USER MANUAL

Z-KEY-P

MODBUS TO PROFINET IO GATEWAY

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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
19/05/2021	1.0.0.0	First revision	MM
20/05/2021	1.0.0.1	Added Modbus TCP-IP Server and Passthrough Chapter	MM
07/06/2021	1.0.0.2	Added Z-KEY-2ETH-P and R-KEY-LT-P	MM
07/10/2021	1.0.0.3	Added R-KEY-LT-P to cap. 13	MM

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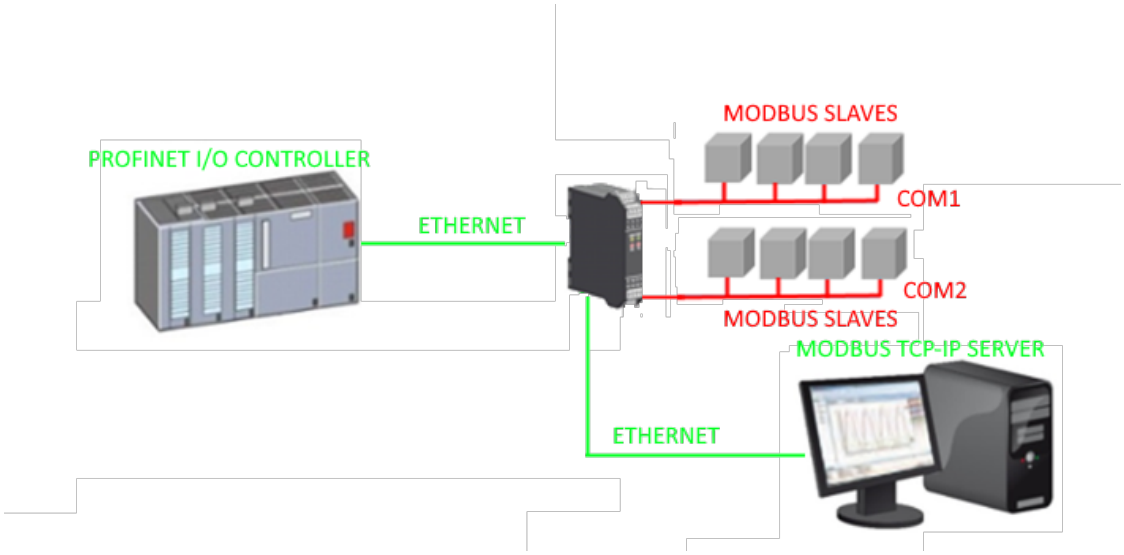
1. INTRODUCTION

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

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.

1.1. DESCRIPTION

The products Z-KEY-P, R-KEY-LT-P, Z-KEY-2TH-P autonomously read the registers of devices on a Modbus serial/ethernet bus and make them available for access by a Profinet IO controller.
Each Modbus variable (tag) is converted to Profinet, a maximum of 500 variables (tags) can be defined.
The integrated webserver can be used to configure the device and for diagnostic purposes.
Below are the connection configurations of a classic use case:



1.2. Z-KEY-P COMMUNICATION PORT SPECIFICATIONS

ETHERNET COMMUNICATION PORT	
Type	Ethernet 100 baseT RJ45 front
Configuration	Via integrated Webserver or Easy Setup 2
Industrial communication protocol	Profinet IO, Modbus TCP-IP client
Factory address	Static address 192.168.90.101

RS485/RS232 SERIAL COMMUNICATION PORTS	
Number of ports	2
Type	COM#1 RS485 port for IDC10 connector Terminal COM#2 RS485/RS232 port
Baud rate	From 1200 to 115200 bit/s
Protocol	Modbus RTU master, Modbus ASCII master, Modbus TCP-IP server
USB COMMUNICATION PORT	
Number of ports	1
Type	Driver Windows/Linux Virtual Com CDC standard
Protocol	Modbus RTU Slave
Configuration	Not modifiable 115200 bit/s, 8 bits, No parity, 1 stop bit, station address 1

1.3. Z-KEY-2ETH-P COMMUNICATION PORT SPECIFICATIONS

ETHERNET COMMUNICATION PORT	
Type	2x Ethernet 100 baseT RJ45 front in switch configuration
Configuration	Via integrated Webserver or Easy Setup 2
Industrial communication protocol	Profinet IO, Modbus TCP-IP client, Modbus TCP-IP server
Factory address	Static address 192.168.90.101

RS485/RS232 SERIAL COMMUNICATION PORTS	
Number of ports	2
Type	RS485 COM#1 port for IDC10 connector COM#2 RS485/RS232 terminal port
Baud Rate	From 1200 to 115200 bit/s
Protocol	Modbus RTU master, Modbus ASCII master
USB COMMUNICATION PORT	
Number of ports	1
Type	Driver Windows/Linux Virtual Com CDC standard
Protocol	Modbus RTU Slave
Configuration	Not modifiable: 115200 bit/s, 8 bit, No parità, 1 stop bit, station address 1

1.3. R-KEY-LT-P COMMUNICATION PORT SPECIFICATIONS

ETHERNET COMMUNICATION PORT	
Type	1x Ethernet 100 baseT RJ45 frontale
Configuration	Via integrated Webserver or Easy Setup 2
Industrial communication protocol	Profinet IO, Modbus TCP-IP client, Modbus TCP-IP server
Factory address	Static address 192.168.90.101

RS485/RS232 SERIAL COMMUNICATION PORTS	
Number of ports	1
Type	COM#1 RS485/RS232 terminal port
Baud Rate	From 1200 to 115200 bit/s
Protocol	Modbus RTU master, Modbus ASCII master

2. ETHERNET PORT

The factory configuration of the Ethernet port is:

STATIC IP: 192.168.90.101
SUBNET MASK: 255.255.0.0
GATEWAY: 192.168.90.1

Multiple devices must not be inserted on the same network with the same static IP.

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DO NOT CONNECT 2 OR MORE FACTORY-CONFIGURED DEVICES ON THE SAME NETWORK, OR THE DEVICE WILL NOT WORK
(CONFLICT OF IP ADDRESSES 192.168.90.101)

3. WEBSERVER MODE AND PROFINET MODE

The device is normally in profinet mode, in profinet mode the device can be configured only through the Easy Setup 2 software .
In order to access the internal webserver, it is necessary to put the device into webserver mode using the Easy Setup2 or Seneca Device Discovery software, it is also possible to change the operating mode by pressing the side button following the procedure:

To force the webserver mode:

1. Switch on the device
2. Hold down the PS1 button until all the LEDs flash quickly.
3. Release the button
4. The device restarts and the LEDs
   On Z-KEY-P: PWR and SD/COM
   On Z-KEY-2ETH-P: PWR and COM
   On R-KEY-LT-P: PWR and COM
   flash slowly to indicate webserver mode

To force Profinet mode:

1. Switch on the device
2. Hold down the PS1 button until all the LEDs flash quickly.
3. Release the button
4. The device restarts and the LEDs
   On Z-KEY-P: PWR and SD/COM
   On Z-KEY-2ETH-P: PWR and COM
   On R-KEY-LT-P: PWR and COM

stop flashing slowly to indicate the Profinet mode.

4. STEP BY STEP GUIDE FOR THE FIRST ACCESS TO THE WEBSERVER

STEP 1: POWER THE DEVICE AND CONNECT THE ETHERNET PORT, PUT THE DEVICE IN WEBSERVER MODE (SEE CHAPTER 3)

STEP 2: SENECA DISCOVERY DEVICE SOFTWARE INSTALLATION

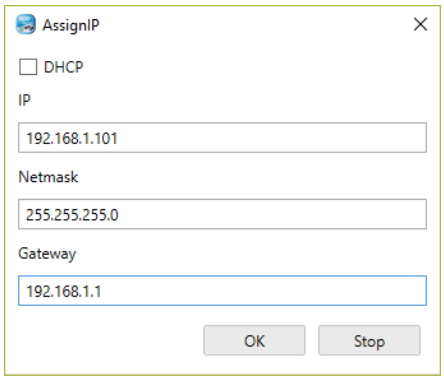
Download (from the Seneca website in the Z-KEY-P section) and install the Seneca Discovery Device software.

STEP 3: SEARCH FOR THE DEVICE

Run the software and press the "SCAN" button: the software will search for the Ethernet devices in the network. Locate the device (factory address 192.168.90.101):

STEP 4 CHANGE OF IP ADDRESS

Select the device and press the "Assign IP" button, set a configuration compatible with your PC, for instance:



Confirm with OK. Now the device can be reached via Ethernet from your PC.

STEP 5 ACCESS TO THE CONFIGURATION WEBSERVER

ENTER your access credentials:
user: admin
password: admin

THE WEB BROWSERS WHICH HAVE BEEN TESTED FOR COMPATIBILITY WITH THE DEVICE WEBSERVER ARE:
MOZILLA FIREFOX AND GOOGLE CHROME.
THEREFORE, THE OPERATION WITH OTHER BROWSERS IS NOT GUARANTEED

5. CONFIGURING THE DEVICE FROM EASY SETUP 2

Devices can be configured using the Easy Setup2 configuration software.
For more information, please refer to the help in the software.

6. WEBSERVER DEVICE CONFIGURATION

For further information on the access to the webserver of a new device, please refer to chapter 0.

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THE WEB BROWSERS WHICH HAVE BEEN TESTED FOR COMPATIBILITY WITH THE DEVICE WEBSERVER ARE:
MOZILLA FIREFOX AND GOOGLE CHROME.
THEREFORE, THE OPERATION WITH OTHER BROWSERS IS NOT GUARANTEED

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

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IF THE PARAMETERS TO ACCESS THE WEBSERVER HAVE BEEN LOST, TO ACCESS IT, IT IS NECESSARY TO GO THROUGH THE PROCEDURE TO RESET THE FACTORY-SET CONFIGURATION

6.1. WEBSERVER SECTIONS

The Webserver is divided into pages (sections) representing the various gateway functions:

Status
It is the section that displays the values of the configured tags in real time.

Setup
It is the section that allows the device basic configuration.

Setup Tag
It is the section that allows adding/modifying the tags (that is the variables) of the Modbus devices connected to the gateway.

Firmware Update
It is the section that allows updating the firmware and database.

Database Update
It is the section that allows updating the firmware and database.

Traffic Monitor
It allows to analyse the ModBUS frames of the serials.

6.2. "STATUS" SECTION

In the status section, it is possible to view the tag values in real time together with their fail/ok status:
50 tags per page maximum can be displayed, the maximum number of pages is 10.
Some basic information among which the device interrogation loop time of both serials is displayed in the top part of the page.
On this page it is also possible to view the mapping that the Modbus tags will have in Profinet IO.

6.3. "SETUP" SECTION

DHCP (ETH) (default: Disabled):
Sets the DHCP client to get an IP address automatically.

STATIC IP* (default: 192.168.90.101*)
Sets the device static address. Careful not to enter devices with the same IP address into the same network.

STATIC IP MASK (default: 255.255.255.0)
Sets the mask for the IP network.

STATIC GATEWAY (default: 192.168.90.1)
Sets the gateway address.

WORKING MODE
Sets the operation mode, currently only gateway mode is supported.

TCP-IP PORT (default: 502)
Sets the communication port for the Modbus TCP-IP client protocol.

