CNV510-PNET-RTU-A

Software version SW67602

PROFINET Slave / Modbus Master Converter

User Manual

WARNING:

Pixsys srl reserves the right to change information in this manual about our product without warning.
Pixsys srl is not responsible for any error this manual may contain.

TRADEMARKS:

All trademarks mentioned in this document belong to their respective owners.

SECURITY ALERT:

GENERAL INFORMATION
To ensure safe operation, the device must be operated according to the instructions in the manual. When using the device, legal and safety regulation are required for each individual application. The same applies also when using accessories.

INTENDED USE
Machines and systems must be designed so the faulty conditions do not lead to a dangerous situation for the operator (i.e. independent limit switches, mechanical interlocks, etc.).

QUALIFIED PERSONNEL
The device can be used only by qualified personnel, strictly in accordance with the specifications.
Qualified personnel are persons who are familiar with the installation, assembly, commissioning and operation of this equipment and who have appropriate qualifications for their job.

RESIDUAL RISKS
The device is state-of-the-art and is safe. The instruments can represent a potential hazard if they are inappropriately installed and operated by untrained personnel. These instructions refer to residual risks with the following symbol:


This symbol indicates that non-observance of the safety instructions is a danger for people that could lead to serious injury or death and / or the possibility of damage.

CE CONFORMITY
The declaration is made by our company. You can send an email to support@pixsys.net or give us a call if you need it.

CHARACTERISTICS:

The CNV510-PNET-RTU-A is a PROFINET Slave → Modbus Master Converter.

It allows the following characteristics:

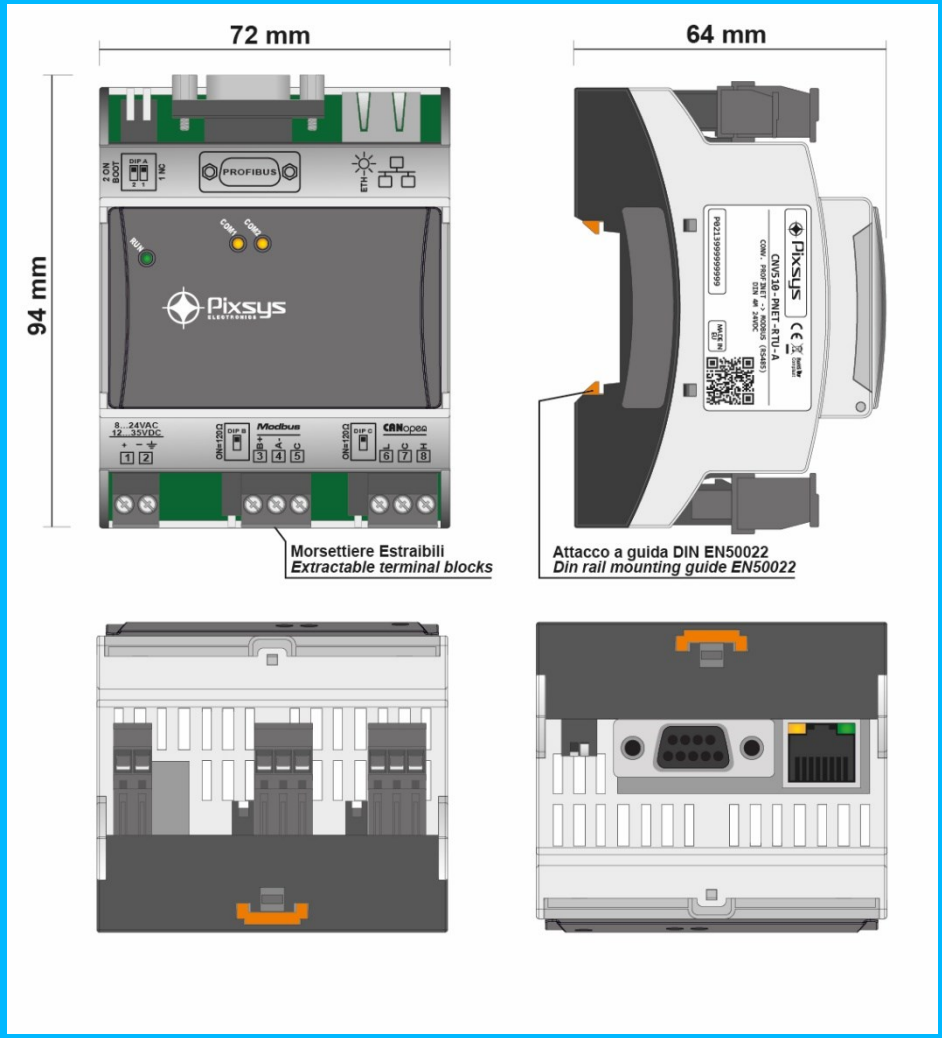
- Up to 512 bytes in reading and 512 bytes in writing;
- Triple isolation between Modbus - Power Supply, Modbus - Ethernet, Power Supply – Ethernet;
- Two-directional information between Modbus bus and PROFINET bus;
- Mountable on 35mm Rail DIN;
- Wide power supply input range: 8..24V AC or 12..35V DC (Maximum consumption at 24V: 3 W / VA);
- Wide environment conditions: 0..45°C, humidity 35..95 uR%.

CONFIGURATION:

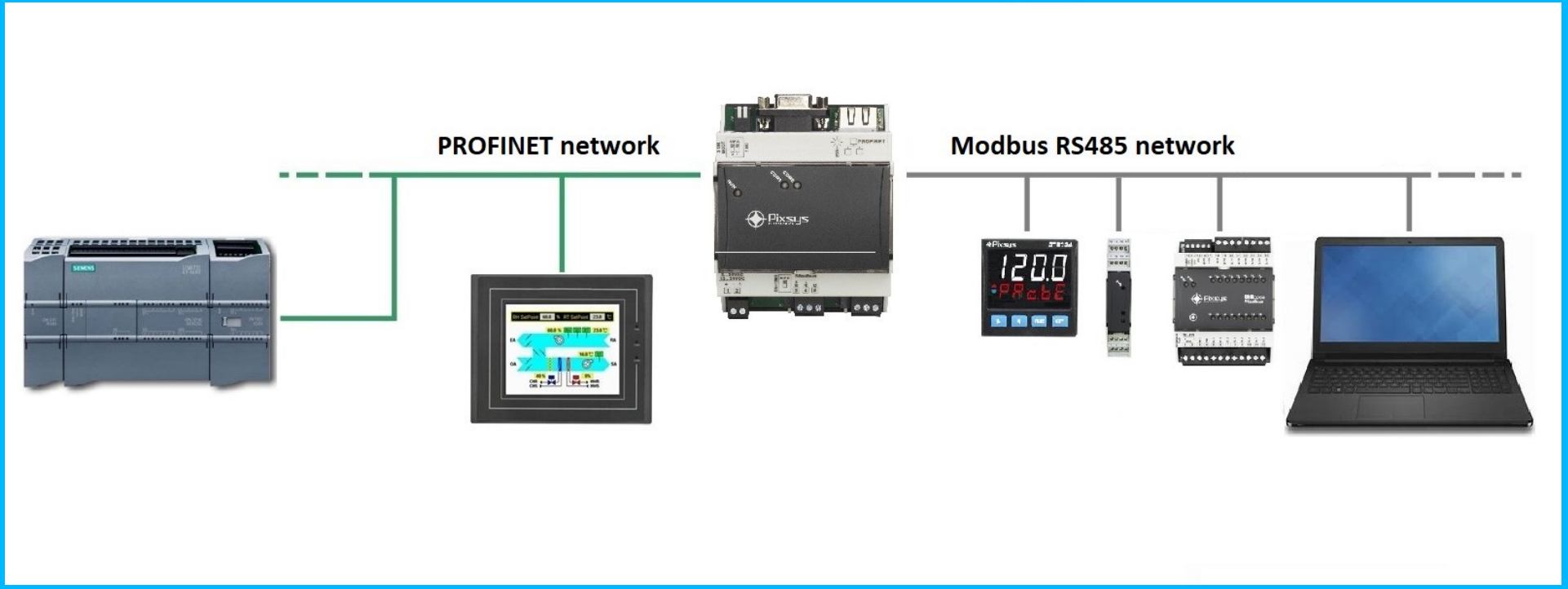
You need Software **SW67602** on your PC in order to perform the following:

- Define the parameter of the PROFINET line;
- Define the parameter of the Modbus line;
- Define the data to Read in Modbus and where to map these information in the PROFINET array;
- Define the data to Write in Modbus and where to take the information in the PROFINET array;
- Update the device.

