# USER MANUAL

## SERIES R-P I/O
## WITH PROFINET
## IO PROTOCOL

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**ORIGINAL INSTRUCTIONS**

# Introduction

The content of this documentation refers to products and technologies described in it.
All technical data contained in the document may be changed without notice.
The content of this documentation is subject to periodic review.
To use the product safely and effectively, read the following instructions carefully before use.
The product must be used only for the use for which it was designed and manufactured: any other use is under the full responsibility of the user.
Installation, programming and set-up are allowed only to authorized, physically and intellectually suitable operators.
Set-up must be performed only after correct installation and the user must follow all the operations described in the installation manual carefully.
Seneca is not responsible for failures, breakages and accidents caused by ignorance or failure to apply the stated requirements.
Seneca is not responsible for any unauthorized modifications.
Seneca reserves the right to modify the device, for any commercial or construction requirement, without the obligation to promptly update the reference manuals.
No liability for the contents of this document can be accepted.
Use the concepts, examples and other content at your own risk.
There may be errors and inaccuracies in this document that could damage your system, so proceed with caution, the author(s) will not take responsibility for it.
Technical specifications are subject to change without notice.

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## Document revisions

| DATE | REVISION | NOTES | AUTHOR |
|---|---|---|---|
| 20/02/2023 | 0 | First revision<br>Supported devices: R-32DIDO-1-P, R-16DI-8DO-P, R-8AI-8DIDO-P | MM |
| 02/03/2023 | 1 | Added chapter “Protection of digital outputs” | MM |
| 16/03/2023 | 2 | Added chapter on FW Update<br>Moved chapter on configuring gsdml file parameters<br>Added information on the procedure to restore the device to factory configuration<br>Added I/O reaction time on R-32DIDO-P<br>Added warning for complete hardware compilation on Tia portal | MM |
| 31/05/2023 | 4 | Default IP changed and Dip Switch chapter added for new firmware<br>Deleted chapter "Restoring the device to factory configuration".<br>Deleted chapter "CONNECTING THE DEVICE TO AN ETHERNET NETWORK"<br>Added R-32DIDO-2-P model | MM |
| 28/11/2023 | 5 | Replaced model R-8AI-8DIDO-P with new hardware version | MM |
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| | | | |
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# 1. INTRODUCTION

**ATTENTION!**

**This user manual extends the information from the installation manual to the configuration of the device. Use the installation manual for more information.**

**ATTENTION!**

**In any case, SENECA s.r.l. or its suppliers will not be responsible for the loss of data/revenue or consequential or incidental damages due to negligence or bad/improper management of the device, even if SENECA is well aware of these possible damages.**
**SENECA, its subsidiaries, affiliates, group companies, suppliers and distributors do not guarantee that the functions fully meet the customer's expectations or that the device, firmware and software should have no errors or operate continuously.**

# 2. R-P SERIES DEVICES

The R series I/O devices support the Profinet IO protocol

## 2.1. INFORMATION ABOUT THE PROFINET IO PROTOCOL

Type of protocol: Class A Device, Cyclic Real-time (RT) and Acyclic Data

The device has been tested using the following PLCs:
SIEMENS S7 1200 firmware revision 4.2.3 (Tia Portal 16)
CODESYS Runtime 3.5 (Codesys 3.5)

## 2.2. R-32DIDO-P

The devices allow the use of 32 digital channels that can be individually configured for input or output.

| *CODE* | *ETHERNET PORTS* |
|---|---|
| R-32DIDO-1-P | 1 10/100 Mbit PORT |
| R-32DIDO-2-P | 2 10/100 Mbit PORTS (Switch mode) |

### 2.2.1. PROTECTION OF DIGITAL OUTPUTS

The outputs are protected against overload and against overtemperature, they open cyclically until the fault is repaired or the output opens.

The limit current is between 0.6 and 1.2 A.

### 2.2.2. I/O REACTION TIME

With an update time of the Profinet IO cycle set at 2ms (default) we obtain that:

The switching of a digital input is updated in the communication in maximum 4ms.

The command of a digital output via Profinet communication switches the output in maximum 4ms.

## 2.3. R-16DI-8DO-P

The devices allow the use of 16 digital input channels and 8 digital output channels (relay).

| ***CODE*** | ***ETHERNET PORTS*** |
|---|---|
| R-16DI8DO-P | 2 10/100 Mbit PORTS (Switch mode) |

## 2.4. R-8AI-8DIDO-P

The devices allow the use of 8 analog input channels and 8 digital channels that can be individually configured for input or output.

| ***CODE*** | ***ETHERNET PORTS*** |
|---|---|
| R-8AI-8DIDO-P | 2 10/100 Mbit PORTS (Switch mode) |

### 2.4.1. ANALOG INPUT UPDATE TIME

Sampling time can be configured from 25ms to 400ms per each channel, in particular:

| *CHANNEL SAMPLING TIME* |
|---|
| 25ms |
| 50ms |
| 100ms |
| 200ms |
| 400ms |

To calculate the update time of a channel, consider the following example:

By activating 8 channels and setting a sampling time of 25 ms, you get an input update every: 25*8 = 200 ms.

***Note (only if thermocouple channels are enabled):***
In the case of a thermocouple input, the Burnout check is carried out every 10 seconds.
The duration of this check takes 25ms on each enabled thermocouple channel.
For example, with 3 active thermocouples, every 10 seconds the following are used:
25ms x 3 channels = 75 ms for Burnout evaluation.

### 2.4.2. UPDATE TIME OF DIGITAL INPUTS/OUTPUTS

The update time of the 8 digital inputs/outputs is 25ms.

# 3. DIP SWITCH

**ATTENTION!**

**THE DIP SWITCH SETTINGS ARE READ ONLY AT THE START. AT EACH CHANGE, IT IS NECESSARY TO RESTART.**

**ATTENTION!**

**DEPENDING ON THE MODEL IT MAY BE NECESSARY TO REMOVE THE REAR COVER OF THE DEVICE TO ACCESS THE DIP SWITCHES**

## 3.1. MEANING OF THE DIP SWITCHES FOR THE R-8AI-8DIDO-P MODEL

Below is the meaning of the SW1 dip switches:

| *DIP1* | *DIP2* | *MEANING* |
|---|---|---|
| OFF | OFF | Normal operation: The device loads the configuration from the flash. |
| ON | ON | Resets the device to its factory configuration |
| OFF | ON | Disables access to the Web server |
| ON | OFF | Reserved |

## 3.2. MEANING OF THE DIP SWITCHES FOR THE R-32DIDO-1-P AND R-32DIDO-2-P MODELS

Below is the meaning of the SW1 dip switches for the various firmware revisions:

### 3.2.1. DIP SWITCH FOR FIRMWARE REVISION <= 1009

| *DIP1* | *DIP2* | *MEANING* |
|---|---|---|
| OFF | OFF | Normal operation: The device loads the configuration from the flash. |
| ON | ON | Resets the device to its factory configuration |
| OFF | ON | Forces the device IP address to the standard value of SENECA Ethernet products: 192.168.90.101 |
| ON | OFF | Reserved |

### 3.2.2. DIP SWITCH FOR FIRMWARE REVISION >= 1010

**ATTENTION!**

**FROM THE 1010 FIRMWARE REVISION THE DEVICES ARE SUPPLIED WITHOUT AN IP ADDRESS (0.0.0.0).**

**MULTIPLE DEVICES CAN THEREFORE BE INSERTED IN THE SAME PROFINET NETWORK AND IDENTIFIED THROUGH THE SCAN OF THE PROFINET NETWORK ITSELF**

**TO SET AN IP ADDRESS (FOR EXAMPLE TO ACCESS THE WEBSERVER OR TO CONNECT TO THE SENECA DISCOVERY DEVICE TOOL) USE THE PROFINET CONFIGURATION ENVIRONMENT OR FORCE THE ADDRESS 192.168.90.101 WITH THE APPROPRIATE DIP SWITCH**

| *DIP1* | *DIP2* | *MEANING* |
|---|---|---|
| OFF | OFF | Normal operation: The device loads the configuration from the flash. |
| ON | ON | Resets the device to its factory configuration:<br>(With IP address 0.0.0.0) In this case the STS LED will start flashing to indicate that the device does not have a configured IP address. |
| OFF | ON | Disables access to the Web server |
| ON | OFF | Forces the device IP address to the standard value of SENECA Ethernet products: 192.168.90.101 |

**ATTENTION!**

**TO INCREASE THE SECURITY OF THE DEVICE DISABLE THE WEBSERVER VIA THE DIP SWITCHES**

# 4. WEB SERVER

**ATTENTION!**

**BEFORE ACCESSING THE WEB SERBER, DISCONNECT THE DEVICE FROM THE PROFINET NETWORK**

**ATTENTION!**

**SOME MODELS ARE SUPPLIED WITHOUT AN IP ADDRESS (0.0.0.0) IN THIS CASE THE "STS" LED FLASHES.**
**TO SET AN IP ADDRESS (FOR EXAMPLE TO ACCESS THE WEBSERVER OR TO CONNECT TO THE SENECA DISCOVERY DEVICE TOOL) USE THE PROFINET CONFIGURATION ENVIRONMENT OR FORCE THE ADDRESS 192.168.90.101 WITH THE APPROPRIATE DIP SWITCH**

The main purpose of the web server is to:

-Configure the Profinet name of the device without using an external development environment (Tia Portal, Codesys…)
-Allow the device firmware update

## 4.1. ACCESS TO THE WEB SERVER

Access to the web server takes place using a web browser and entering the IP address of the device.

On first access the user name and password will be requested.
The default values are:

User Name: admin
Password: admin

**ATTENTION!**

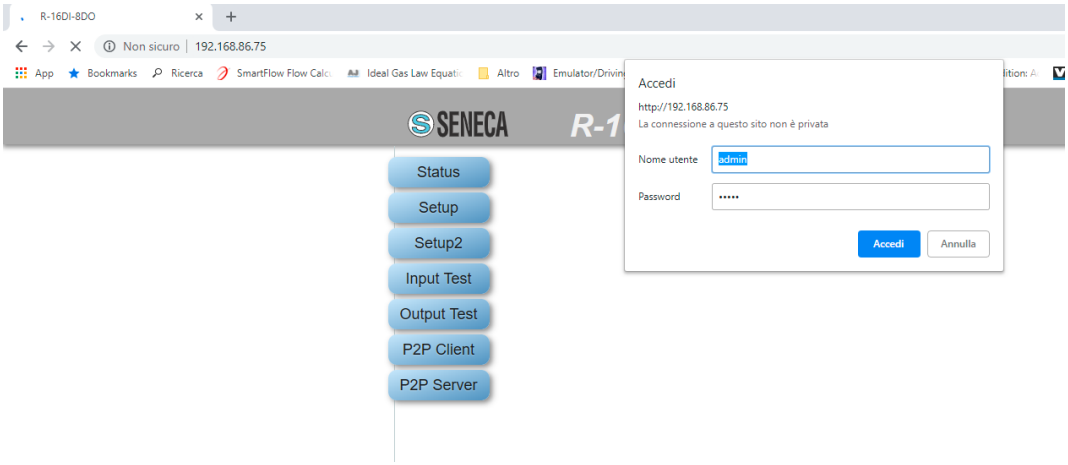
**DEPENDING ON THE DEVICE MODEL AND THE FIRMWARE INSTALLED IN THE DEVICE, IT MAY BE NECESSARY TO ACTIVATE THE DIP SWITCHES TO USE THE WEBSERVER**

**ATTENTION!**

**AS LONG AS THE STS LED IS FLASHING IT MEANS THE DEVICE HAS NOT SET AN IP ADDRESS. IN THIS SITUATION IT WILL NOT BE POSSIBLE TO ACCESS THE WEBSERVER**

**ATTENTION!**

**AFTER THE FIRST ACCESS CHANGE USER NAME AND PASSWORD IN ORDER TO PREVENT ACCESS TO THE DEVICE TO UNAUTHORIZED PEOPLE.**




## ATTENTION!

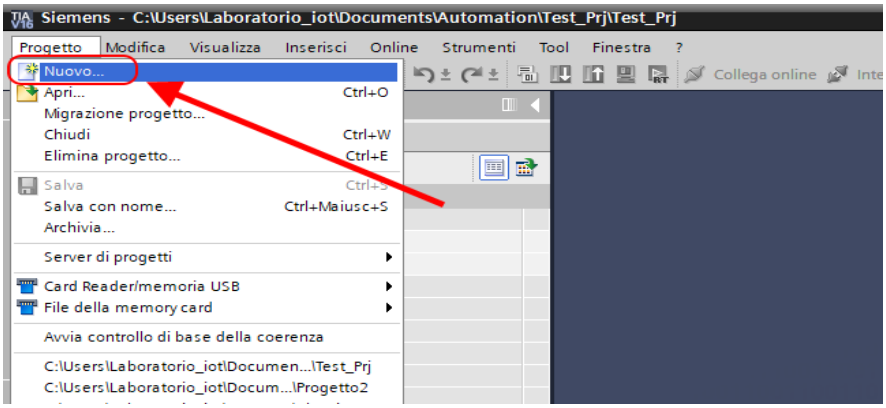
**IF THE PARAMETERS TO ACCESS THE WEB SERVER HAVE BEEN LOST, IT IS NECESSARY TO RESET THE FACTORY-SET CONFIGURATION**

## ATTENTION!

**AVOID INSERTING SPECIAL CHARACTERS IN THE PROFINET NAME OF THE DEVICE**

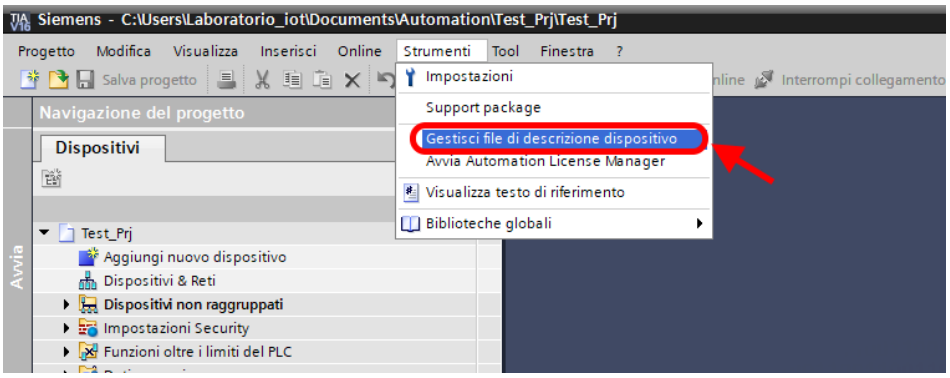
# 5. EXAMPLE OF CREATING A PROJECT WITH SIEMENS PLC (TIA PORTAL 16)

Creating a new project:

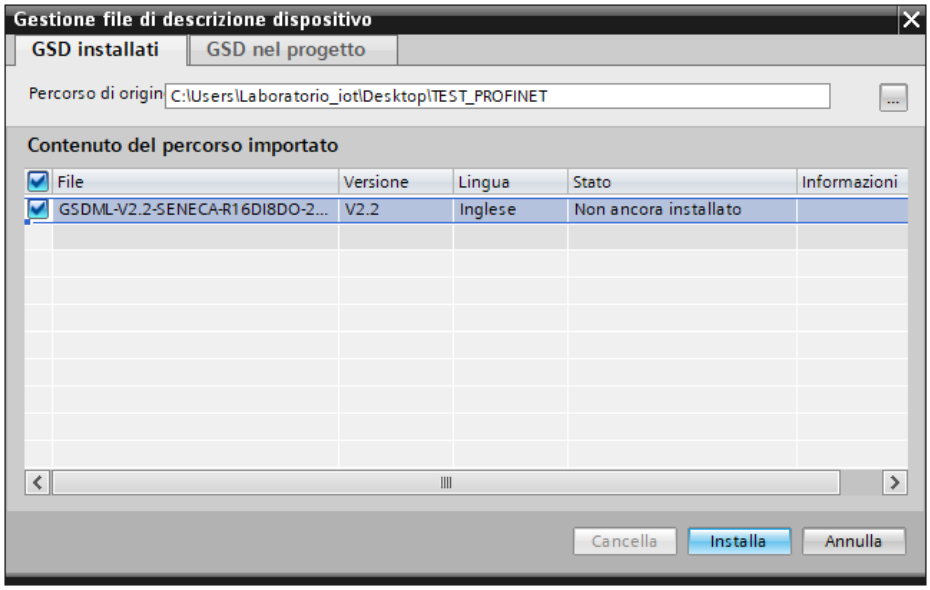


## 5.1. INSTALLING THE GSDML FILE

Install the GSDML file of the Seneca product (it is possible to obtain the file on the web page of the device on the www.seneca.it site):



