

USER MANUAL

I/O ZE-P SERIES
WITH PROTOCOL
PROFINET IO



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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

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13/04/2023	1	Update time updated Some screenshots of the step-by-step configuration replaced	MM
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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. ZE-P SERIES DEVICES

The ZE-P 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 4.3 (Tia Portal 16)
 CODESYS Runtime 3.5 (Codesys 3.5)

2.2. ZE-2AI-P / ZE-4DI-2AI-2DO-P

The device allowa the use of 2 analog channels that can be individually configured in Voltage or Current.

CODE	ETHERNET PORTS
ZE-2AI-P	1 10/100 Mbit PORT
ZE-4DI-2AI-2DO-P	1 10/100 Mbit PORT

2.2.1. ANALOG INPUT UPDATE TIME

The sampling time is a parameter that can be modified from the hardware configuration of the Profinet IO Master and is unique for both channels.

The range of possible values varies from 10 ms to 300 ms in steps of 1 ms.

Considering that there are 2 channels in total, the measurement update time of a single channel is double the set sampling time.

Depending on the sampling time set, the measurement update times detected (with 2ms Profinet update time) are shown in the following table:

SAMPLING TIME CONFIGURATION FOR CHANNEL 1 AND 2	REAL PROFINET REFRESH TIME PER CHANNEL
10ms	About 60 ms
20ms	About 80 ms
40ms	About 120 ms

2.2.2. RESOLUTION AND MEASUREMENT STABILITY OF THE ANALOG INPUTS

The resolution of the analog digital converter (ADC) depends on the set sampling time, in particular:

If the sampling time of the channel is < 150 ms the ADC is set with a resolution of 12 bits

If the sampling time of the channel is >= 150 ms the ADC is set with a resolution of 16 bits

In addition to the resolution of the measurement, it should be noted that the greater the sampling time, the lower the stability of the measurement.

2.3. ZE-SG3-P

The device allows the use of an analogue channel for strain gauge load cells and 2 digital channels that can be individually configured for input or output.

CODE	ETHERNET PORTS
ZE-SG3-P	1 10/100 Mbit PORT

The measurement is carried out with the 4 or 6 wire technique.

The device is equipped with a new noise filter specifically developed to obtain a rapid response time.

2.3.1. LOAD CELL CONNECTION

It is possible to connect the converter to the load cell in 4- or 6-wire mode. 6-wire measurement is preferable for measurement accuracy.

The load cell power supply is provided directly by the device.

2.3.2. 4- OR 6-WIRE LOAD CELL CONNECTION

A load cell can have a four-wire or six-wire cable. In addition to having the +/- excitation and +/- signal lines a six-wire cable also has the +/- sense lines. It is a common misconception to think that the only difference between 4- or 6-wire load cells is the possibility of the latter to measure the actual voltage at the load cell. A load cell is compensated to work within specifications in a certain temperature range (usually -10 - +40°C). Since the cable resistance depends on the temperature, the response of the cable to temperature changes must be eliminated. The 4-wire cable is part of the load cell temperature compensation system. The 4-wire load cell is calibrated and compensated with a certain amount of cable connected. For this reason, never cut the cable of a 4-wire load cell. The cable of a 6-wire cell, on the other hand, is not part of the load cell temperature compensation system. The sense lines are connected to the ZE-SG3-P sense terminals, to measure and adjust the actual voltage of the load cell. The advantage of using this "active" system is the possibility of cutting (or extending) the 6-wire load cell cable to any length. It must be considered that a 6-wire load cell will not reach the performance declared in the specifications if the sense lines are not used.

2.3.3. CHECKING THE LOAD CELL OPERATION

Before starting the configuration of the device it is necessary to verify the correctness of the wiring and the integrity of the load cell.

2.3.3.1. CHECKING CABLES WITH A DIGITAL MULTIMETER

First you need to check with the load cell manual that there are about 5V DC between the +Excitation and – Excitation cables. If the cell has 6 wires check that the same voltage is also measured between +Sense and – Sense.

Now leave the cell at rest (without the tare) and check that the voltage between the +Signal and –Signal cables is around 0 V.

Now unbalance the cell by applying a compression force, checking that the voltage between the +Signal and – Signal cables increases until it reaches the full scale (if possible) where the measurement will be approximately:

5* (cell sensitivity) mV.

For example, if the declared cell sensitivity is 2 mV/V, $5 * 2 = 10$ mV must be obtained.

In the case of bipolar measurement only (compression/traction) it is necessary to completely unbalance the cell even in traction, in this case the same value must be measured between the +Signal and –Signal cables but with the negative sign:

-5* (cell sensitivity) mV.

2.3.4. CONNECTION OF MORE LOAD CELLS IN PARALLEL

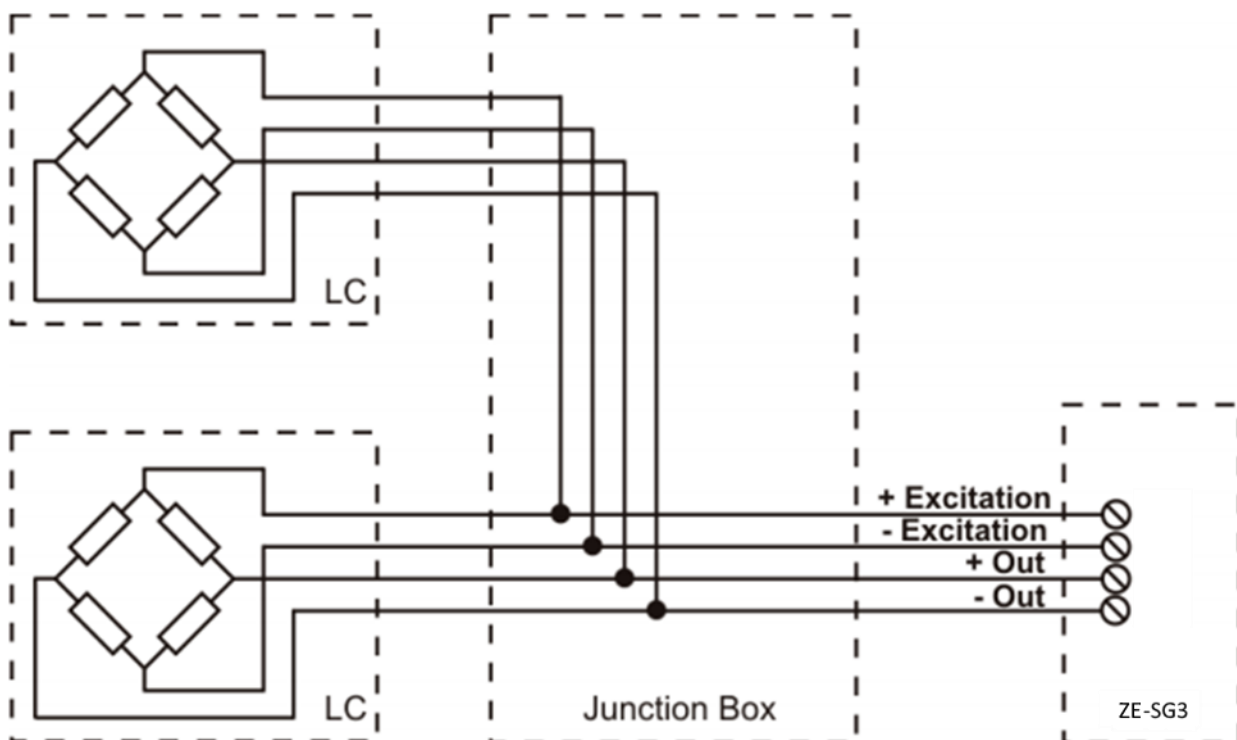
It is possible to connect up to a maximum of 8 load cells (and in any case without ever falling below the minimum 87 Ohms).

It is therefore possible to connect:

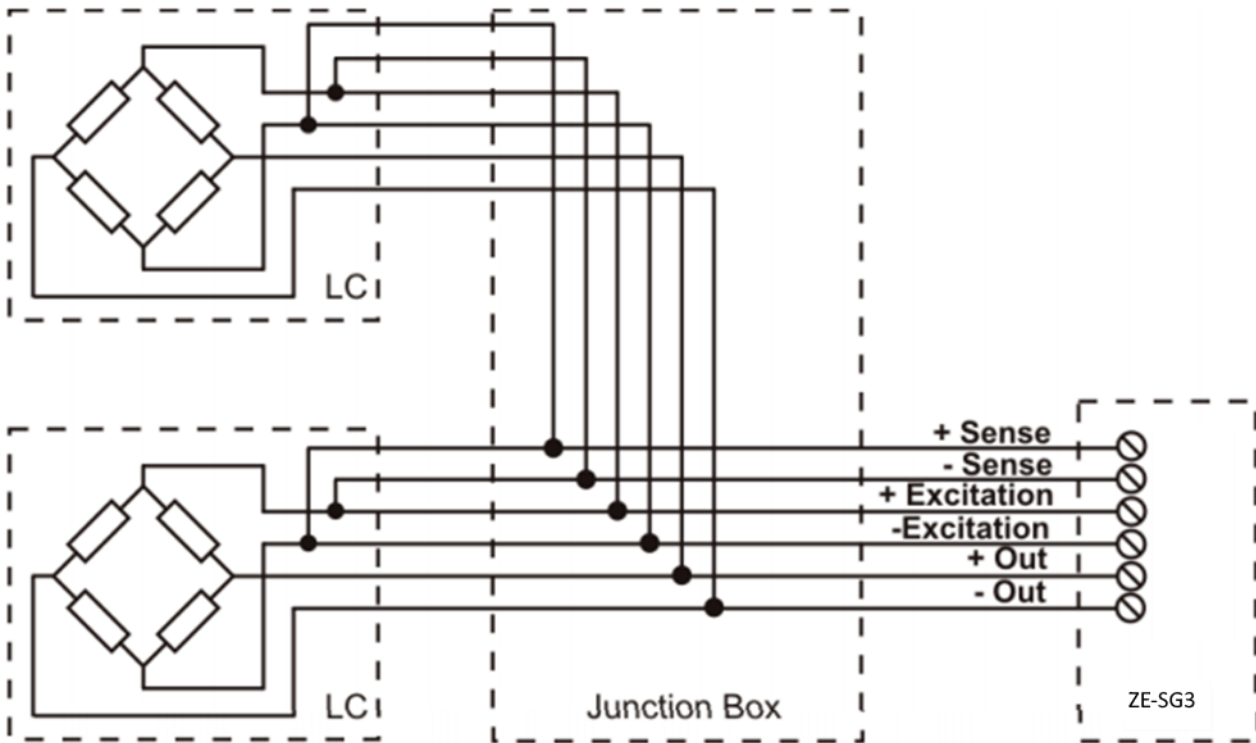
NUMBER OF LOAD CELLS IN PARALLEL	
IMPEDANCE OF THE STATED LOAD CELL [Ohm]	MAXIMUM NUMBER OF CONNECTABLE CELLS IN PARALLEL
350	4
1000	8

For the connection of 4 load cells Seneca recommends using the SG-EQ4 product.

To connect 2 or more 4-wire cells in parallel with the SG-EQ4 junction box, use the following diagram:



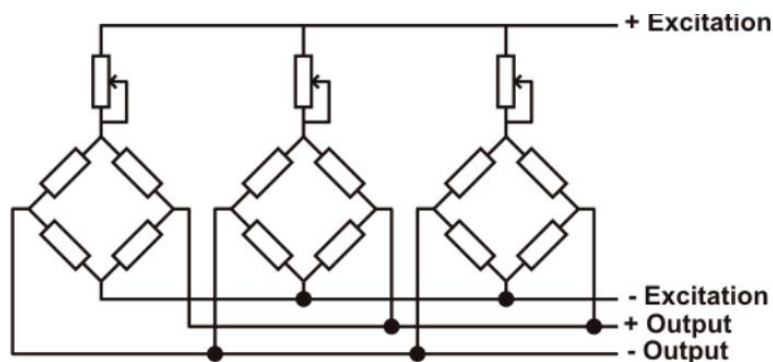
To connect 2 or more 6-wire cells in parallel with the SG-EQ4 junction box use the following diagram:



For more details, refer to the SG-EQ4 Junction Box accessory manual.

2.3.5. TRIMMING 4-WIRE LOAD CELLS

The figure below shows a diagram of three trimmed load cells.



A variable resistor, independent of the temperature, or a typically 20 Ω potentiometer is inserted in the +Excitation cable of each load cell. There are two ways to trim the load cells. The first method is to adjust the potentiometers by trial, shifting the calibration weights from one corner to another. All the potentiometers must be adjusted so as to set the maximum sensitivity for each cell, turning them all completely clockwise. Then, once the angle with the lowest output is located, act on the trimmers of the other cells until obtaining the same minimum output value. This method can be very long, especially for large scales where the use of test weights

on the corners is not very practical. In these cases the second, more suitable method is to "pre-trim" the potentiometers using a precision voltmeter (at least 4 1/2 digits). You can use the following procedure:

- 1) Determine the exact mV/V ratio of each load cell, shown in the calibration certificate of the cell itself.
- 2) Determine the exact excitation voltage provided by the indicator/meter (for example Z-SG), measuring this voltage with the voltmeter (for example 10.05 V).
- 3) Multiply the lowest mV/V value found (point 1) by the excitation voltage (point 2).
- 4) Divide the trimming factor calculated in point 3 by the mV/V value of the other load cells.
- 5) Measure and adjust the excitation voltage of the other three load cells using the respective potentiometer. Check the results and make a final adjustment by moving a test load from corner to corner.