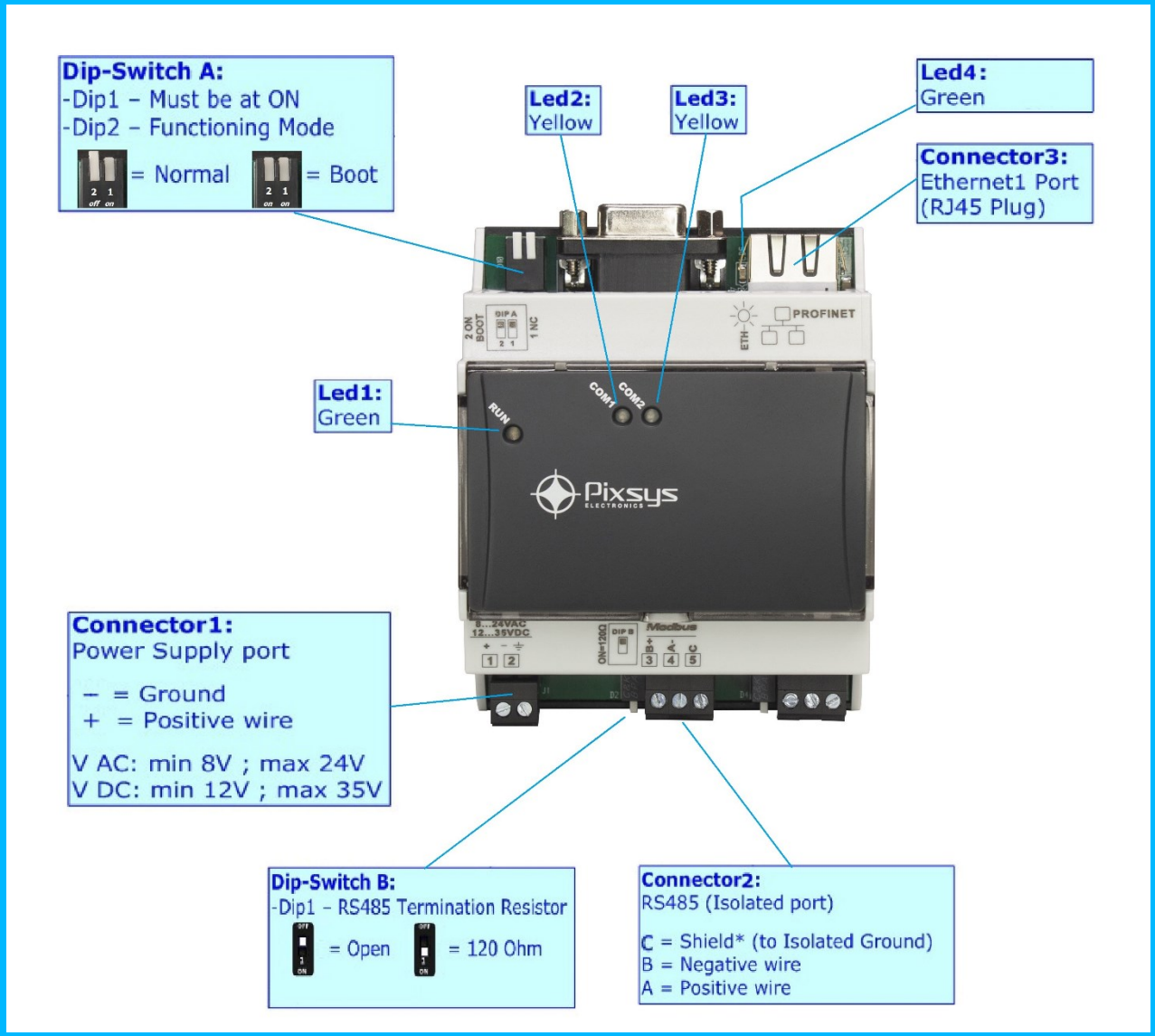
MECHANICAL DIMENSIONS:



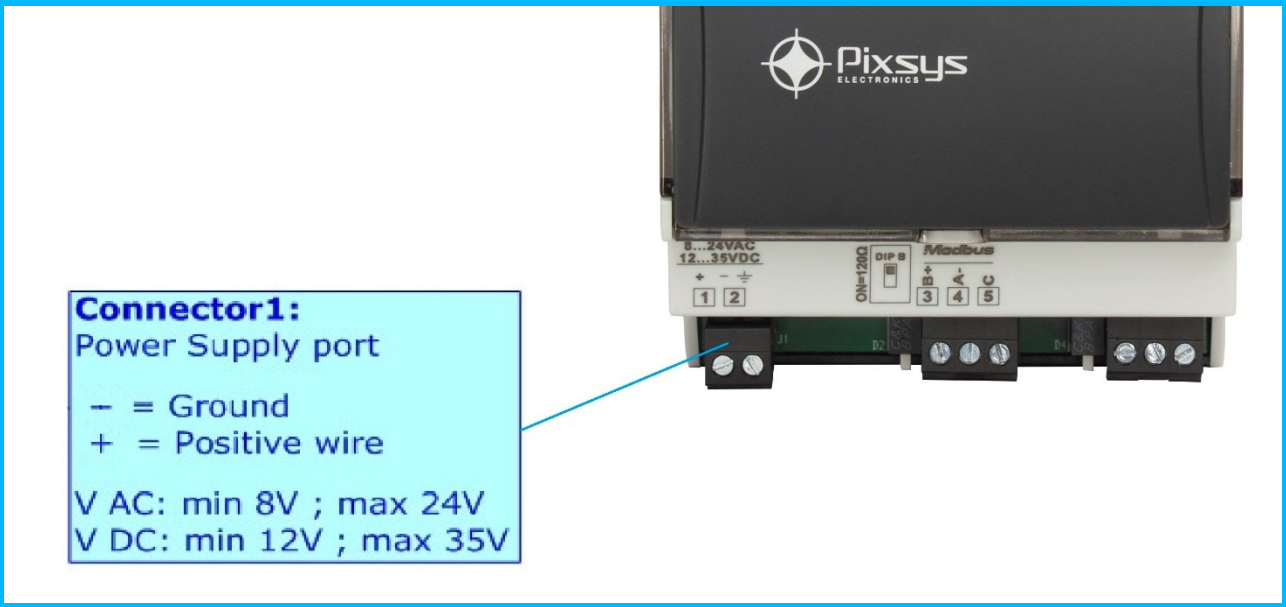
EXAMPLE OF CONNECTION:



CONNECTION SCHEME:



POWER SUPPLY:

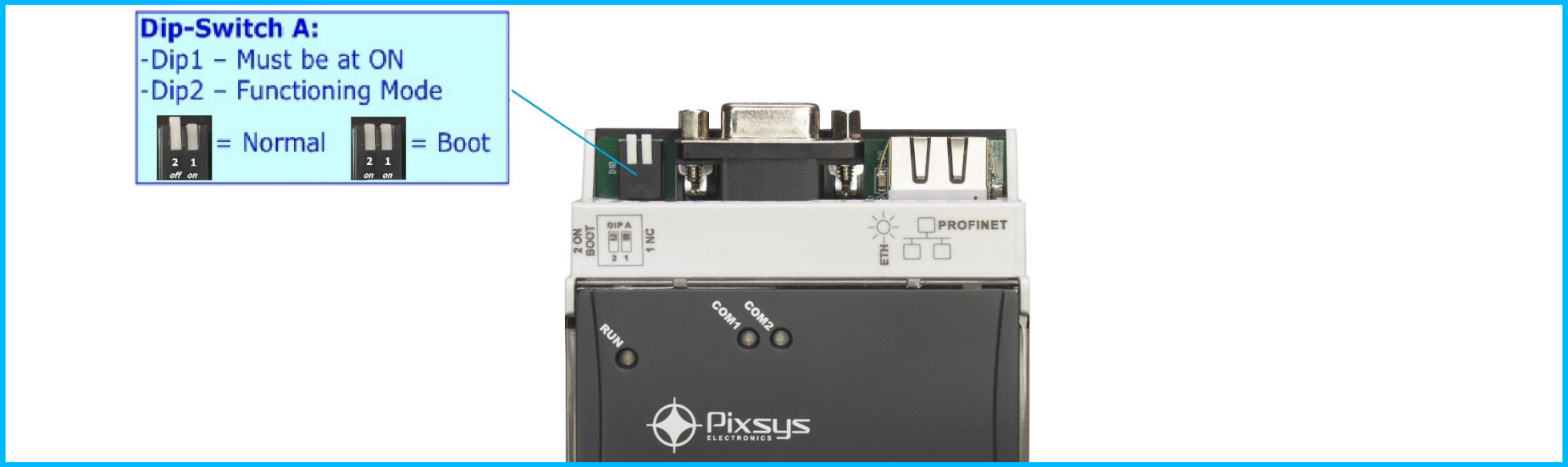


FUNCTION MODES:

The device has got two functions mode depending of the position of the 'Dip2 of Dip-Switch A':

- Normal Mode: 'Dip2 of Dip-Switch A' at "OFF" position (not pressed down), the device transmit data regularly.
- BOOT mode: 'Dip2 of Dip-Switch A' at "ON" position (pressed down), used to upload the Project and/or Firmware.

According to the functioning mode, the LEDs will have specifics functions, see 'LEDS' section.



Warning:
Dip1 of 'Dip-Switch A' must be always at ON position (pressed down)!

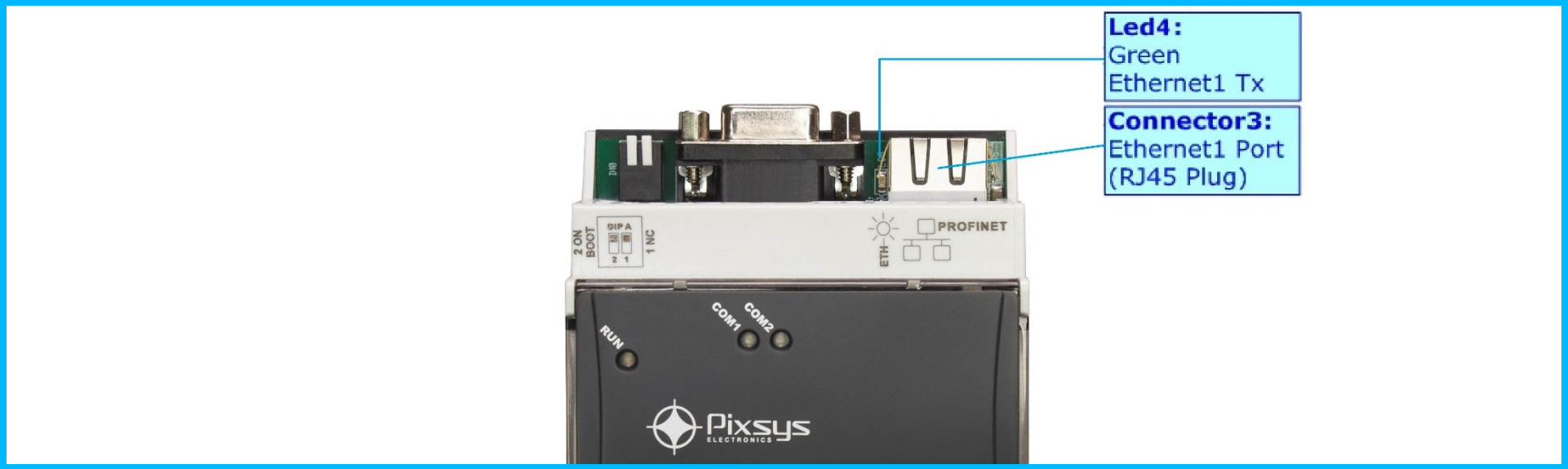
LEDS:

LEDs that are used to give information of the functioning status.
The various meanings of the LEDs are described in the table below.