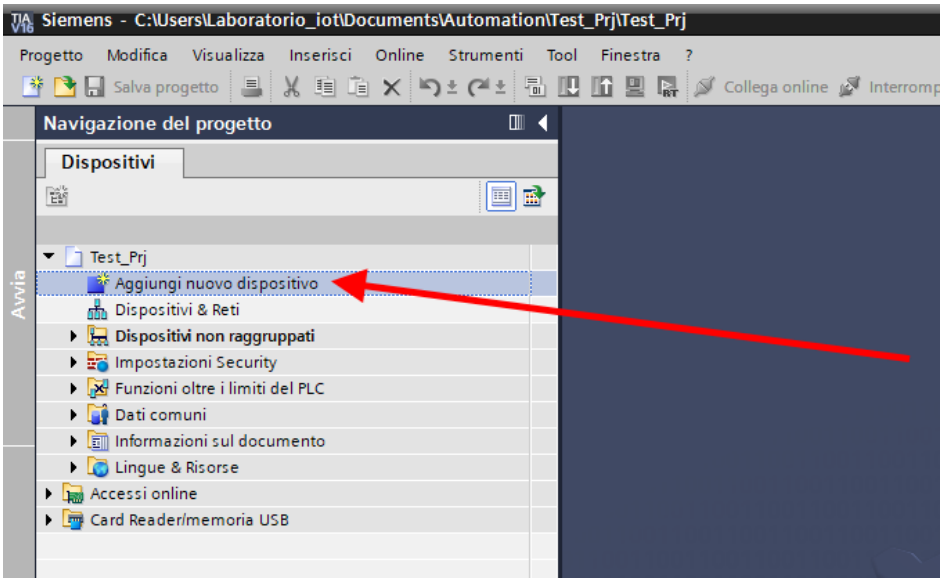

Point to the directory where the file is and press OK, then the list of GSD files in the folder will appear:

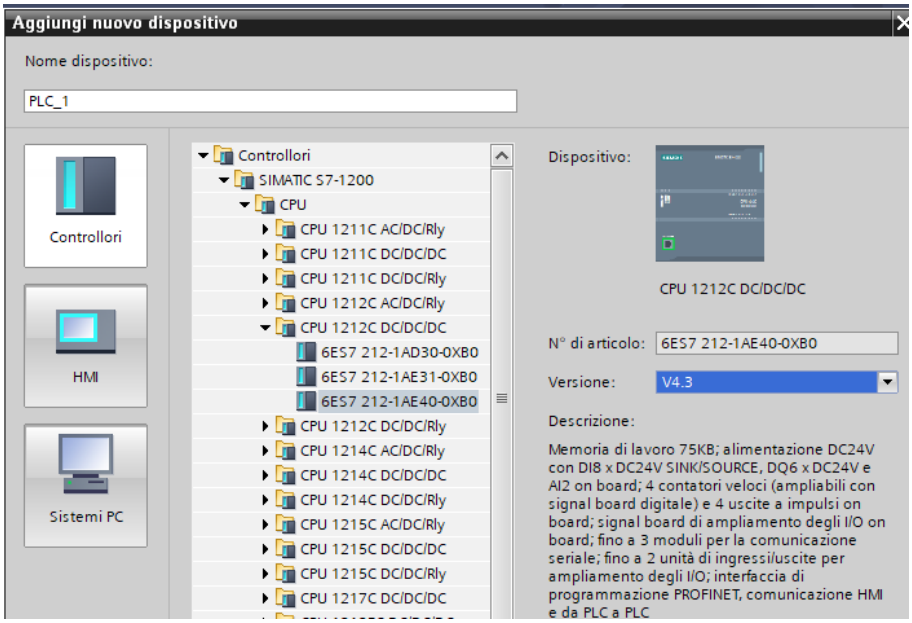



Click on "install".

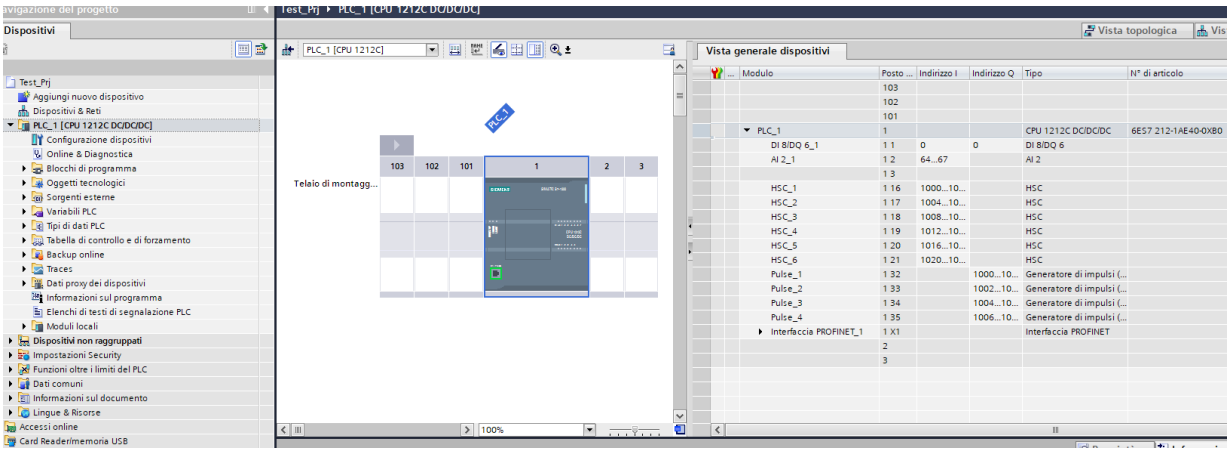
## 5.2. INSERTION OF THE SIEMENS PLC IN THE PROJECT

Now insert the Siemens PLC (in our example a SIEMATIC S7 1200), click on "Add new device ...":

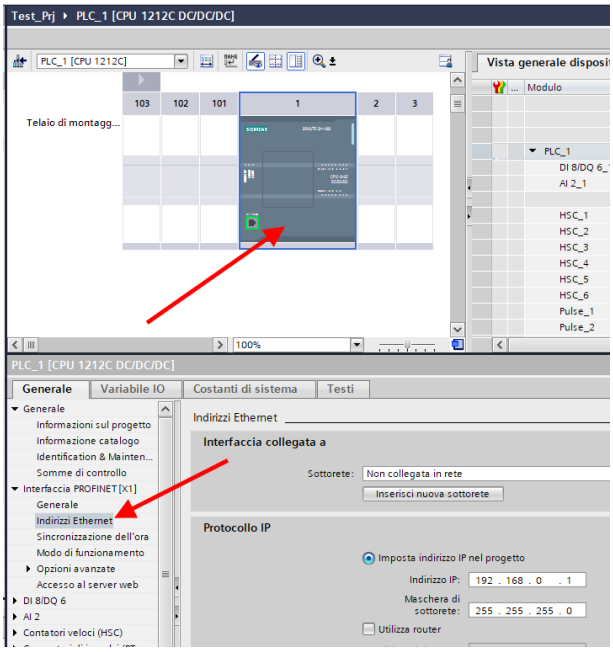


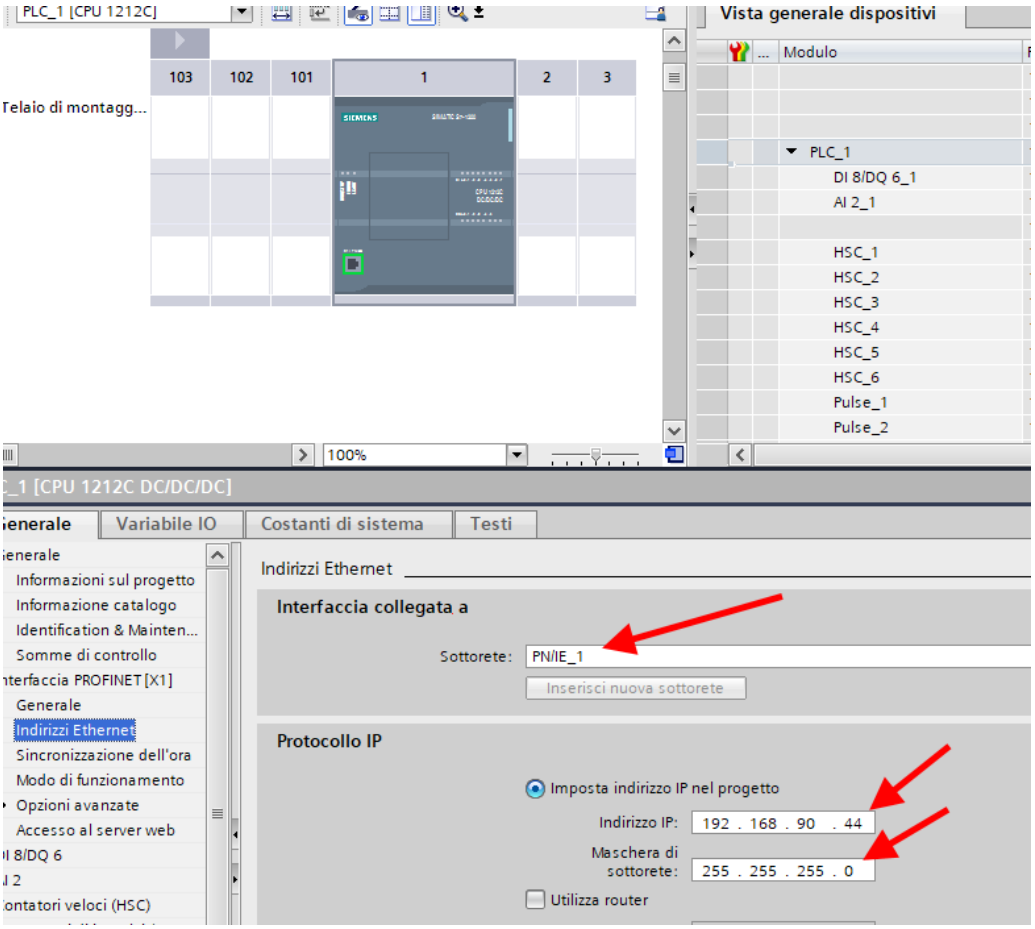
Confirm and the PLC will be added to the rack:



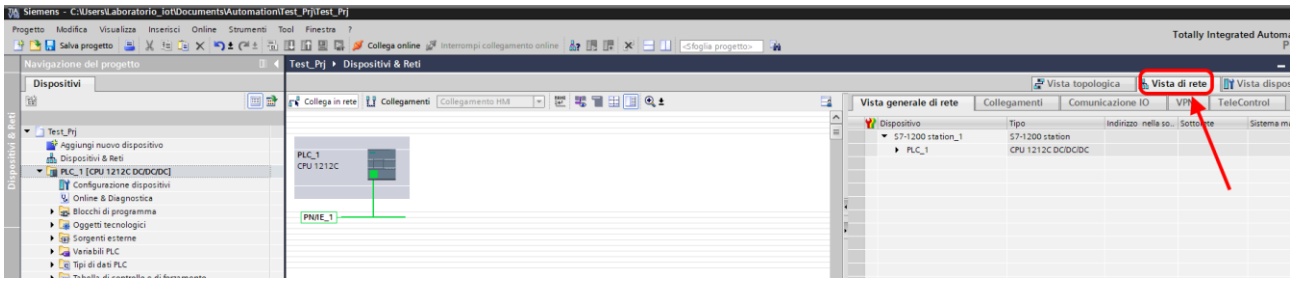

Now click on the PLC and select Profinet interface -> Ethernet addresses



Set the IP you want (in this case 192.168.90.44) and the PLC subnet:

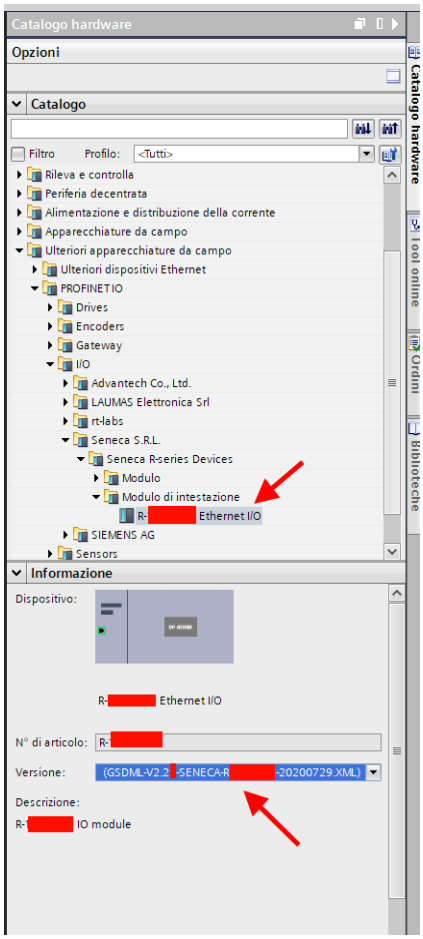



Move on to the network view:

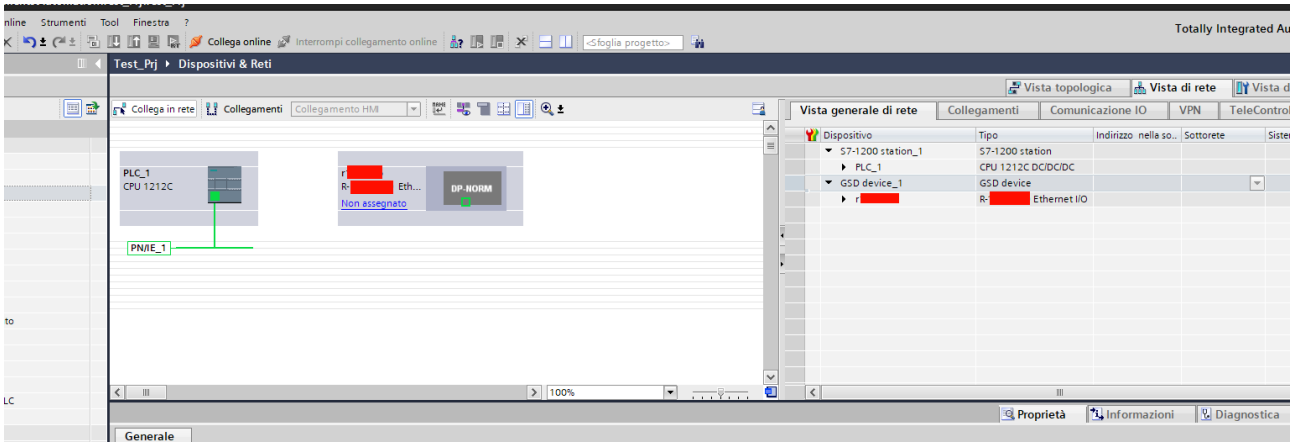


## 5.3. INSERTION OF THE PROFINET SENECA IO

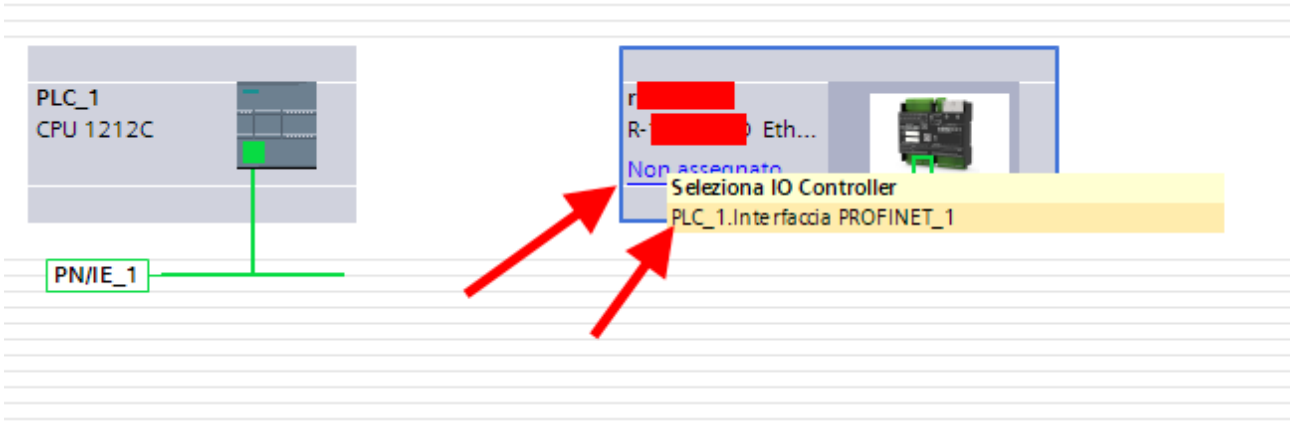
On the right, select "Hardware Catalogue" and then under "Additional Field Device" -> PROFINET IO -> I/O -> Seneca R-Series-> Header module (in the example an R-16DI-8DO device is shown):