TCP-IP TIMEOUT [ms] (default 512 ms)
Sets the waiting time for a request to be considered in timeout.

PORT #1 MODBUS PROTOCOL (default RTU)
Sets the protocol on the serial between Modbus RTU or Modbus ASCII

PORT #2 MODBUS PROTOCOL (default RTU)
Sets the protocol on the serial between Modbus RTU or Modbus ASCII

PORT #1 BAUDRATE (default: 38400 baud)
Selects the communication speed of the COM #1 serial port

PORT #1 DATA BITS (default: 38400 baud)
Selects the communication speed of the COM #1 serial port

PORT #1 PARITY (default: None)
Sets the parity for the COM #1 serial communication port.

PORT #1 STOP BIT (default: 1)
Sets the number of stop bits for the COM #1 serial communication port.

PORT #1 TIMEOUT [ms]
Sets the wait time before defining fail.

PORT #1 DELAY BETWEEN POLLS [ms]
Waiting time before making a new serial request.

PORT #1 WRITING RETRIES (default: 3)
Selects the number of writing attempts to be made on a serial slave before returning an error.

PORT #1 MAX READ NUM
Sets the maximum number of simultaneous serial reading ModBUS registers, the firmware will use this value to optimize the ModBUS readings.

PORT #1 MAX WRITE NUM
Sets the maximum number of simultaneous writing ModBUS registers of the serial, the firmware will use this value to optimize the ModBUS writings.

PORT #2 BAUDRATE (default: 38400 baud) (only per Z-KEY-P and Z-KEY-2ETH-P)
Selects the communication speed of the COM #2 serial port

PORT #2 DATA BITS (default: 38400 baud) (only per Z-KEY-P and Z-KEY-2ETH-P)
Selects the communication speed of the COM #2 serial port

PORT #2 PARITY (default: None) (only per Z-KEY-P and Z-KEY-2ETH-P)
Sets the parity for the COM #2 serial communication port.

PORT #2 STOP BIT (default: 1) (only per Z-KEY-P and Z-KEY-2ETH-P)
Sets the number of stop bits for the COM #2 serial communication port.

PORT #2 TIMEOUT [ms] (only per Z-KEY-P and Z-KEY-2ETH-P)
Sets the wait time before defining fail.

PORT #2 DELAY BETWEEN POLLS [ms] (only per Z-KEY-P and Z-KEY-2ETH-P)
Waiting time before making a new serial request.

PORT #2 WRITING RETRIES (default: 3) (only per Z-KEY-P and Z-KEY-2ETH-P)
Selects the number of writing attempts to be made on a serial slave before returning an error.

PORT #2 MAX READ NUM (only per Z-KEY-P and Z-KEY-2ETH-P)
Sets the maximum number of simultaneous serial reading ModBUS registers of the remote TCP-IPModbus server, the firmware will use this value to optimize the ModBUS readings.

PORT #2 MAX WRITE NUM
Sets the maximum number of simultaneous writing ModBUS registers of the serial, the firmware will use this value to optimize the ModBUS writings.

WEB SERVER AUTHENTICATION USER NAME (default: admin)
Sets the username to access the webserver.

WEB SERVER PASSWORD (default: admin)
Sets the password to access the webserver and to read/write the configuration (if enabled).

WEB SERVER PORT (default: 80)
Sets the communication port for the webserver.

IP CHANGE FROM DISCOVERY (default: Enabled)
Selects whether or not the device accepts the IP address change from the Seneca Discovery Device software.

PORT #1 AFTER FAIL DELAY [s]
Sets the number of quarantine seconds after a tag has been declared in fail (i.e. these tags are no longer considered) before being interrogated again.

PORT #2 AFTER FAIL DELAY [s] (only per Z-KEY-P and Z-KEY-2ETH-P)
Sets the number of quarantine seconds after a tag has been declared in fail (i.e. these tags are no longer considered) before being interrogated again.

PROFINET DEVICE NAME
Sets the name of the Profinet peripheral

MODBUS TCP-IP CLIENT
Enables or not the TCP-IP client Modbus

MODBUS TCP-IP SERVER#1…10 PORT
Sets the port for max. 10 remote TCP-IP Modbus servers

MODBUS TCP-IP SERVER#1…10 ADDRESS
Sets the IP address for max. 10 remote TCP-IP Modbus servers

MODBUS TCP-IP CLIENT TIMEOUT [ms]
Sets the timeout for remote TCP-IP Modbus servers

MODBUS TCP-IP CLIENT DELAY BETWEEEN POLLS [ms]
Sets the waiting time between one call and the next of the TCP-IP client ModBUS

MODBUS TCP-IP CLIENT WRITING ATTEMPTS
Selects the number of writing attempts to be made on a remote TCP-IP Modbus server before returning an error and activating the quarantine.

MODBUS TCP-IP CLIENT MAX READ NUM
Sets the maximum number of simultaneous serial reading ModBUS registers of the remote TCP-IP Modbus server, the firmware will use this value to optimize the ModBUS readings.

MODBUS TCP-IP CLIENT MAX WRITE NUM
Sets the maximum number of simultaneous serial writing ModBUS registers of the remote TCP-IP Modbus server, the firmware will use this value to optimize the ModBUS writings.

SERVER AFTER FAIL DELAY
Sets the number of quarantine seconds after a tag has been declared in fail (i.e. these tags are no longer considered) before being interrogated again.

In addition, a configuration can be exported / imported via the webserver.

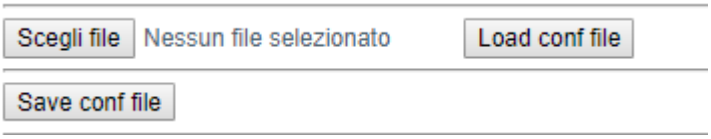
6.3.1. SAVING A CONFIGURATION ON A FILE

A configuration that includes:

CONFIGURATION
TAG

It can be saved to a file this way:

Go to the Setup section and select the file to save, press the "Save config" button



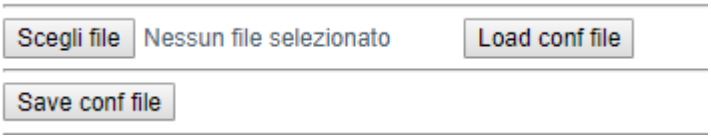
6.3.2. IMPORTING A CONFIGURATION FROM A FILE

A configuration that includes:

CONFIGURATION
TAG

It can be imported from a file this way:

Go to the Setup section and select the file to load, press the "Load config" button



6.4. "TAG SETUP" SECTION

In this section you can add, edit or delete a tag.
A tag represents a variable (typically 1 or 2 ModBUS addresses depending on the type of data) that will be converted into Profinet IO.

Using the ADD button you can add a new tag.
Using the MODIFY button it is possible to modify an existing tag.
Using the DEL button it is possible to delete an existing tag.

GATEWAY TAG NAME
It is the identifying name of the tag

TARGET MODBUS DEVICE
It represents the Seneca Modbus device selected from those available in the database.
In the case of a non-Seneca device, select CUSTOM.

TARGET RESOURCE
It represents the Seneca device variable you want to add.

TARGET CONNECTED TO
It selects the serial to be used for Modbus serial communication for the specified TAG.

TARGET MODBUS STATION ADDRESS
It selects the station address to use for the TAG.

TARGET MODBUS START REGISTER

It represents the starting Modbus address of the TAG (in the case of a Seneca device it is filled in automatically).

TARGET MODBUS REQUEST TYPE

It represents the type of Modbus command to use (Holding Register, Coil etc.).
In the case of a Seneca device it is filled in automatically.

TARGET REGISTER DATA TYPE

It represents the type of data of the tag used (Bit, Unsigned 16 bit, Unsigned 32 bit etc…).
In the case of a Seneca device it is filled in automatically.

TARGET MODBUS WRITE MODE

If you need to write the TAG via Profinet IO, it allows you to select the writing technique on the Modbus side: Periodic or Data change.
Periodic: writing is carried out continuously with the set time interval
Data Change: writing occurs only if the tag changes its value.

Periodic or data Change: combines the two previous modes.

TARGET MODBUS WRITE PERIODIC TIME [s]

It represents the time interval in the case of TARGET MODBUS WRITE MODE of the TIMED type

6.5. "FIRMWARE UPDATE" SECTION

In order to improve, add, optimize the functions of the product, Seneca releases firmware updates on the device section on the www.seneca.it website

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

6.6. "DATABASE UPDATE" SECTION

Seneca releases new Database files of its updated ModBUS devices on the Z-KEY-P device section of the www.seneca.it website.
To update the database, select the file and press the "Update Database" button.
The device is already updated at the factory with the most recent database at the time of production

7. MAPPING OF MODBUS TAGS ON PROFINET

It is possible to view how the ModBUS TAGs have been converted to Profinet IO through the table on the "status" page of the webserver.

In particular, the fields are:

GATEWAY TAG NR
It represents the incremental number of the TAG, a maximum of 500 tags are supported.

GATEWAY TAG NAME
It is the mnemonic name of the TAG

GATEWAY MODBUS START REGISTER
It is the ModBUS address of the TAG in the internal memory of the device (for future use).

TAG VALUE
It represents the current value of the tag.

TAG READING STATUS
It represents the status of the tag whether OK or FAIL

TAG DATA TYPE
It represents the type of data of the TAG: Boolean, Unsigned 16. Signed 16, Unsigned 32, Signed 32 or Signed 64

NR BYTE
It represents the NR of bytes in which the tag is converted into profinet.

8. SUPPORTED MODBUS COMMUNICATION PROTOCOLS

The Modbus communication protocols supported are:

- Modbus RTU master (from #1 and #2 serial ports)
- Modbus TCP-IP Client (from the Ethernet port) up to 10 remote TCP-IP Modbus Servers

For more information on these protocols, see the website:
http://www.modbus.org/specs.php.