LED	Normal Mode	Boot Mode
1: RUN [supply voltage] (green)	**ON:** Device powered **OFF:** Device not powered	**ON:** Device powered **OFF:** Device not powered
2: COM1 [PROFINET state] (yellow)	**ON:** PROFINET transmissions present **FLASHING:** No PROFINET transmissions present	**Blinks quickly**
3: COM2 [Modbus state] (yellow)	**ON:** MODBUS-RTU transmissions present **FLASHING:** No MODBUS-RTU transmissions present	**Blinks quickly**
4: ETH Tx (green)	**Blinks** when is transmitting Ethernet frames	**Blinks quickly**
Internal LED (green)	**Blinks very slowly (~0.5Hz):** Device is working in normal mode	**Blinks quickly**

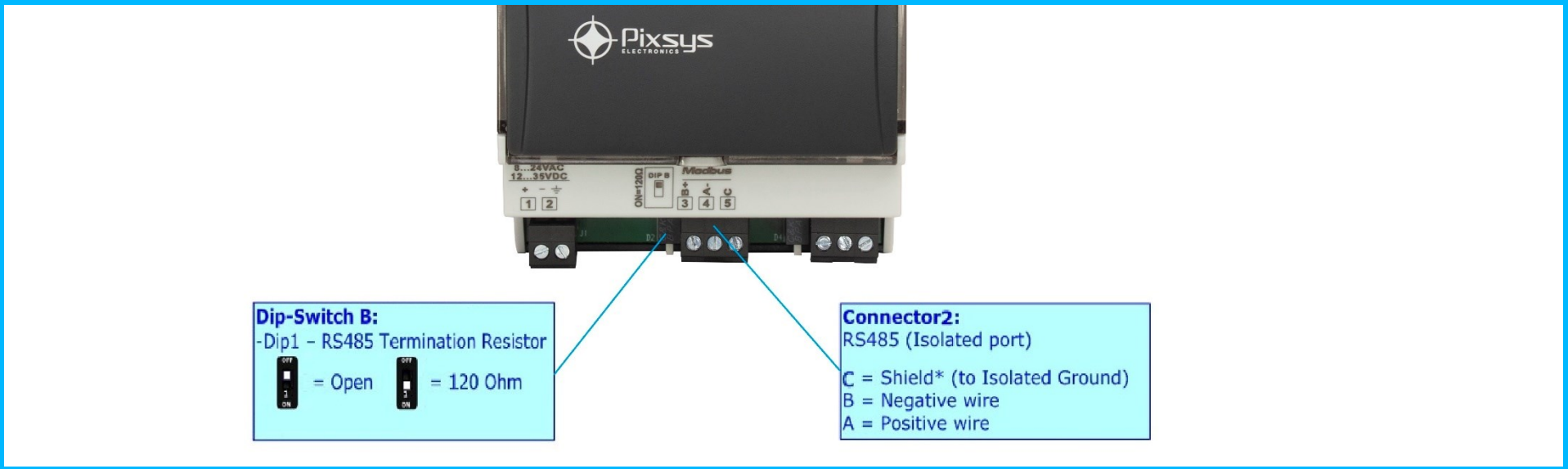
PROFINET:

The PROFINET connection must be made using Connector3 with at least a Category 5E cable. The maximum length of the cable should not exceed 100m. The cable must conform to the T568 norms relative to connections in cat.5 up to 100 Mbps. To connect the device to an Hub/Switch is recommended the use of a straight cable, to connect the device to a PC/PLC/other is recommended the use of a cross cable.



RS485:

For terminate the RS485 line with a 120Ω resistor it is necessary to put ON dip 1, like in figure.



The maximum length of the cable should be 1200m (4000 feet).

Here some codes of cables:

- Belden: p/n 8132 - 2x 28AWG stranded twisted pairs conductor + foil shield + braid shield;
- Belden p/n 82842 - 2x 24AWG stranded twisted pairs conductor + foil shield + braid shield;
- Tasker: p/n C521 - 1x 24AWG twisted pair conductor + foil shield + braid shield;
- Tasker: p/n C522 - 2x 24AWG twisted pairs conductor + foil shield + braid shield.

USE OF CONFIGURATION SOFTWARE SW67602:

To configure the Converter, use the available software that runs with Windows called SW67602. It is downloadable on the Pixsys download are (https://cloud.pixsys.net/) and its operation is described in this document. *(This manual is referenced to the last version of the software present on our web site).* The software works only on Microsoft Windows (XP, Vista, Seven, 8, 10; 32/64bit architectures).

When launching the SW67602, the window below appears (Fig. 2).

Note:
It is necessary to have installed .Net Framework 4.

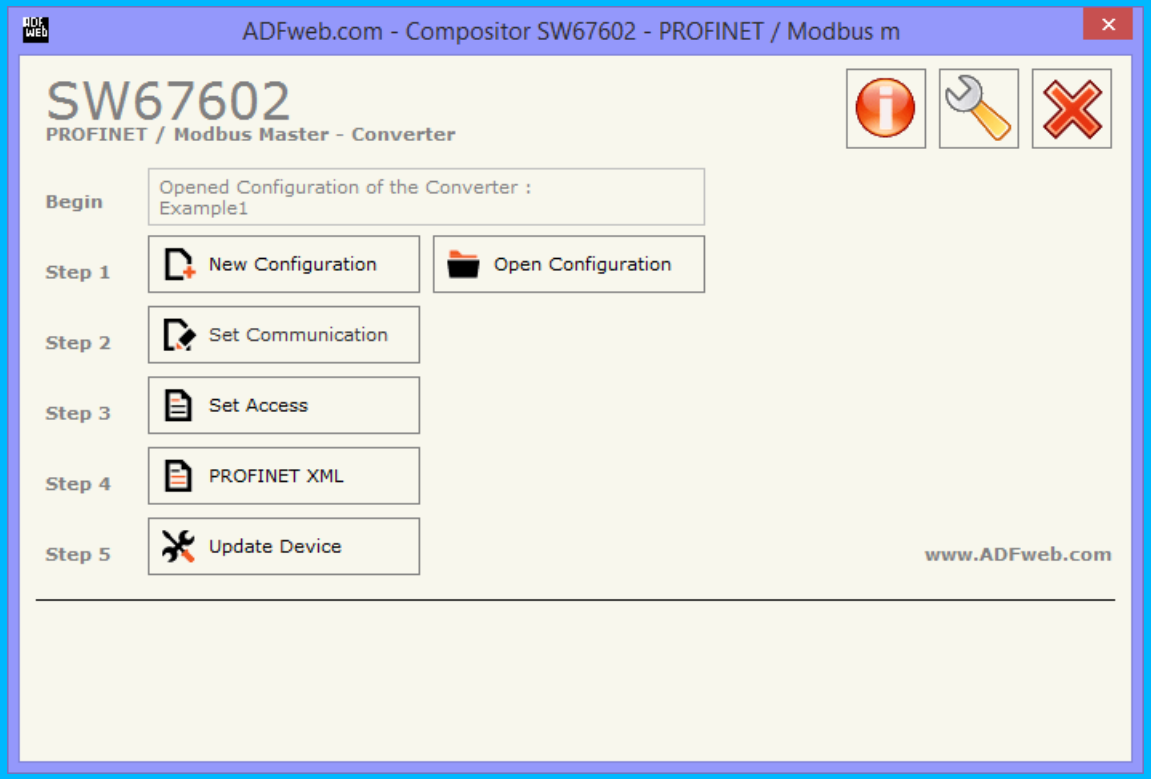
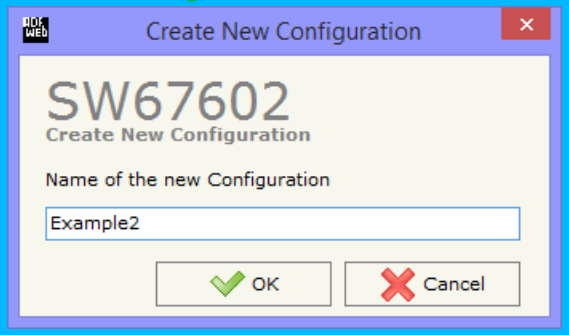


Figure 2: Main window for SW67602

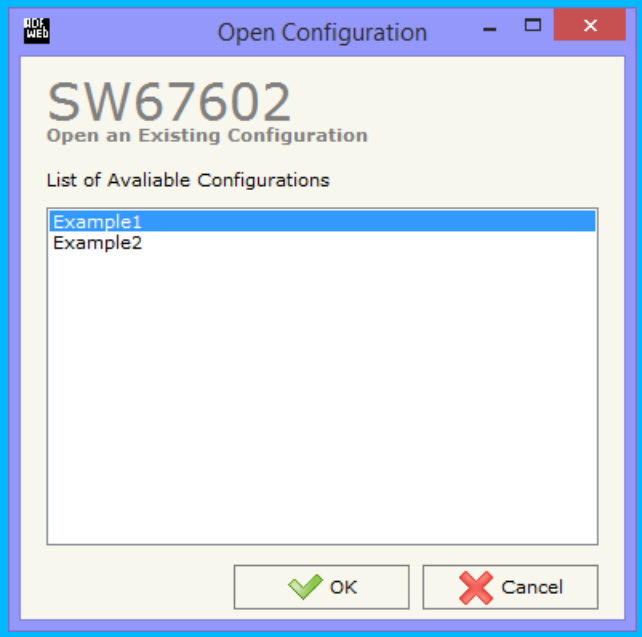
NEW CONFIGURATION / OPEN CONFIGURATION:

The "**New Configuration**" button creates the folder which contains the entire device's configuration.



