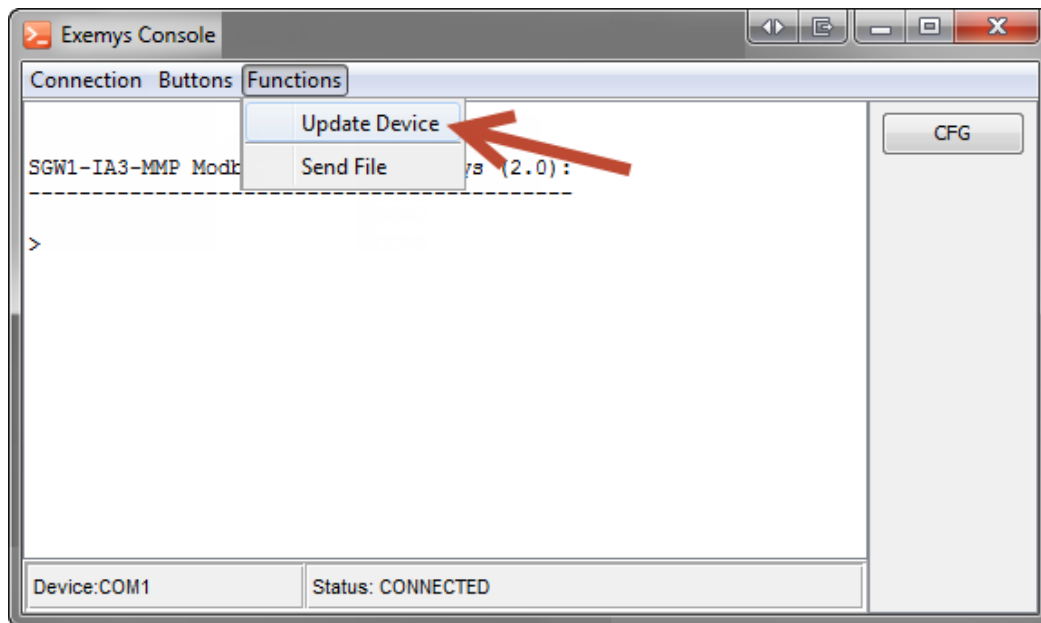


1. Turn on the SGW1 and within the first 7 seconds type CFG and press ENTER or press the CFG button that is available. After doing it the SGW1 will show the welcome message:

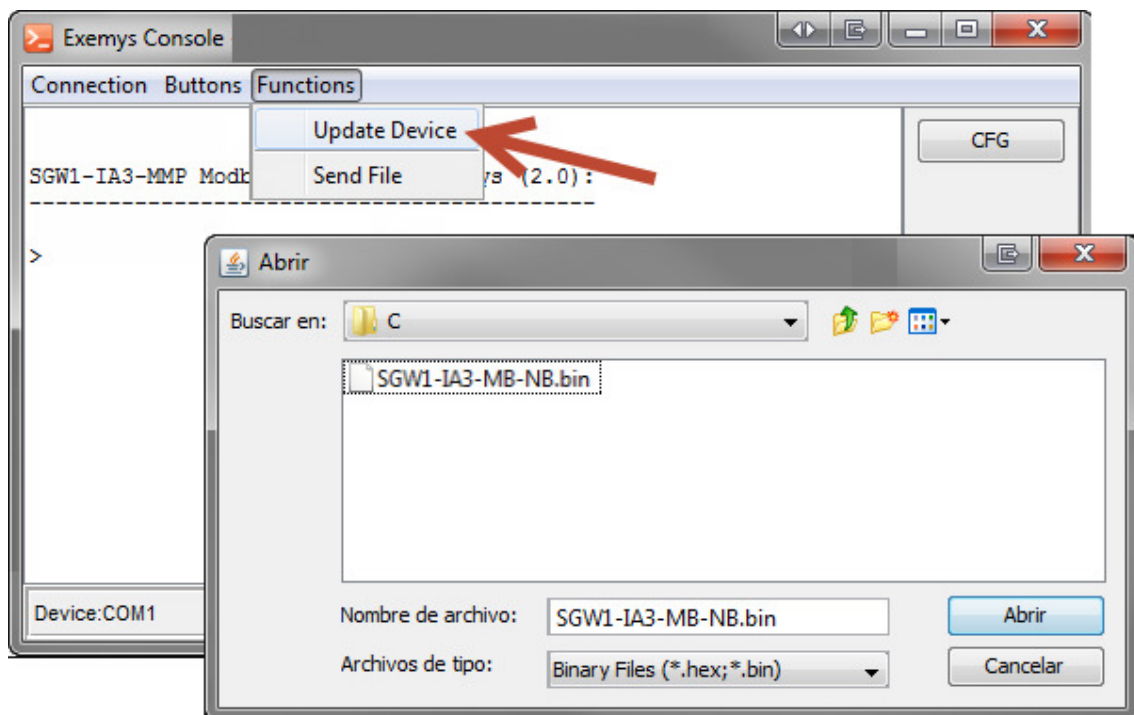
```
SGW1-MB-NM NMEA to Modbus converter - Exemys (2.0):
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>
```