2.3.6. PS BUTTON1

The PS1 button is positioned next to the SW2 dip switch. If pressed for a few seconds it allows you to acquire the Tare (the same function is possible from the command register and digital input).

3. DIP SWITCH

ATTENTION!

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

3.1. MEANING OF THE DIP SWITCHES FOR THE ZE-2AI-P/ZE-4DI-2AI-2DO-P MODEL


<i>DIP1</i>	<i>DIP2</i>	<i>MEANING</i>
OFF	OFF	Normal operation: The device loads the configuration from the flash.
ON	ON	Resets the device to its factory configuration: With IP address 192.168.90.101
OFF	ON	Disables access to the Web server
ON	OFF	Reserved

ATTENTION!

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

3.2. MEANING OF THE DIP SWITCHES FOR THE ZE-SG3-P MODEL

SW1 dip switches 1 to 8 are not used and must always be set to the “OFF” state.

 ATTENTION!

THE DEVICES ARE SUPPLIED WITHOUT AN IP ADDRESS (0.0.0.0).

MORE DEVICES CAN THEREFORE BE INSERTED INTO THE SAME PROFINET NETWORK AND IDENTIFIED THROUGH 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

The meaning of SW2 dip-switches is as follows:

DIP 3 and DIP 4 must always be set to OFF and their function is RESERVED.

As regards DIP1 and DIP2, refer to the following table:

DIP1	DIP2	MEANING
OFF	OFF	Normal operation: The device loads the configuration from the flash.
ON	ON	Resets the device to its factory configuration: (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 SERVER, DISCONNECT THE DEVICE FROM THE PROFINET NETWORK

 **ATTENTION!**

**SOME MODELS ARE SUPPLIED WITHOUT AN IP ADDRESS (0.0.0.0).
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!**

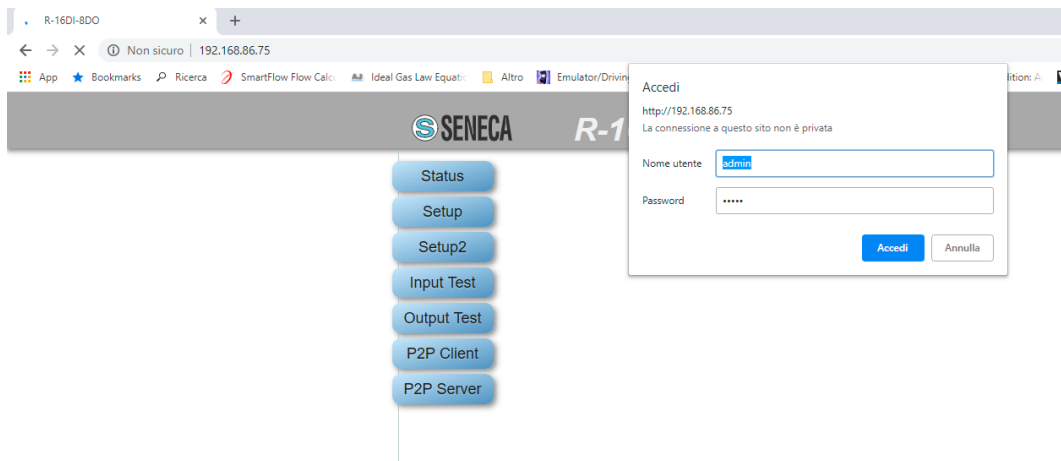
**DEPENDING ON THE DEVICE MODEL AND THE FIRMWARE INSTALLED IN THE DEVICE, IT MAY BE
NECESSARY TO ACTIVATE THE DIP SWITCHES TO USE THE WEBSERVER**

 **ATTENTION!**

**UPON FIRST USE THE IP ADDRESS OF THE DEVICE IS NOT SET (0.0.0.0), 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!**

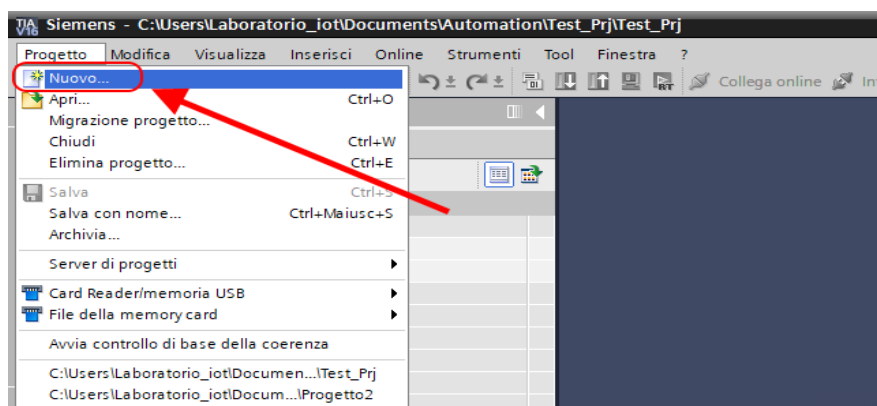
IF THE PARAMETERS TO ACCESS THE WEB SERVER HAVE BEEN LOST, IT IS NECESSARY TO RESET THE FACTORY-SET CONFIGURATION

 **ATTENTION!**

AVOID INSERTING SPECIAL CHARACTERS IN THE PROFINET NAME OF THE DEVICE

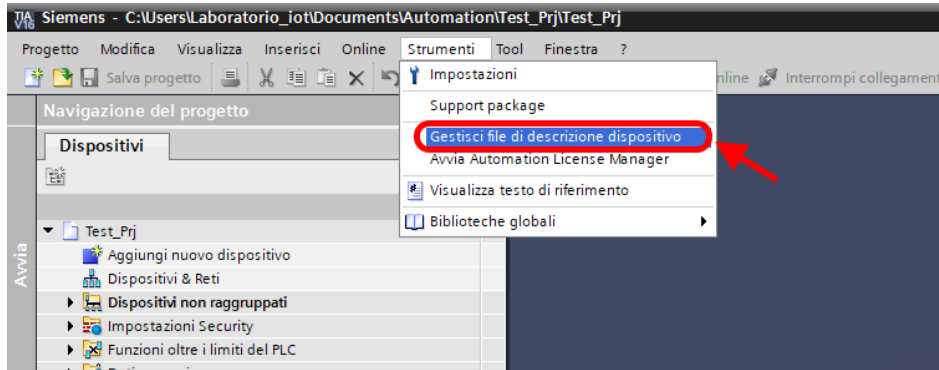
5. EXAMPLE OF CREATING A PROJECT WITH SIEMENS PLC (TIA PORTAL 16)

Creating a new project:

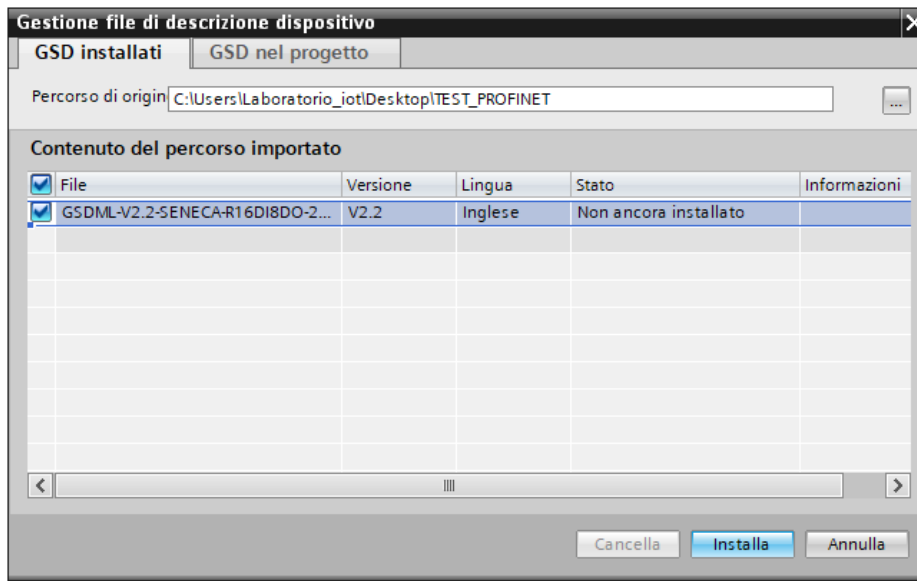


5.1. INSTALLING THE GSDML FILE

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):



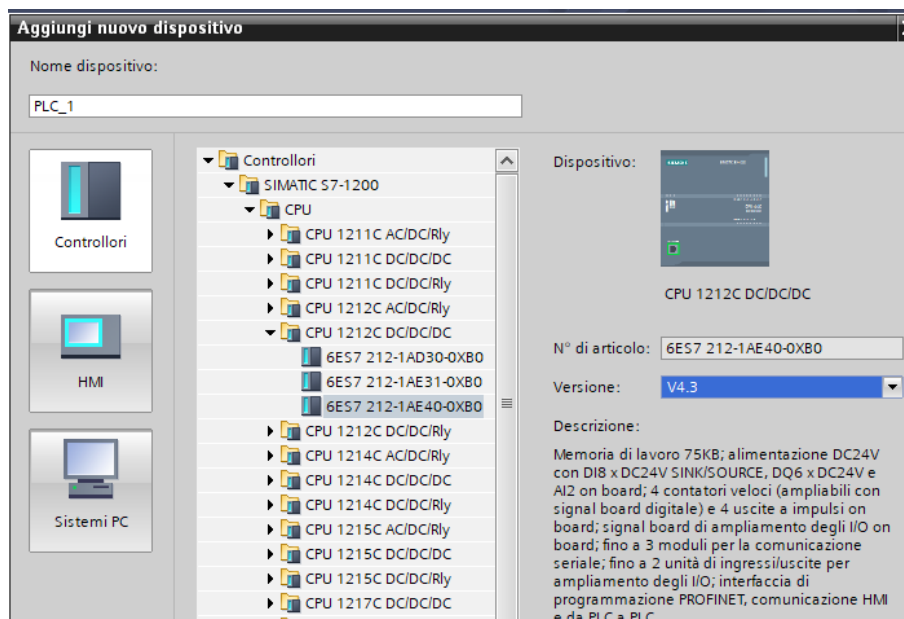
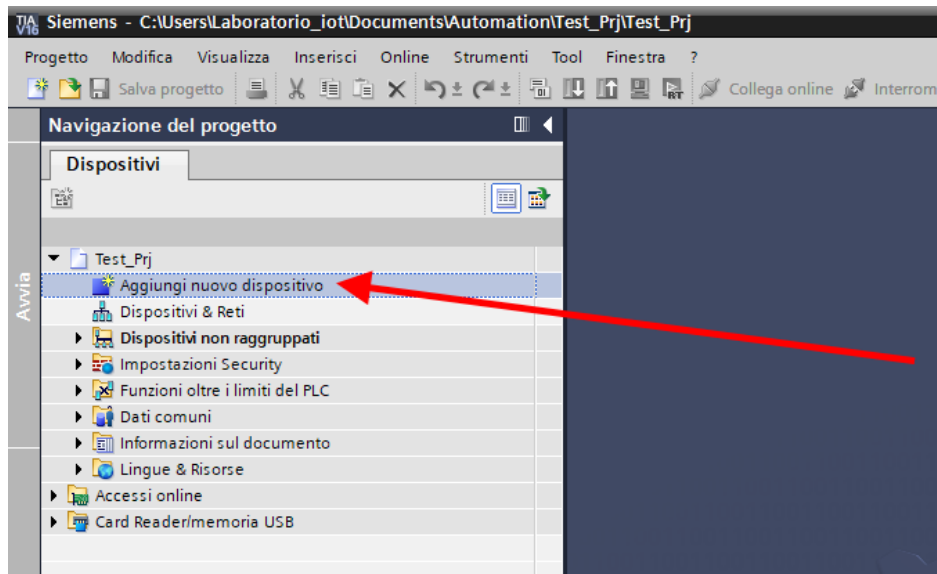
Point to the directory where the file is and press OK, then the list of GSD files in the folder will appear:



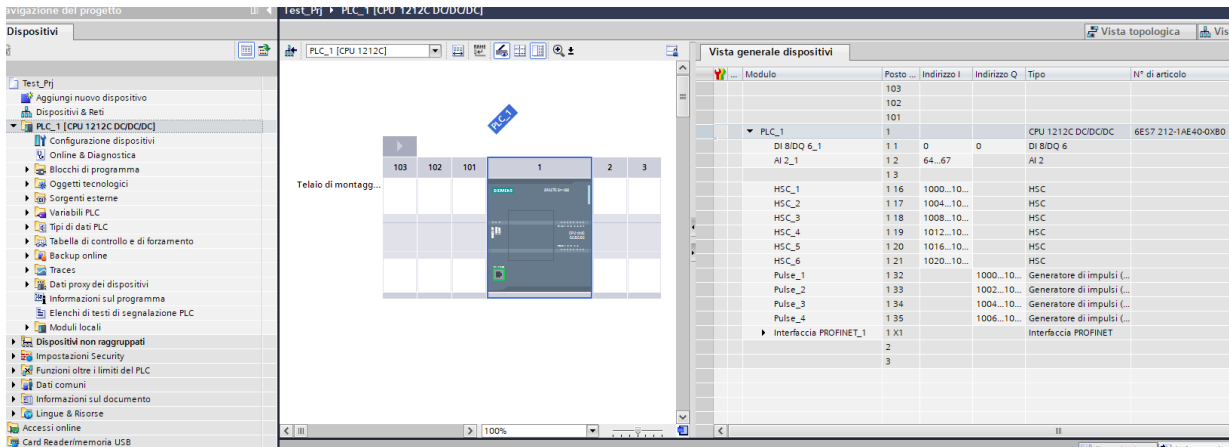
Click on "install".