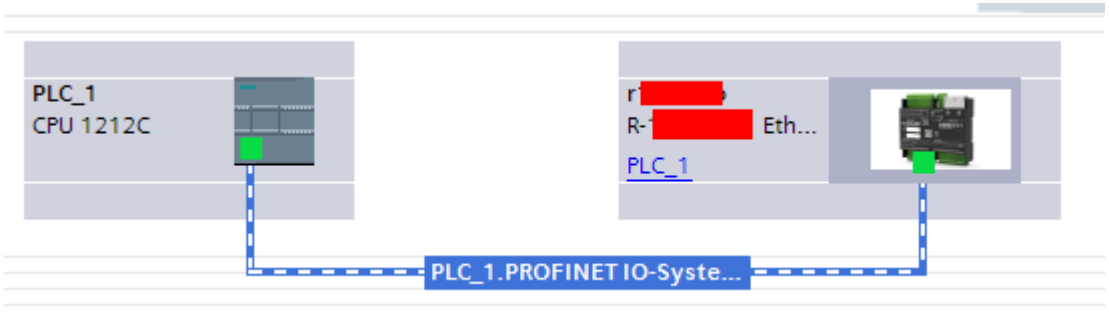


Drag the device to the network view:

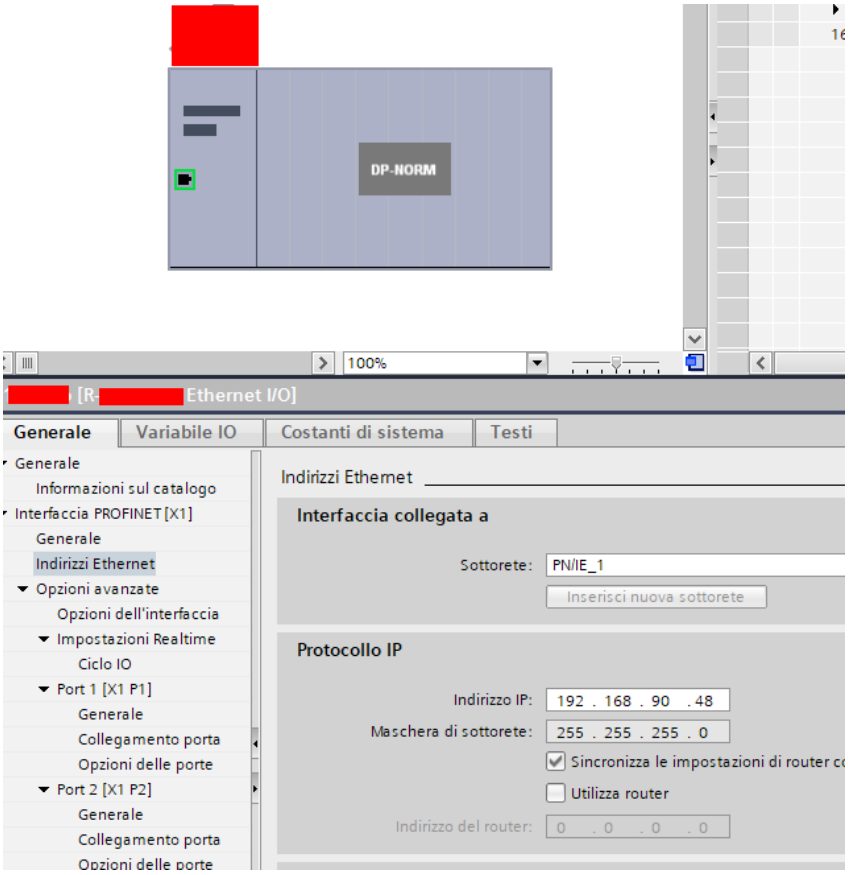



Now associate it to the PLC by clicking with the left mouse on "Not assigned" and then select the PLC:



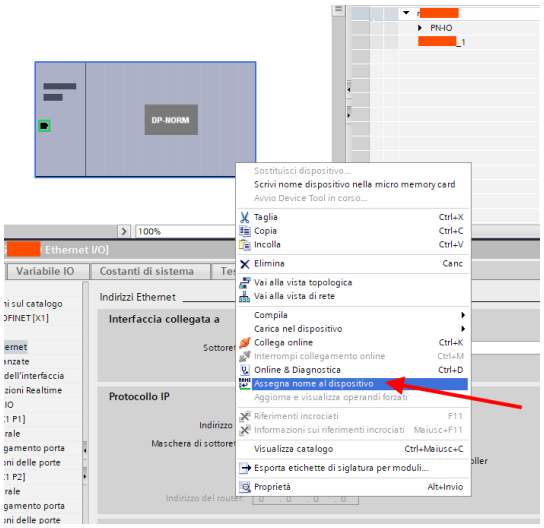
Click twice on the Seneca device and configure the IP address here too (for example 192.168.90.48):




In Profinet the devices are identified by their name, so right click on the Seneca device and select "Assign device name"

**ATTENTION!**

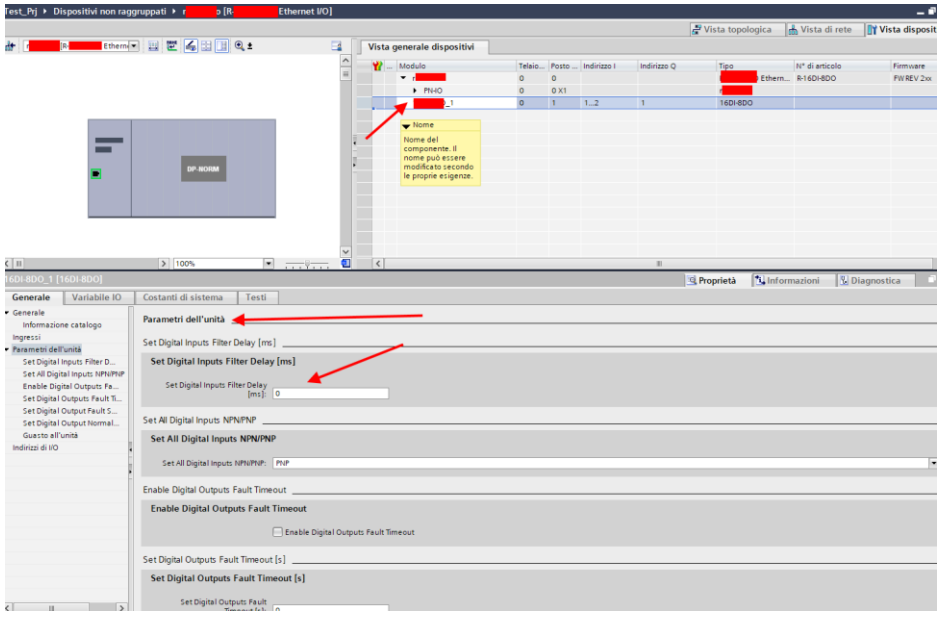
**AVOID INSERTING SPECIAL CHARACTERS IN THE PROFINET NAME OF THE DEVICE**




Scan the network with "Update list" and set (if necessary) the device name with "Assign name".

## 5.4. CONFIGURATION OF THE PARAMETERS OF THE SENECA DEVICE

It is also possible to directly configure the device IO without any external software.
To configure the device, click on the IO so that the "Unit parameters" appear:




At the next start, the PLC will send the desired configuration to the device.

## 5.5. CONFIGURATION PARAMETERS OF THE GSDML FILE

### 5.5.1. R-32DIDO-P

***SET DIGITAL IO INPUT/OUTPUT***
Selects whether the selected input will work as an input or output.

***SET DIGITAL INPUT NORMALLY HIGH/LOW***
If selected as digital input, it configures whether the input is normally high or low.

***SET DIGITAL OUTPUT NORMALLY OPEN/CLOSE***
If selected as digital output, it configures whether the output is normally open or closed.

***SET DIGITAL OUTPUT WATCHDOG***
If selected as digital output, it sets the output watchdog mode.
If “Disabled”, it disables the watchdog function for the selected output.
If "Enabled on Profinet Communication" the output goes into "Watchdog state" if there has been no generic Profinet communication within the set time.

***SET DIGITAL OUTPUT WATCHDOG STATE***
Sets the value that the digital output must adopt if the watchdog has been triggered.

***SET DIGITAL OUTPUT WATCHDOG TIMEOUT [s]***
Represents the watchdog time of the digital output in seconds. If the PLC stops communicating with the device within the set time, then the outputs will go into the "Watchdog state" condition (if the function is enabled).

### 5.5.2. R-16DI-8DO-P

***SET DIGITAL INPUTS FILTER DELAY [ms]***
Sets the filtering of the counters, the value is expressed in [ms].
The filter cut-off frequency corresponds to:
$fcut[Hz]$ = 1000/ (2 $*$ $Counters\ Filter\ [ms]$)
For example, if the filter counter is 100ms the cutting frequency will be:
$fcut[Hz]$ = 1000/ (2 $*$ $Counters\ Filter\ [ms]$) = 5 $Hz$
So all input frequencies greater than 5 Hz will be cut.

***SET ALL DIGITAL INPUTS NPN/PNP***
Sets the input operating mode to between npn “Sink” and pnp “Source”

***ENABLE DIGITAL OUTPUTS FAULT TIMEOUT***

Set whether the digital output watchdog is to activated. When enabled, if within the timeout time there has been no communication from the master to the device, the outputs go into a Fail state. This mode allows to obtain a safe system in case of malfunction of the master.

***SET DIGITAL OUTPUTS FAULT TIMEOUT [s]***

Set the watchdog time of the digital outputs.

***SET DIGITAL OUTPUT FAULT STATES OPEN/CLOSE***

They set the states of each of the outputs under normal conditions.

***SET DIGITAL OUTPUT NORMALLY OPEN/CLOSE***

They set the states of each of the outputs in fail conditions.

### 5.5.3. R-8AI-8DIDO-P

***SET DIGITAL IO INPUT/OUTPUT***

Selects whether the selected input will work as an input or output.

***SET DIGITAL INPUT NORMALLY HIGH/LOW***

If selected as digital input, it configures whether the input is normally high or low.

***SET DIGITAL OUTPUT NORMALLY OPEN/CLOSE***

If selected as digital output, it configures whether the output is normally open or closed.

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Represents the watchdog time of the digital output in seconds. If the PLC stops communicating with the device within the set time, then the outputs will go into the "Watchdog state" condition (if the function is enabled).

***SET ANALOG MODE***

Set the type of measurement for the selected input.
It is possible to choose between the following types of input:
+-100mV
+-30V
+-24 mA
Thermocouple
PT100 3 wires (only for input 1).

***SAMPLING TIME***

Set the sampling time of the input, selectable between
25ms and 400ms

***SET ANALOG INPUT MOVING FILTER (10 SAMPLES)***

Set whether or not to activate the 10-sample moving average filter.

***SET ANALOG INPUTS MEASURE OFFSET***

Set an offset for analog measurements

***SET INPUT START/END SCALE***

Represents the start of the electrical scale of the analog measurement used for the register of the engineering measurement.
The value to enter is in the unit of measurement based on the type of input chosen [V], or [mV], or [uA], or [°C]

***SET INPUT START/END ENG. SCALE***

Represents the electrical full scale of the analog measurement used for the engineering measurement register.

Example:
ANALOG INPUT START SCALE = 4 [mA]
ANALOG INPUT STOP SCALE = 20 [mA]
ANALOG INPUT ENG STOP SCALE = -200 [metri]
ANALOG INPUT ENG START SCALE = 200 [metri]
With a 12 mA input the engineering value will be 0 metres.

***SET ANALOG INPUTS TC TYPE***

In the case of thermocouple measurement, it allows to select the type of thermocouple between: J, K, R, S, T, B, E, N, L

***SET ANALOG INPUTS TC COLD JUNCTION MODE***

In the case of thermocouple measurement, it enables or disables the automatic cold junction offset of the device. If channel 1 has been configured as PT100 cold junction measurement, this sensor will be used for the offset and not the one inside the instrument.

***SET ANALOG INPUTS TC COLD JUNCTION OFFSET***

In the case of thermocouple measurement, set an offset in the cold junction measurement in [°C]

***SET ANALOG INPUTS TC BURNOUT MODE***

In the case of thermocouple measurement, it selects the behaviour in case of sensor failure: In the case of "Last Value" the value is stopped at the last valid value, in the case of "Fail Value" the "Burnout" value is loaded in the registers.

***SET ANALOG INPUTS TC BURNOUT VALUE***

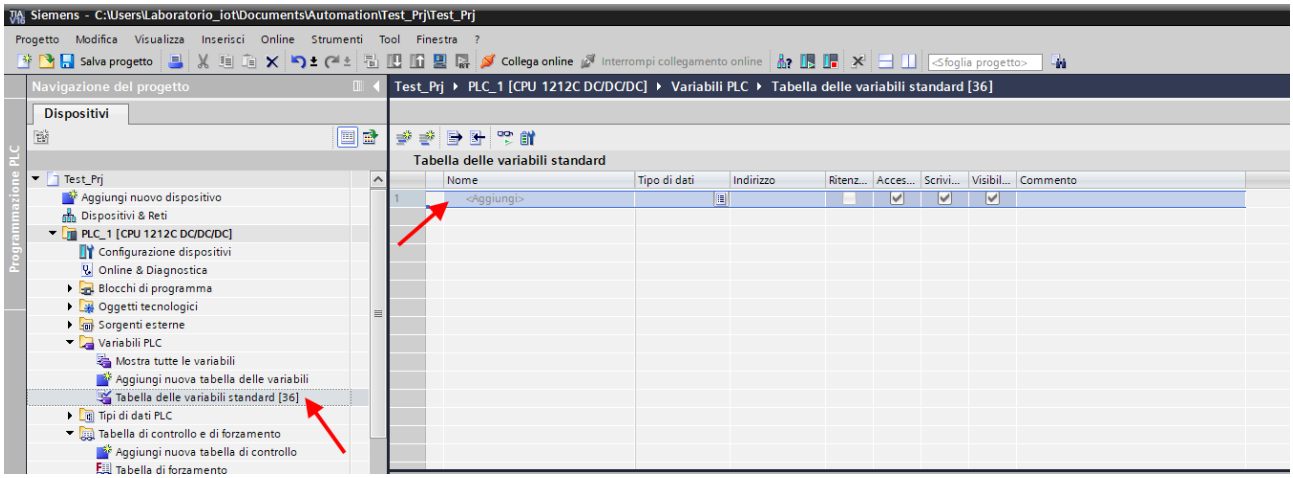
In the case of thermocouple measurement, if the ANALOG INPUT BURNOUT MODE = “FAIL VALUE” mode is activated and the sensor is in the “burn” state, it allows you to set a value in °C to be taken by the measurement register.

***PT100 3 WIRE***

Allows you to choose whether the AIN1 is used as a cold junction or as a temperature measurement with PT100.