A device's configuration can also be imported or exported:

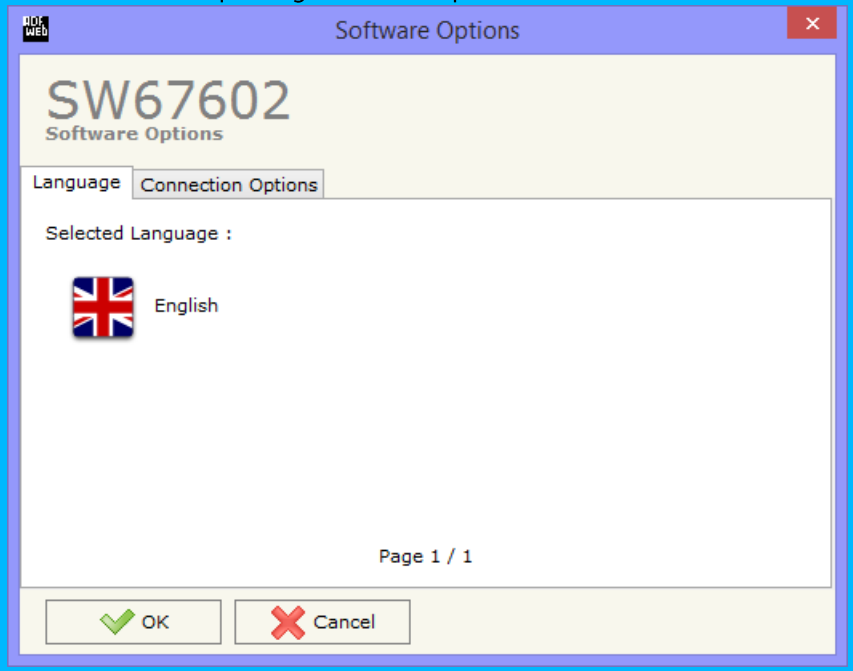
- To clone the configurations of a Programmable "PROFINET Slave / Modbus Master - Converter" in order to configure another device in the same manner, it is necessary to maintain the folder and all its contents;
- To clone a project in order to obtain a different version of the project, it is sufficient to duplicate the project folder with another name and open the new folder with the button "**Open Configuration**".

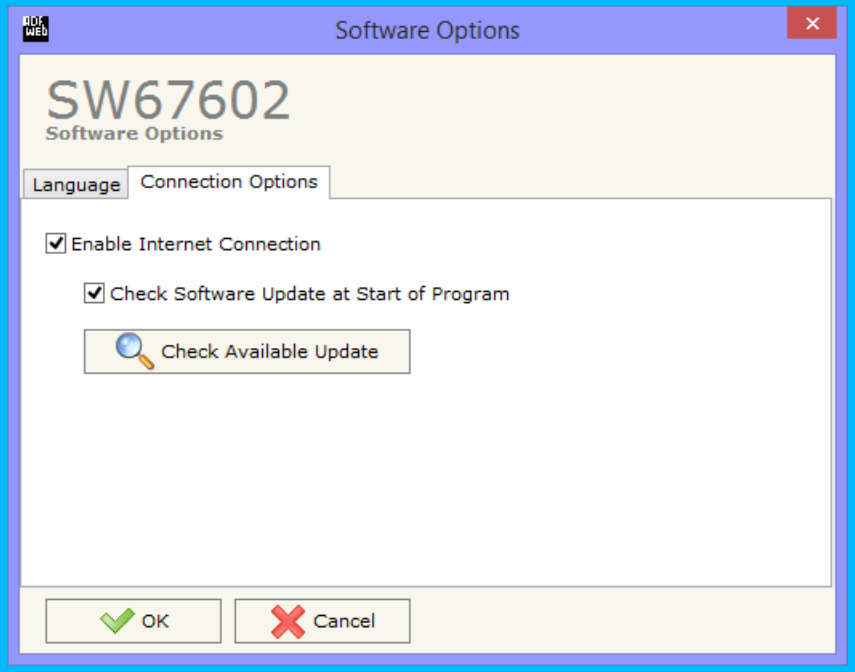


SOFTWARE OPTIONS:

By pressing the "**Settings**" ( ) button there is the possibility to change the language of the software and check the updatings for the compositor.

In the section "Language" it is possible to change the language of the software.





In the section "Connection Options", it is possible to check if there are some updatings of the software compositor in Pixsys srl website.
Checking the option "**Check Software Update at Start of Program**", the SW67602 check automatically if there are updatings when it is launched.

SET COMMUNICATION:

This section defines the fundamental communication parameters of two buses, PROFINET and Modbus.

By Pressing the "**Set Communication**" button from the main window for SW67602 (Fig. 2) the window "Set Communication" appears (Fig. 3).
The window is divided in two sections, one for the PROFINET and the other for the Modbus Master.

The means of the fields for "PROFINET" are:

- In the fields "**IP ADDRESS**" insert the IP address that you want to give to the Converter;
- In the fields "**SUBNET Mask**" insert the Subnet Mask;
- In the fields "**GATEWAY**" insert the default gateway that you want to use. This feature can be enabled or disabled pressing the Check Box field. This feature is used for going out of the net;
- In the field "**Port**" is possible to define the port to use for the "Tunneling mode" (see "Advanced functions" section for more details);
- In the field "**PROFINET Name of Station**" is possible to assign a name to the PROFINET node;
- In the fields "**Number Byte IN**" insert the number of input byte of the slave station;
- In the fields "**Number Byte Out**" insert the number of output byte of the slave station;
- In the field "**Diagnostic**" insert the starting byte of the PROFINET array where you will save the diagnostic of Modbus. It is possible to enable/disable this function using the checkbox.
  For more information about the diagnostic, see "Diagnostic" section.

The means of the fields for the "Modbus Master" section are:

- In the field "**Serial**" the serial to use is defined (select RS485);
- In the field "**Baudrate**" the baudrate for the serial line is defined;
- In the field "**Parity**" the parity of the serial line is defined;
- In the field "**TimeOut (ms)**" there is the maximum time that the device attends for the answer from the Slave interrogated;
- In the field "**Communication Idle Time (ms)**" the minimun delay between two polls is defined.

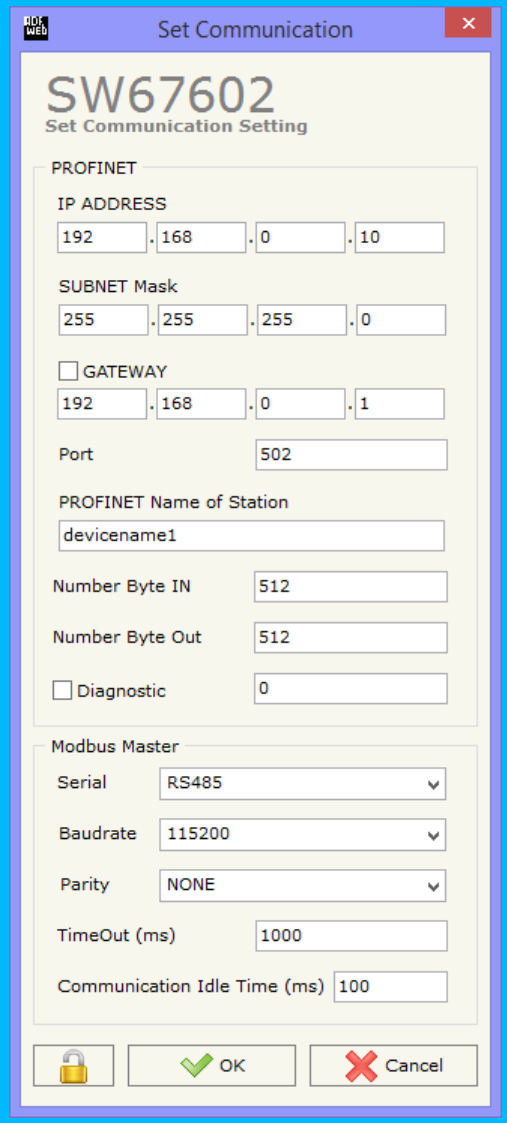


Figure 3: "Set Communication" window

SET ACCESS:

By pressing the "**Set Access**" button from the main window for SW67602 (Fig. 2) the window "Set Access" appears.

This window is divided in two parts, the "***Modbus Read***" (Fig. 4) and the "***Modbus Write***" (Fig. 5).
The first part "Modbus Read" is used to read the data from the Modbus slaves, and make them available to read from the Master PROFINET.
The second part "Modbus Write " is used to write the data that arrives from the Master PROFINET into the slaves Modbus.