5.2. INSERTION OF THE SIEMENS PLC IN THE PROJECT

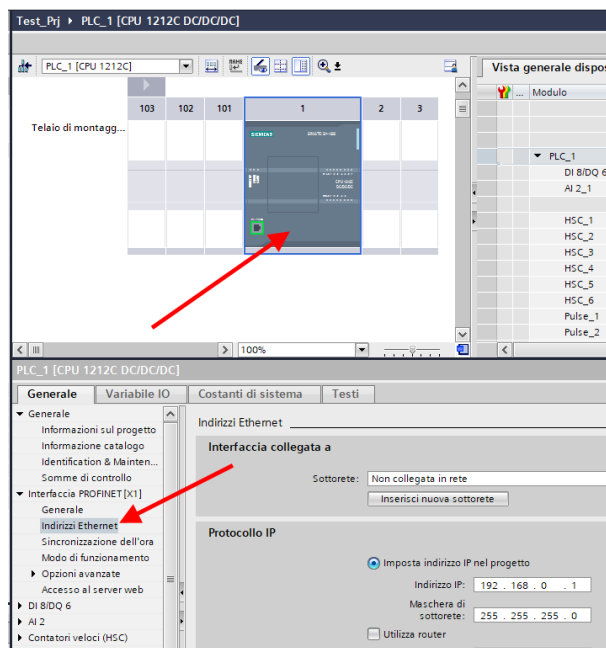
Now insert the Siemens PLC (in our example a SIEMATIC S7 1200), click on "Add new device ...":



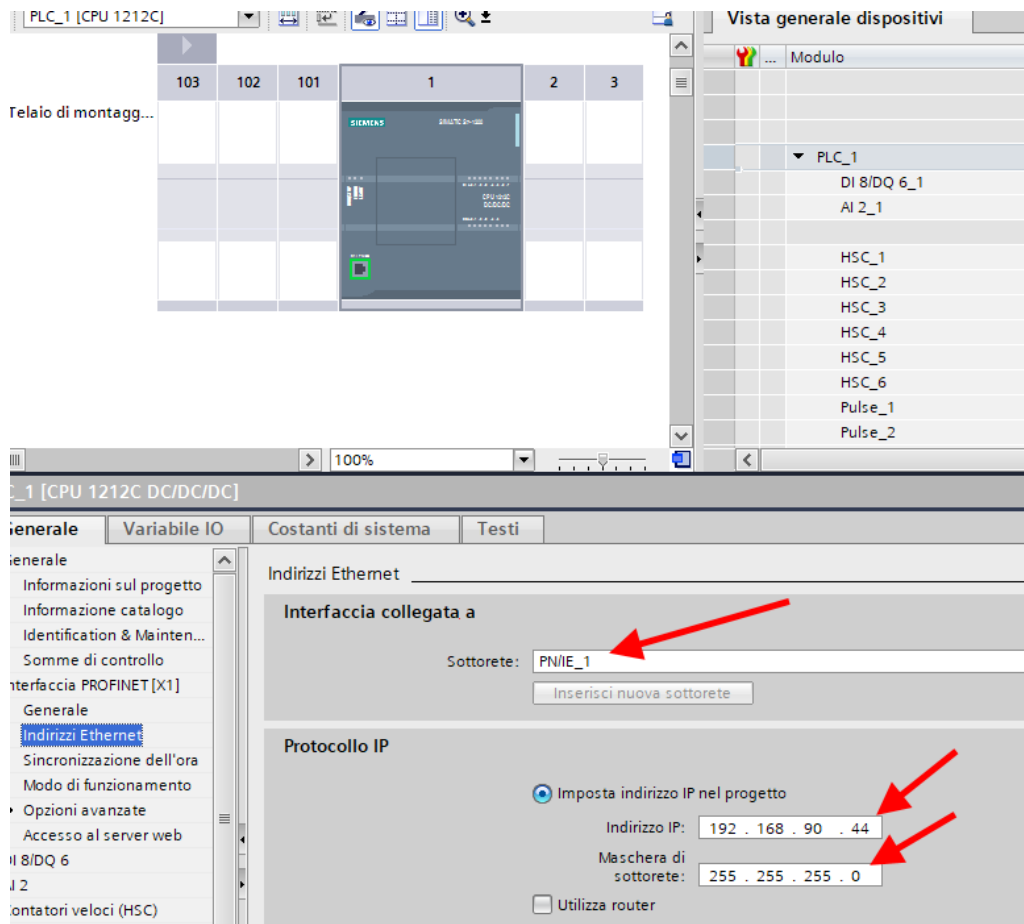
Confirm and the PLC will be added to the rack:



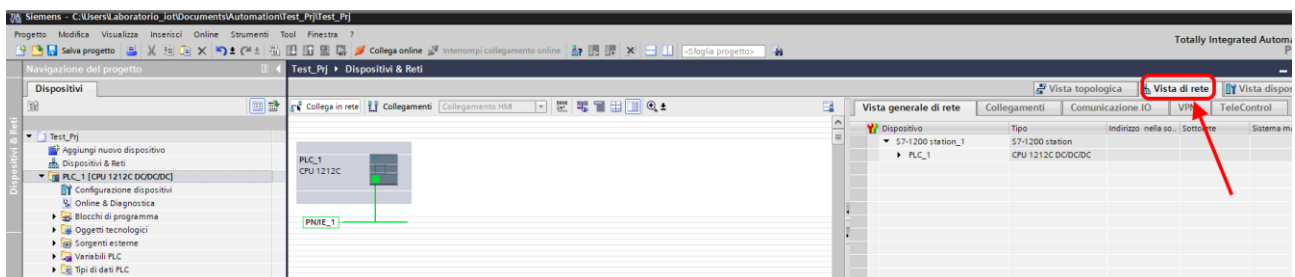
Now click on the PLC and select Profinet interface -> Ethernet addresses



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

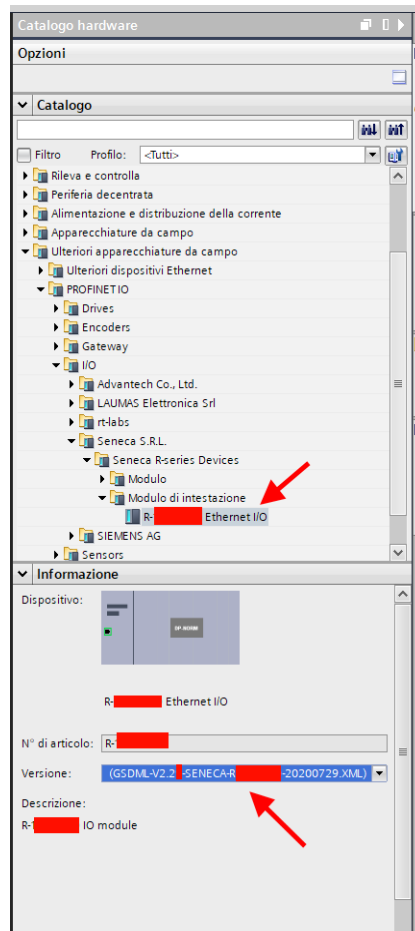


Move on to the network view:

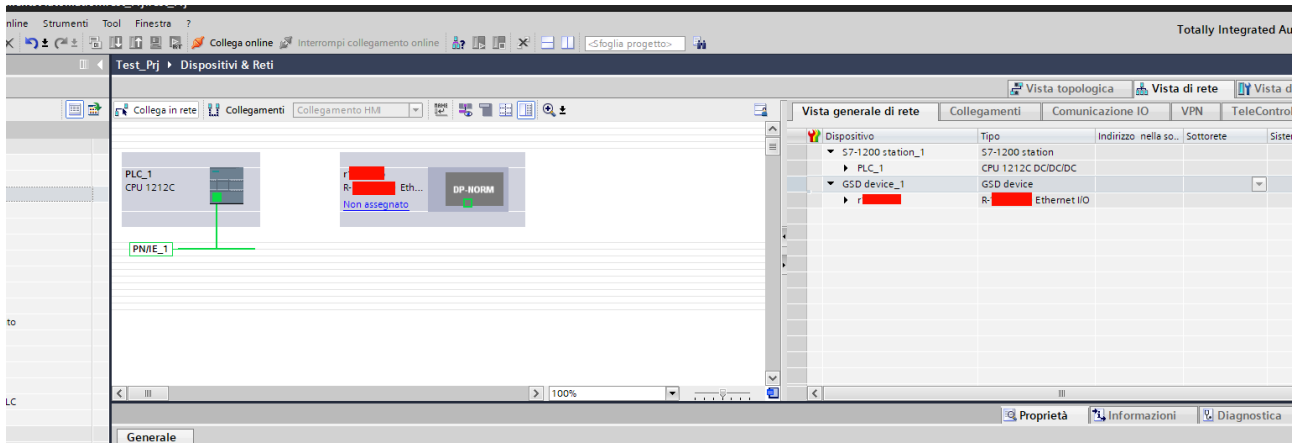


5.3. INSERTION OF THE PROFINET SENECA IO

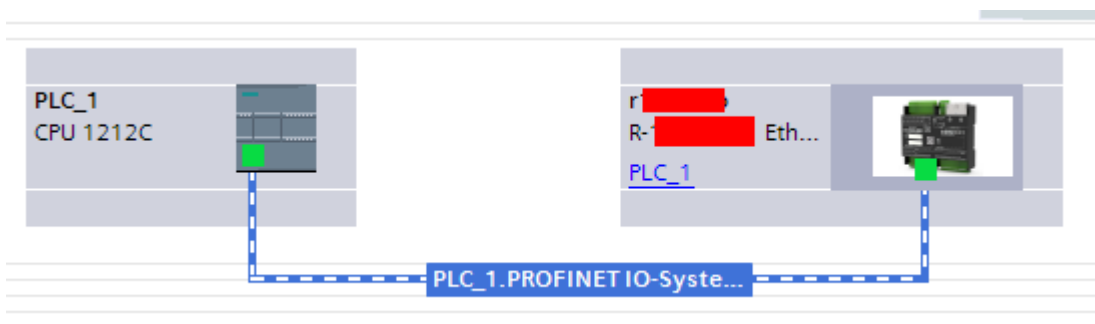
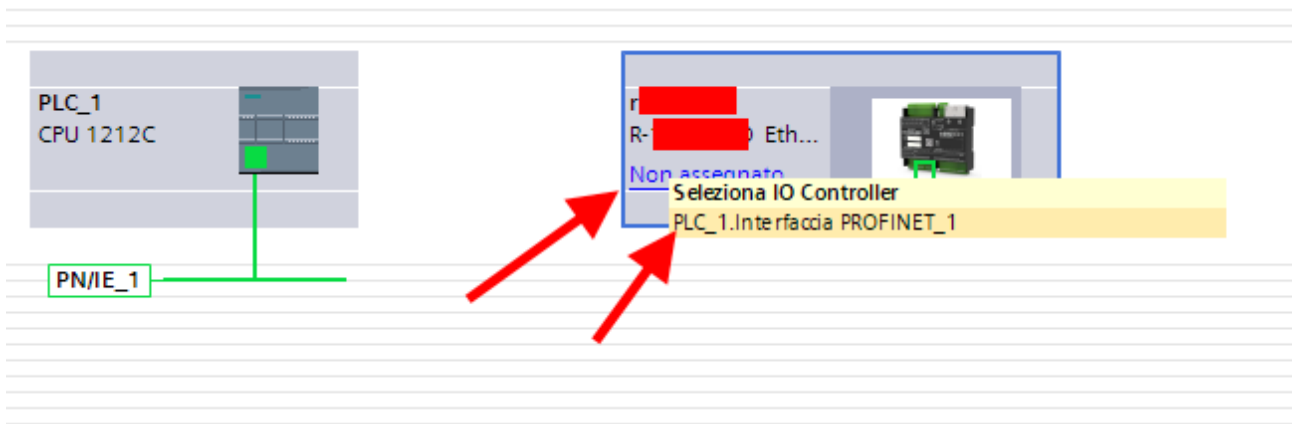
On the right, select "Hardware Catalogue" and then under "Additional Field Device" -> PROFINET IO -> I/O -> Seneca R-Series-> Header module (in the example an R-16DI-8DO device is shown):