## 5.6. R-32DIDO-P I/O DATA

Define the PLC tags directly in the "standard tag table":




Now let's add the variables related to the IO, the addresses are shown here:


So:

The bytes from I1 to I4 contain the inputs (bit 0 is IO1, bit 1 is IO2 etc.)

Bytes Q1 to Q4 contain the outputs (bit 0 is IO1, bit 1 is IO2 etc ...), obviously only the outputs are writable.

Below is the default mapping of available IOs:

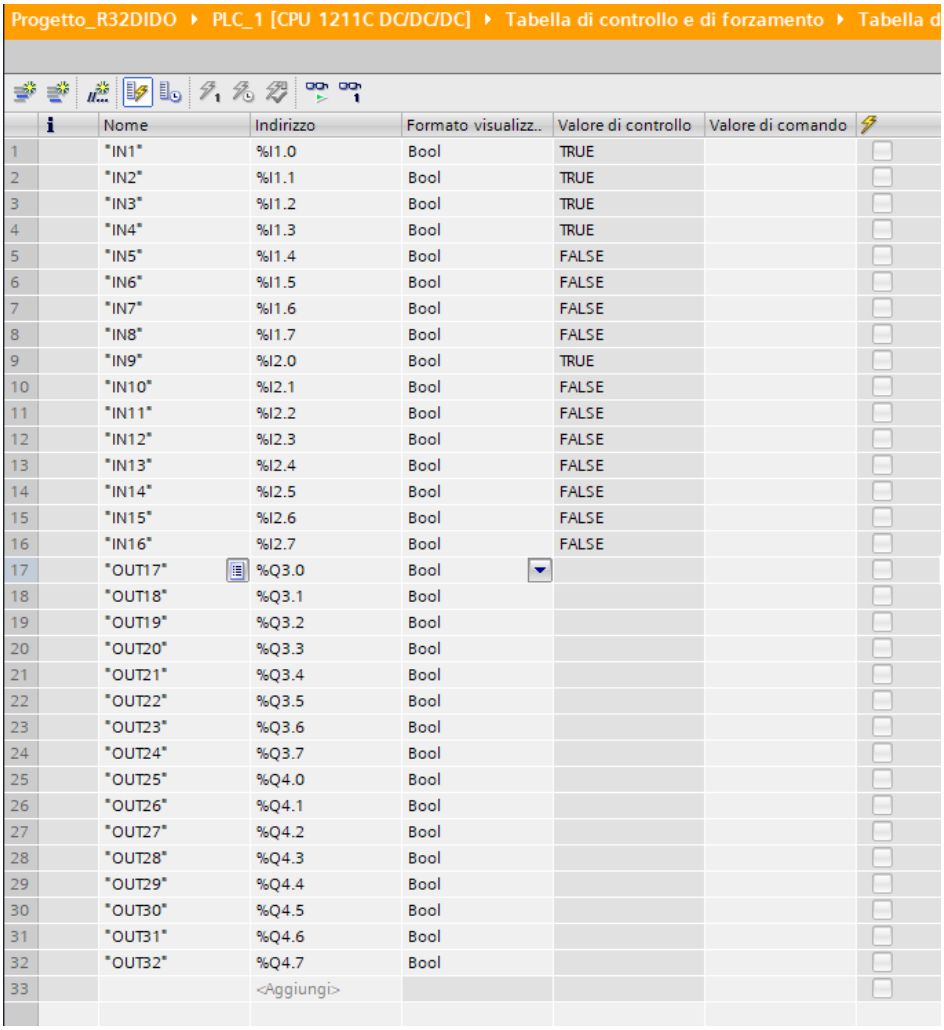
| *INPUT/OUTPUT* | *DEFAULT ADDRESS IO CONFIGURED AS AN INPUT* | *DEFAULT ADDRESS IO CONFIGURED AS AN OUTPUT* |
|---|---|---|
| IO1 | I1.0 | Q1.0 |
| IO2 | I1.1 | Q1.1 |
| IO3 | I1.2 | Q1.2 |
| IO4 | I1.3 | Q1.3 |
| IO5 | I1.4 | Q1.4 |
| IO6 | I1.5 | Q1.5 |
| IO7 | I1.6 | Q1.6 |
| IO8 | I1.7 | Q1.7 |
| IO9 | I2.0 | Q2.0 |
| IO10 | I2.1 | Q2.1 |
| IO11 | I2.2 | Q2.2 |
| IO12 | I2.3 | Q2.3 |
| IO13 | I2.4 | Q2.4 |
| IO14 | I2.5 | Q2.5 |
| IO15 | I2.6 | Q2.6 |
| IO16 | I2.7 | Q2.7 |
| IO17 | I3.0 | Q3.0 |
| IO18 | I3.1 | Q3.1 |
| IO19 | I3.2 | Q3.2 |
| IO20 | I3.3 | Q3.3 |
| IO21 | I3.4 | Q3.4 |
| IO22 | I3.5 | Q3.5 |
| IO23 | I3.6 | Q3.6 |
| IO24 | I3.7 | Q3.7 |
| IO25 | I4.0 | Q4.0 |
| IO26 | I4.1 | Q4.1 |
| IO27 | I4.2 | Q4.2 |
| IO28 | I4.3 | Q4.3 |
| IO29 | I4.4 | Q4.4 |
| IO30 | I4.5 | Q4.5 |
| IO31 | I4.6 | Q4.6 |
| IO32 | I4.7 | Q4.7 |

So if, for example, I need 16 inputs and 16 outputs, I can use the Booleans from I1.0 to I2.7 for the inputs (which will therefore be found in the IO1 ... IO16) and the Booleans from Q3.0 to Q4.7 for the outputs (which will then be found in the IO17 ... IO32).

**ATTENTION!**

**An IO configured as an input cannot be controlled as an output.**
**An IO configured as an output cannot be read as an input.**

Always following our example (16 inputs and 16 outputs) we define the 16 inputs and 16 outputs in the standard variables table:

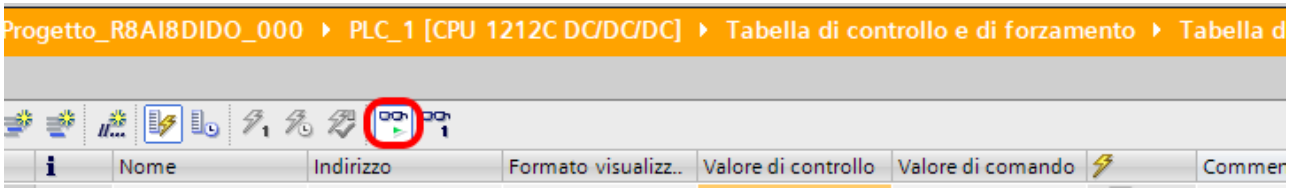


Progetto_R32DIDO ▸ PLC_1 [CPU 1211C DC/DC/DC] ▸ Tabella di controllo e di forzamento ▸ Tabella d

| | Nome | Indirizzo | Formato visualizz.. | Valore di controllo | Valore di comando |
|---|---|---|---|---|---|
| 1 | "IN1" | %I1.0 | Bool | TRUE | |
| 2 | "IN2" | %I1.1 | Bool | TRUE | |
| 3 | "IN3" | %I1.2 | Bool | TRUE | |
| 4 | "IN4" | %I1.3 | Bool | TRUE | |
| 5 | "IN5" | %I1.4 | Bool | FALSE | |
| 6 | "IN6" | %I1.5 | Bool | FALSE | |
| 7 | "IN7" | %I1.6 | Bool | FALSE | |
| 8 | "IN8" | %I1.7 | Bool | FALSE | |
| 9 | "IN9" | %I2.0 | Bool | TRUE | |
| 10 | "IN10" | %I2.1 | Bool | FALSE | |
| 11 | "IN11" | %I2.2 | Bool | FALSE | |
| 12 | "IN12" | %I2.3 | Bool | FALSE | |
| 13 | "IN13" | %I2.4 | Bool | FALSE | |
| 14 | "IN14" | %I2.5 | Bool | FALSE | |
| 15 | "IN15" | %I2.6 | Bool | FALSE | |
| 16 | "IN16" | %I2.7 | Bool | FALSE | |
| 17 | "OUT17" | %Q3.0 | Bool | | |
| 18 | "OUT18" | %Q3.1 | Bool | | |
| 19 | "OUT19" | %Q3.2 | Bool | | |
| 20 | "OUT20" | %Q3.3 | Bool | | |
| 21 | "OUT21" | %Q3.4 | Bool | | |
| 22 | "OUT22" | %Q3.5 | Bool | | |
| 23 | "OUT23" | %Q3.6 | Bool | | |
| 24 | "OUT24" | %Q3.7 | Bool | | |
| 25 | "OUT25" | %Q4.0 | Bool | | |
| 26 | "OUT26" | %Q4.1 | Bool | | |
| 27 | "OUT27" | %Q4.2 | Bool | | |
| 28 | "OUT28" | %Q4.3 | Bool | | |
| 29 | "OUT29" | %Q4.4 | Bool | | |
| 30 | "OUT30" | %Q4.5 | Bool | | |
| 31 | "OUT31" | %Q4.6 | Bool | | |
| 32 | "OUT32" | %Q4.7 | Bool | | |
| 33 | | <Aggiungi> | | | |

Now compile, send the project and go online with the PLC.

Once online, press the glasses icon to update the status of the variables.



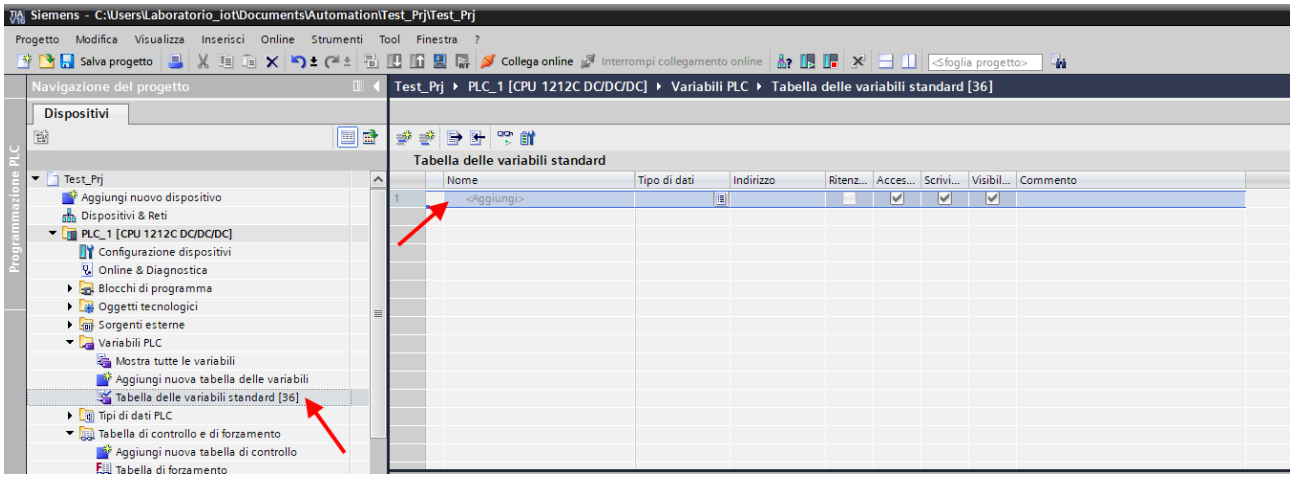

Under the "Control value" column you can read the I/O value in real time.

To control the outputs, it is necessary to enter "TRUE" or "FALSE" in the "Command value" column and then press the icon with the lightning bolt to order the writing. Note the status of the LED relating to the commanded output.

In the "Control value" column, the status of the outputs is also read in real time.

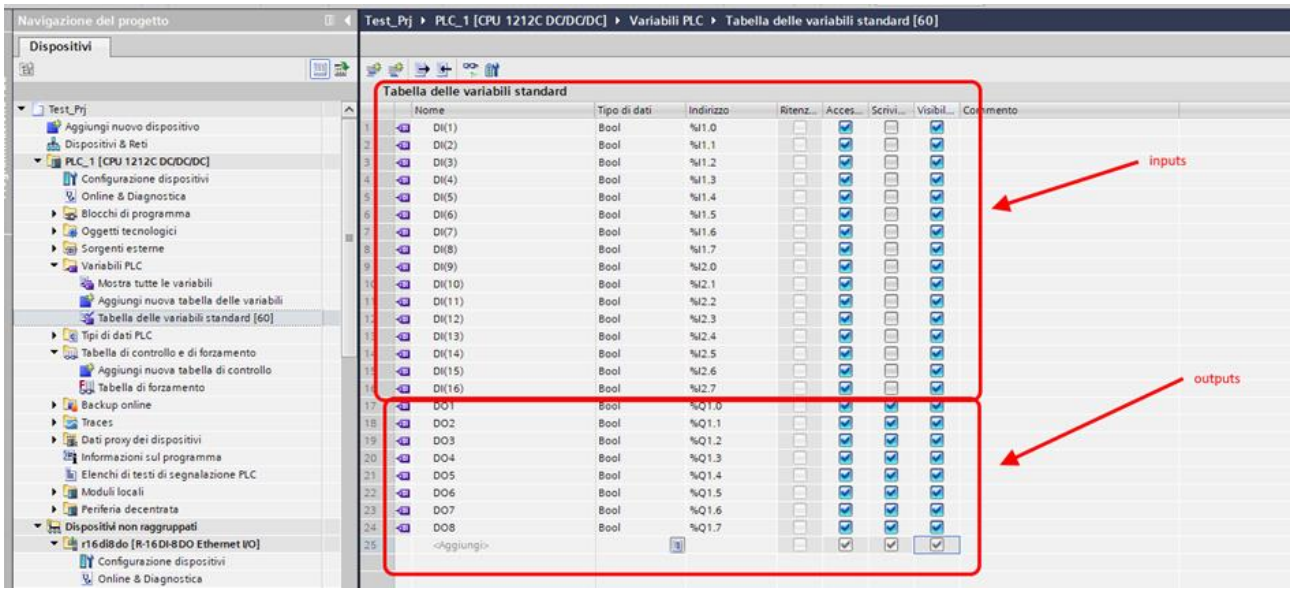
## 5.7. R-16DI-8DO-P I/O DATA

Define the PLC tags directly in the "standard tag table":



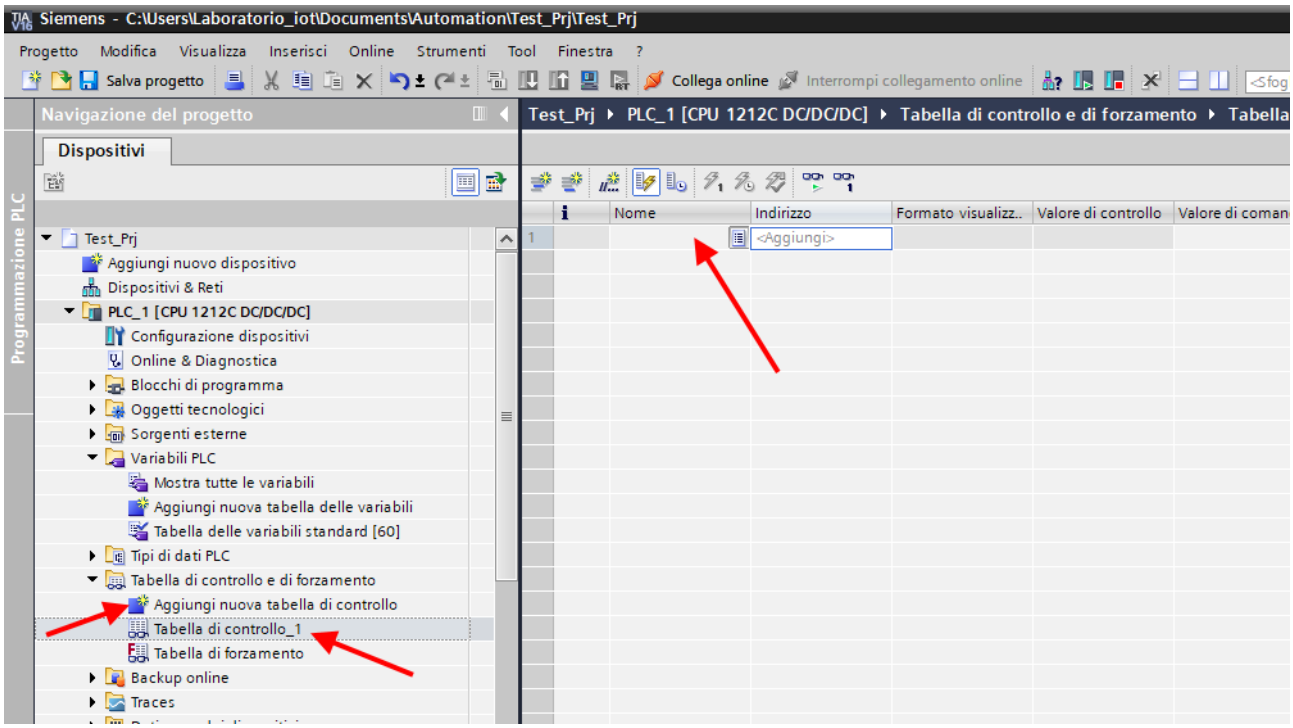

Add the tags related to the IO (in the example it is an R-16DI-8DO that is 16 digital inputs and 8 digital outputs). The addresses are written here:

So bytes I1 and I2 contain the 16 inputs, byte Q1 the 8 outputs:



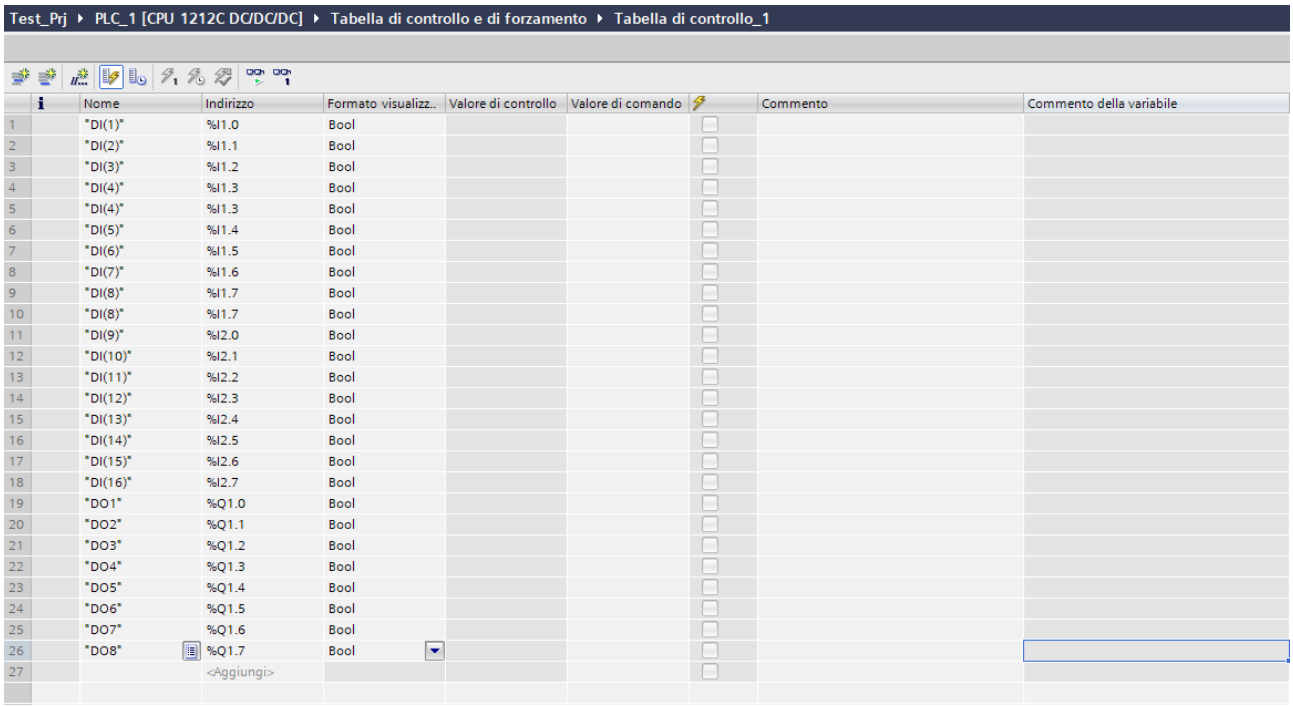

After this operation, define a new control table:

Click on "Add new control table" and then insert the variables

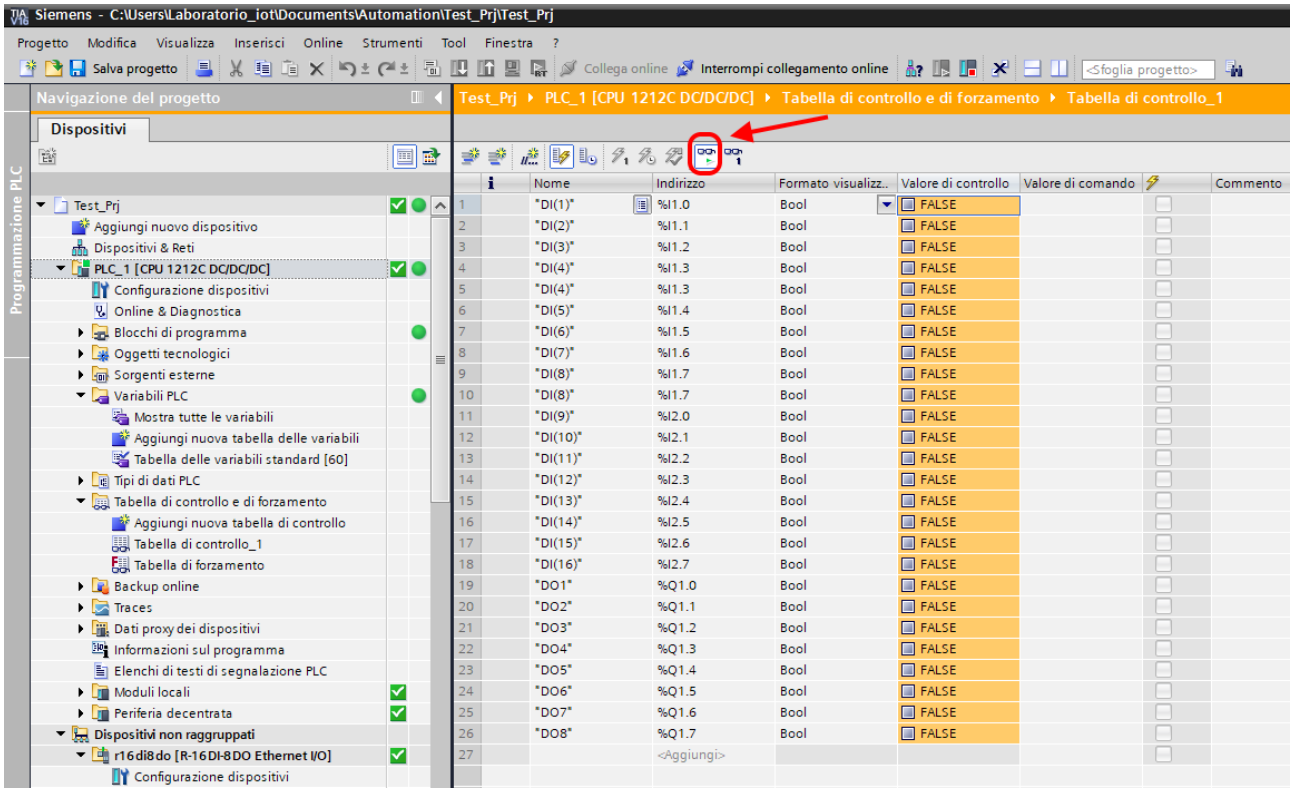


Since you have already defined them previously, just select the ones we want to monitor from the list:


Once you have added all of them you will get:

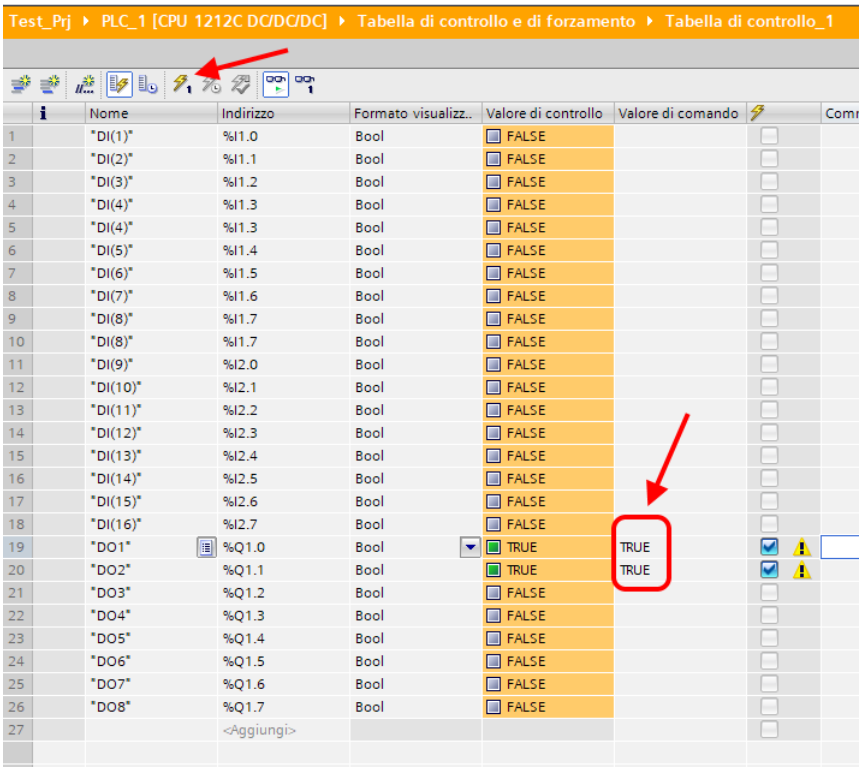


Now compile, send the project and go online with the PLC (all operations seen previously):
Once online, press the glasses icon to update the status of the variables:




Under the "Control value" column you can read the I/O value in real time.

To control the outputs, it is necessary to enter "TRUE" in the "Command value" column and then press the icon with the lightning bolt to order the writing:

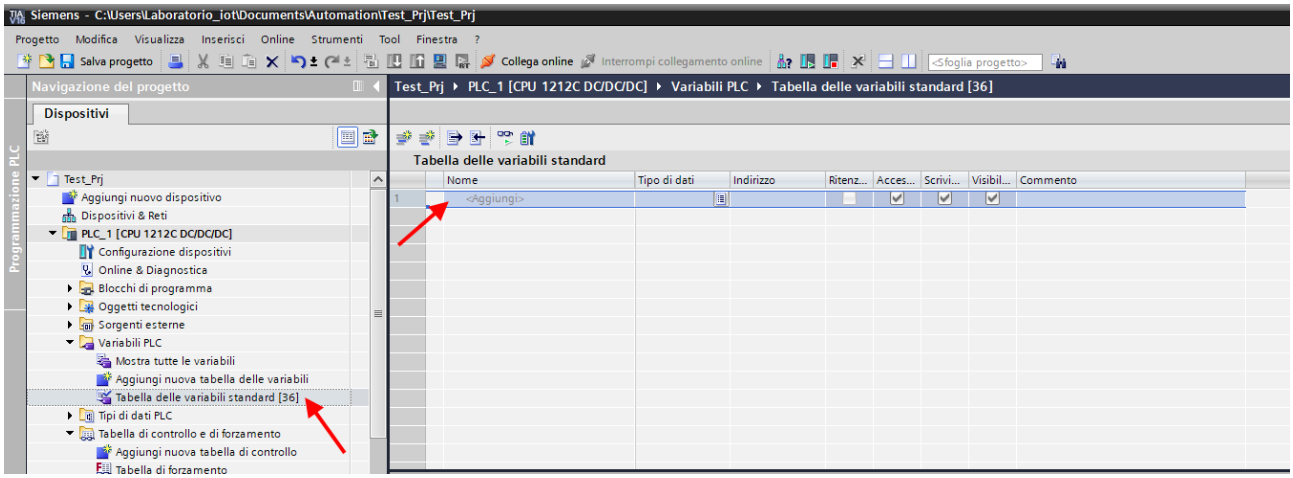



| | Nome | Indirizzo | Formato visualizz.. | Valore di controllo | Valore di comando |
|---|---|---|---|---|---|
| 1 | "DI(1)" | %I1.0 | Bool | FALSE | |
| 2 | "DI(2)" | %I1.1 | Bool | FALSE | |
| 3 | "DI(3)" | %I1.2 | Bool | FALSE | |
| 4 | "DI(4)" | %I1.3 | Bool | FALSE | |
| 5 | "DI(4)" | %I1.3 | Bool | FALSE | |
| 6 | "DI(5)" | %I1.4 | Bool | FALSE | |
| 7 | "DI(6)" | %I1.5 | Bool | FALSE | |
| 8 | "DI(7)" | %I1.6 | Bool | FALSE | |
| 9 | "DI(8)" | %I1.7 | Bool | FALSE | |
| 10 | "DI(8)" | %I1.7 | Bool | FALSE | |
| 11 | "DI(9)" | %I2.0 | Bool | FALSE | |
| 12 | "DI(10)" | %I2.1 | Bool | FALSE | |
| 13 | "DI(11)" | %I2.2 | Bool | FALSE | |
| 14 | "DI(12)" | %I2.3 | Bool | FALSE | |
| 15 | "DI(13)" | %I2.4 | Bool | FALSE | |
| 16 | "DI(14)" | %I2.5 | Bool | FALSE | |
| 17 | "DI(15)" | %I2.6 | Bool | FALSE | |
| 18 | "DI(16)" | %I2.7 | Bool | FALSE | |
| 19 | "DO1" | %Q1.0 | Bool | TRUE | TRUE |
| 20 | "DO2" | %Q1.1 | Bool | TRUE | TRUE |
| 21 | "DO3" | %Q1.2 | Bool | FALSE | |
| 22 | "DO4" | %Q1.3 | Bool | FALSE | |
| 23 | "DO5" | %Q1.4 | Bool | FALSE | |
| 24 | "DO6" | %Q1.5 | Bool | FALSE | |
| 25 | "DO7" | %Q1.6 | Bool | FALSE | |
| 26 | "DO8" | %Q1.7 | Bool | FALSE | |
| 27 | | <Aggiungi> | | | |

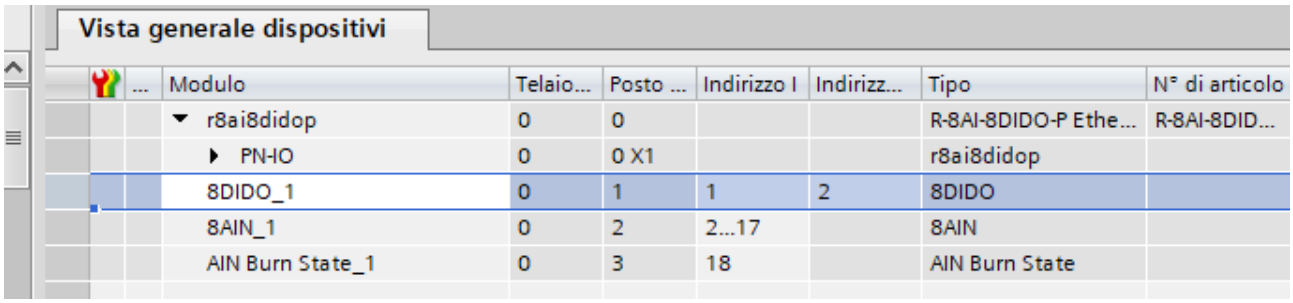
In the "Control value" column, the outputs are now correctly read to "True".