8.1. SUPPORTED MODBUS FUNCTION CODES

The following Modbus functions are supported:

- Read Coils (function 1)
- Read Discrete Inputs (function 2)
- Read Holding Registers (function 3)
- Read Input Registers (function 4)
- Write Single Coil (function 5)
- Write Single Register (function 6)
- Write multiple Coils (function 15)
- Write Multiple Registers (function 16)

All 32-bit tags are contained in 2 consecutive Modbus registers
All 64-bit tags are contained in 4 consecutive Modbus registers

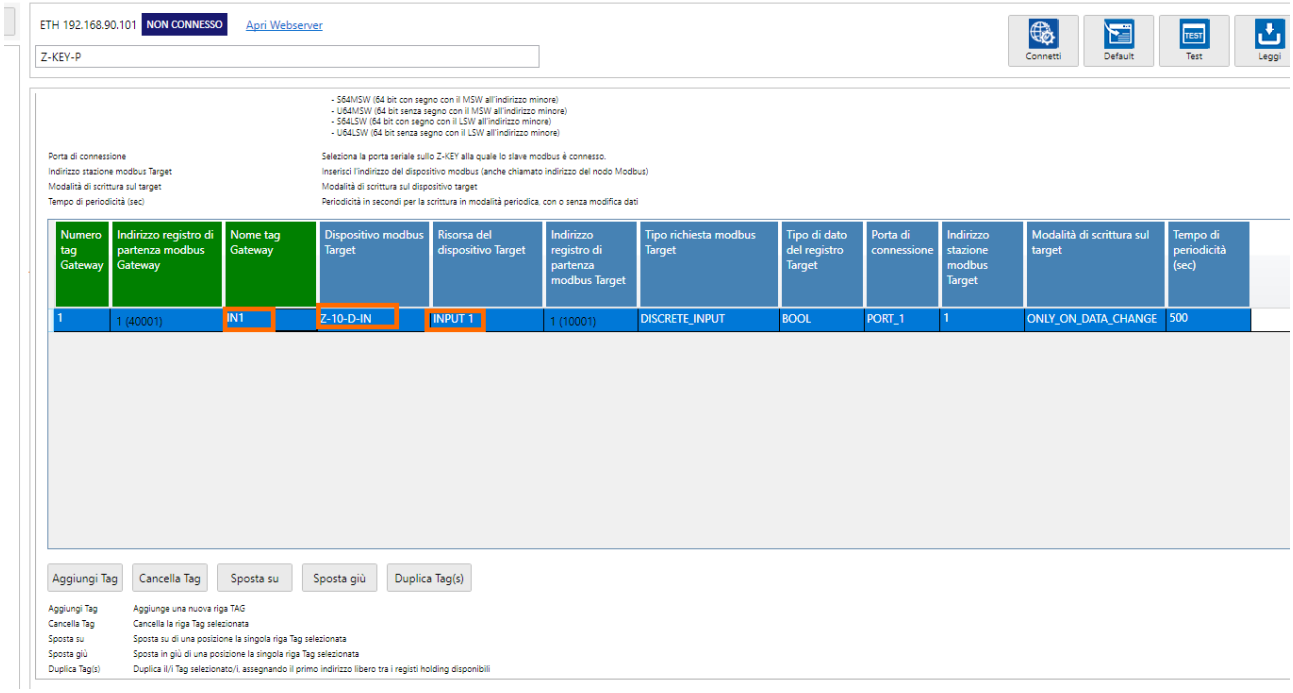
9. STEP BY STEP CONFIGURATION EXAMPLE OF THE DEVICE USING THE WEBSERVER

You want to connect a Siemens PLC to two Seneca Modbus RTU slave devices:
Z-10-D-IN (SLAVE ADDRESS 1) and Z-10-D-OUT (SLAVE ADDRESS 2).

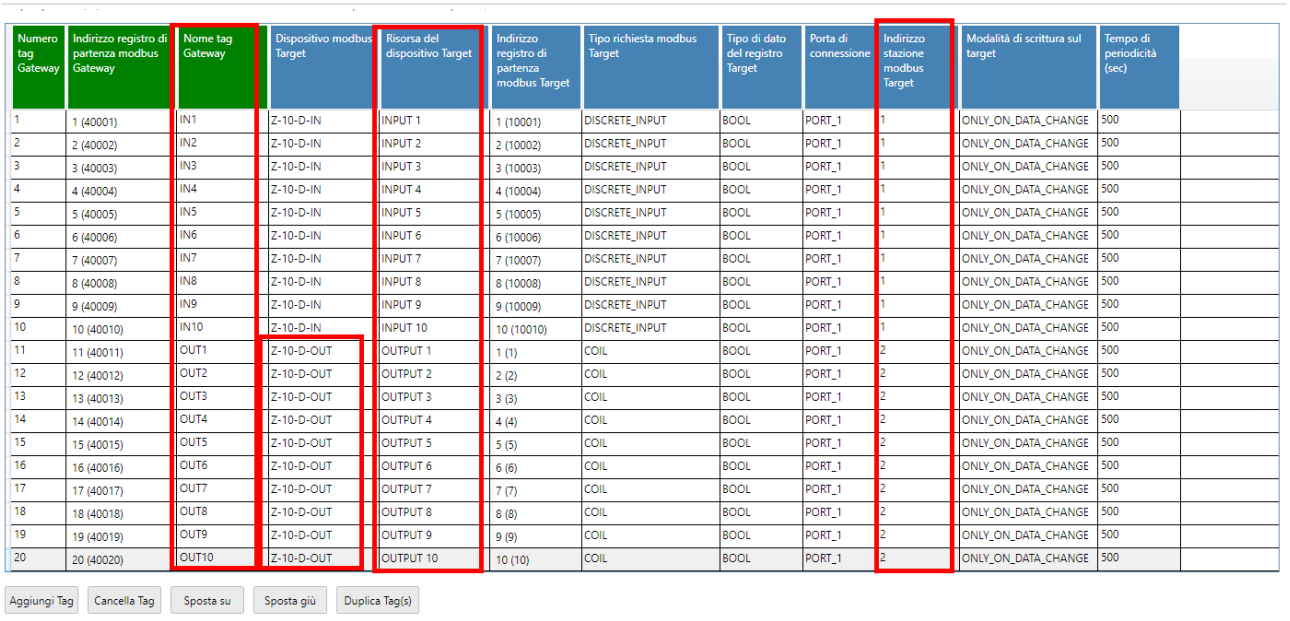
In the example we will use the product Z-KEY-P (the steps are quite similar for the other devices R-KEY-LT-P and Z-KEY-2ETH).
The 10 digital inputs of the Z-10-D-IN are from coil address 1 to coil address 10 of slave #1 device
The 10 digital outputs of the Z-10-D-OUT are from coil address 1 to coil 10 of slave #2 device

Now we use the Easy Setup 2 software and select Z-KEY-P:

We add the first input of Z-10-D-IN to slave address #1 on serial port #1, to do this we select the device Z-10-D-IN from the list and as resource INPUT1. Now rename the TAG to IN1:



We duplicate the tag for all 10 inputs and modify the INPU2, INPUT3 etc... resources. Same operation for the 10 outputs of Z-10-D-IN on slave addresss#2 and serial port #1 in order to obtain the following table:



Numero tag Gateway	Indirizzo registro di partenza modbus Gateway	Nome tag Gateway	Dispositivo modbus Target	Risorsa del dispositivo Target	Indirizzo registro di partenza modbus Target	Tipo richiesta modbus Target	Tipo di dato del registro Target	Porta di connessione	Indirizzo stazione modbus Target	Modalità di scrittura sul target	Tempo di periodicità (sec)
1	1 (40001)	IN1	Z-10-D-IN	INPUT 1	1 (10001)	DISCRETE_INPUT	BOOL	PORT_1	1	ONLY_ON_DATA_CHANGE	500
2	2 (40002)	IN2	Z-10-D-IN	INPUT 2	2 (10002)	DISCRETE_INPUT	BOOL	PORT_1	1	ONLY_ON_DATA_CHANGE	500
3	3 (40003)	IN3	Z-10-D-IN	INPUT 3	3 (10003)	DISCRETE_INPUT	BOOL	PORT_1	1	ONLY_ON_DATA_CHANGE	500
4	4 (40004)	IN4	Z-10-D-IN	INPUT 4	4 (10004)	DISCRETE_INPUT	BOOL	PORT_1	1	ONLY_ON_DATA_CHANGE	500
5	5 (40005)	IN5	Z-10-D-IN	INPUT 5	5 (10005)	DISCRETE_INPUT	BOOL	PORT_1	1	ONLY_ON_DATA_CHANGE	500
6	6 (40006)	IN6	Z-10-D-IN	INPUT 6	6 (10006)	DISCRETE_INPUT	BOOL	PORT_1	1	ONLY_ON_DATA_CHANGE	500
7	7 (40007)	IN7	Z-10-D-IN	INPUT 7	7 (10007)	DISCRETE_INPUT	BOOL	PORT_1	1	ONLY_ON_DATA_CHANGE	500
8	8 (40008)	IN8	Z-10-D-IN	INPUT 8	8 (10008)	DISCRETE_INPUT	BOOL	PORT_1	1	ONLY_ON_DATA_CHANGE	500
9	9 (40009)	IN9	Z-10-D-IN	INPUT 9	9 (10009)	DISCRETE_INPUT	BOOL	PORT_1	1	ONLY_ON_DATA_CHANGE	500
10	10 (40010)	IN10	Z-10-D-IN	INPUT 10	10 (10010)	DISCRETE_INPUT	BOOL	PORT_1	1	ONLY_ON_DATA_CHANGE	500
11	11 (40011)	OUT1	Z-10-D-OUT	OUTPUT 1	1 (1)	COIL	BOOL	PORT_1	2	ONLY_ON_DATA_CHANGE	500
12	12 (40012)	OUT2	Z-10-D-OUT	OUTPUT 2	2 (2)	COIL	BOOL	PORT_1	2	ONLY_ON_DATA_CHANGE	500
13	13 (40013)	OUT3	Z-10-D-OUT	OUTPUT 3	3 (3)	COIL	BOOL	PORT_1	2	ONLY_ON_DATA_CHANGE	500
14	14 (40014)	OUT4	Z-10-D-OUT	OUTPUT 4	4 (4)	COIL	BOOL	PORT_1	2	ONLY_ON_DATA_CHANGE	500
15	15 (40015)	OUT5	Z-10-D-OUT	OUTPUT 5	5 (5)	COIL	BOOL	PORT_1	2	ONLY_ON_DATA_CHANGE	500
16	16 (40016)	OUT6	Z-10-D-OUT	OUTPUT 6	6 (6)	COIL	BOOL	PORT_1	2	ONLY_ON_DATA_CHANGE	500
17	17 (40017)	OUT7	Z-10-D-OUT	OUTPUT 7	7 (7)	COIL	BOOL	PORT_1	2	ONLY_ON_DATA_CHANGE	500
18	18 (40018)	OUT8	Z-10-D-OUT	OUTPUT 8	8 (8)	COIL	BOOL	PORT_1	2	ONLY_ON_DATA_CHANGE	500
19	19 (40019)	OUT9	Z-10-D-OUT	OUTPUT 9	9 (9)	COIL	BOOL	PORT_1	2	ONLY_ON_DATA_CHANGE	500
20	20 (40020)	OUT10	Z-10-D-OUT	OUTPUT 10	10 (10)	COIL	BOOL	PORT_1	2	ONLY_ON_DATA_CHANGE	500

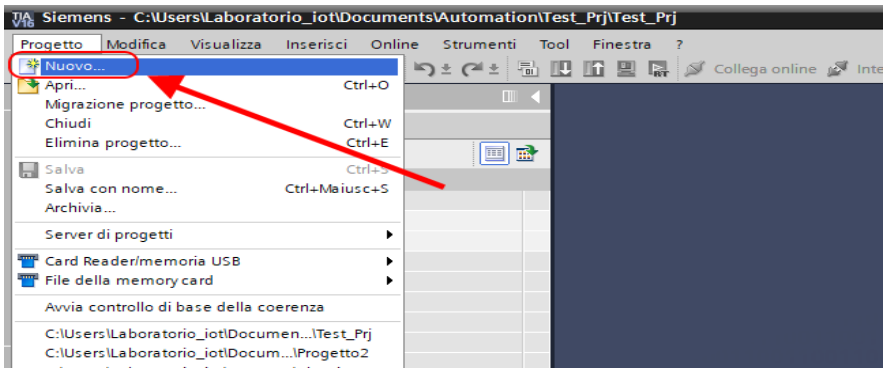
Aggiungi Tag | Cancella Tag | Sposta su | Sposta giù | Duplica Tag(s)

We check that the configuration is correct in the configuration test.
We can now move on to the configuration of the PLC.