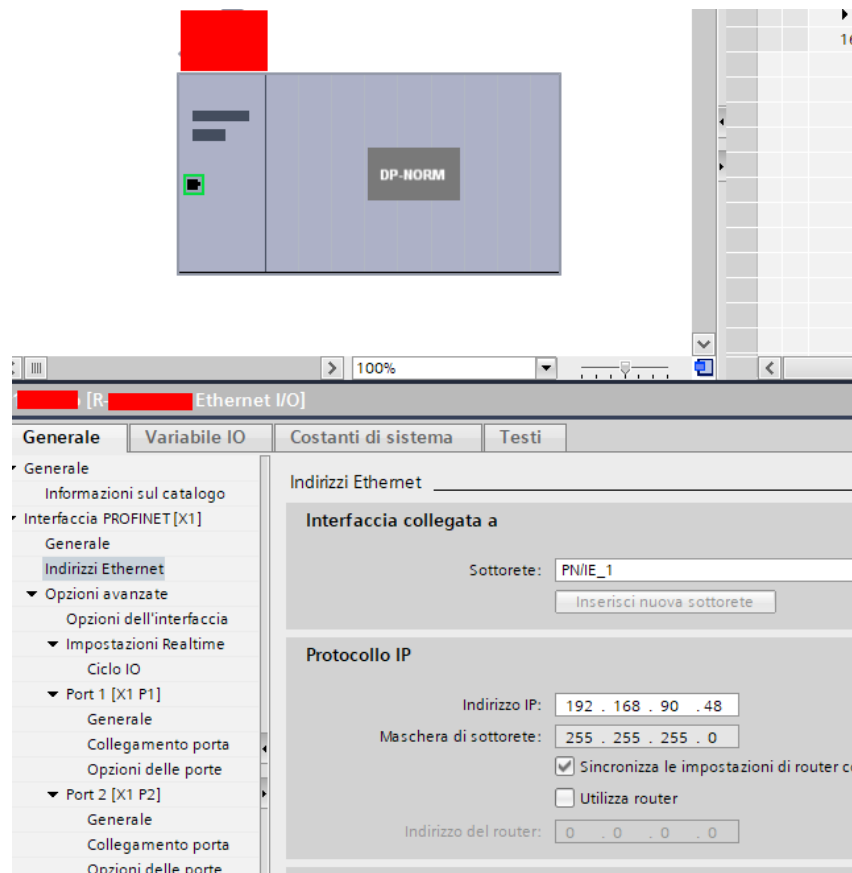
Drag the device to the network view:



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



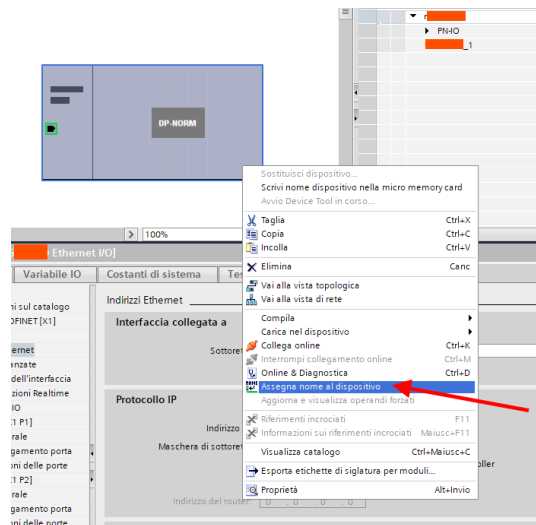
Click twice on the Seneca device and configure the IP address here too (for example 192.168.90.48):



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

 **ATTENTION!**

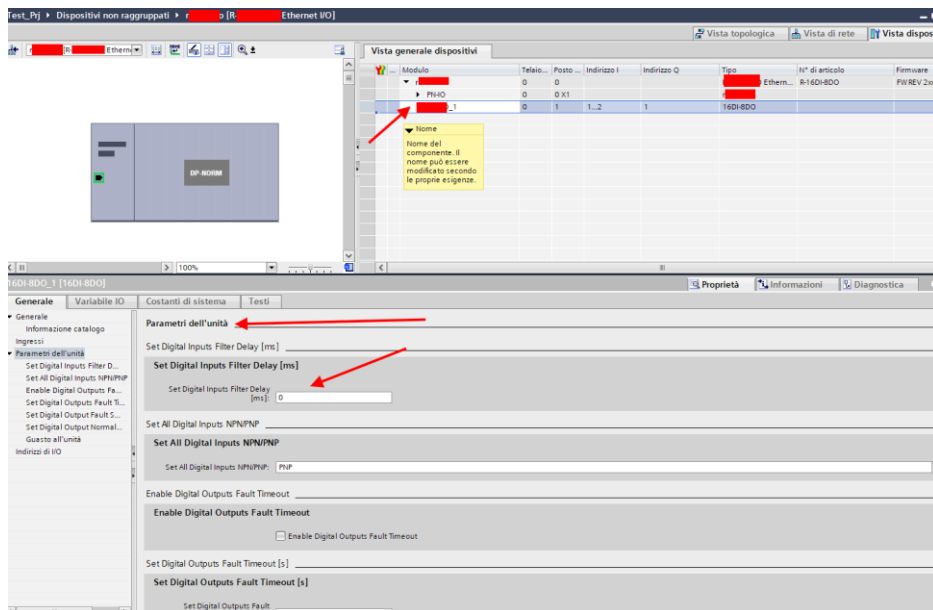
AVOID INSERTING SPECIAL CHARACTERS IN THE PROFINET NAME OF THE DEVICE



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. ZE-2AI-P / ZE-4DI-2AI-2DO-P

AIN Sample Time [ms]

Allows you to set the sampling time of the analog inputs.

The range of possible values varies from 10 ms to 300 ms in steps of 1 ms.

Considering that there are 2 channels in total, the measurement update time of a single channel is double the set sampling time.

Depending on the sampling time set, the measurement update times detected (with 2ms Profinet update time) are shown in the following table:

The resolution of the analog digital converter (ADC) depends on the set sampling time, in particular:

If the sampling time of the channel is < 150 ms the ADC is set with a resolution of 12 bits

If the sampling time of the channel is >= 150 ms the ADC is set with a resolution of 16 bits

AIN Setup

Input Type: Select if the respective input is a voltage or current input

Begin Scale [mV/uA]: measurement scale start, expressed in mV [0-30000 mV] or in uA [0-20000 uA]

End Scale [mV/uA]: scale of measurement end, expressed in mV [0-30000 mV] or in uA [0-20000 uA]

Begin Eng. Scale: Engineering scale start, associated with the measurement scale start [-32768 - + 32767]

End Eng. Scale: Engineering scale end, associated with the start of the measurement scale [-32768 - + 32767]

Example:

Input Type = Current

Begin Scale = 4000 [uA]

End Scale = 20000 [uA]

Begin Eng. Scale = 0

End Eng. Scale = 1000

The engineering measure will be 0 with an input of 4 mA, it will be 1000 with an input of 20 mA and will follow a linear trend between these two extremes, for example it will be 500 with an input of 12 mA (50% of the electrical scale)

DIN/DOUT Setup (ZE-4DI-2AI-2DO-P MODEL ONLY)

DIN Input Type: Selects the type of digital input if PNP or NPN

DOUT Fail mode: Selects whether or not to activate the fail state in case of communication timeout. If the PLC no longer communicates for the set Timeout time, then the digital outputs go into the FAIL state.

DOUT Fail Timeout [s]: allows you to set the communication Timeout time in seconds after which the outputs are brought to the FAIL state.

DOUT1/DOUT2 when in fail mode: Sets the state that the digital outputs must have in case of FAIL.

5.5.2. ZE-SG3-P***FUNCTION MODE***

It allows to configure the basic operation of the device, can be set to factory calibration or to Calibration with standard weight:

FACTORY CALIBRATION

It is used when a load cell with declared sensitivity is available.

In this mode, calibration only consists in acquiring the tare directly in the field with a direct measurement. If it is not possible to acquire the tare with a direct measurement (for example in the case of an already filled silo) it is possible to manually enter the tare value in the desired unit of measurement (kg, t, etc.).

CALIBRATION WITH STANDARD WEIGHT

It is used when a sample weight is available (as far as possible towards the load cell full scale). In this mode the calibration consists in acquiring both the tare and the sample weight directly on the field.

MEASURE TYPE

It allows to configure the operation of the device between:

BALANCE (UNIPOLAR)

It is used when a scale is being created in which the load cell is only compressed, in this case the maximum resolution of the compression measurement is obtained.

COMPRESSION AND TRACTION (BIPOLAR)

It is used when a measurement system (typically of force) is being created that can both compress and extend the load cell. In this case the direction of the force can also be decided, if compression the measurement will have the + sign, if traction it will have the - sign. A typical case of use is to link the direction of the force to the analog output so that, for example, 4mA correspond to the maximum traction force and 20mA correspond to the maximum compression force (in this case the cell at rest will provide 12Ma).

MEASURE UNIT

Sets the unit of measurement for the weighing in g, Kg, etc.

CELL SENSITIVITY

It is the declared cell sensitivity value expressed in mV/V (in most cells it is 2mV/V).

CELL FULL SCALE

It is the full scale value of the cell expressed in the selected unit of measurement.

STANDARD WEIGHT VALUE

It represents the value of the sample weight that will be used in the calibration if the operating mode with standard weight has been chosen.

NOISE FILTER

Enables or disables measurement filtering.

FILTER LEVEL

Allows you to set the measurement filter level according to the following table:

FILTER LEVEL	RESPONSE TIME [ms]
0	2
1	6.7
2	13
3	30
4	50
5	250
6	850
ADVANCED	Configurable

The higher the filter level the more stable (but slow) the weight measurement will be.

If you select the advanced filtering level (Advanced), the configuration will allow you to select the following parameters:

ADC SPEED Selects the ADC acquisition speed from 4.7 Hz to 960 Hz

NOISE VARIATION It is the variation in ADC points due to noise alone (represents the measurement uncertainty due to noise) or how much we expect the measurement to vary (the unit of measurement is in raw ADC points).

FILTER RESPONSE SPEED

Represents a parameter related to the filter response speed, it can vary from 0.001 (slowest response) to 1 (fastest response). Represents the variance of the process.

NET WEIGHT RESOLUTION

It is the resolution with which the value of the net weighing is represented, it can be worth:

MAXIMUM RESOLUTION

It will represent the net weight with the highest possible resolution

MANUAL

It will represent the net weight with the manual resolution set (in engineering units).

For example, by setting 0.1 Kg you will get that the net weight can only vary by multiples of 100g.

AUTOMATIC RESOLUTION

It will represent the net weight with a calculated resolution of about 20000 points. Unlike Maximum or Manual resolution, this setting limits also the ADC value and therefore affects all measurements.

 **CAUTION**

Keep in mind that in the "Calibration with sample weight" mode, using the "Manual Resolution", the correct sample weight value may not be perfectly represented:

For example, you have:

Cell full scale 15000 g
Sample weight 14000 g
Manual Resolution 1.5 g

The value of the sample weight (14000 g) cannot be represented with the resolution in 1.5g steps (14000/1.5g = 9333.333 is not an integer value) so it will be represented as: 9333*1.5g = 13999.5g
To avoid this effect, use a resolution that allows the value to be represented (for example 1g or 2g).

SAMPLE PIECE WEIGHT

Sets the weight of a single piece in technical units for the mode. By setting the net weight of a single element in this register, the converter will be able to indicate the number of pieces present in the scales special register according to the relation:

$$Nr\ Pezzi = \frac{Peso\ Netto}{Peso\ Pezzo\ Campione}$$

AUTOMATIC TARE TRACKER

It allows you to enable or disable the automatic tare reset.

ADC VALUE

It allows to set the number of ADC points within which to reset the tare automatically.

If after 5 seconds of stable weighing condition the ADC value of the net weight deviates by less than this value then a new tare is acquired.

DELTA WEIGHT

Weight variation that contributes to the definition of “Stable Weight”

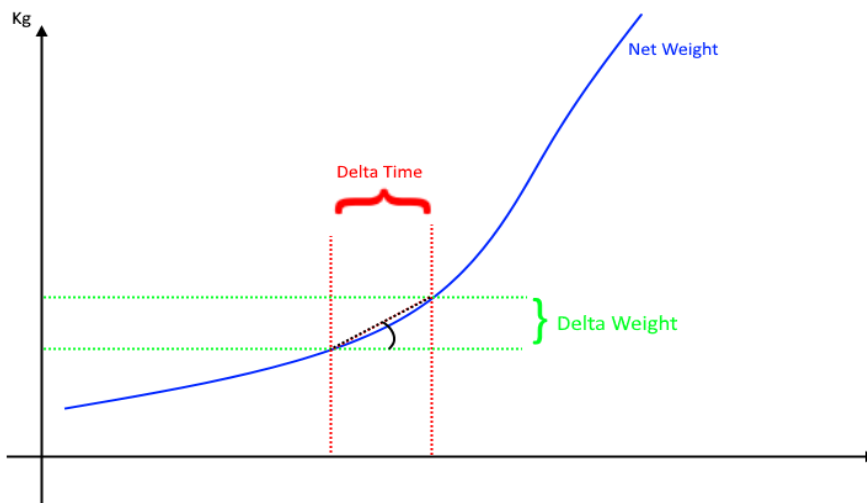
DELTA TIME [x100ms]

Time variation that contributes to the definition of “Stable Weight”

STABLE WEIGHT (Stable weighing condition)

The stable weighing condition is used to indicate that the net weight measurement is stable if:

The net weight remains within the weight $\Delta peso_netto$ over time $\Delta tempo$ or if the slope of the curve drawn by the net weight is less than $\frac{\Delta peso_netto}{\Delta tempo}$:



You will be prompted to enter Delta Net Weight (**Delta Weight**) (in engineering units) and Delta Time (**Delta Time**) (in 0.1 seconds).

ANALOG OUTPUT WORKING MODE

Select whether the analogue output is linked to the net measurement or controlled by the Profinet io protocol.

ANALOG OUTPUT TYPE

Select whether the analogue output is Voltage or Current

DIGITAL I/O MODE

Configure the device's digital I/O as input or output

FUNCTION

Configure the operation if the I/O is configured as a digital input:

ACQUIRE TARE

In this mode, if the digital input is activated for a time longer than 3 seconds, a new tare value is acquired (in RAM, then it is lost upon restart). It is equivalent to sending the command 49594 (decimal) in the command register.

DIGITAL INPUT

The input is configured as a digital input whose value can be read from the appropriate register.

DIGITAL OUTPUT MODE

In the case of configuring the I/O as a digital output it is possible to choose whether this should be configured as normally open (**Normally Open**) or as normally closed (**Normally Close**)

DIGITAL OUTPUT CONFIGURATION

Here you can choose the behaviour of the digital output:

FULL SCALE CELL

The digital output is activated if the cell has reached the measurement full scale.