## 5.8. R-8AI-8DIDO-P I/O DATA

Define the PLC tags directly in the "standard tag table":




Add the tags related to the IO (in the example it is an R-16DI-8DO that is 16 digital inputs and 8 digital outputs). The addresses are written here:




| ... | Modulo | Telaio... | Posto ... | Indirizzo I | Indirizz... | Tipo | N° di articolo |
|---|---|---|---|---|---|---|---|
| | r8ai8didop | 0 | 0 | | | R-8AI-8DIDO-P Ethe... | R-8AI-8DID... |
| | PN-IO | 0 | 0 X1 | | | r8ai8didop | |
| | 8DIDO_1 | 0 | 1 | 1 | 2 | 8DIDO | |
| | 8AIN_1 | 0 | 2 | 2...17 | | 8AIN | |
| | AIN Burn State_1 | 0 | 3 | 18 | | AIN Burn State | |

So byte I1 contains the 8 digital inputs (those as inputs), byte Q2 the 8 outputs (those configured as outputs).
Bytes from I2 to I17 show the values of the 8 analog inputs (2 bytes per input).
Byte I3 shows the burnout status of the analog inputs.

Below is the default mapping of the available digital IOs:

| *INPUT/OUTPUT* | *DEFAULT ADDRESS IO CONFIGURED AS AN INPUT* | *DEFAULT ADDRESS IO CONFIGURED AS AN OUTPUT* |
|---|---|---|
| IO1 | I1.0 | Q1.0 |
| IO2 | I1.1 | Q1.1 |
| IO3 | I1.2 | Q1.2 |
| IO4 | I1.3 | Q1.3 |
| IO5 | I1.4 | Q1.4 |
| IO6 | I1.5 | Q1.5 |
| IO7 | I1.6 | Q1.6 |
| IO8 | I1.7 | Q1.7 |

The default mapping of the analog IOs is as follows:

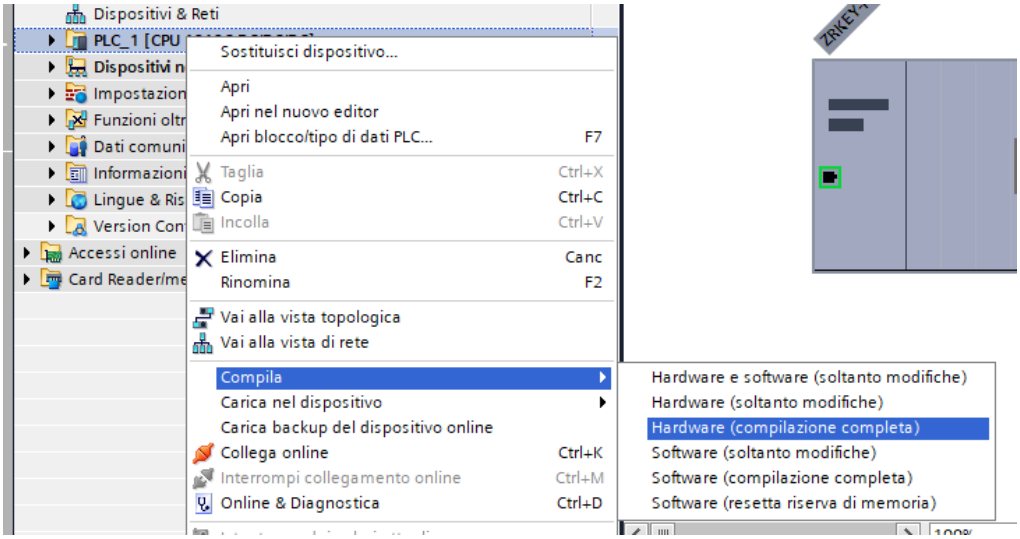
| *ANALOG INPUT* | *DEFAULT ADDRESS INPUT* |
|---|---|
| AIN1 | IW2 |
| AIN 2 | IW4 |
| AIN 3 | IW6 |
| AIN 4 | IW8 |
| AIN 5 | IW10 |
| AIN 6 | IW12 |
| AIN 7 | IW14 |
| AIN 8 | IW16 |

## 5.9. COMPILATION AND SENDING OF THE PROJECT TO THE SIEMENS PLC

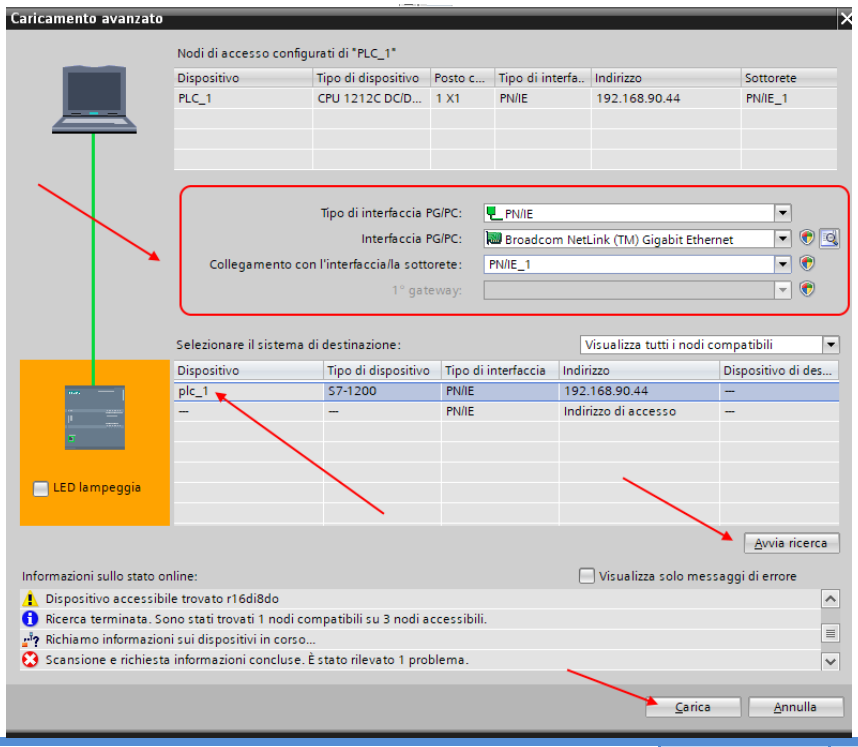
Now that the devices are configured, all that remains is to compile and send the configuration to the PLC.

**ATTENTION!**

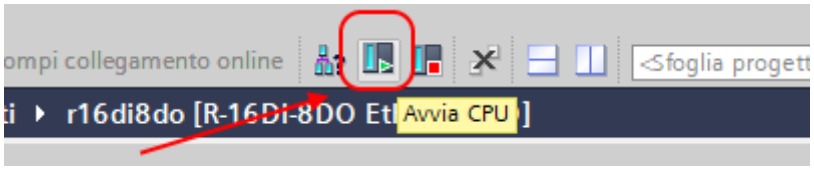
**YOU MUST ALWAYS DO A FULL HARDWARE COMPILATION BEFORE SENDING A PROJECT TO THE DEVICE:**



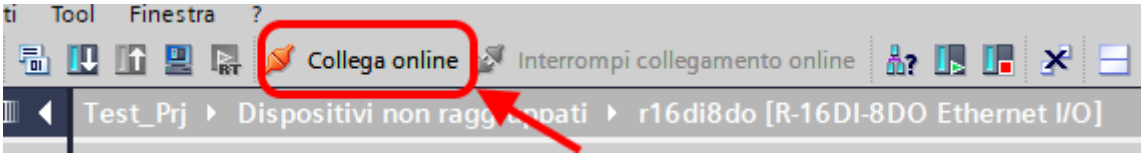

Before sending the project to the PLC, you are asked to select the ethernet interface and start the search, in order to select the PLC and press "Load".



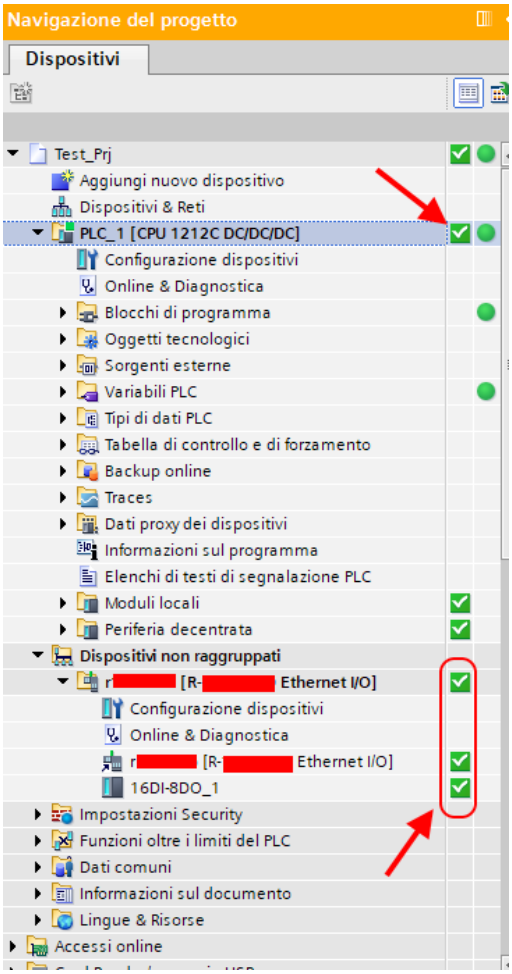
Once the project has been sent, RUN the PLC:




And go ON-Line so as to check if there are any errors:

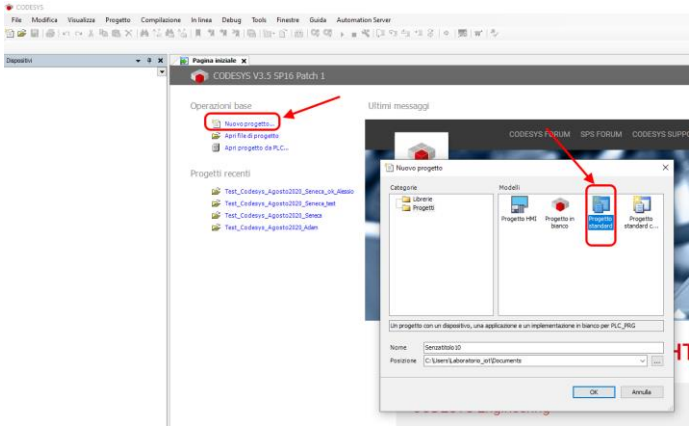



If everything is correct you will get a green icon next to the Seneca device:



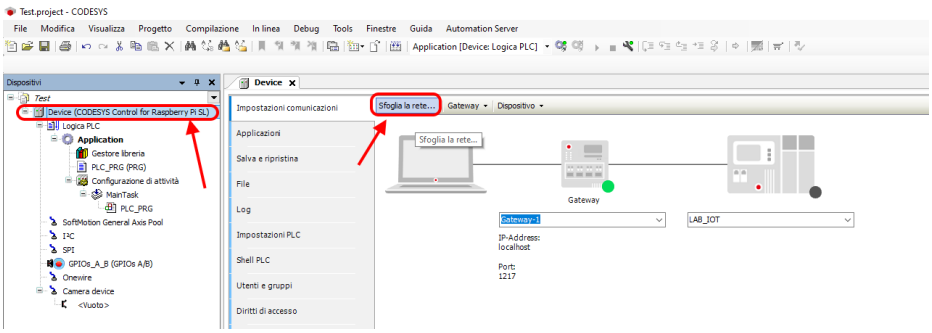
# 6. EXAMPLE OF CREATING A PROJECT WITH PLC CODESYS 3.5

Create a new standard project:

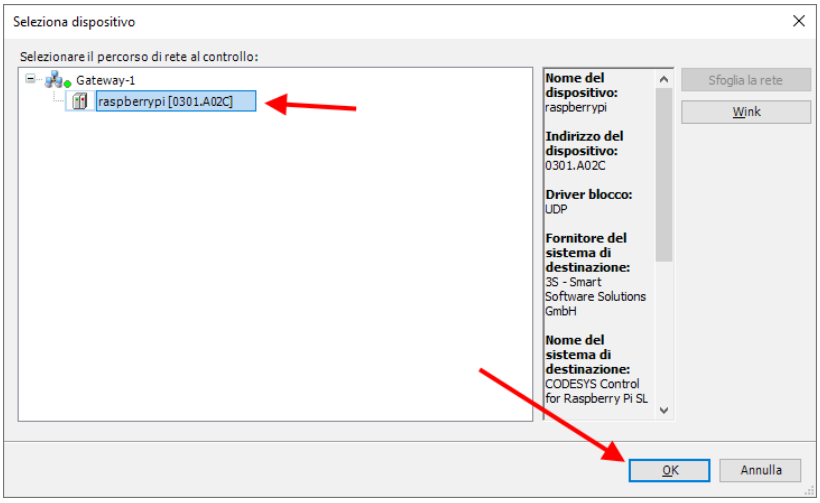


### 6.1.1. INSERTION OF THE CODESYS PLC IN THE PROJECT

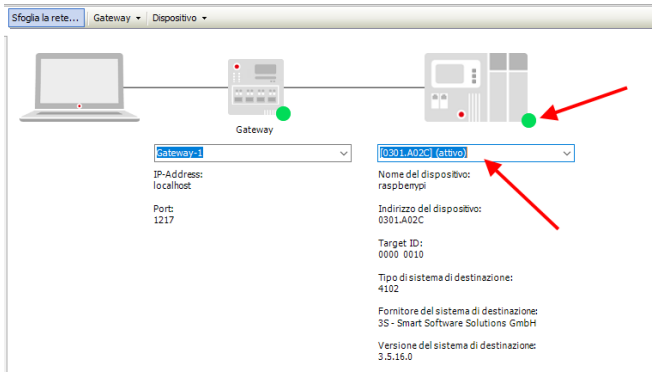
Configure the PLC by selecting it in the tree on the left and then browsing the network:



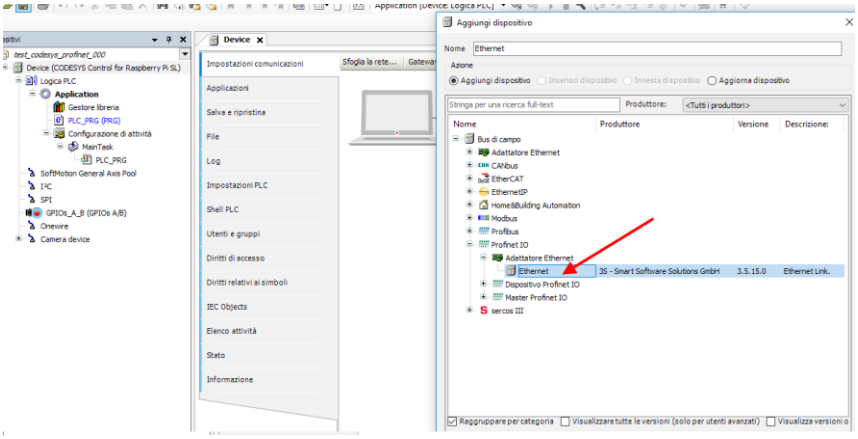

Select the PLC after scanning the network:



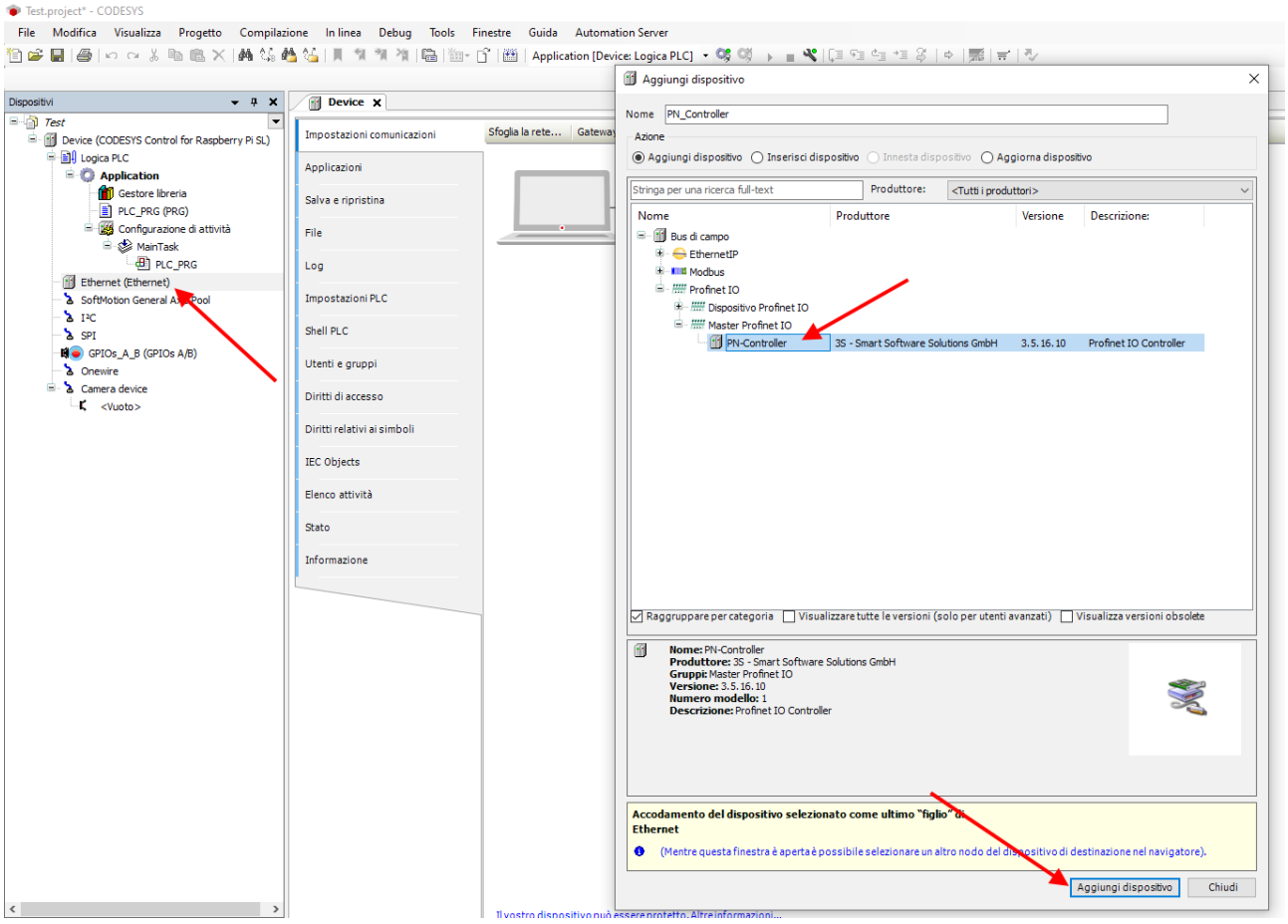

The PLC is now connected to the system:



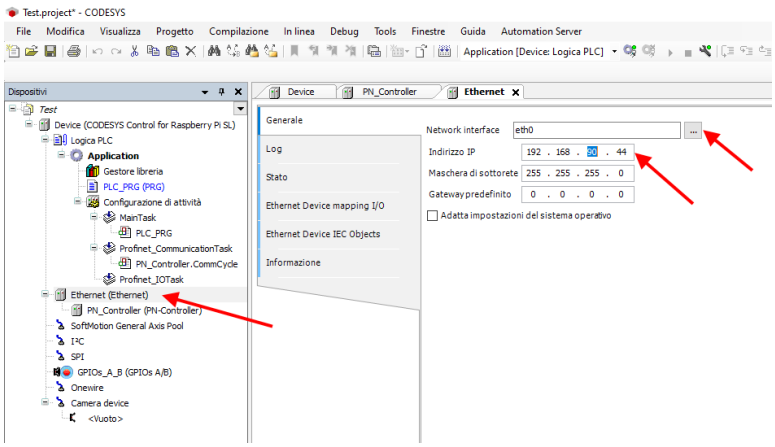

Now that the PLC has been detected, move on to insert a Profinet port on standard Ethernet:
Right click on device and "add device":



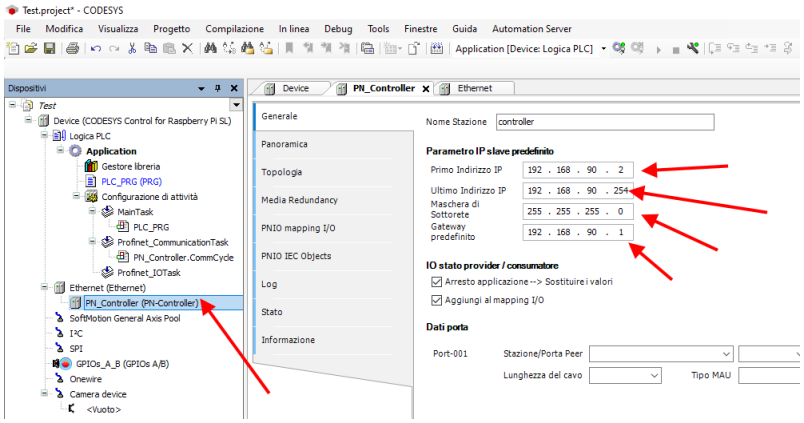

Then add the Profinet IO Master:




Double click on Ethernet, set the Ethernet port and the IP address of the PLC (in this case use 192.168.90.44):

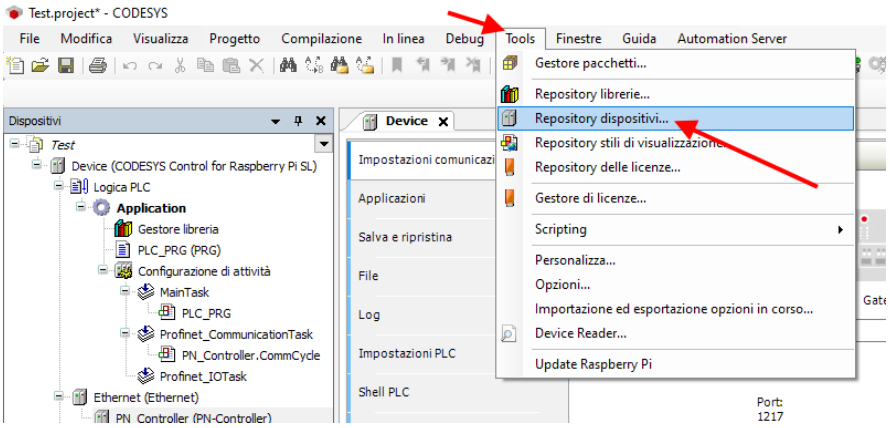


Set also the address range for the Profinet peripheral, double click on PN_Controller:

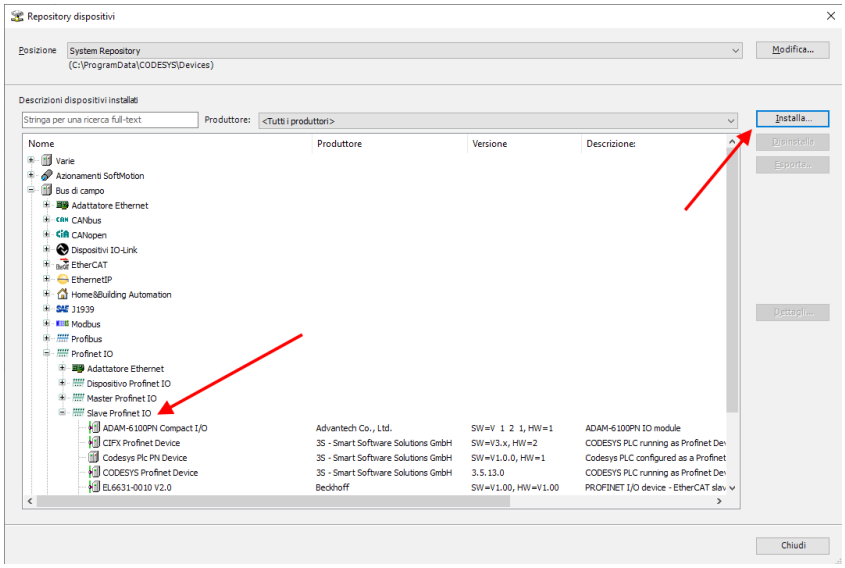


### 6.1.2. INSTALLING THE GSD

Now you need to connect the Seneca slave device PROFINET IO to the profinet master (controller).
First install the GSD file of the Seneca IO.
Select Tools->Device Repository:



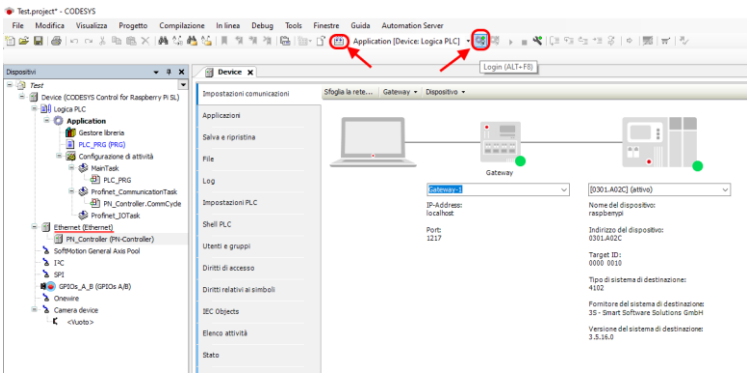

Now import the GSD file by selecting Profinet IO Slave and then Install:




Now point to the correct folder and press OK.
Codesys has now added the GSD file correctly.

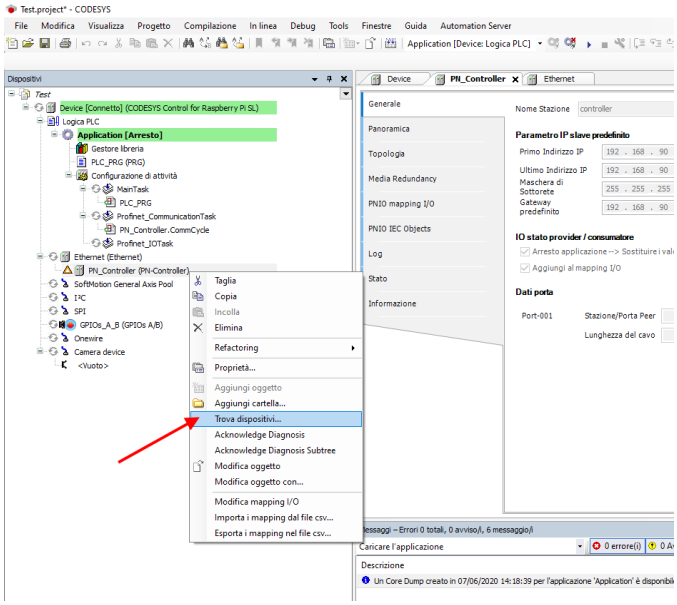
At this point you can scan the network in search of Slave devices (Device).

First compile the project and log in to the PLC:

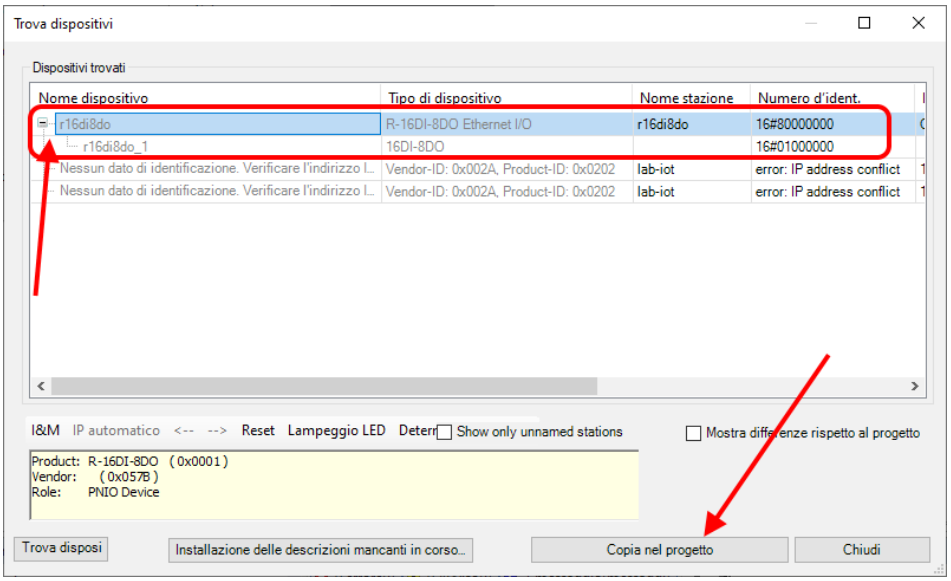


### 6.1.3. INSTALLATION OF THE SENECA PROFINET IO

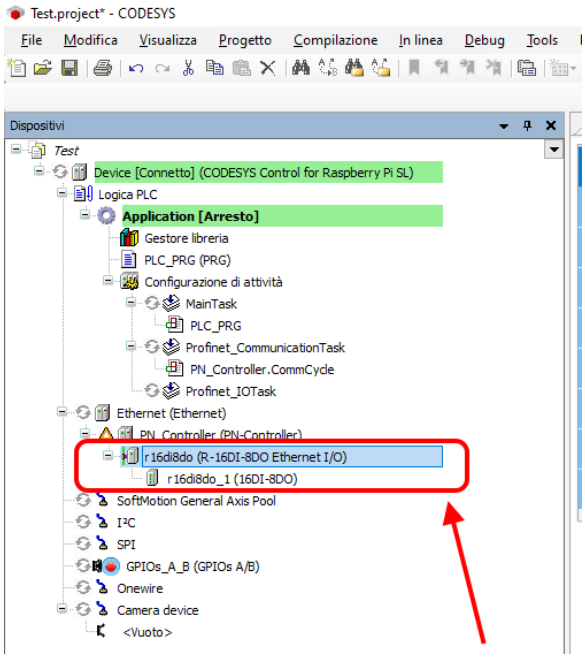
Now that you are connected to the PLC, run the scan to find the devices:




In the list of devices, select the Seneca IO and then "Copy to project":

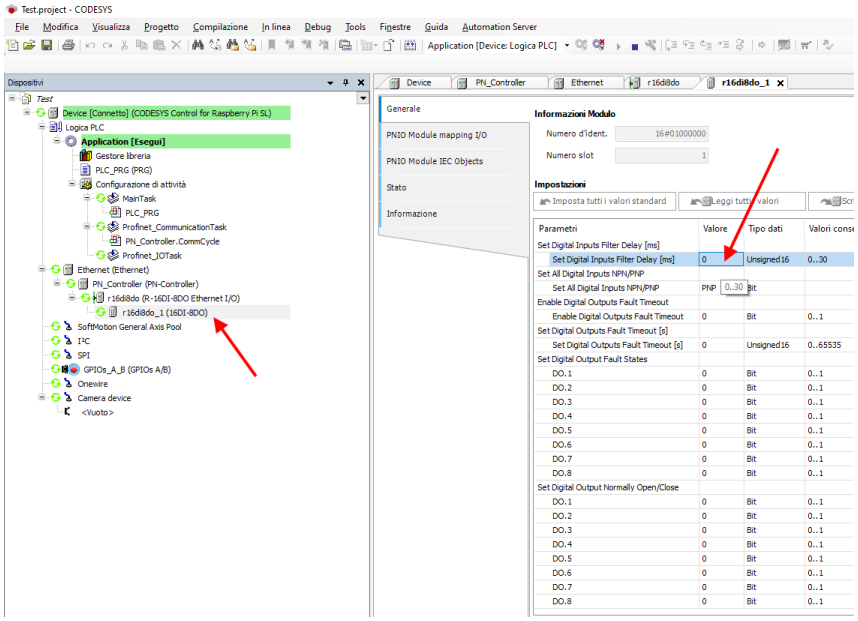


At this point you have added the device to the project:



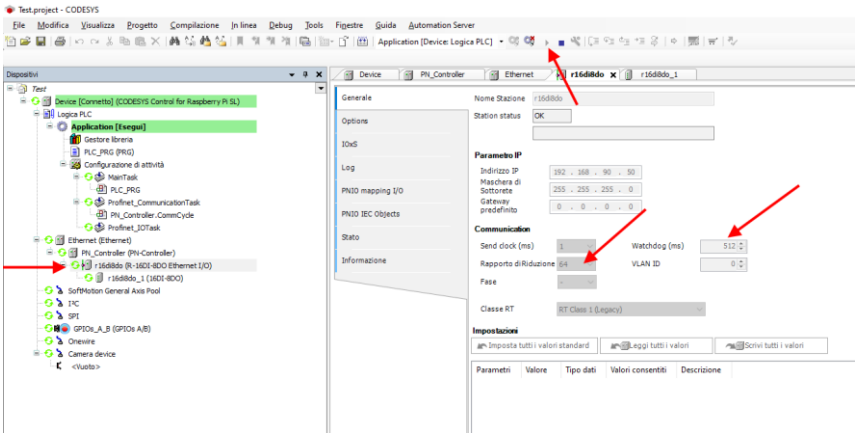

## 6.1.4. CONFIGURATION OF THE PARAMETERS OF THE SENECA IO

If you want to change the IO configuration parameters, you can set them from here:



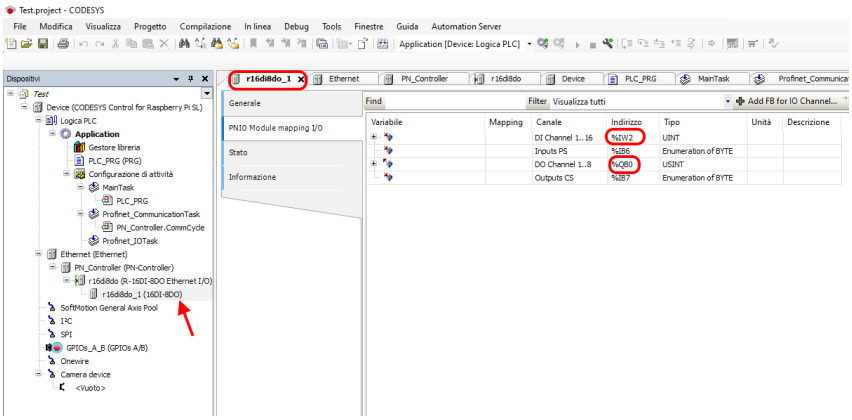

Check that everything is correct by compiling and running the PLC.