MODBUS READ:

The means of the fields are:

- In the field "**Slave ID**" is defined the address of the Modbus device you have to read;
- In the field "**Type**" insert the data type of the register you would like to read. You can choose between the following:
  - Coil Status;
  - Input Status
  - Holding Register;
  - Input Register.
- In the field "**Address**" is defined the start address of the register to be read;
- In the field "**NPoint**" insert the number of consecutive registers to be read;
- In the field "**Poll Time**" insert the time to make this request;
- In the field "**Max Error**" is the number of errors continues that the gateway waits before suspending the poll until the next reboot. If is set to zero, this function is disabled;
- In the field "**Position**" insert the address of the PROFINET array where place the information;
- In the field "**Start Bit**" insert the start bit of the first byte of the field "Position" where start to insert the data read. Valid only for the "Coil Status" and "Input Status".
- In the field "**Mnemonic**" the description for the request is defined.

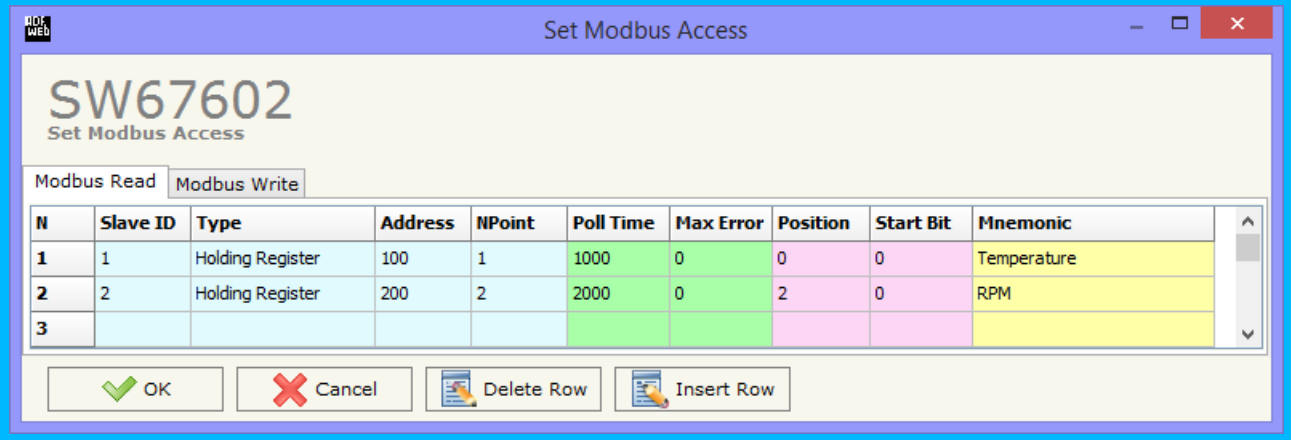


Figure 4: "Set Access→Modbus Read" window

MODBUS WRITE:

The means of the fields are:

- In the field "**Slave ID**" is defined the address of the Modbus device that you have to write;
- In the field "**Type**" insert the data type of the register you would like to read. You can choose between the following:
  - Coil Status;
  - Holding Register;
- In the field "**Address**" is defined the start address of the register to be written;
- In the field "**NPoint**" insert the number of consecutive registers to be written;

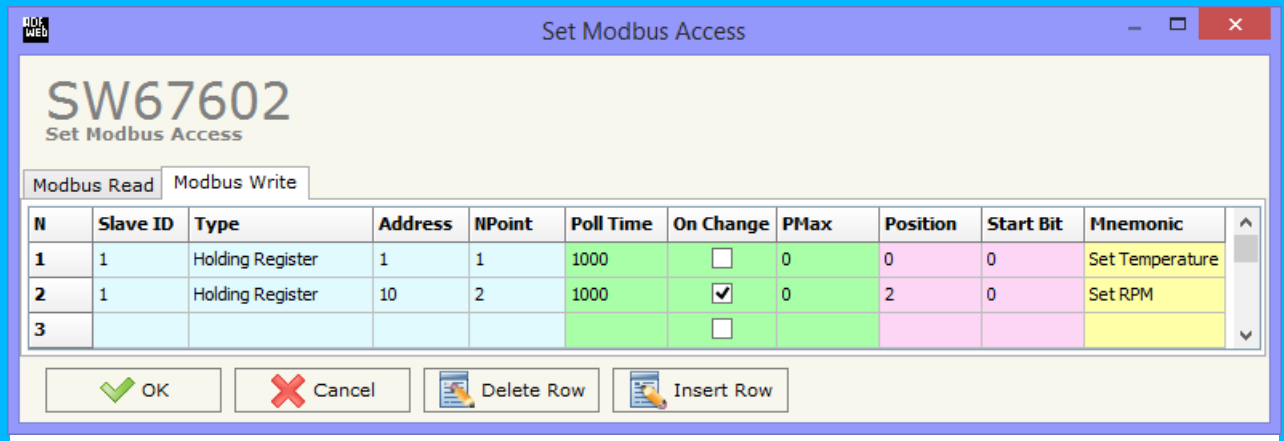


Figure 5: "Set Access --> Serial Write" window

- In the field "**Poll Time**" insert the time to make this request;
- If the field "**On Change**" is checked, the gateway send the Write request in Modbus when the data change the value.
- In the field "**Max Error**" is the number of errors continues that the gateway waits before suspending the poll until the next reboot. If is set to zero this function is disabled;
- In the field "**Position**" insert the address of the PROFINET array where read the information;
- In the field "**Start Bit**" insert the start bit of the first byte of the field "Position" where start to read the data to write. Valid only for the "Coil Status";
- In the field "**Mnemonic**" the description for the request is defined.

Note:
If you want that the converter sends the data only "On change" the "Poll Time" must be at 0.

Note:
If the field "On change" is checked and the "Poll Time" is different from 0, the converter sends the Write request cyclically and also when the data is changed.

UPDATE DEVICE:

By pressing the "**Update Device**" button it is possible to load the created configuration into the device; and also the Firmware, if is necessary.

If you don't know the actual IP address of the device you have to use this procedure:

- Turn off the Device;
- Put Dip2 of 'Dip-Switch A' at ON position;
- Turn on the device
- Connect the Ethernet cable;
- Insert the IP "**192.168.2.205**";
- Press the "**Ping**" button, must appear "Device Found!";
- Press the "**Next**" button;
- Select which operations you want to do;
- Press the "**Execute update firmware**" button to start the upload;
- When all the operations are "OK" turn off the Device;
- Put Dip2 of 'Dip-Switch A' at OFF position;
- Turn on the device.

At this point the configuration/firmware on the device is correctly updated.

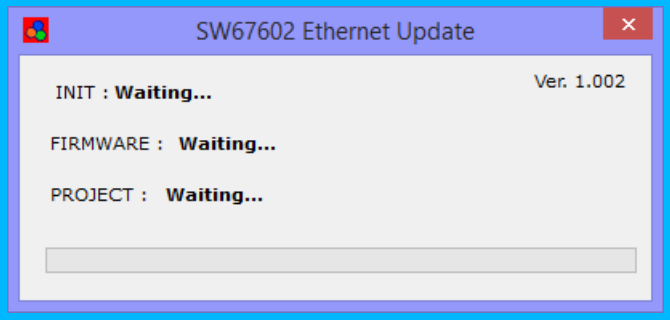
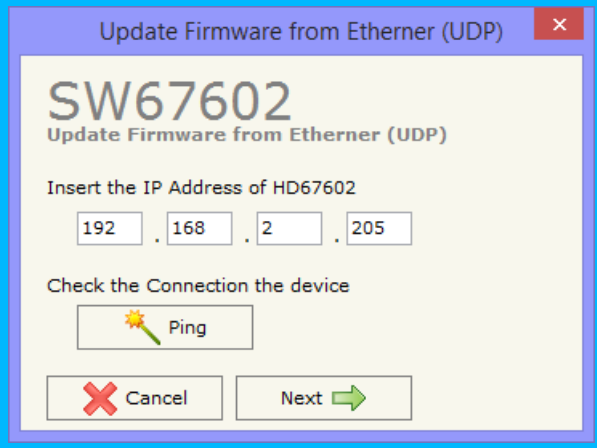
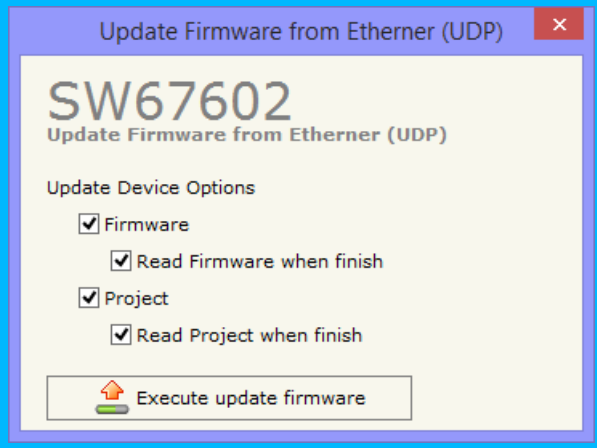


Figure 6: "Update device" windows





If you know the actual IP address of the device, you must use this procedure:

- Turn on the Device with the Ethernet cable inserted;
- Insert the actual IP of the Converter;
- Press the "**Ping**" button, must appear "Device Found!";
- Press the "**Next**" button;
- Select which operations you want to do;
- Press the "**Execute update firmware**" button to start the upload;
- When all the operations are "OK" the device automatically goes at Normal Mode.

At this point the configuration/firmware on the device is correctly update.

Note:
When you install a new version of the software it is better if the first time you do the update of the Firmware in the CNV510-PNET-RTU-A device.

Note:
When you receive the device, for the first time, you must update also the Firmware in the CNV510-PNET-RTU-A device.