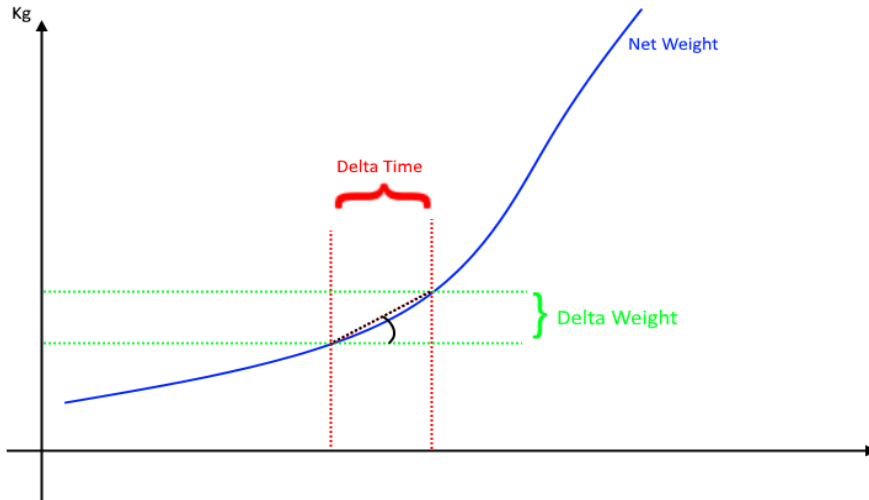
THRESHOLD AND STABLE WEIGHT

In this mode, the output activates when the net weight reaches the threshold and the weigh is in a stable weighing condition

STABLE WEIGHT

The stable weighing condition is used to indicate that the net weight measurement is stable if:

The net weight remains within the weight $\Delta peso_netto$ over time $\Delta tempo$ or if the slope of the curve drawn by the net weight is less than $\frac{\Delta peso_netto}{\Delta tempo}$:



STABLE WEIGHT

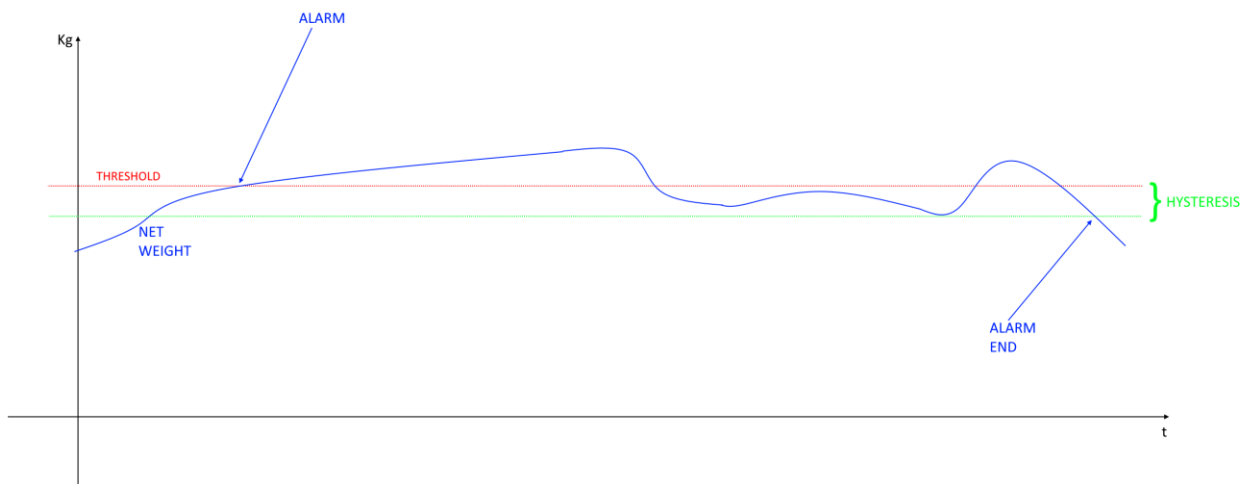
In this mode the output is activated if the weighing is in the stable weighing condition.

COMMANDABLE FROM PROFINET

In this mode the digital output can be controlled by the Profinet IO protocol.

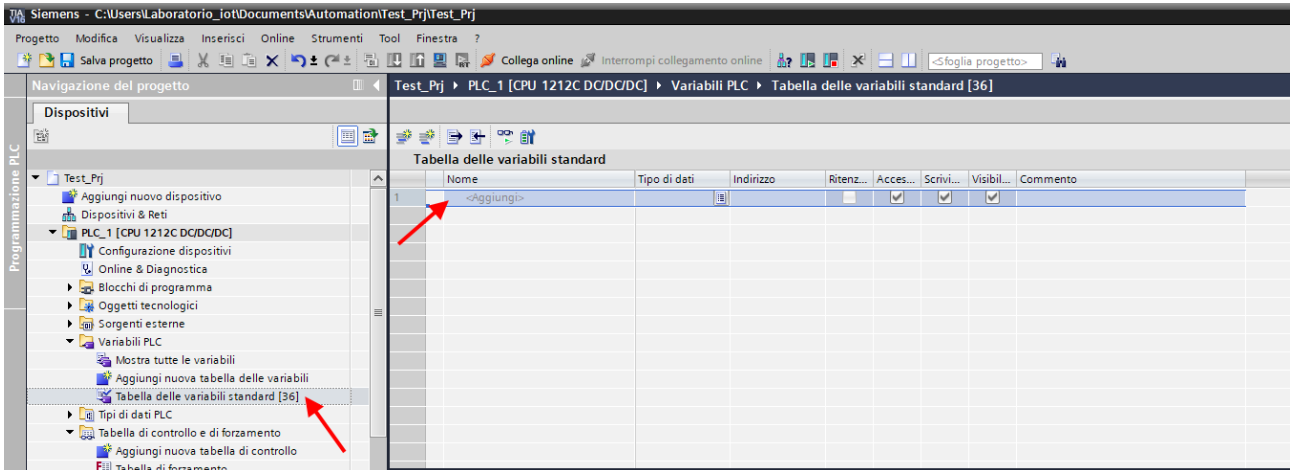
THRESHOLD WITH HYSTERESIS

In this mode the output is activated when the net weight reaches the threshold, the alarm is cancelled when the net weight falls below the Threshold-Hysteresis value:



5.6. I/O ZE-2AI-P / ZE-4DI-2AI-2DO-P 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 (for example for the ZE-4DI-2AI-2DO-P model):

Vista generale dispositivi							
Modulo	Telaio...	Posto ...	Indirizzo I	Indirizzo Q	Tipo	N° di articolo	
ze2ai4di2dop	0	0			ZE-2AI-4DI-2DO-P ...	ZE-2AI4DI2DO-P	
PN-IO	0	0 X1			ze2ai4di2dop		
AIN ENG_1	0	1	1...4		AIN ENG.		
DIN/DOU_1	0	2	5	1	DIN/DOU		
	0	3					
	0	4					

So:

Bytes I1 to I4 contain the analog inputs in engineering format (i.e. after scaling) (IW1 for analog input 1 and IW3 for analog input 2)

Byte I5 contains the status of the 4 digital inputs, i.e. I5.0 the DIN1, I5.1 the DIN2, I5.2 the DIN3 etc...

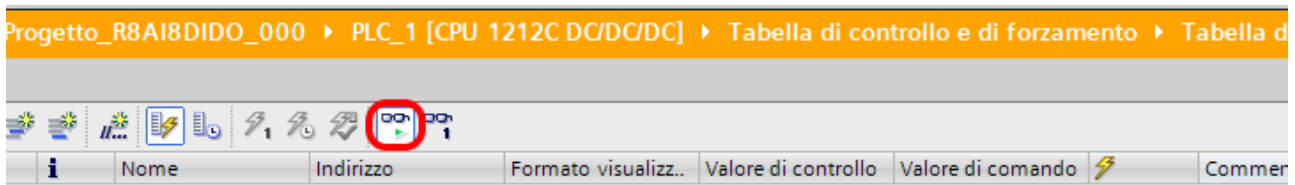
Q1 contains the status of the 2 digital outputs, i.e. Q1.0 the DOUT1 and Q1.1 the DOUT2.

We define the 2 analog inputs, the 4 digital inputs and the 2 digital outputs in the table of the standard variables:

	Nome	Tipo di dati	Indirizzo	Ritenz...	Acces...	Scrivi...	Visibil...	Comment
1	AIN1	UInt	%IW1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2	AIN2	UInt	%IW3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
3	DIN1	Bool	%I5.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4	DIN2	Bool	%I5.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5	DIN3	Bool	%I5.2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
6	DIN4	Bool	%I5.3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
7	DOUT1	Bool	%Q1.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
8	DOUT2	Bool	%Q1.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
9	<Aggiungi>			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

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.

ZE-2AI-P MODEL

SLOT	No. OF BYTES	TYPE	INFO
AIN ENG	4	READ	<p><i>Represents the measurements of the two analog scaled in engineering units. The scale values can be set via the hardware configuration of the Profinet IO Master.</i></p> <p><i>Byte[0][1] = AIN1 value</i> <i>Byte[2][3] = AIN2 value</i></p>

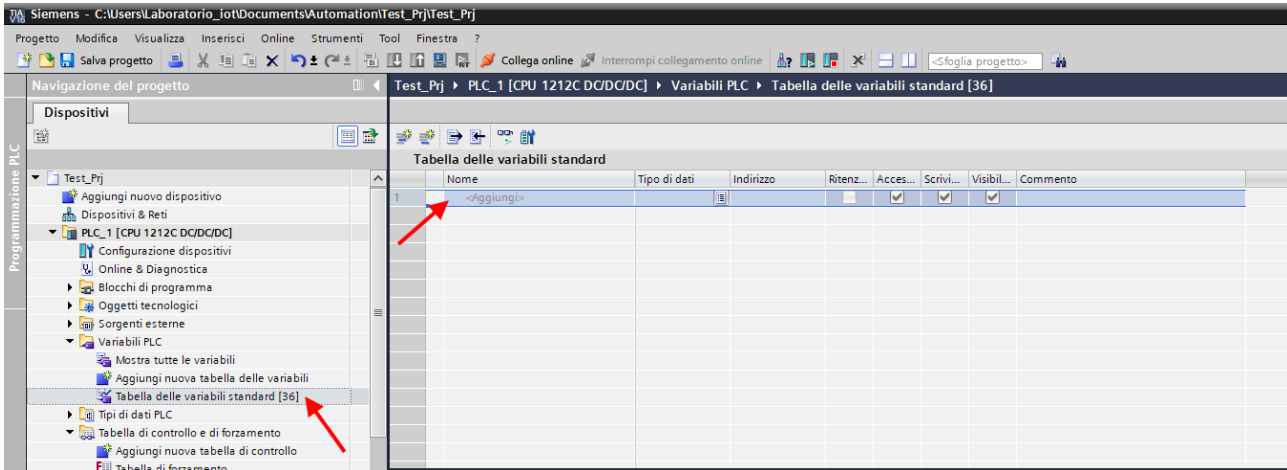
<i>AIN (optional)</i>	<i>4</i>	<i>READ</i>	<p><i>Represents the measurements of the two analogs in mV/uA</i></p> <p><i>Byte[0][1] = AIN1 value Byte[2][3] = AIN2 value</i></p>
<i>DIAGNOSTIC (optional)</i>	<i>1</i>	<i>READ</i>	<p><i>Allows to detect the anomaly status related to the analog measures. The interpretation is to be carried out in bits as follows:</i></p> <p><i>bit .0 = NOT USED bit .1 = AIN1 underflow bit .2 = AIN1 overflow bit .3 = AIN2 underflow bit .4= AIN2 overflow</i></p>

ZE-4DI-2AI-2DO-P MODEL

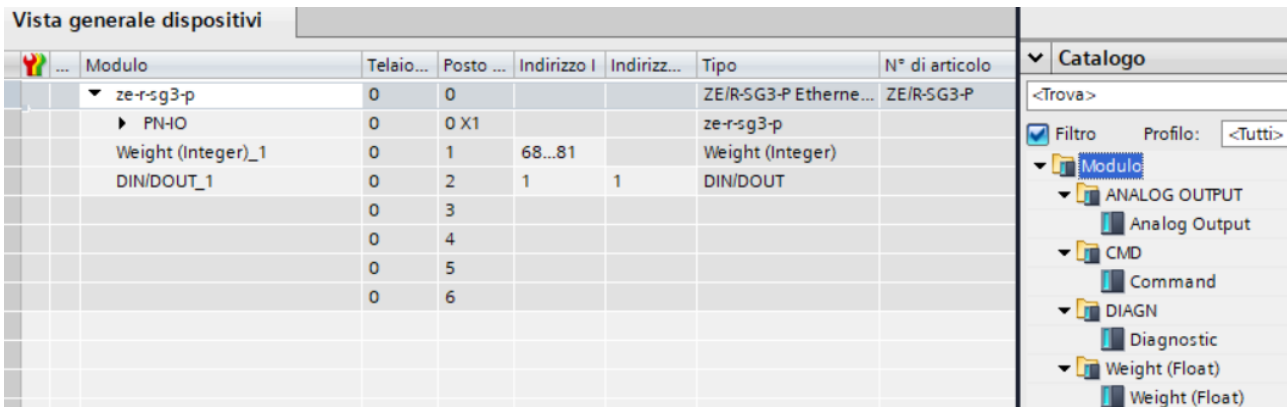
SLOT	No. OF BYTES	TYPE	INFO
AIN ENG	4	READ	<p>Represents the measurements of the two analog scaled in engineering units. The scale values can be set via the hardware configuration of the Profinet IO Master.</p> <p>Byte[0][1] = AIN1 value Byte[2][3] = AIN2 value</p>
DIN/DOU	2	1 BYTE READ 1 BYTE WRITE	<p>Represents the states of the digital inputs and digital outputs.</p> <p>READ: bit .0 = DIN1 bit .1 = DIN2 bit .2 = DIN3 bit .3 = DIN4</p> <p>WRITE: bit .0 = DOUT1 bit .1 = DOUT2</p>
AIN (optional)	4	READ	<p>Represents the measurements of the two analogs in mV/uA</p> <p>Byte[0][1] = AIN1 value Byte[2][3] = AIN2 value</p>
DIAGNOSTIC (optional)	1	READ	<p>Allows to detect the anomaly status related to the analog measures. The interpretation is to be carried out in bits as follows:</p> <p>bit .0 = NOT USED bit .1 = AIN1 underflow bit .2 = AIN1 overflow bit .3 = AIN2 underflow bit .4 = AIN2 overflow</p>