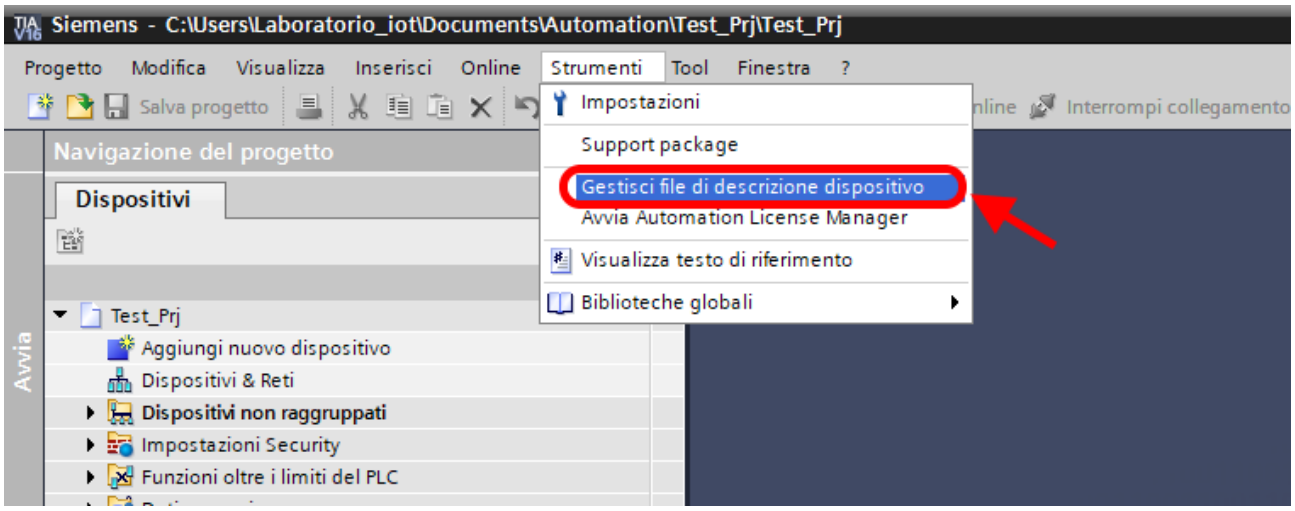
9.1. STEP-BY-STEP CONFIGURATION EXAMPLE WITH A SIEMENS™ PLC THROUGH TIA PORTAL™16

Let's start the configuration on the TIA Portal:

Creating a new project:

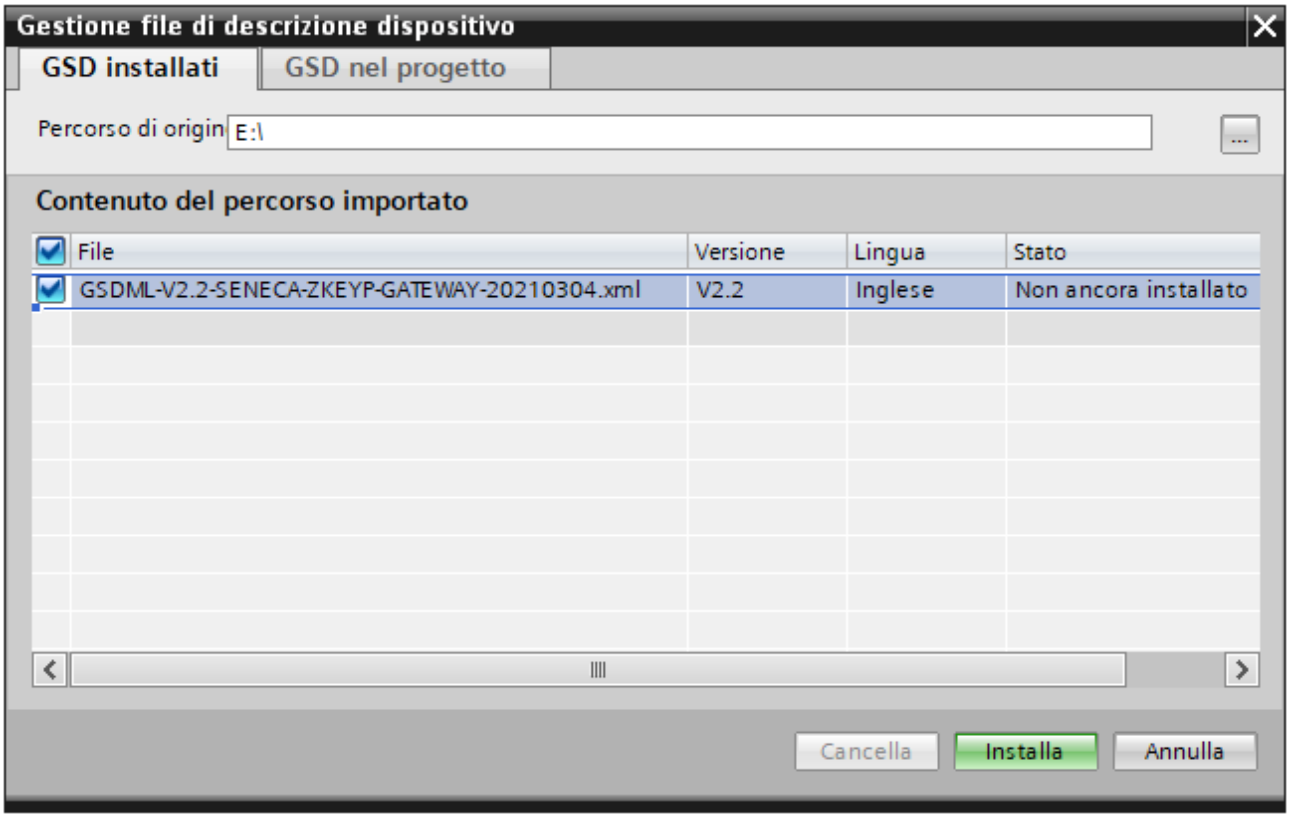


Install the GSD file of the Seneca product:



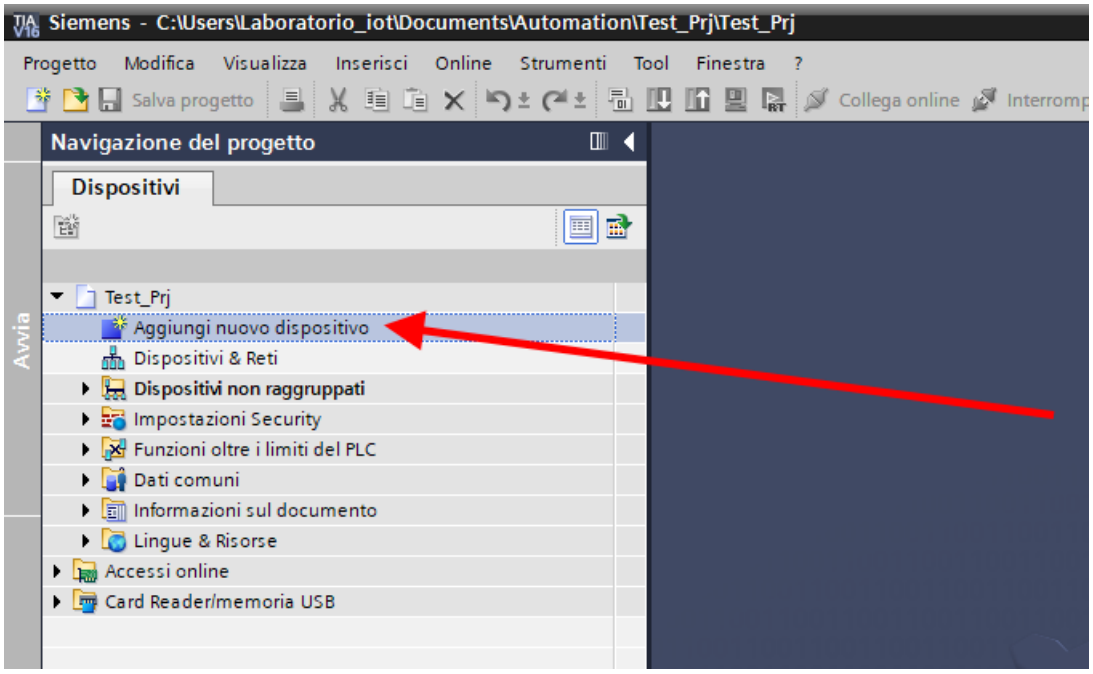
Point to the directory where the file is and press OK, then the list of GSD files in the folder will appear:

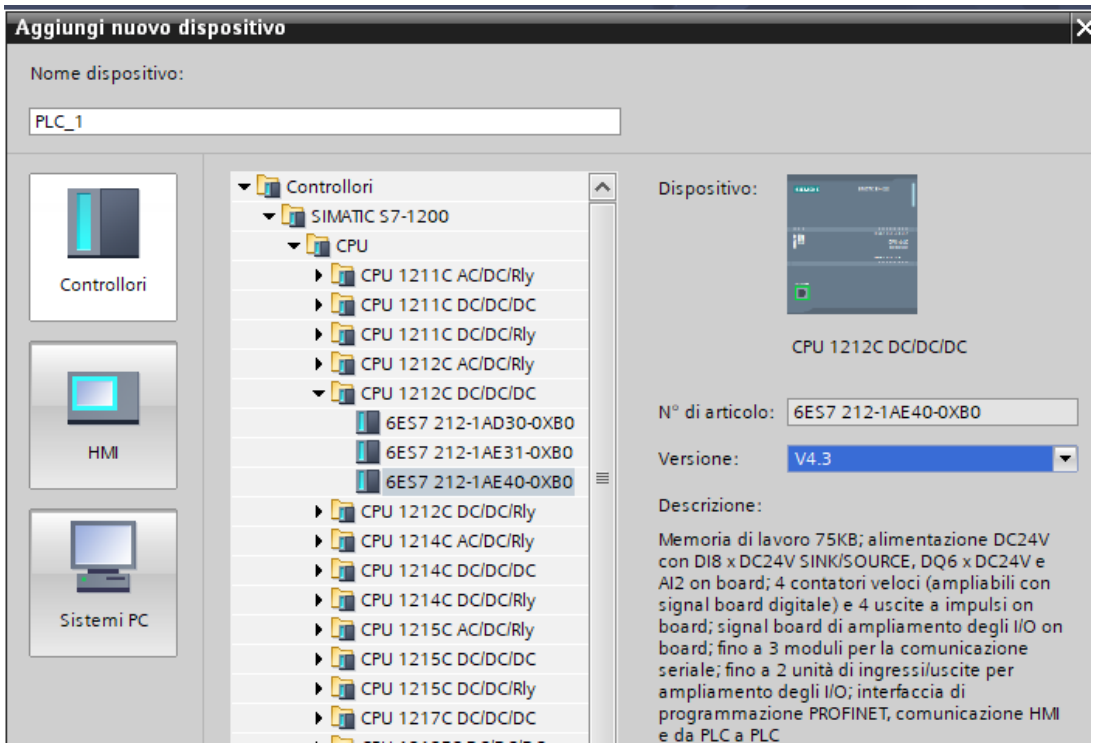
Then import the Seneca gsd file:



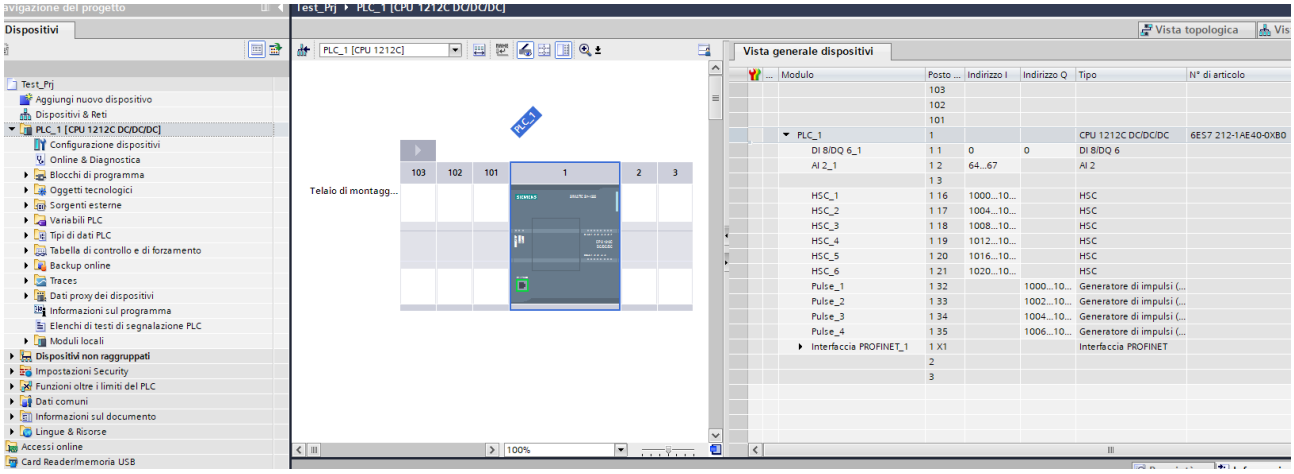
Press “install”.

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

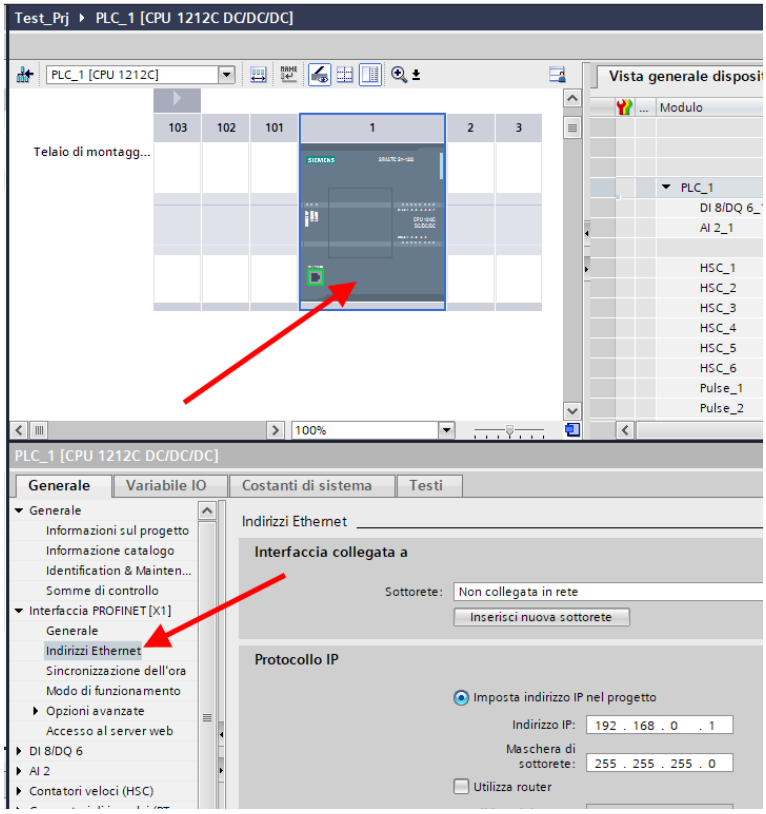




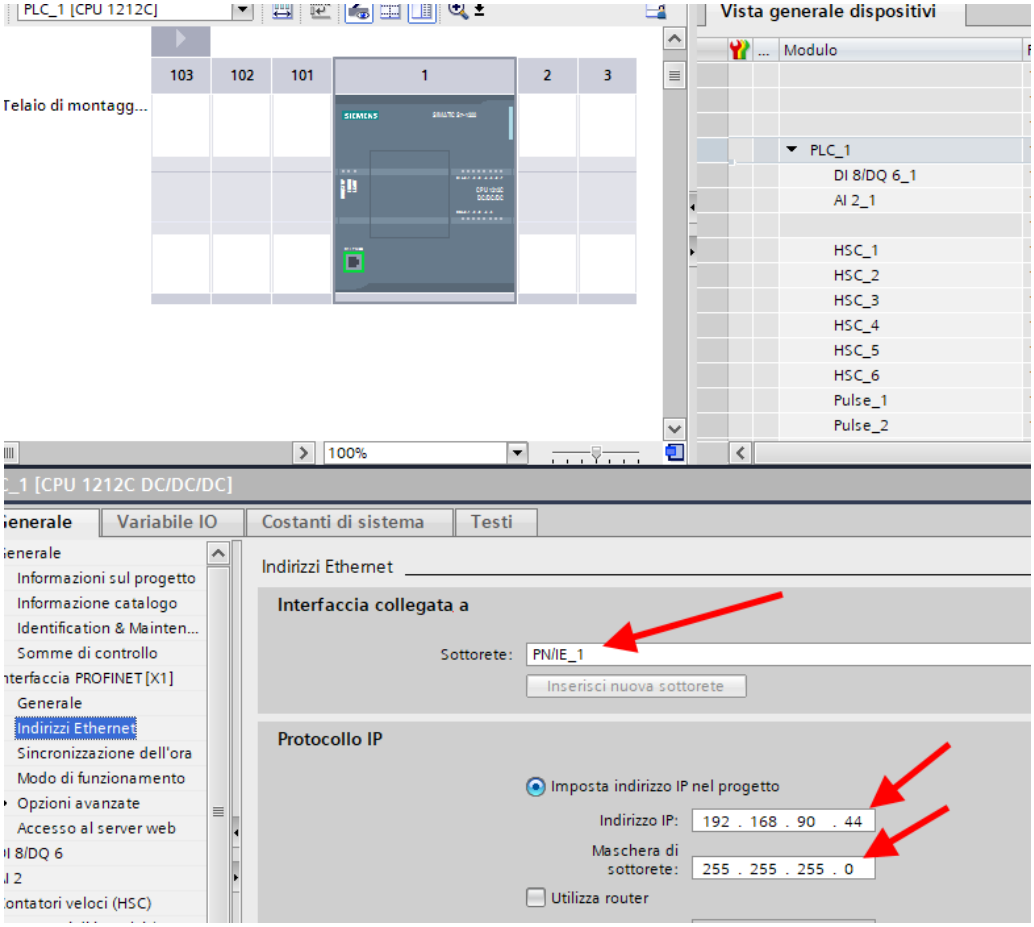
Confirm and the PLC will be added to the rack:



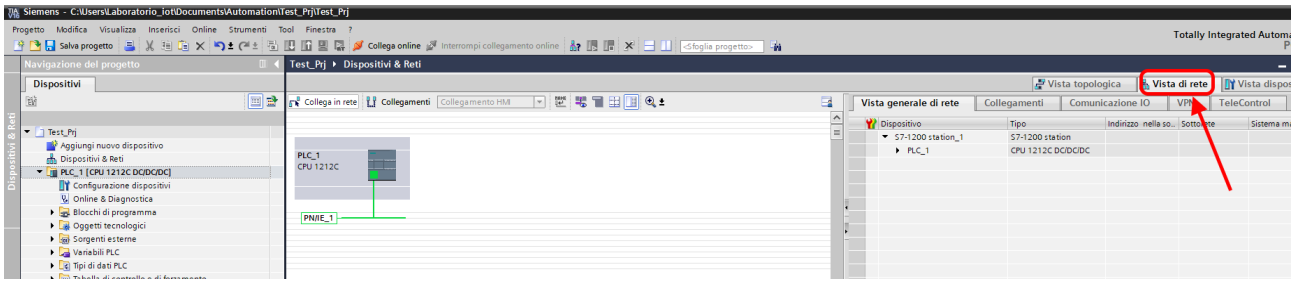
Now click on the PLC and select Profinet interface -> Ethernet addresses



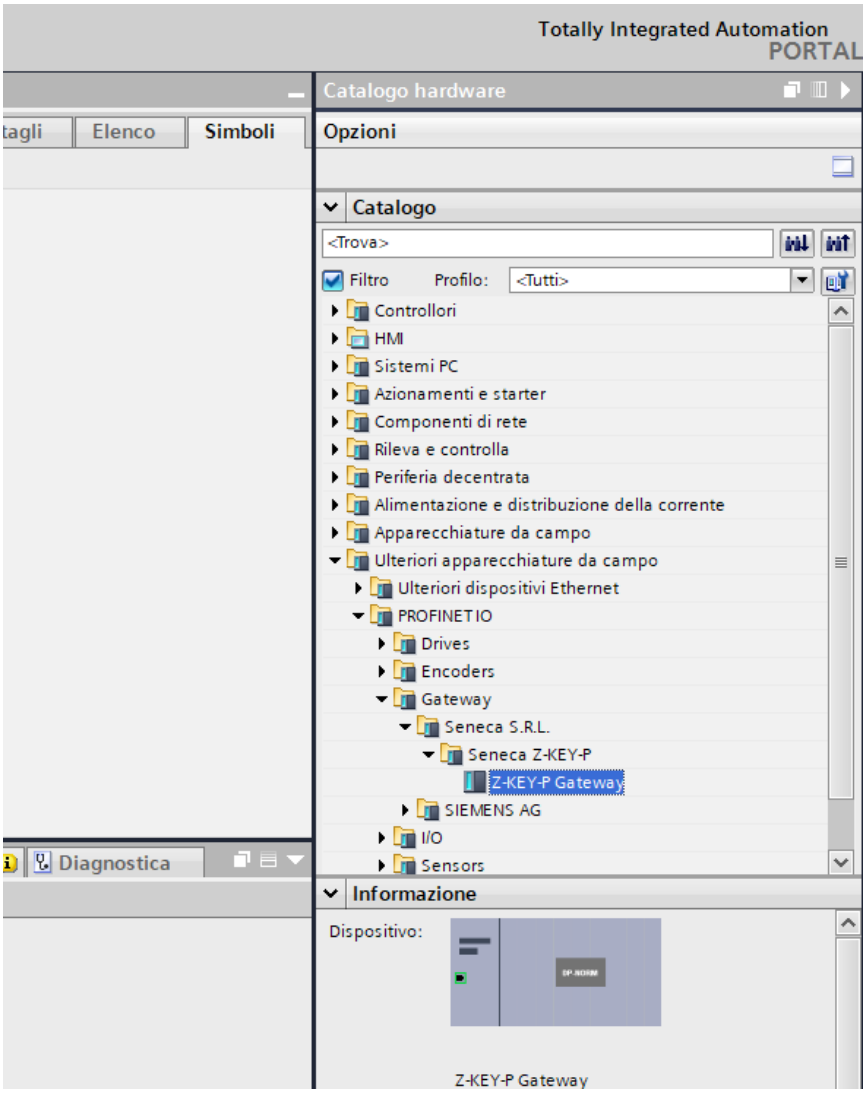
Set the IP you want for the PLC (in this case 192.168.90.44) and the PLC subnet:



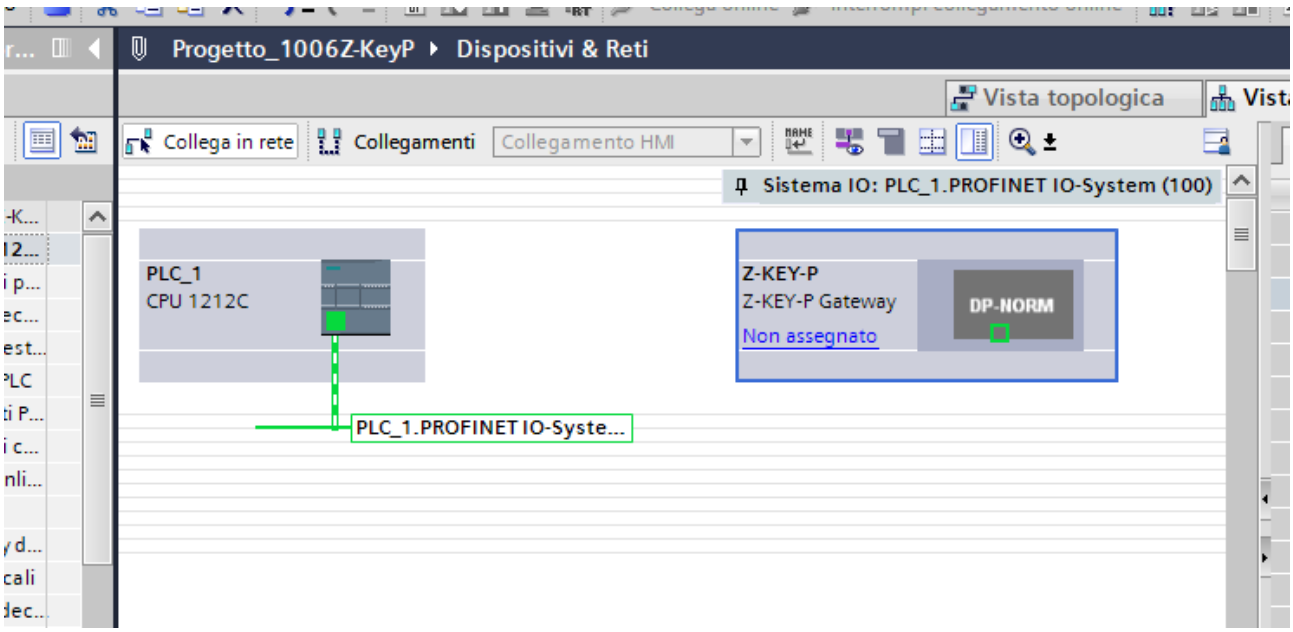
Move on to the network view:



On the right select "Hardware Catalogue" and then under "Additional Field Equipment" -> PROFINET IO -> GATEWAY -> Seneca SRL -> Z-KEY-P Gateway

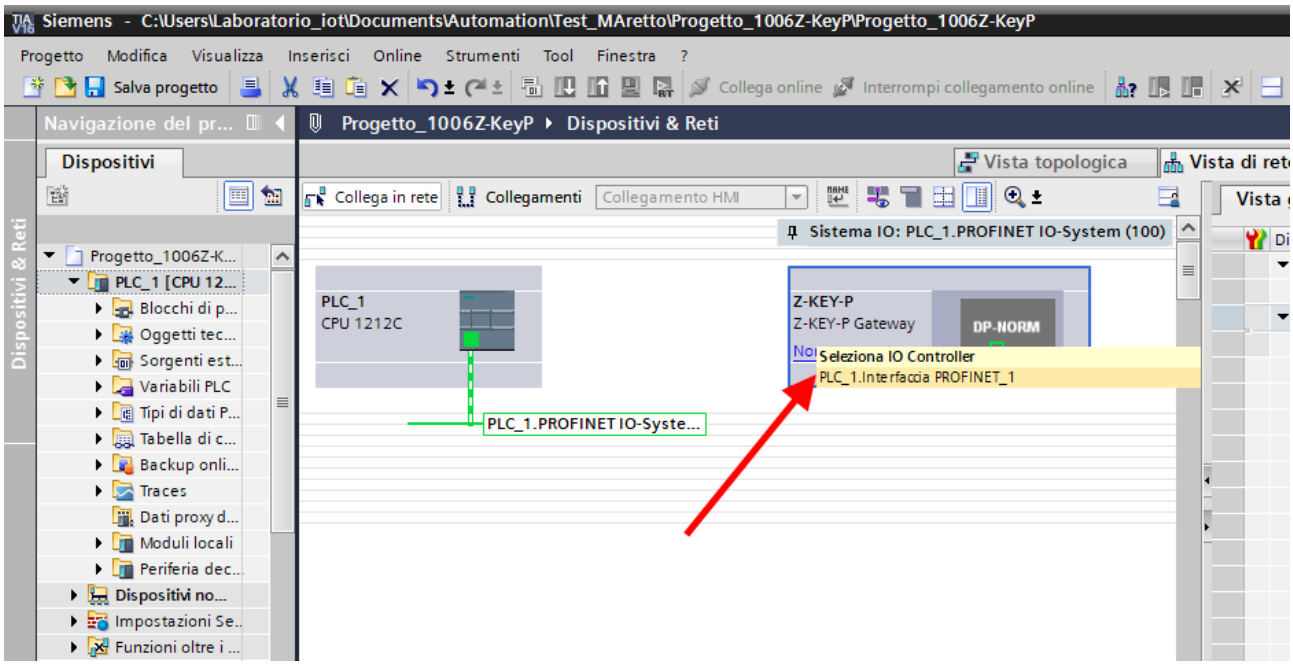


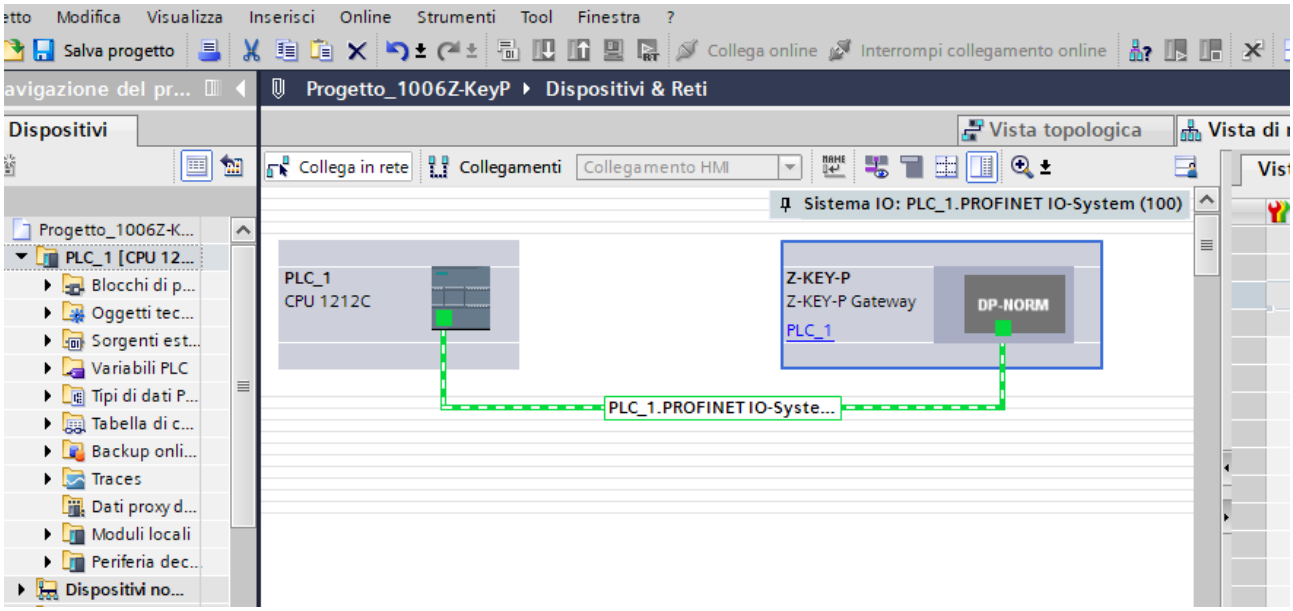
Drag the device to the network view:



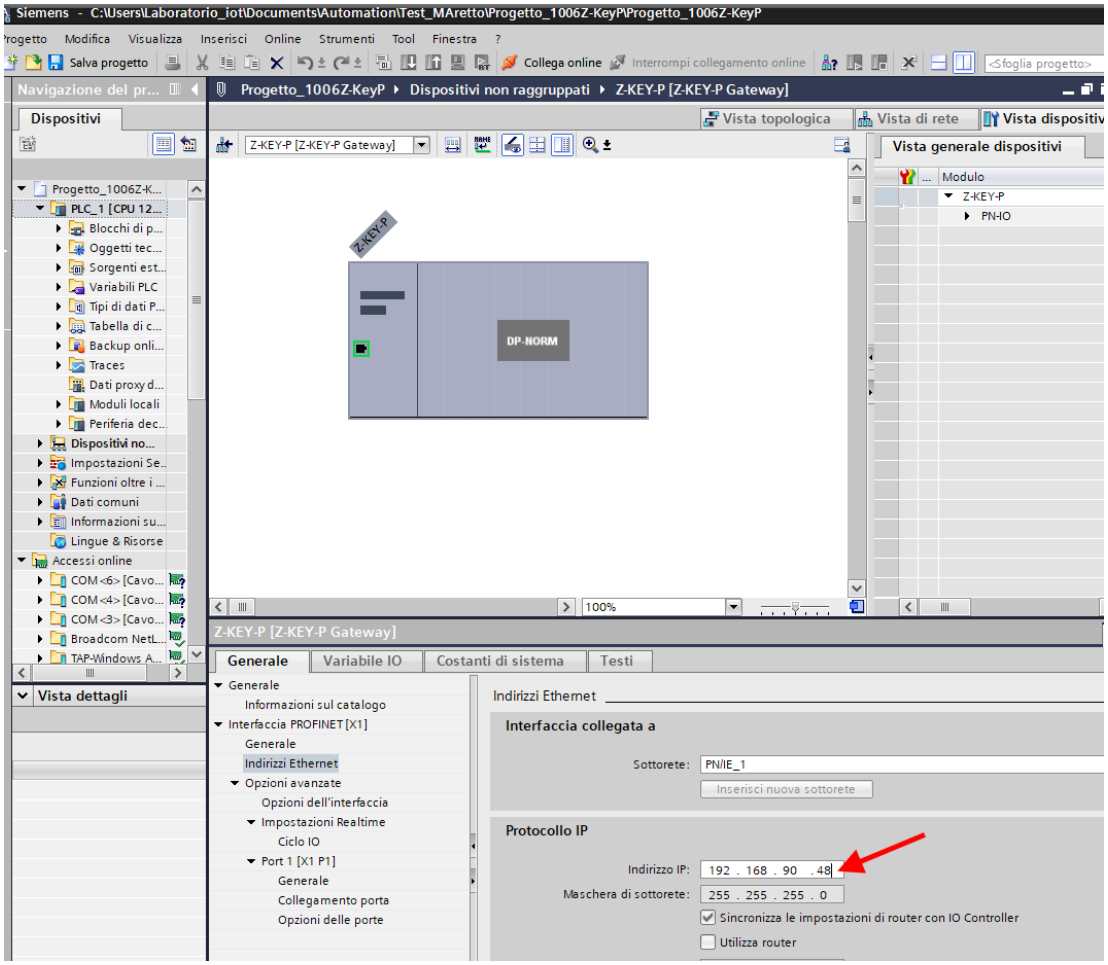
Now associate it with the PLC:

Click with the left mouse button on "Not assigned" and then select the PLC:

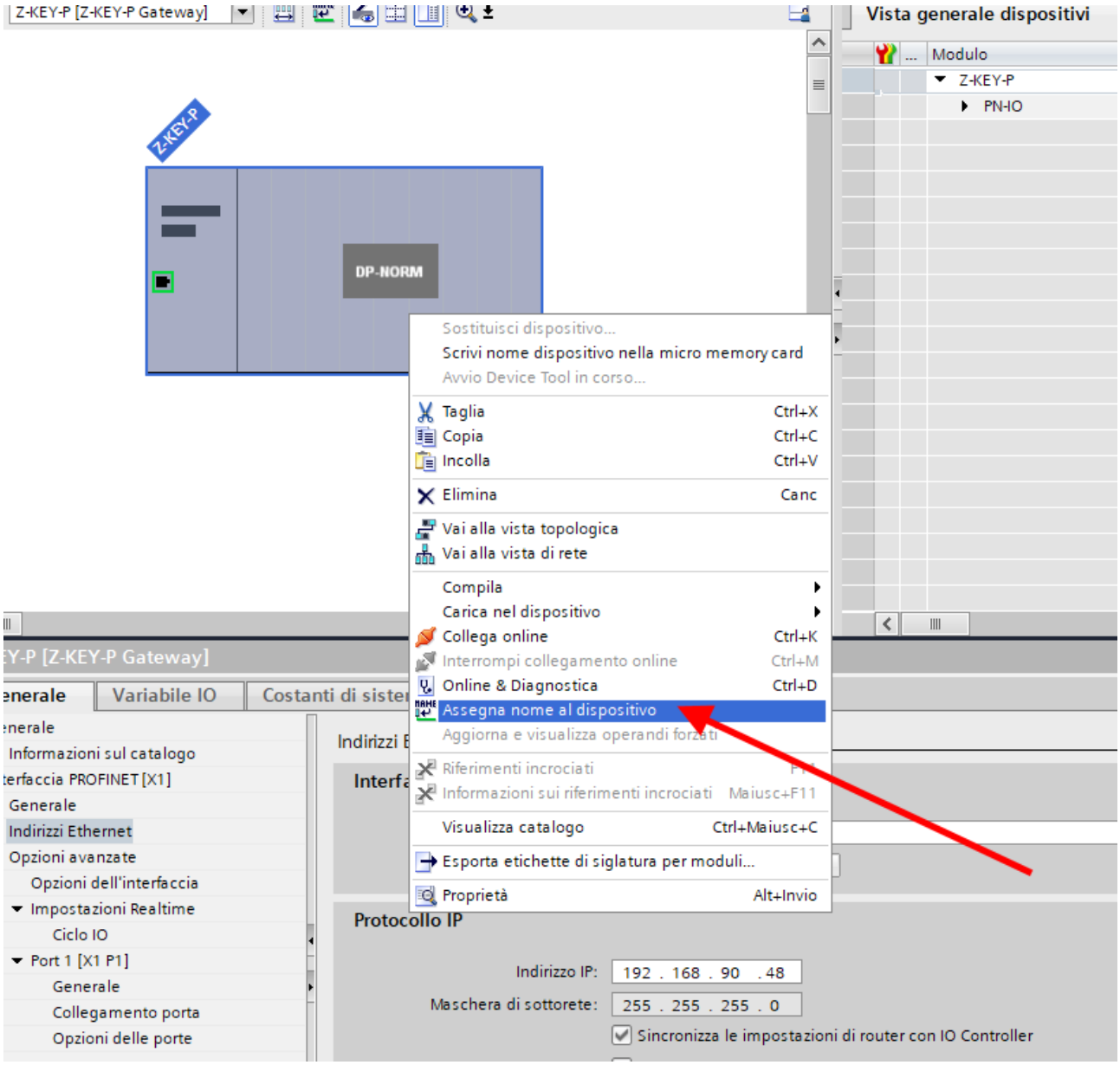




Click twice on the Seneca device and configure the IP address here too (for example 192.168.90.48):



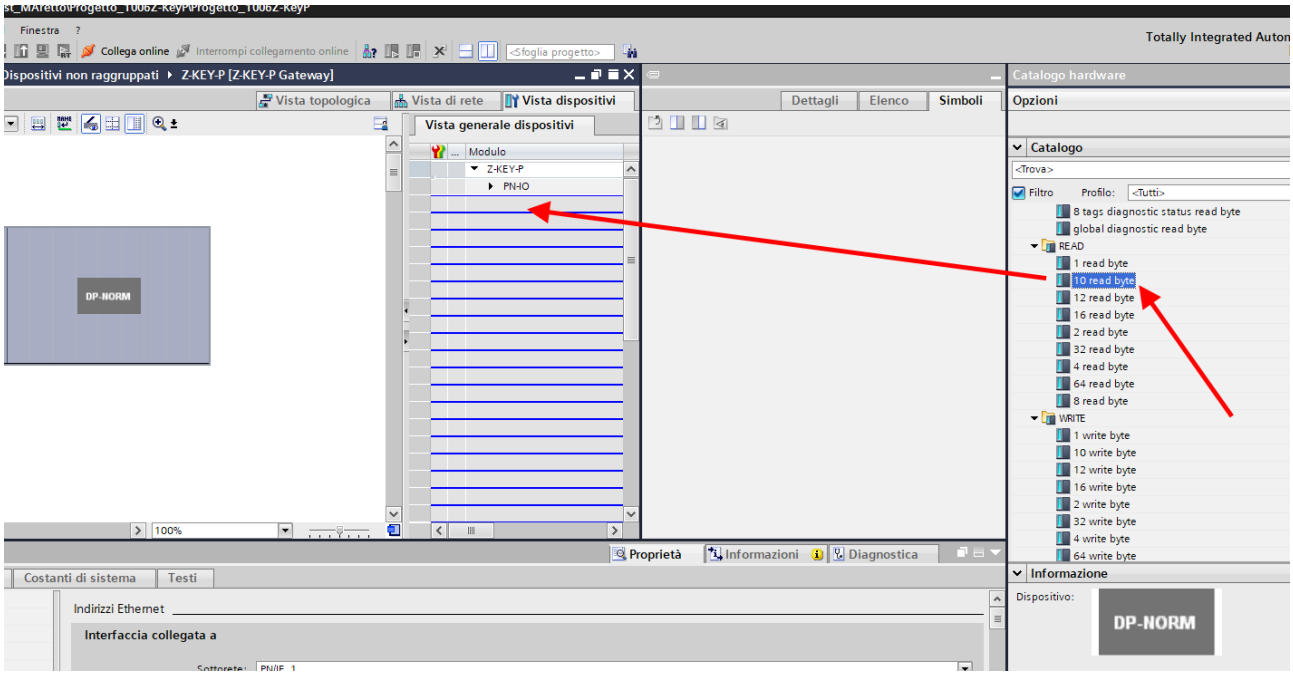
In Profinet the devices are identified by their name, so right click on the Seneca device and select "Assign device name"



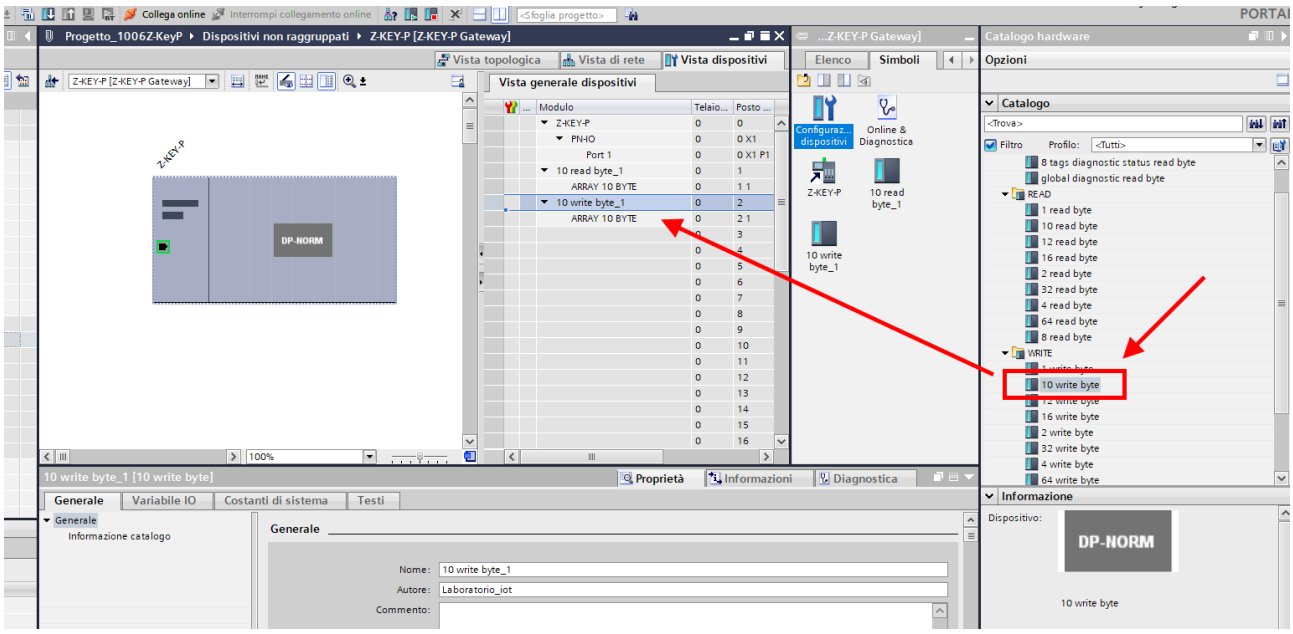
Scan the network with "Update list" and set (if necessary) the device name with "Assign name".

In our Modbus configuration we have 10 read only tags (the 10 inputs of the Z-10-D-IN) and 10 write tags (the 10 outputs of the Z-10-D-OUT).
Each boolean Tag in profinet is converted into a byte, so we will need 10 bytes to read for the Z-10-D-IN and 10 bytes to write for the Z-10-D-OUT.