Warning:
If the Fig. 7 appears when you try to do the Update before require assistance try these points:

- Try to repeat the operations for the updating;
- Try with another PC;
- Try to restart the PC;
- If you are using the program inside a Virtual Machine, try to use in the main Operating System;
- If you are using Windows Seven or Vista or 8/10, make sure that you have the administrator privileges;
- Take attention at Firewall lock;
- Check the LAN settings.

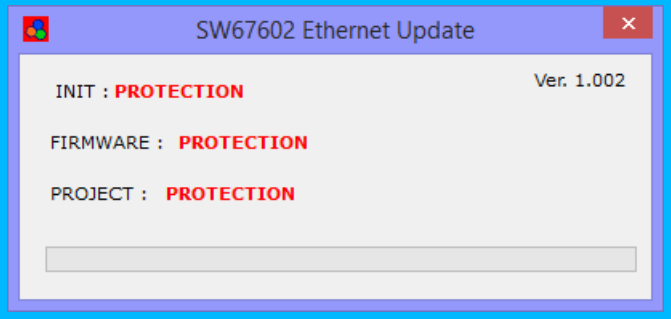


Figure 7: "Protection" window

MODBUS DIAGNOSTIC OVER PROFINET:

During the normal functioning of the device, if all the programmed Modbus requests have received a valid reply (not an exception error), every PROFINET frame has the "Data Status" byte at the value of 0x35.
Otherwise, if at least one Modbus reply is not valid, the "Data Status" byte assumes the value 0x15; that means "Problem Indicator".
If this happens, using the port 5000 there is a UDP message that is possible to send in order to understand which Modbus modules have generated that error.
This command is described in the section "Advanced Functions" under the “B2 command”.

Moreover, it is possible to save the Modbus Diagnostic on Output PROFINET array using the field “Diagnostic” of the section “Set Communication”.
In this case, the status of each Modbus request defined in the section “Set Access” is saved starting from the byte of the PROFINET array defined in the section “Set Communication”.
Each bit will represent the status of a Modbus request:

- If for a request the converter receives a correct response, the status bit is put to ‘0’;
- If for a request the converter receives a wrong response or it doesn’t receive any response, the status bit is put to ‘1’.

Example:
In the section “Set Access” are defined 8 Modbus reading requests (“Modbus Read” table) and 8 Modbus writing requests (“Modbus Write” table). The Modbus reading requests are working and the Modbus writing request are not working.

The status bits of the Modbus Diagnostic on PROFINET will be:

Byte x								Byte x+1							
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

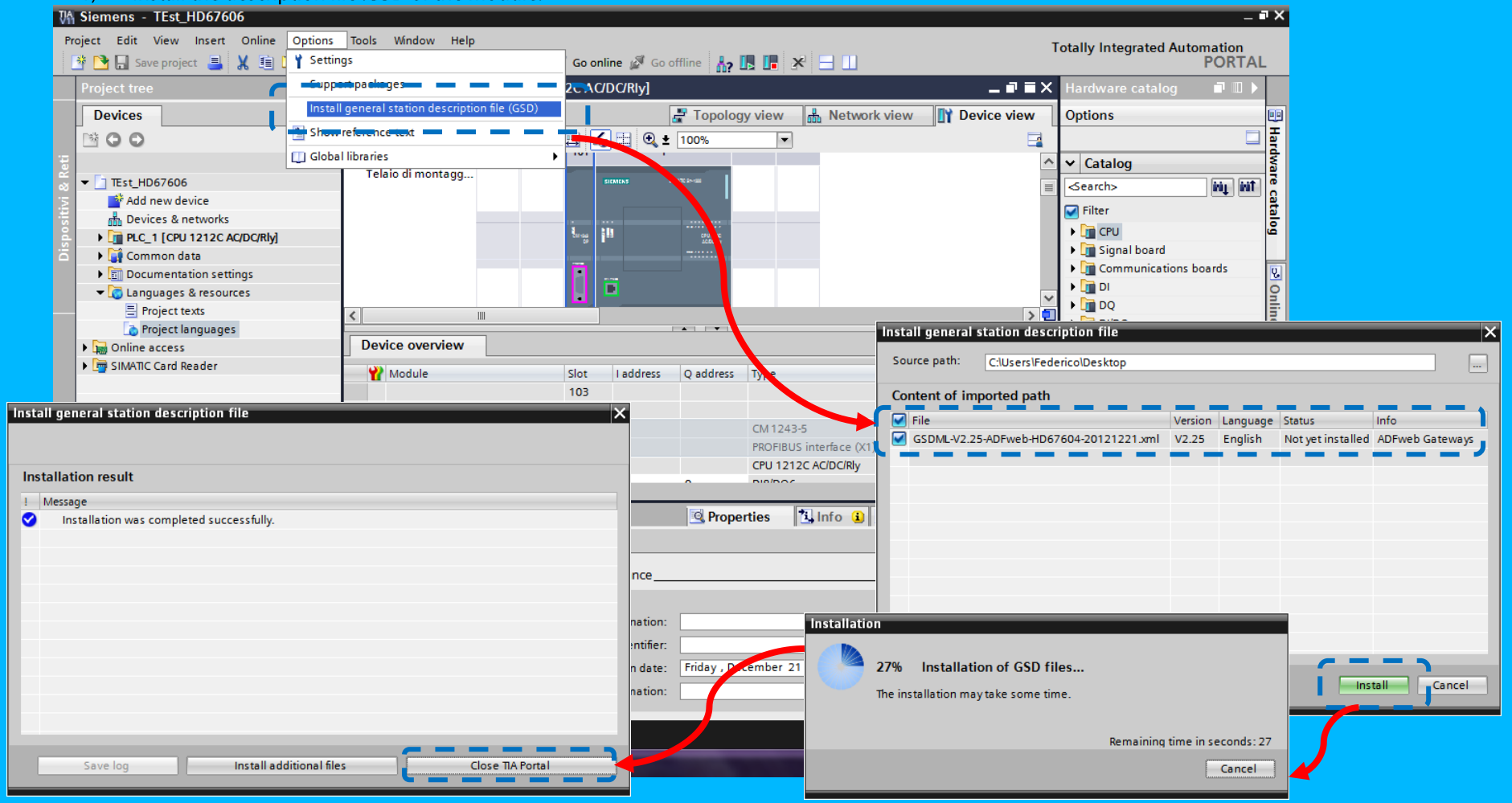
where ‘x’ is the starting byte of the PROFINET array where the Modbus diagnostic is saved.

PLC CONFIGURATION:

The configuration and commissioning of the PROFINET Converter as described on the following pages was accomplished with the help of the TIA Portal V11-software by Siemens. In the case of using a control system from another supplier, refer to attend to the associated documentation.

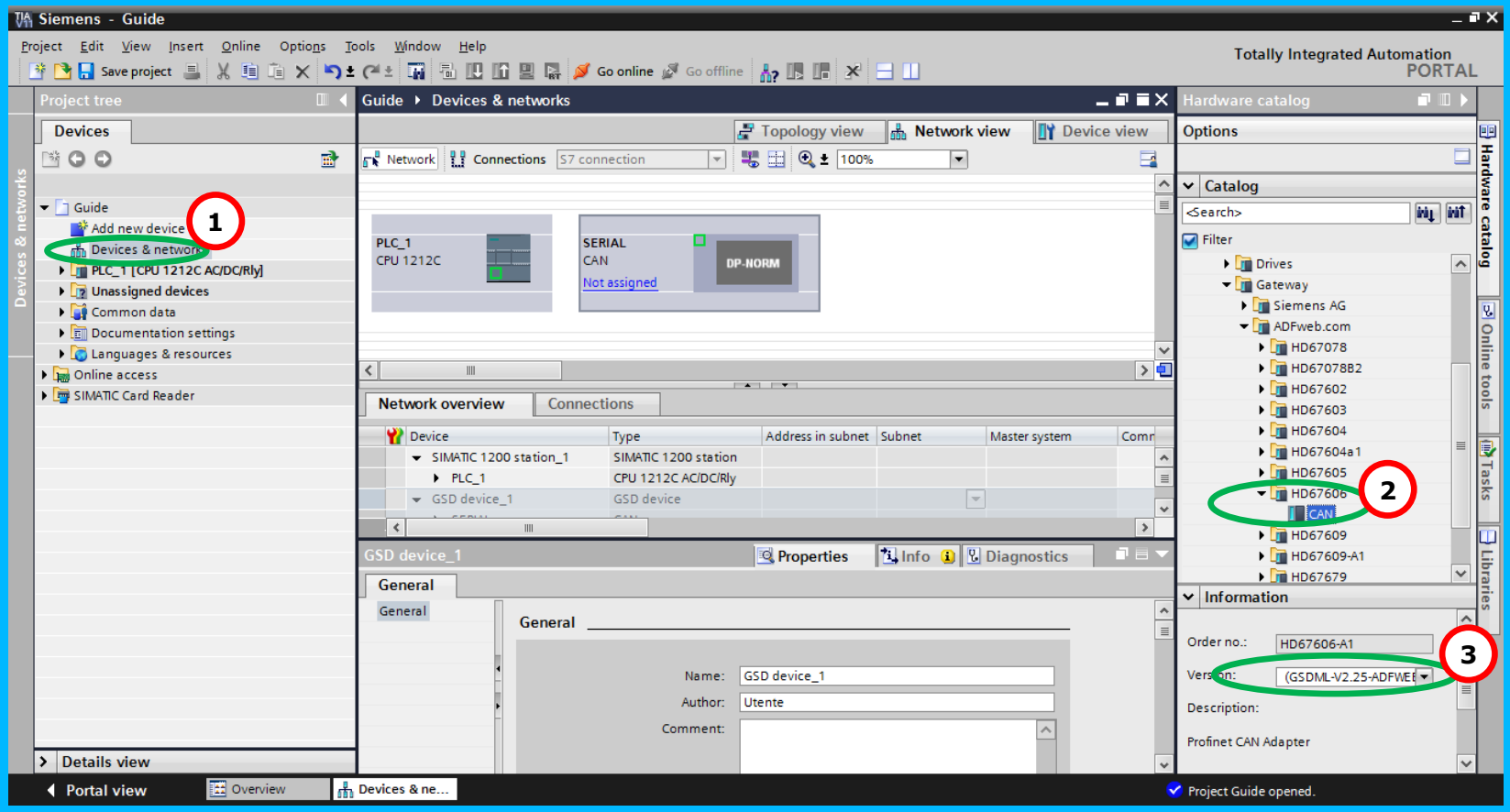
Note: Please follow the steps below in the exact order they are described!