5.7. I/O ZE-SG3-P DATA

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



Let's now add the variables relating to the IO.
For example the addresses are written here:



WEIGHT (INTEGER)

Name	Data Type
Net weight	Integer32
Gross weight	Integer32
Tare weight	Integer32
Num. pieces	Unsigned16

Where:

<i>WEIGHT INTEGER</i>	<i>DEFAULT ADDRESS INPUT</i>
NET WEIGHT	ID2
GROSS WEIGHT	ID4
TARE WEIGHT	ID6
PIECES NR.	IW8

DIN/DOUT

Name	Data Type	Display as Bits
Digital Inputs (1..2)	Unsigned8	Bit 0: Digital Input 1 Bit 1: Digital Input 2

Name	Data Type	Display as Bits
Digital Outputs (1..2)	Unsigned8	Bit 0: Digital Output 1 Bit 1: Digital Output 2

<i>INPUT/OUTPUT</i>	<i>DEFAULT ADDRESS IO CONFIGURED AS AN INPUT</i>	<i>DEFAULT ADDRESS IO CONFIGURED AS AN OUTPUT</i>
IO1	I1.0	Q1.0
IO2	I1.1	Q1.1

Optionally you can add:

ANALOGUE OUTPUT (NOT USABLE ON THE R-SG3-P MODEL)

Name	Data Type
Analog output value	Unsigned16

It allows you to control the analogue voltage/current output by providing the value in uA or mV

COMMAND

Name	Data Type
Command value	Unsigned16

It allows you to send commands to the device:

COMMAND (DECIMAL)	FUNCTION
43948	Reboot the device
49594	Acquires the tare in RAM (at reboot is lost)
49914	Acquires the tare in Flash for the calibration procedure in both operating modes (factory calibration and with sample weight)
50700	Acquires the sample weight value in Flash for calibration with standard weight
50773	Acquires the tare value from the register MANUAL TARE (only for the factory calibration mode)
49151	Reset the maximum net weight
45056	Reset the register with the minimum net weight

DIAGNOSTIC

Name	Data Type
Diagnostic	Unsigned16

BIT 0 LSBIT (RO)

Bit 0 = 1 THRESHOLD AND STABLE WEIGHT for DIDO 1

BIT 1 (RO)

Bit 1 = 1 FULL SCALE CELL

BIT 2 (RO)

Bit 2 = 1 NET WEIGHT < 0

BIT 3 (RO)

Bit 3 = 1 THRESHOLD AND STABLE WEIGHT for DIDO 2

BIT 4 (RO)

Bit 4 = 1 Stable weight

BIT 5-6 Not used

BIT 7 (RO)
Bit 7 = 1 Threshold with hysteresis for DIDO 1

BIT 8 (RO)
Bit 8 = 1 automatic tare tracker (if enabled)

BIT 9 (RO)
Bit 9 = 1 Threshold with hysteresis for DIDO 2

BIT 10..15 Not used

WEIGHT (FLOAT)

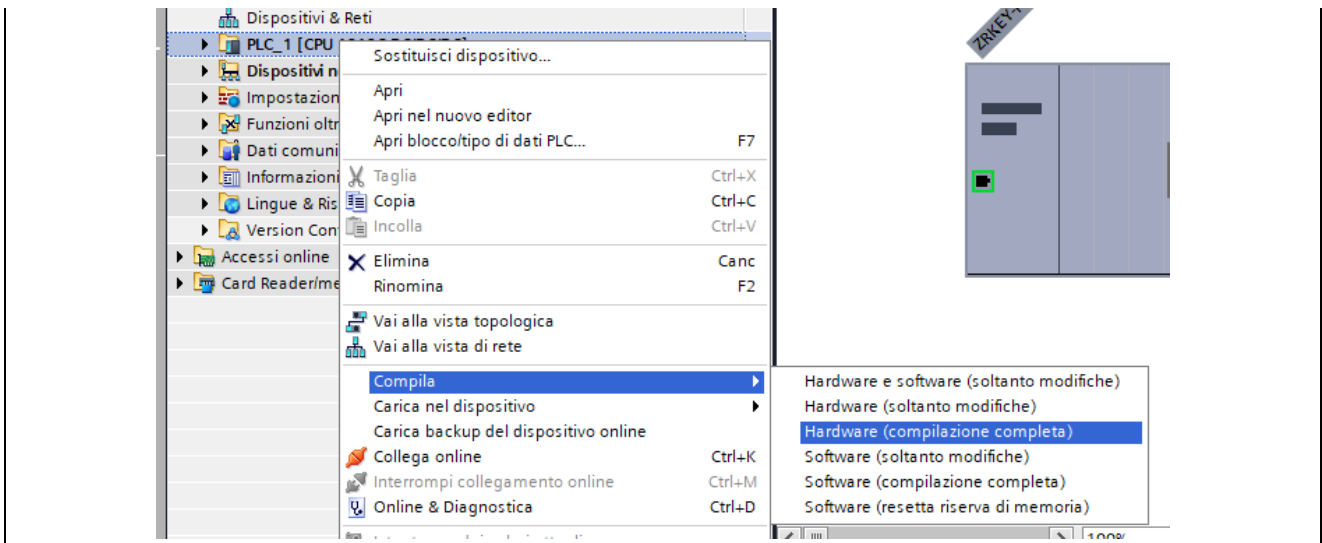
Name	Data Type
Net weight	Float32
Gross weight	Float32
Tare weight	Float32
Max Net weight	Float32
Min Net weight	Float32

5.8. COMPILATION AND SENDING OF THE PROJECT TO THE SIEMENS PLC

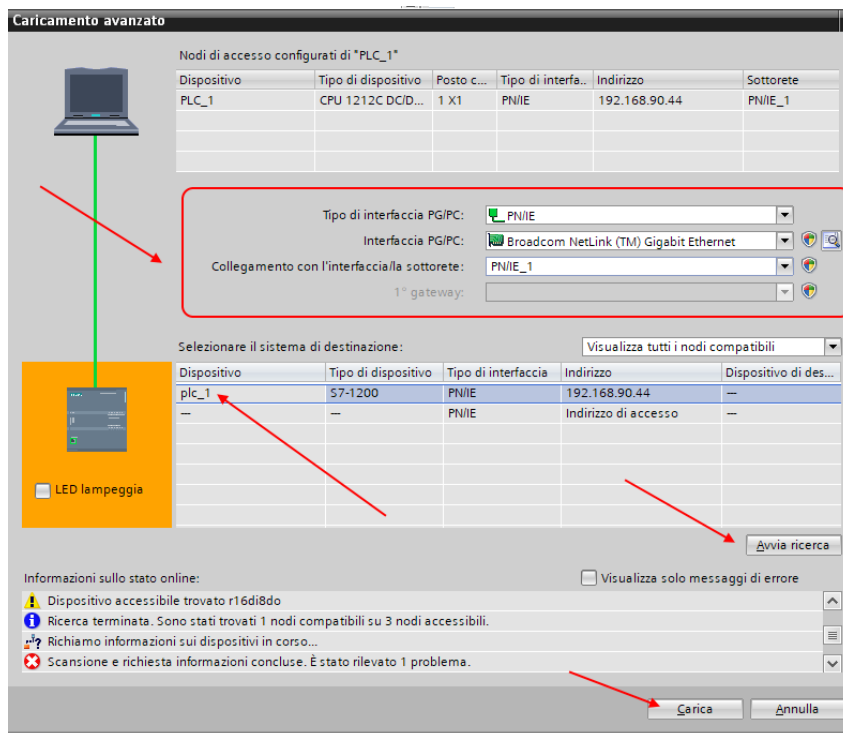
Now that the devices are configured, all that remains is to compile and send the configuration to the PLC.



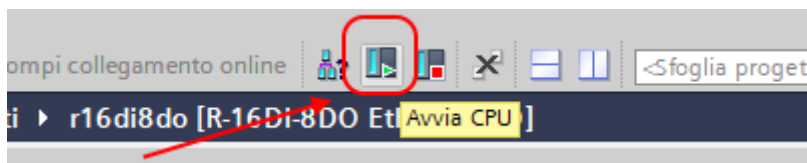
YOU MUST ALWAYS DO A FULL HARDWARE COMPILATION BEFORE SENDING A PROJECT TO THE DEVICE:



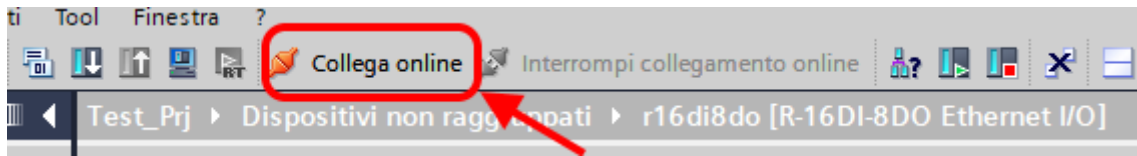
Before sending the project to the PLC, you are asked to select the ethernet interface and start the search, in order to select the PLC and press "Load".



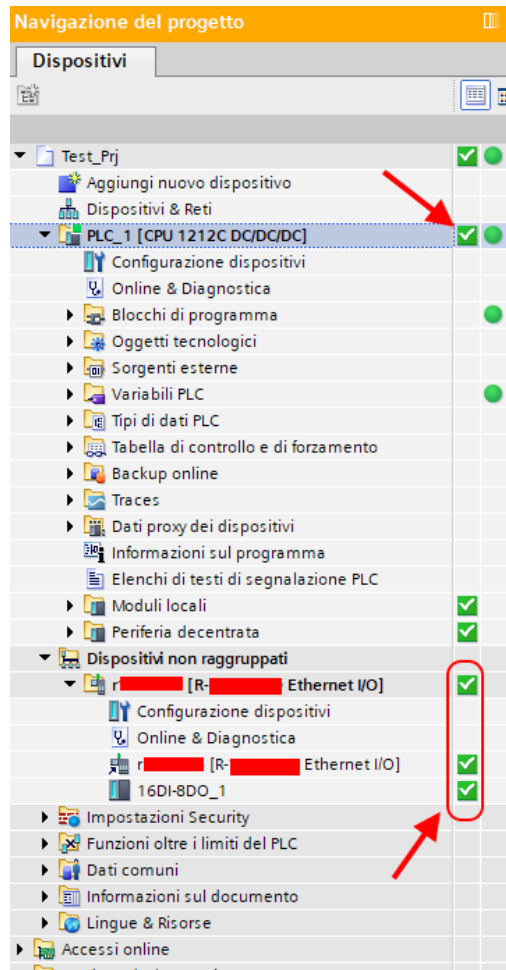
Once the project has been sent, RUN the PLC:



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

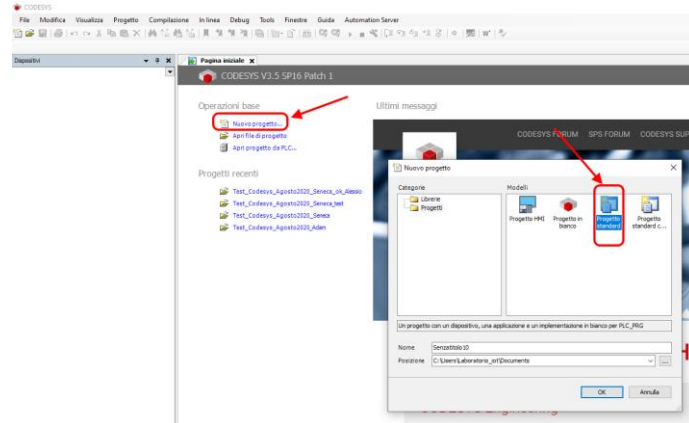


If everything is correct you will get a green icon next to the Seneca device:



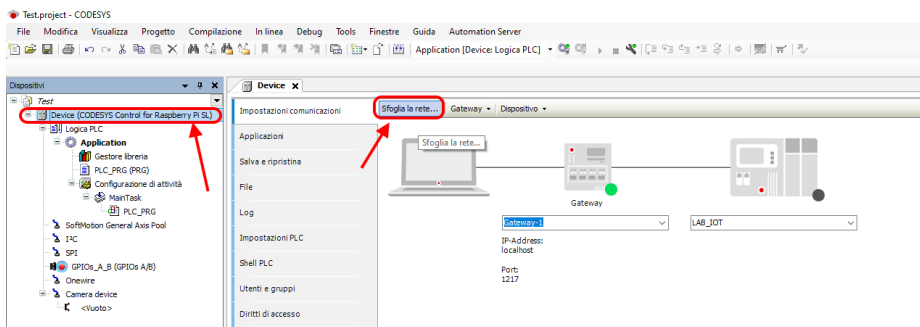
6. EXAMPLE OF CREATING A PROJECT WITH PLC CODESYS 3.5

Create a new standard project:

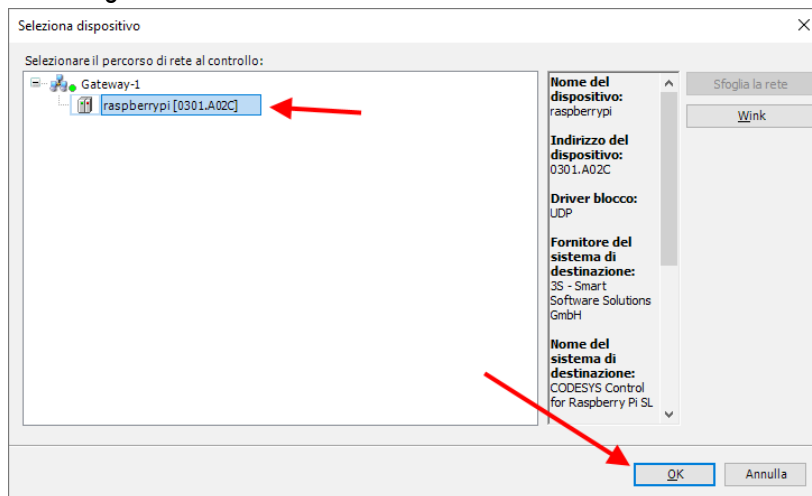


6.1.1. INSERTION OF THE CODESYS PLC IN THE PROJECT

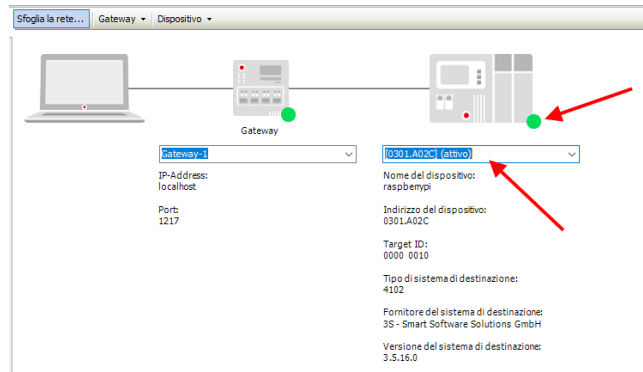
Configure the PLC by selecting it in the tree on the left and then browsing the network:



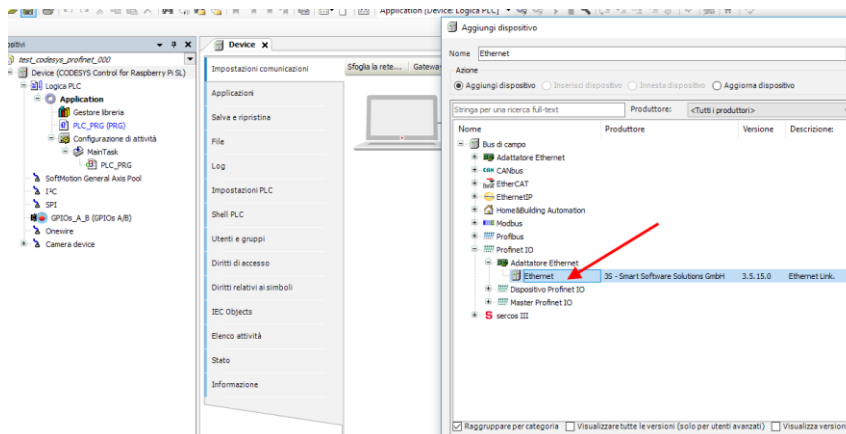
Select the PLC after scanning the network:



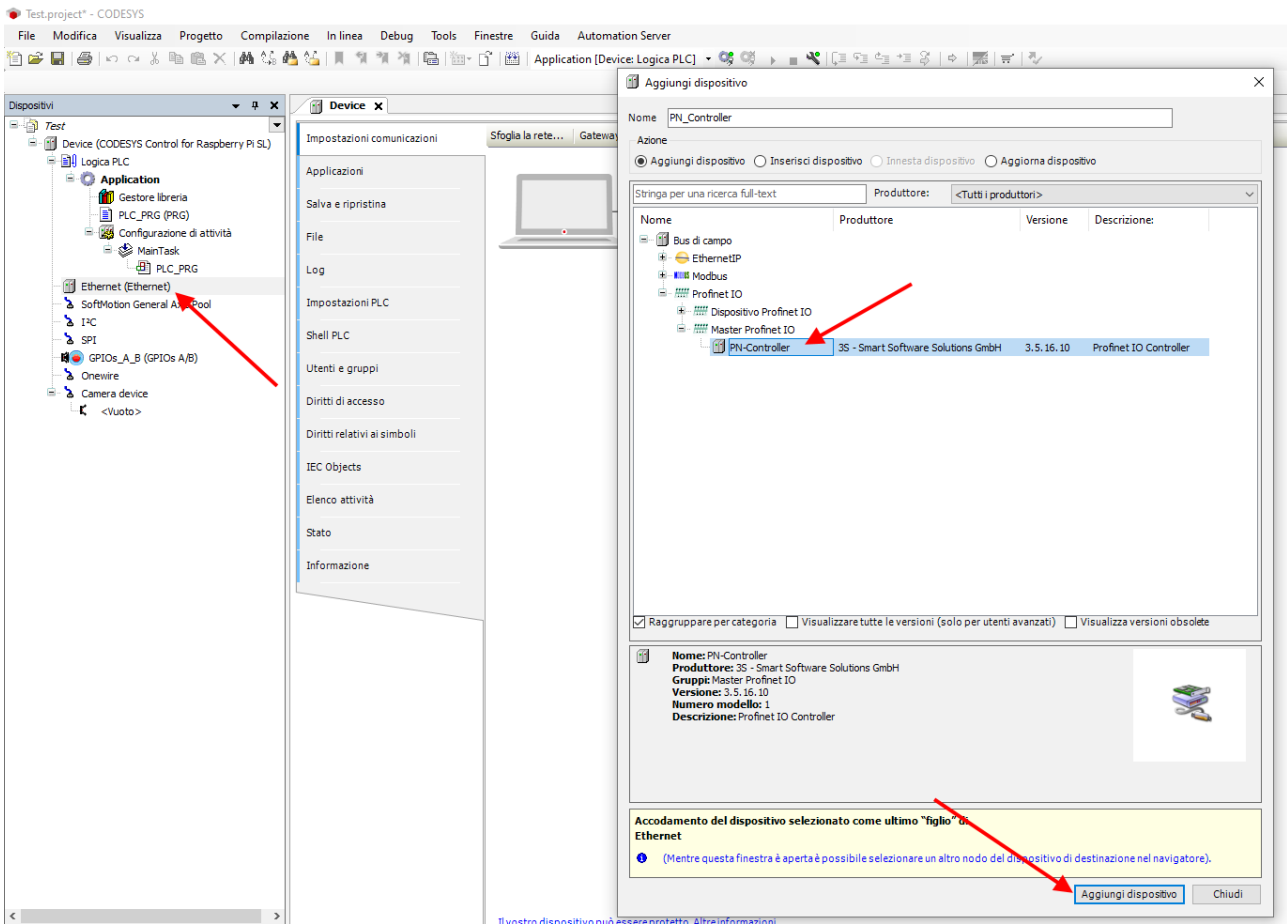
The PLC is now connected to the system:



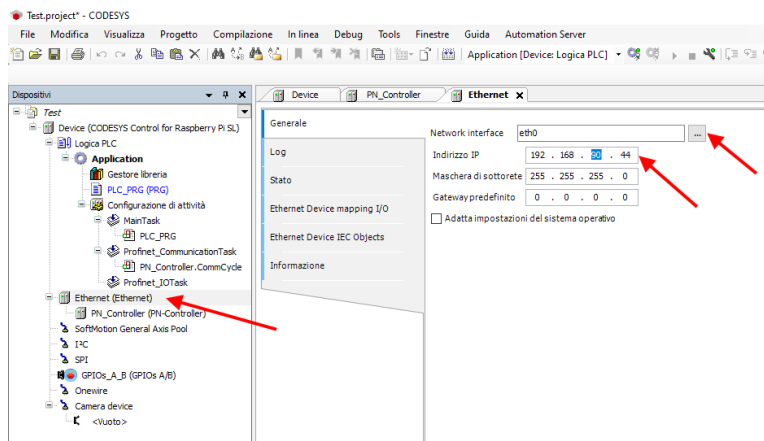
Now that the PLC has been detected, move on to insert a Profinet port on standard Ethernet:
 Right click on device and "add device":



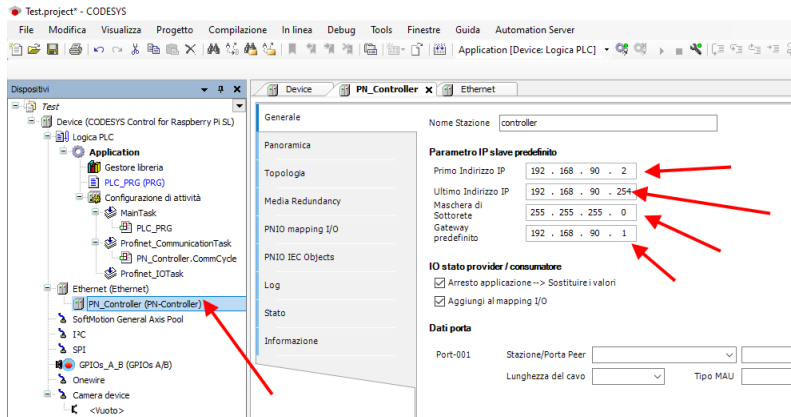
Then add the Profinet IO Master:



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:

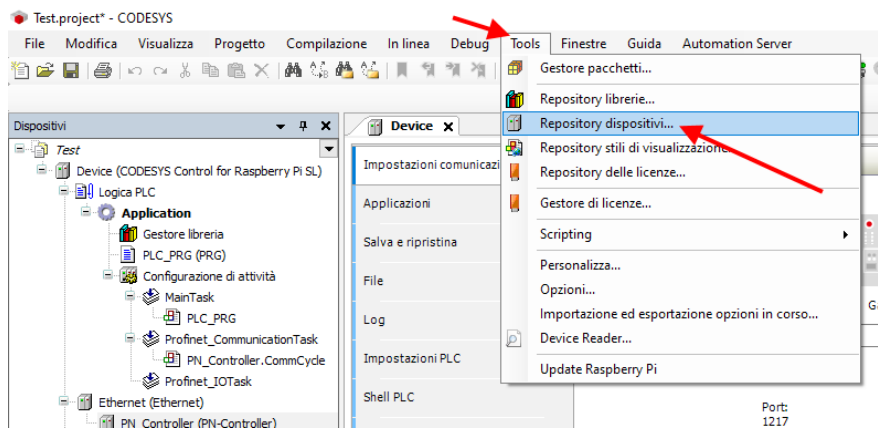


6.1.2. INSTALLING THE GSDML FILE

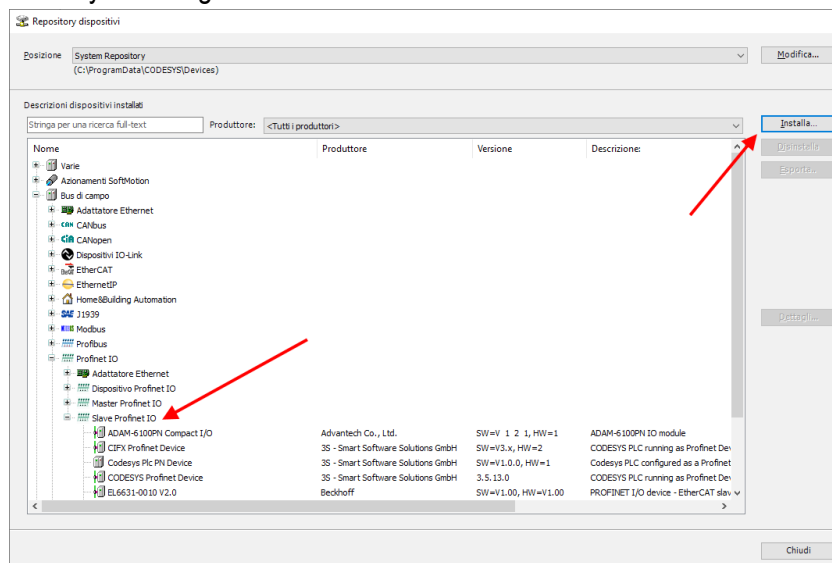
Now you need to connect the Seneca slave device PROFINET IO to the profinet master (controller).

First install the GSD file of the Seneca IO.