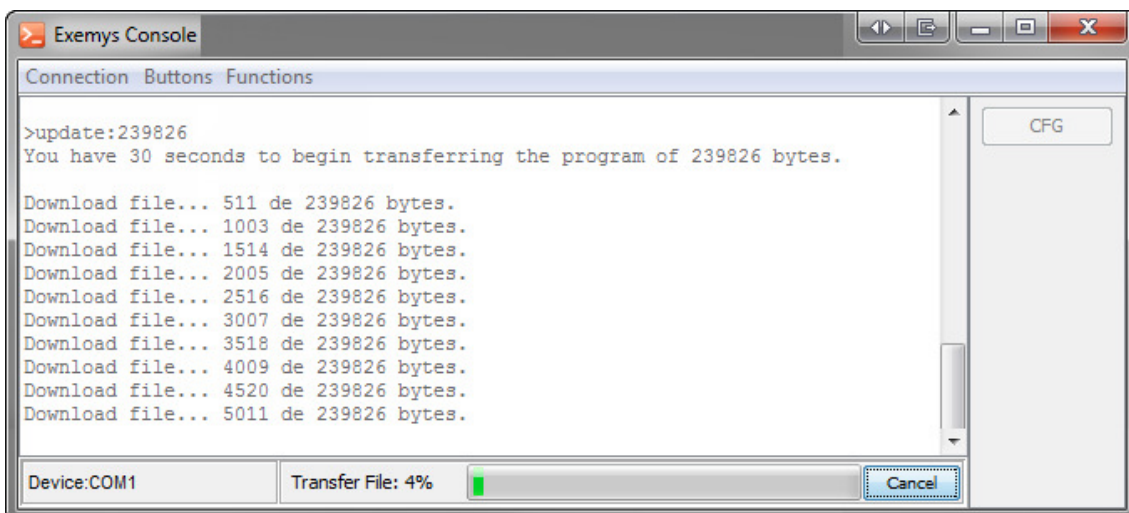
2. Then go to the menu Functions -> Update Device.



3. Locate and select the binary file (.bin) to be transferred and press the Open button to start the firmware update of the device.



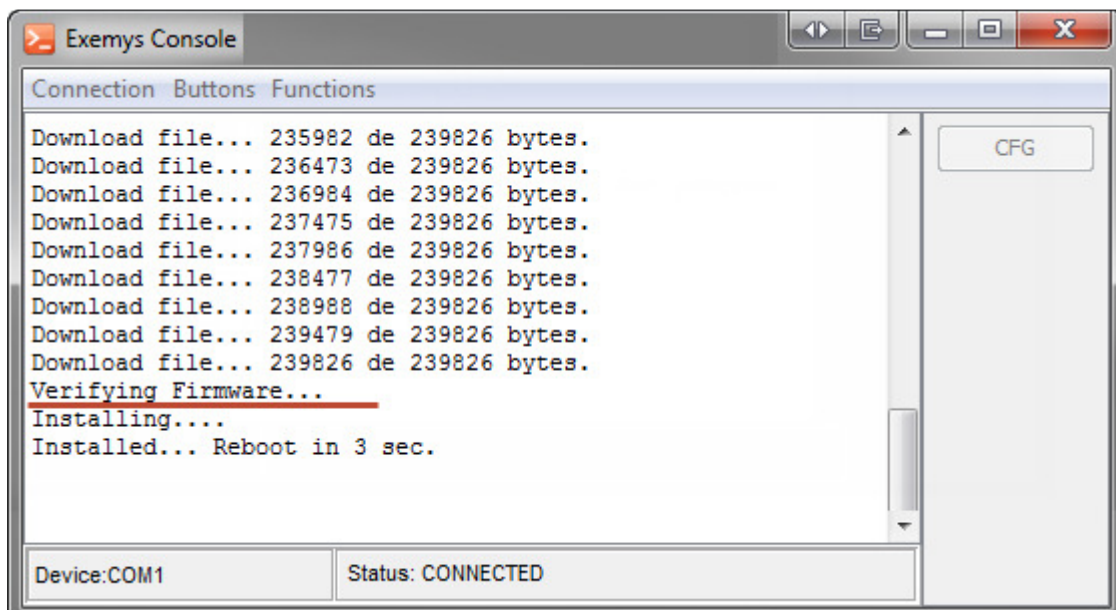
4. During the file transfer the progress of the process will be displayed.