1) Install the description file ***.GSD*** of the module.

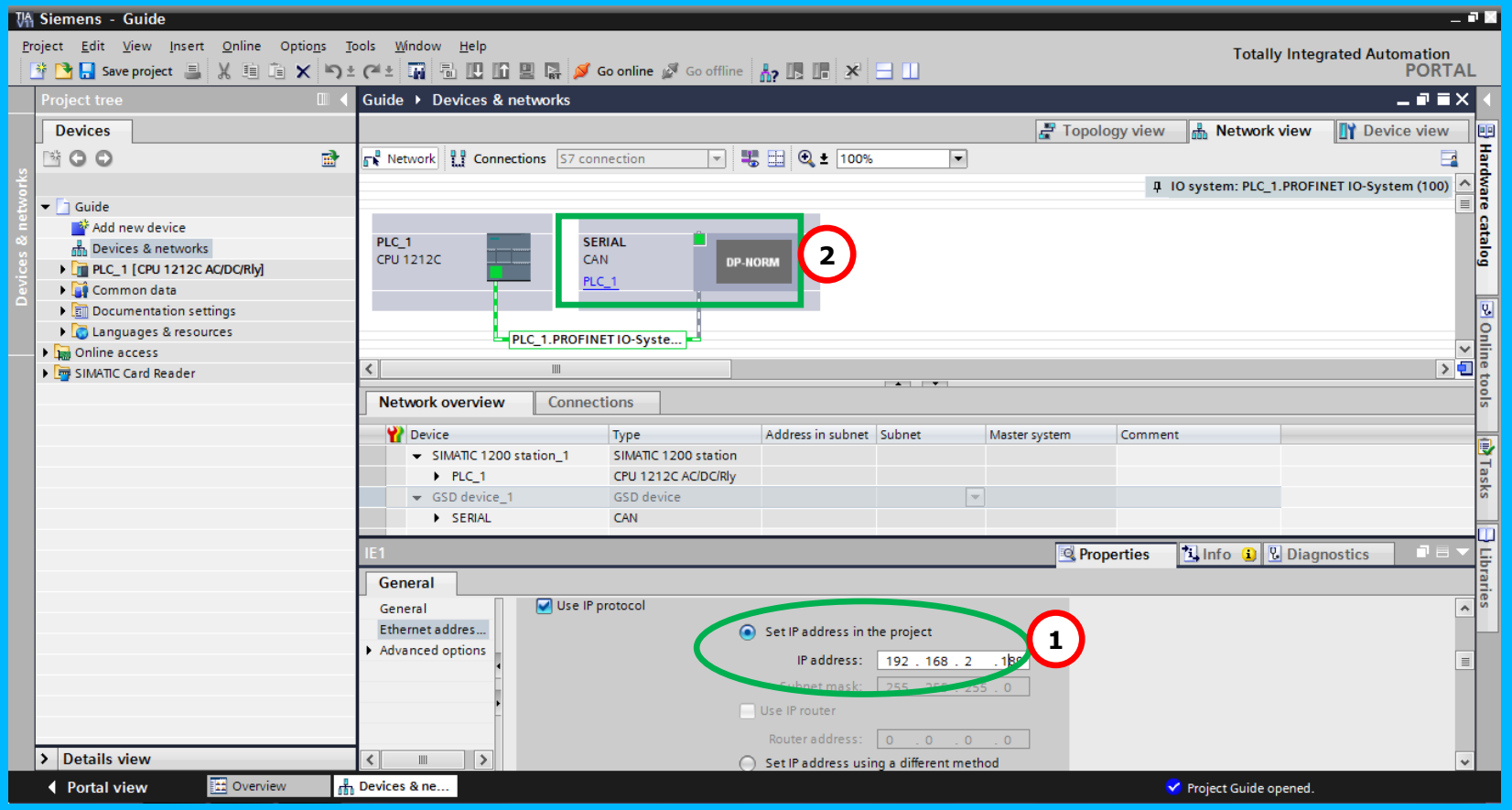


2) Press the "**Devices and networks**" button ***(1)***, from the right drop-down menu, under "Other field devices→PROFINET IO→Gateway→ ADFweb →HD67602" double click on "Serial" module ***(2)***.

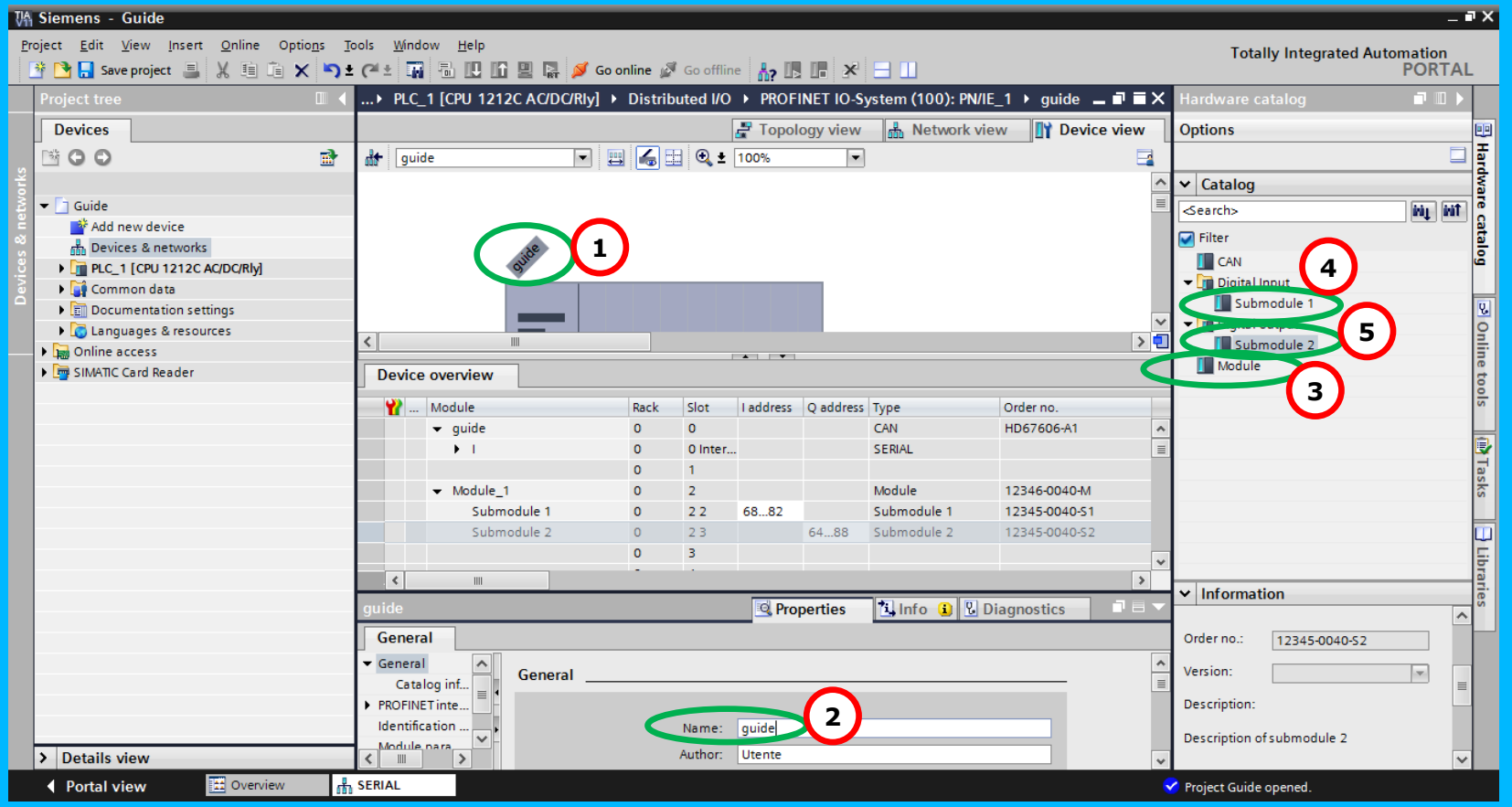
Note:
If you have installed more than one ***.xml*** file, go to the Information section and in the "Version" field select the correct ***.xml*** file ***(3)***, before double clicking on "Serial" module