Select Tools->Device Repository:



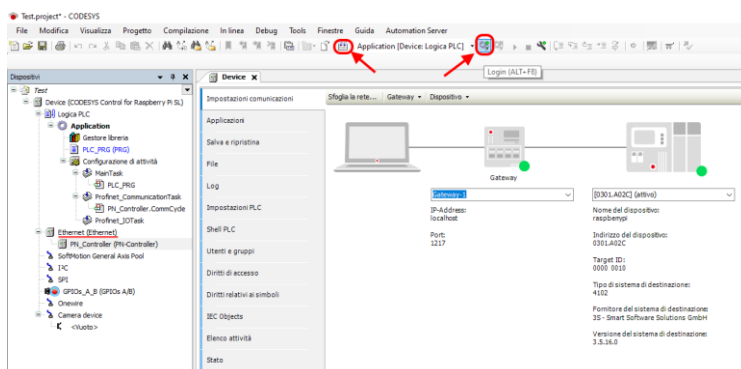
Now import the GSD file by selecting Profinet IO Slave and then Install:



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

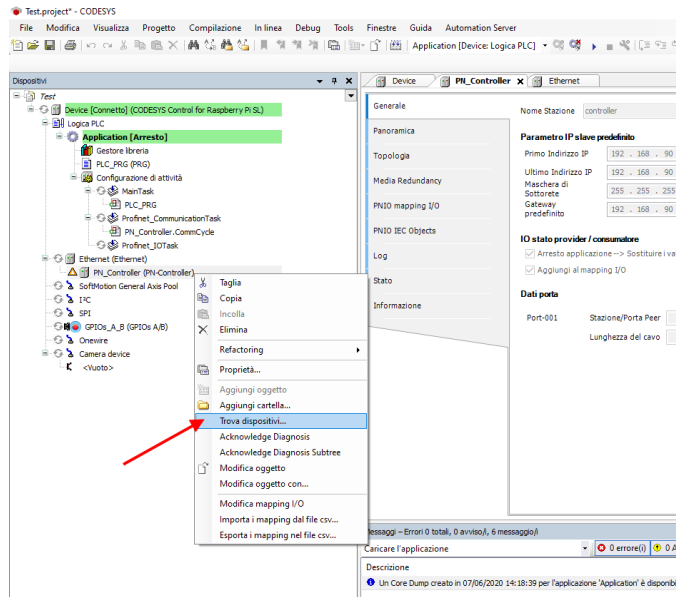
At this point you can scan the network in search of Slave devices (Device).

First compile the project and log in to the PLC:

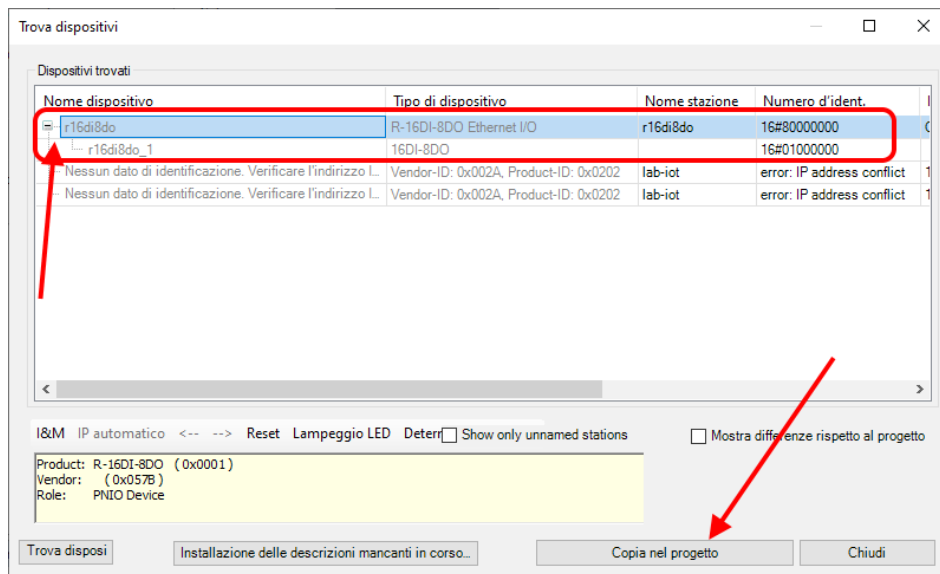


6.1.3. INSTALLATION OF THE SENECA PROFINET IO

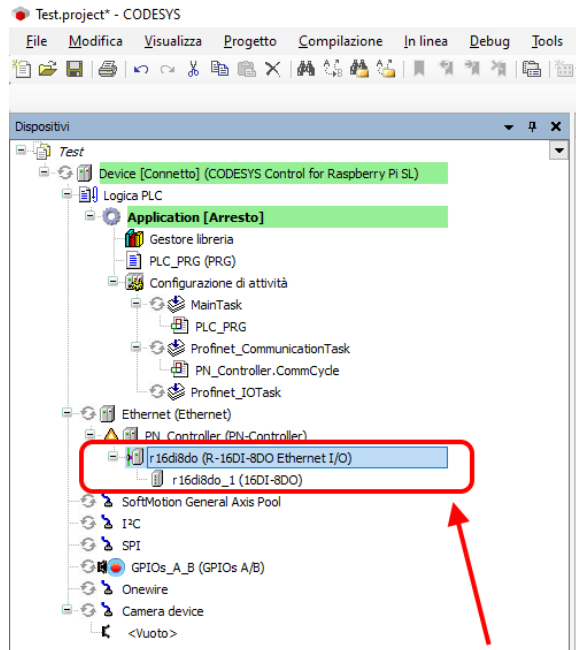
Now that you are connected to the PLC, run the scan to find the devices:



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

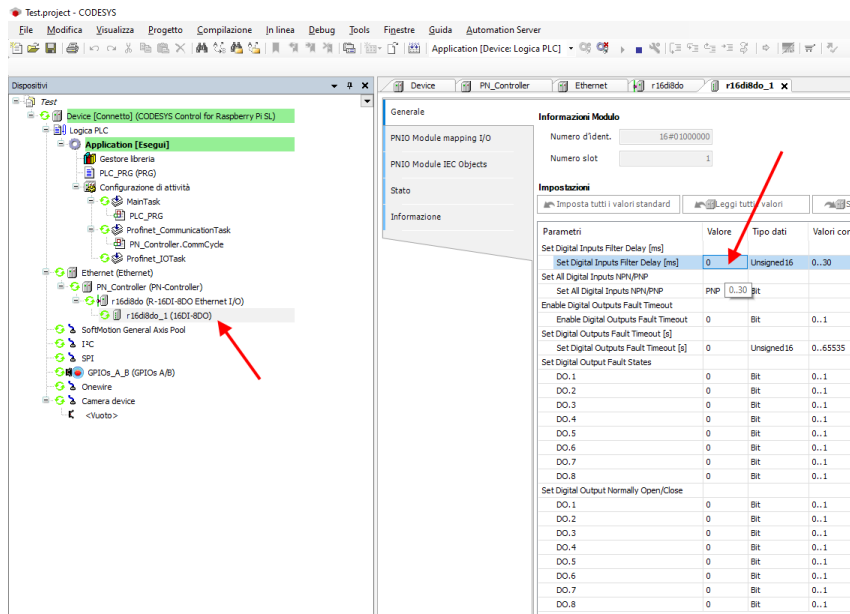


At this point you have added the device to the project:



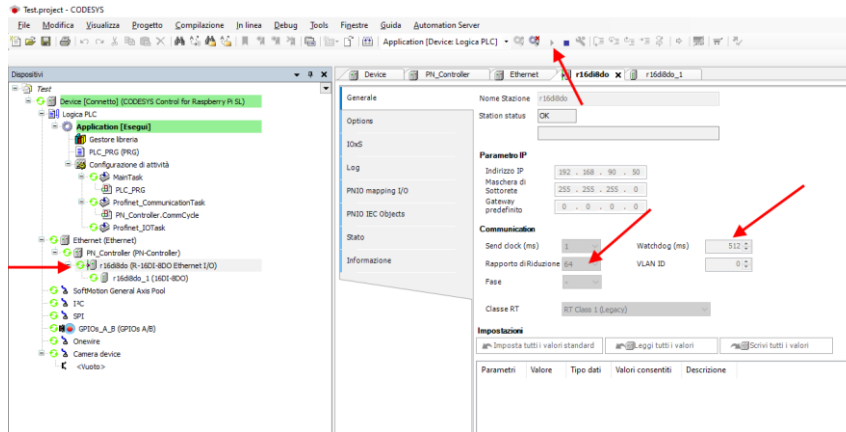
6.1.4. CONFIGURATION OF THE PARAMETERS OF THE SENECA IO

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:

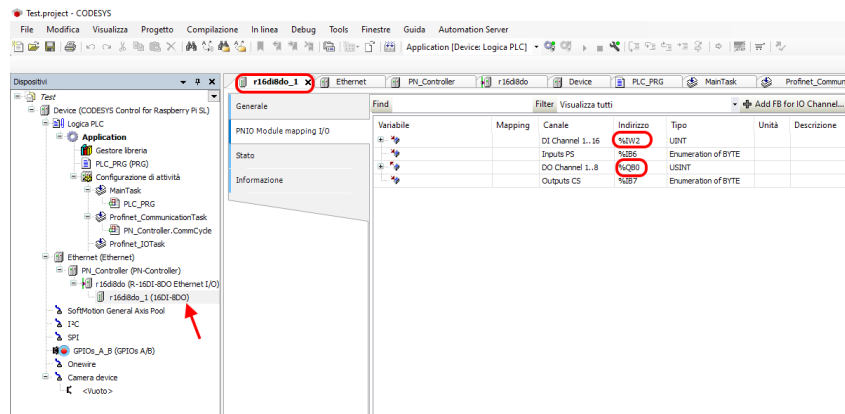


6.1.5. READING AND WRITING THE SENECA IO FROM CODESYS

Now see how it is possible to read and write IO on the Seneca device.

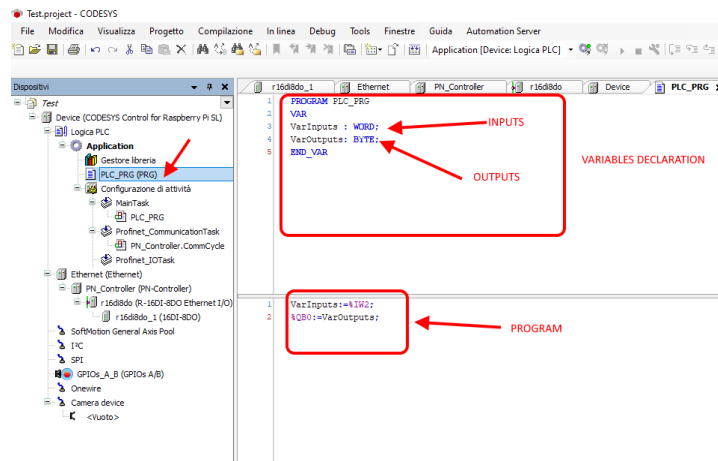
To write and read the status of the IO you have to insert a few code lines under PRG.

In the program, read the inputs from the %IW2 address and write in the %QB0 address as it is obtained from here:



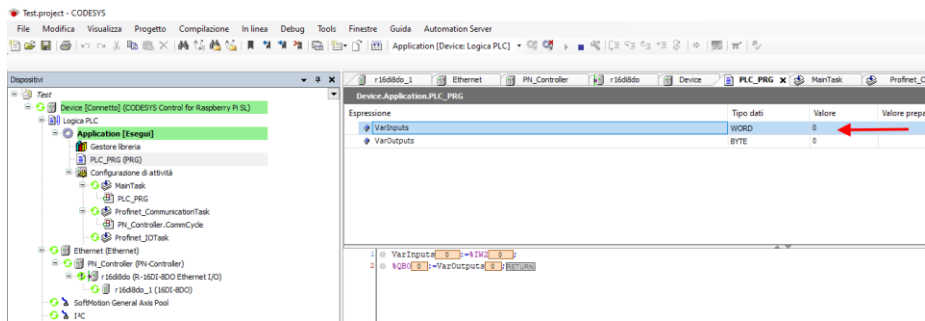
Declare an 8-bit (Word) variable for the 16 inputs and one byte for the 8 outputs.

In the program, instead, read the inputs from %IW2 and write the outputs on %QB0:

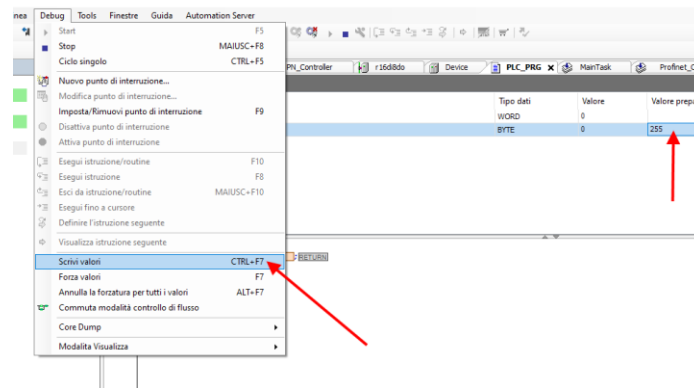


Go into login and start.

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. 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.

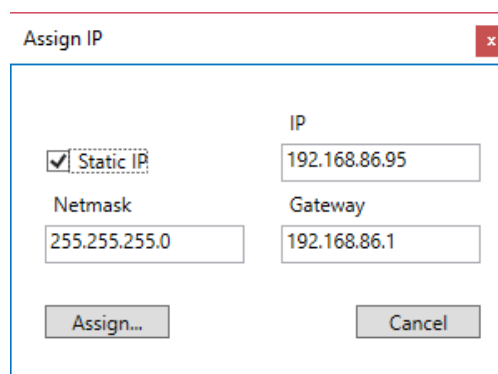
The software can be downloaded from:

<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!**

UPON FIRST USE THE IP ADDRESS OF THE DEVICE IS NOT SET (0.0.0.0). IN THIS SITUATION IT WILL NOT BE POSSIBLE TO SEARCH FOR THE DEVICE WITH THE SENECA DISCOVERY TOOL SOFTWARE

8. 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).
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**