The PLC (Raspberry-pi) is quite slow and not real time, consequently it cannot manage the profinet at maximum speed so we modify the values by setting safety parameters:

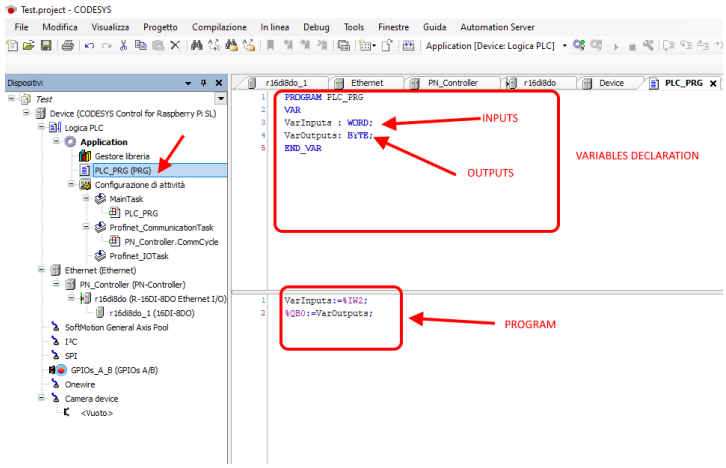


### 6.1.5. READING AND WRITING THE SENECA IO FROM CODESYS

Now see how it is possible to read and write IO on the Seneca device.
To write and read the status of the IO you have to insert a few code lines under PRG.
In the program, read the inputs from the %IW2 address and write in the %QB0 address as it is obtained from here:

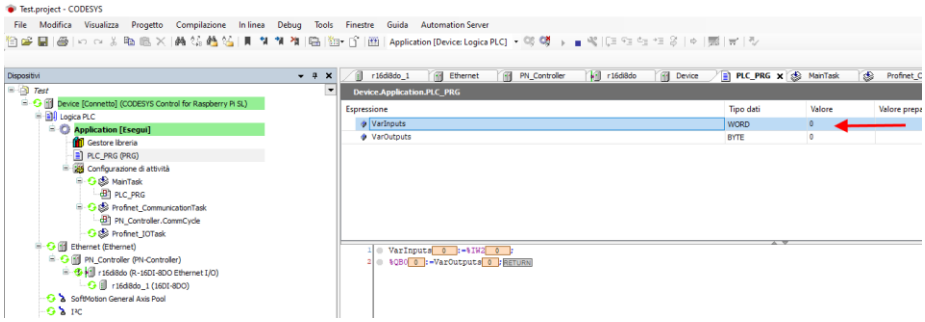



Declare an 8-bit (Word) variable for the 16 inputs and one byte for the 8 outputs.
In the program, instead, read the inputs from %IW2 and write the outputs on %QB0:

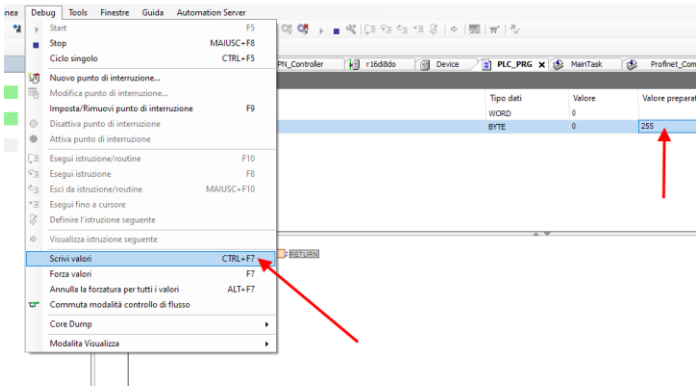



Go into login and start.

The value of the inputs can be read here:



while to write the outputs you just set the byte value in the "prepared value" column, for example by writing 255 decimal = 11111111 binary all the outputs will be brought to 1:



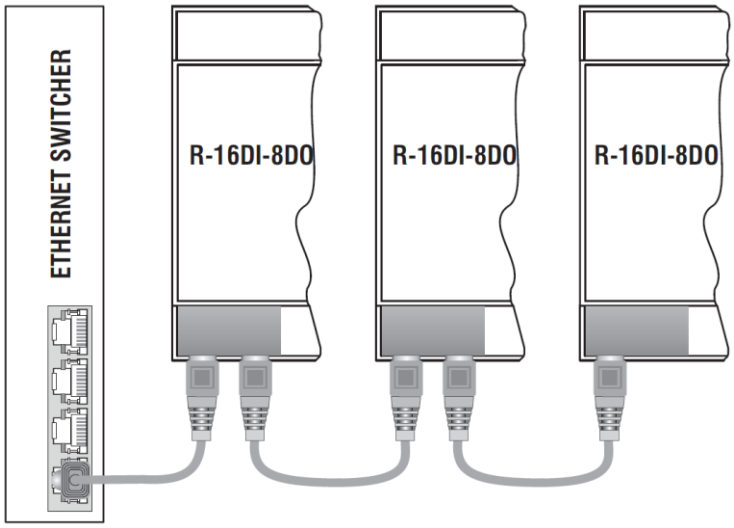
And then with "Write values" all the outputs are activated correctly.

# 7. CABLE HARNESS FOR MODELS WITH DOUBLE ETHERNET PORT

Models with double Ethernet port can be connected in daisy chain and take advantage of the Lan Fault Bypass.

## 7.1. CHAIN ETHERNET CONNECTION (DAISY CHAIN)

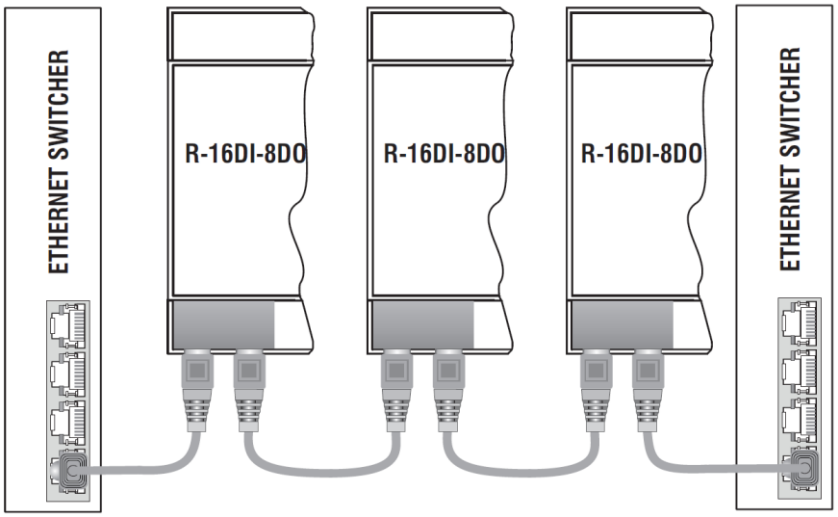
Using the daisy chain connection it is not necessary to use switches to connect the devices.
An example (in this case on R-16DI-8DO-P) of connection of 3 devices is as follows:



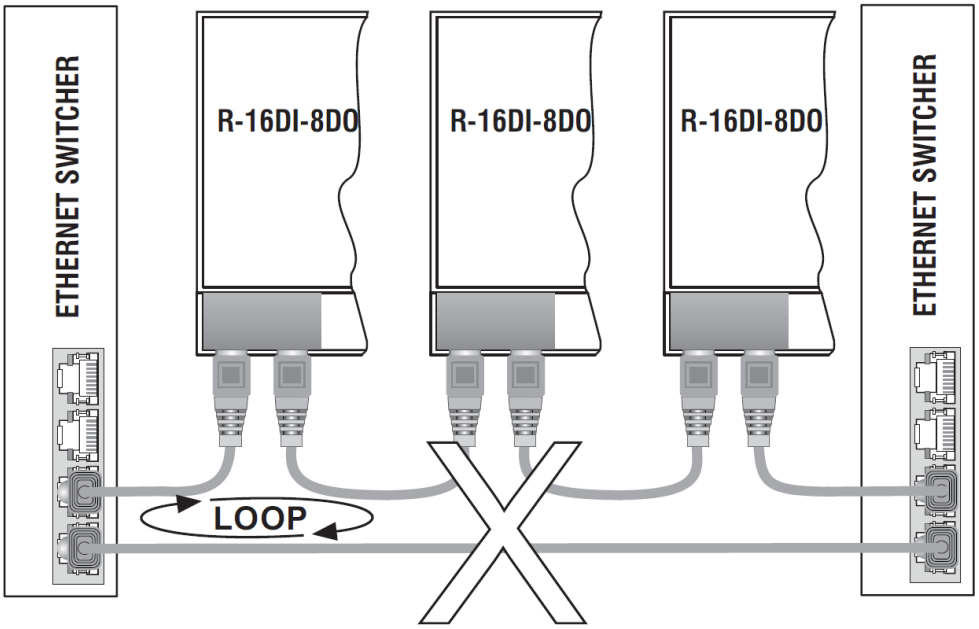

**ATTENTION!**

**IT IS NOT POSSIBLE CREATE LOOPS WITH ETHERNET CABLES**

If it is necessary to connect the devices to the switches, correct wiring is as follows:

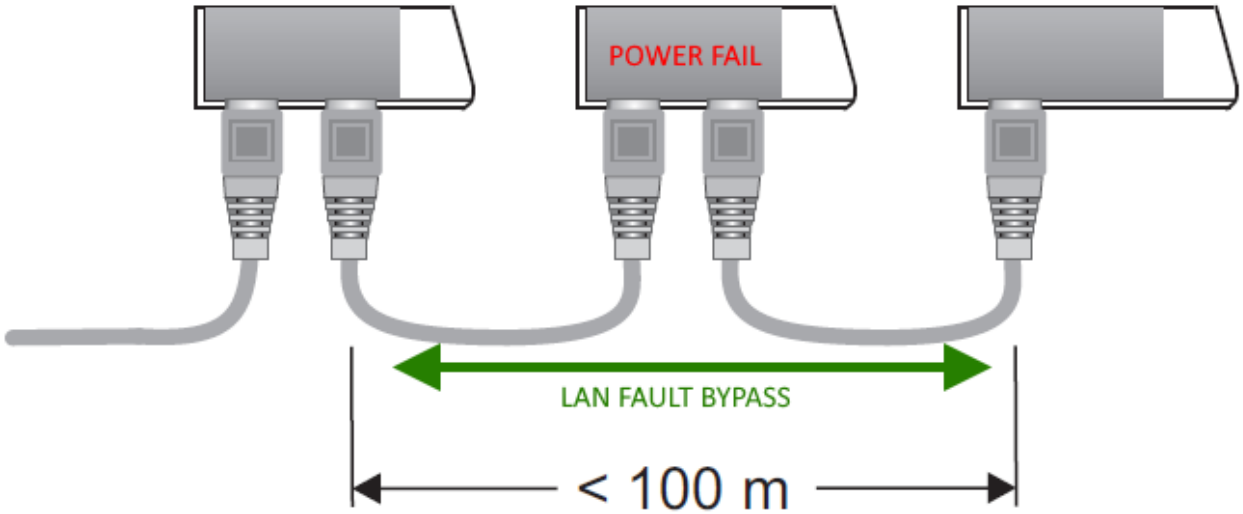



In the Ethernet wiring there must be no loop, otherwise the communication will not work, some examples of incorrect wiring are the following:



### 7.2. LAN FAULT-BYPASS FUNCTION

The LAN fault-bypass function allows you to keep the connection between the two Ethernet ports of the device ON, in the event of power failure problems.
If a device turns off, the chain is not interrupted and the devices downstream of the switched-off one will still be accessible.
This function has a limited duration: the connection remains active for a few days, typically 4.
The Lan fault-bypass function requires that the sum of the lengths of the two cables connected to the switched off module is less than 100m.




## 8. SEARCH AND MODIFICATION OF THE DEVICE IP WITH SENECA DISCOVERY TOOL

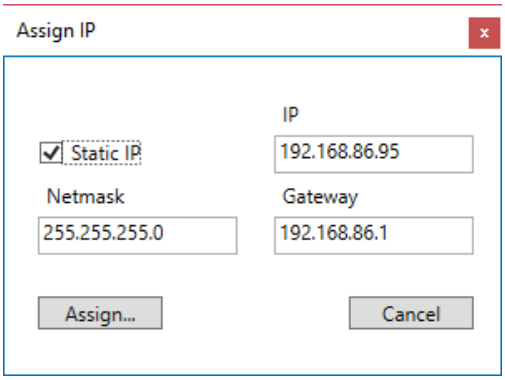
When in the R series device the STS LED is on steady, it is possible to obtain the IP address which has been set using the "Seneca Discovery" tool too.

The software can be downloaded from:

https://www.seneca.it/en/linee-di-prodotto/software/easy/sdd

Pressing the "search" button starts the search for all Seneca devices present in the network even if with IP addresses not compatible with the current PC configuration:


It is now possible to change the address by pressing the "Assign" button:




The software works on layer 2 level and it is therefore not necessary to have an Ethernet configuration compatible with the device you are looking for.

## ⚠ ATTENTION!

**AS LONG AS THE STS LED IS FLASHING IT MEANS THE DEVICE HAS NOT SET AN IP ADDRESS. IN THIS SITUATION IT WILL NOT BE POSSIBLE TO SEARCH FOR THE DEVICE WITH THE SENECA DISCOVERY TOOL SOFTWARE**

## 9. FIRMWARE UPDATE

The firmware update can be performed via the web server in the appropriate section.

**ATTENTION!**

**BEFORE ACCESSING THE WEB SERVER, DISCONNECT THE DEVICE FROM THE PROFINET NETWORK**

**ATTENTION!**

**NOT TO DAMAGE THE DEVICE DO NOT REMOVE THE POWER SUPPLY DURING THE FIRMWARE UPDATE OPERATION.**

**ATTENTION!**

**SOME MODELS ARE SUPPLIED WITHOUT AN IP ADDRESS (0.0.0.0) IN THIS CASE THE "STS" LED FLASHES.**
**TO SET AN IP ADDRESS (FOR EXAMPLE TO ACCESS THE WEBSERVER OR TO CONNECT TO THE SENECA DISCOVERY DEVICE TOOL) USE THE PROFINET CONFIGURATION ENVIRONMENT OR FORCE THE ADDRESS 192.168.90.101 WITH THE APPROPRIATE DIP SWITCH**