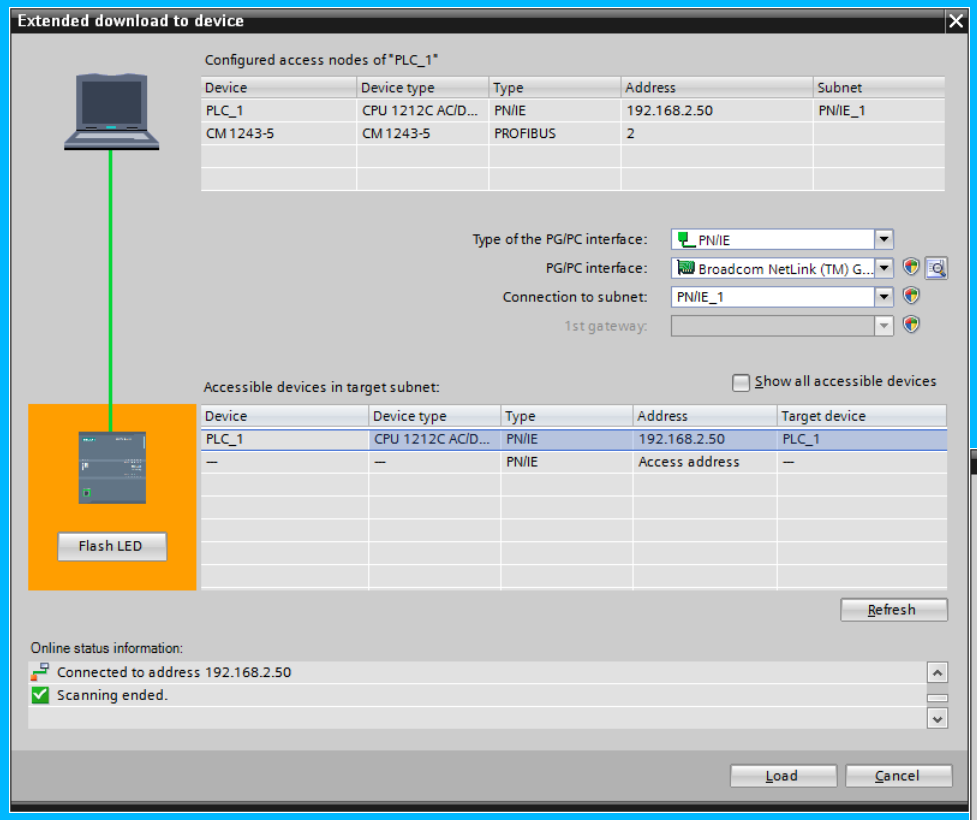
3) Connect the PLC to the CNV510-PNET-RTU-A module by drawing the Ethernet wire between the two Ethernet ports. Then assign the IP Address ***(1)*** defined in the Compositor_SW67602 to the CNV510-PNET-RTU-A. Then double click the "Module" ***(2)***.

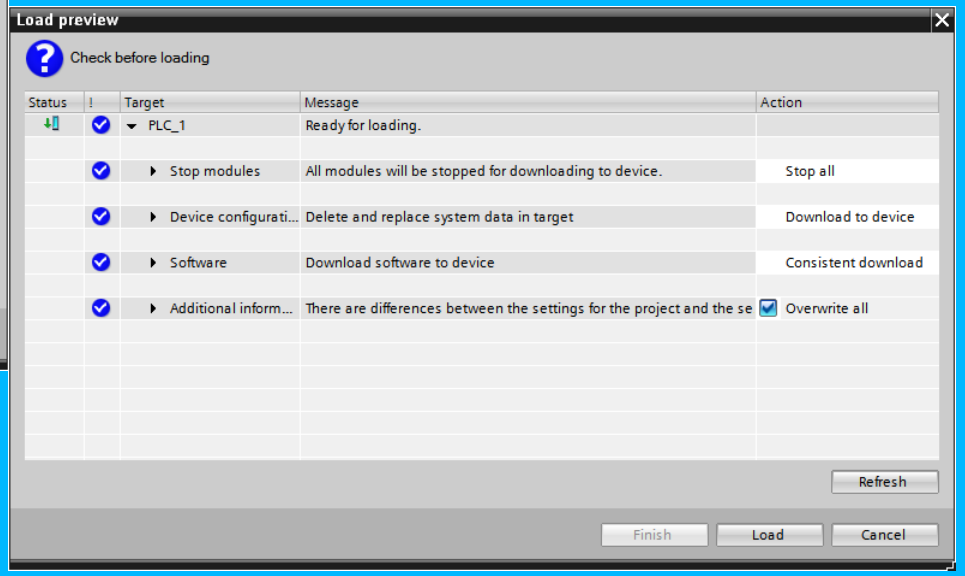


4) Then double click on the “Serial” label ***(1)*** and in the field name change it accordingly to the name defined in the Compositor_SW67602 ***(2)***. Then add the main module “Module” and the sub-modules of “Digital Input” and “Digital Output” by double click on the three items in this order “Module” ***(3)***, “Submodule 1” ***(4)***, “Submodule 2” ***(5)***.



5) Load the configuration into the PLC.





ADVANCED FUNCTIONS:

In the CNV510-PNET-RTU-A are implemented some advanced commands that allows to check the functioning of the converter and send some Modbus commands directly from Ethernet side. To use them, it is necessary to send UDP messages to the port 5000.

The function of each command and the structure of the UDP messages are described below.

B0 command
This command allows to enable/disable the Modbus polls on Modbus side.

REQ:

Byte 0	B1/bit7	B1/bit6	B1/bit5	B1/bit4	B1/bit3	B1/bit2	B1/bit1	B1/bit0	…	Bn/bitn
0xB0	Poll 0	Poll 1	Poll 2	Pol 3	Poll 4	Poll 5	Poll 6	Poll 7	…	Poll x

1 = Poll disabled
0 = Poll enabled

If the message is received correctly, the same message will be sent back by the converter.

Note:
In the UDP message, after the command's identifier, you must enable/disable the Modbus reading requests and then the Modbus Writing requests.

Example:
In the section "Set Access" are defined 8 Modbus reading requests ("Modbus Read" table) and 8 Modbus writing requests ("Modbus Write" table). We want to disable the firsts 4 Modbus reading requests and the firsts 4 Modbus writing requests.

Byte 0	Byte 1								Byte 2							
0xB0	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Poll0	Poll1	Poll2	Poll3	Poll4	Poll5	Poll6	Poll7	Poll8	Poll9	Poll10	Poll11	Poll12	Poll13	Poll14	Poll15
	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0

B1 command
This command allows to read the status of the enabling/disabling of the Modbus polls.

REQ:

Byte 0
0xB1

RES:

Byte 0	B1/bit0	B1/bit1	B1/bit2	…	Bn/bitn
0xB1	Poll 0	Poll 1	Poll 2	…	Poll x

1 = Poll disabled
0 = Poll enabled

Note:
In the UDP message, after the command's identifier (0xB1), you can read the status of the Modbus Reading requests and then the status of the Modbus writing requests.

Example:
Referring to the previous example, if we read the status of the enabling/disabling, the response from the converter will be:

Byte 0	Byte 1								Byte 2							
0xB0	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Poll0	Poll1	Poll2	Poll3	Poll4	Poll5	Poll6	Poll7	Poll8	Poll9	Poll10	Poll11	Poll12	Poll13	Poll14	Poll15
	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0

B2 command
This command allows to see the number of errors for each Modbus poll defined in the section “Set Access”.

REQ:

Byte 0
0xB2

RES:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	…
0xB2	Number of errors for Poll 1				Number of errors for Poll 2				…

Note:
In the UDP message, after the command’s identifier (0xB2), you can read the number of errors for the Modbus Reading requests and then for the Modbus writing requests defined in the section “Set Access”.

Example:
We have defined one Modbus Reading request and one Modbus Writing request in the section “Set Access”. We want to know the number of error for each poll, so we use the B2 command

REQ:

Byte 0
0xB2

RES:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Identifier	Number of error for poll 1				Number of error for poll 2			
0xB2	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x05

In this example, for the Modbus poll 1 (Modbus Reading request) the errors are 0 and fort he Modbus poll 2 (Modbus Writing Request) the errors are 5.

B3 command

This command allows to enable the Transparent: it will be possible to send Modbus commands directly from Ethernet side. The converter will become completely transparent.

Byte 0	Byte 1
0xB3	Enabling/disabling of Transparent Mode

0x01 = Poll disabled
0x00 = Poll enabled

If the message is received correctly, the same message will be sent back by the converter.

Note:
When the Transparent Mode is enabled, the Modbus polling will stop on Modbus side.

Note:
The port used for send/receive the frames is defined in the section “Set Communication” step, in the field “Port”.

B4 command

This command allows to read the status of the Transparent Mode (enabled/disabled).

REQ:

Byte 0
0xB4

RES:

Byte 0	Byte 1
0xB4	Status

0x01 = Transparent Mode disabled
0x00 = Transparent Mode enabled

B5 command
This command allows to enable/disable the polling to a single Modbus slave.

REQ:

Byte 0	Byte 1	Byte 2
0xB5	Slave ID	0x00/0x01

0x01 = Disable polling for Modbus slave
0x00 = Enable polling for Modbus slave

If the message is received correctly, the same message will be sent back by the converter.

Example:
They are connected 3 Modbus slaves (Modbus IDs 1, 2, 3) to the converter and we want to stop the polling to the slave with ID = 2.
The message to send to the converter will be:

Byte 0	Byte 1	Byte 2
0xB5	0x02	0x01

B6 command
This command allows to enable/disable a single poll on Modbus side.

REQ:

Byte 0	Byte 1	Byte 2
0xB6	Poll No	0x00/0x01

0x01 = Disable poll
0x00 = Enable poll

If the message is received correctly, the same message will be sent back by the converter.

Example:
In the section "Set Access" are defined 3 Modbus reading requests and 3 Modbus writing requests.
We want to disable the first Modbus writing request (4th poll).
The message to send to the converter will be:

Byte 0	Byte 1	Byte 2
0xB6	0x04	0x01

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- Send the product to the address provided with the RMA, having prepaid the shipping costs (shipment costs billed to us will not be accepted).

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