- At the end, the device will be restarted to install the update, preserving the current configuration.



Do not turn off the device until the "Installed" message is displayed, this can cause a permanent damage to the device.



# Appendix B

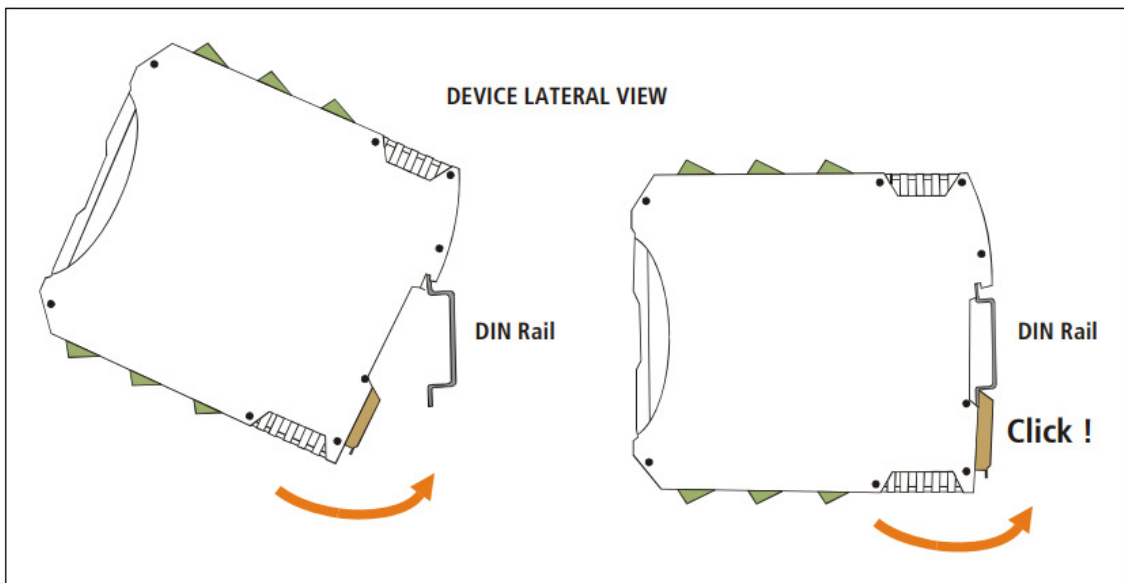
## B. Factory settings

Parameter	Value
<b>Modbus Port (A)</b>	
Baud rate	9600 bps
Data bits	8
Parity	NO
Stop bits	1
Modbus type	Modbus RTU
Modbus slave ID	240
Exceptions	Disabled
Modbus RTU packet time	3 bytes time
<b>Port NMEA (B)</b>	
Baud rate	9600 bps
Data bits	8
Parity	NO
Stop bits	1

# Appendix C

## C. DIN Rail mount

The equipment can be DIN rail mounted. To attach the module to the rail, point the top of the device toward it and locate the adapter slot on its top edge. Press firmly onto the rail until it clicks into place (a click will be heard when attaching the module to the DIN rail)



To remove the rail module, first remove the input terminals. Then insert a screwdriver into the lower lock of the device's DIN connector and force the connector down until the module disengages.