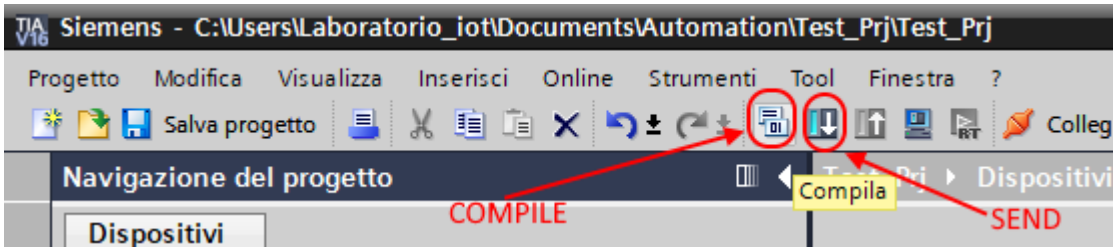
So drag a 10-byte array to read:



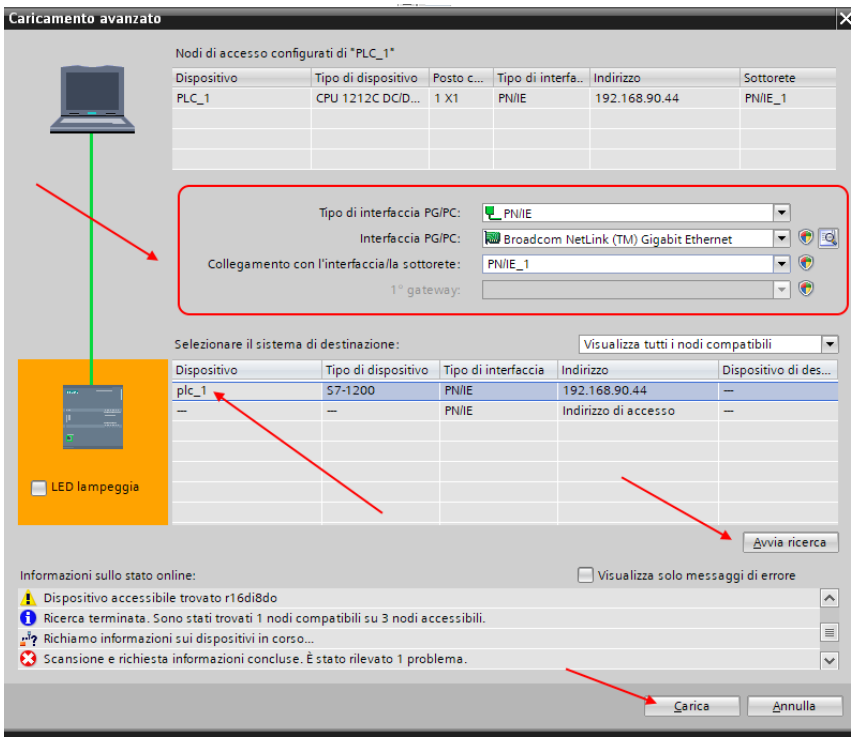
And 10 Bytes to write:



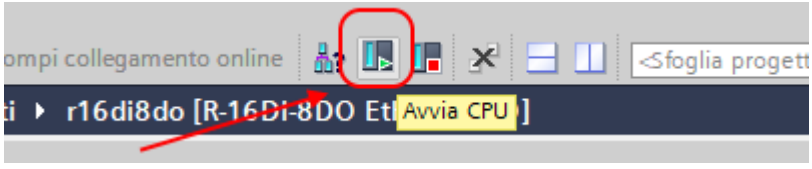
Now the devices are configured, all that remains is to compile and send the configuration to the PLC. The first icon compiles the second sends the project:



Before sending the project to the PLC select the Ethernet interface and start the search, select the PLC and press "Load".

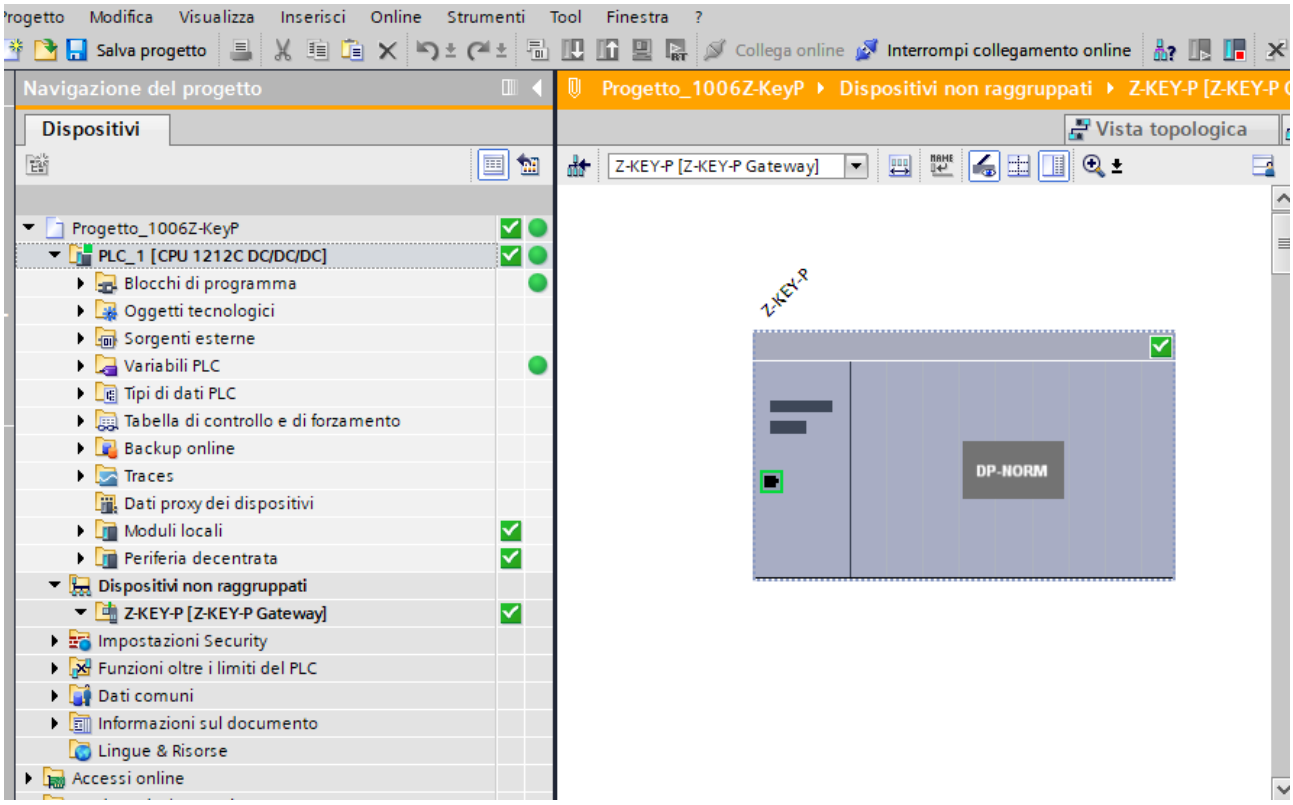


Once the project has been sent, RUN the PLC:



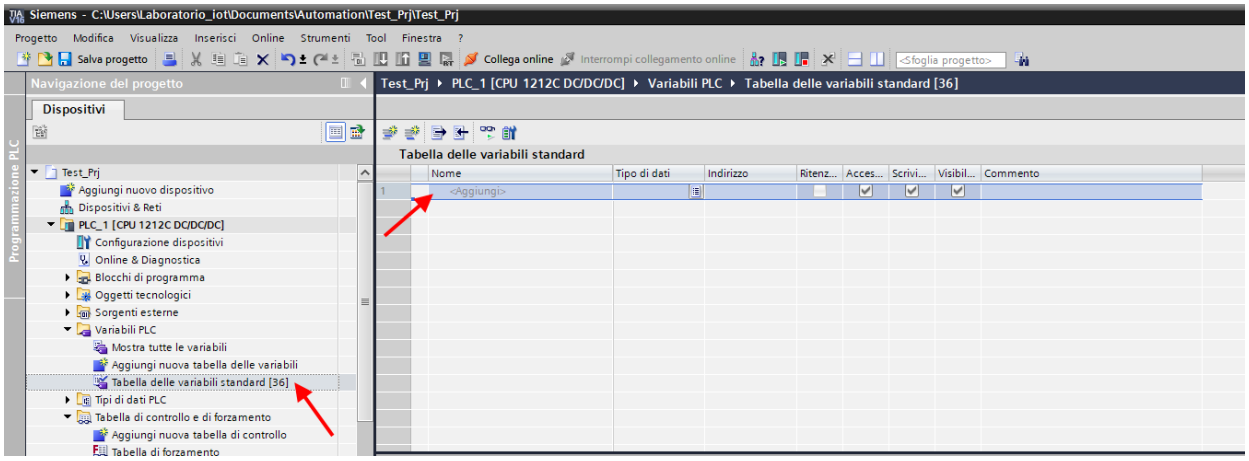
Go ON-Line so as to check if there are any errors:

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



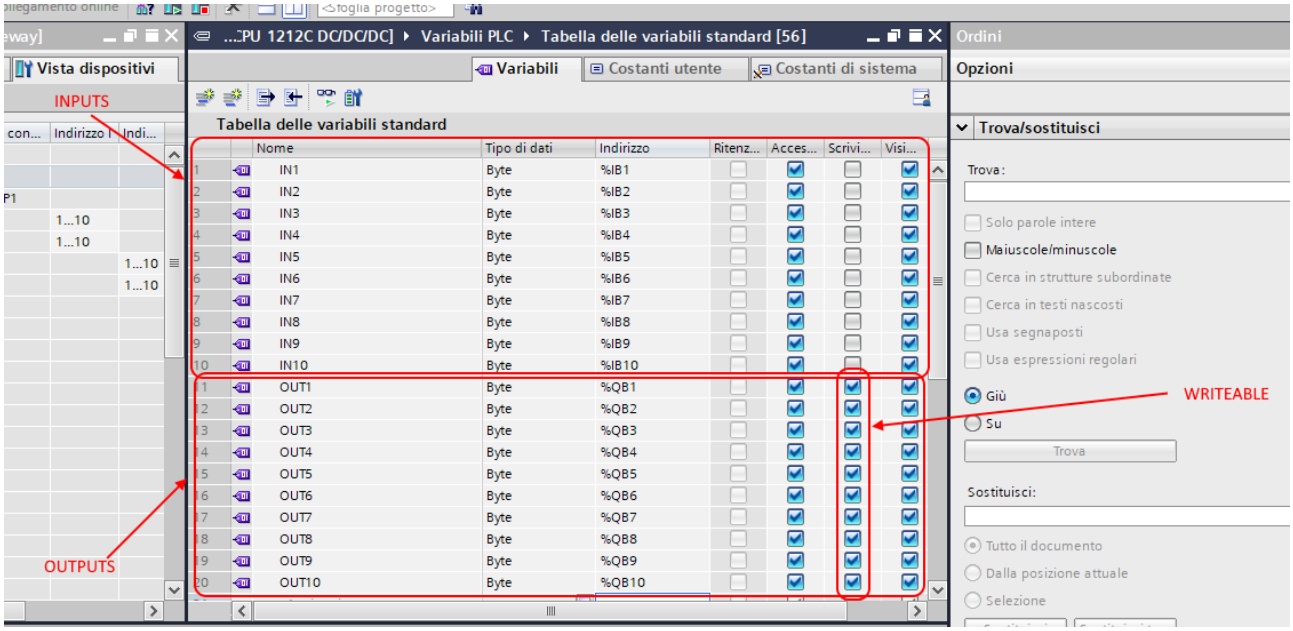
It is also possible to read and write the IO (for debugging purposes) directly from the TIA portal.

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



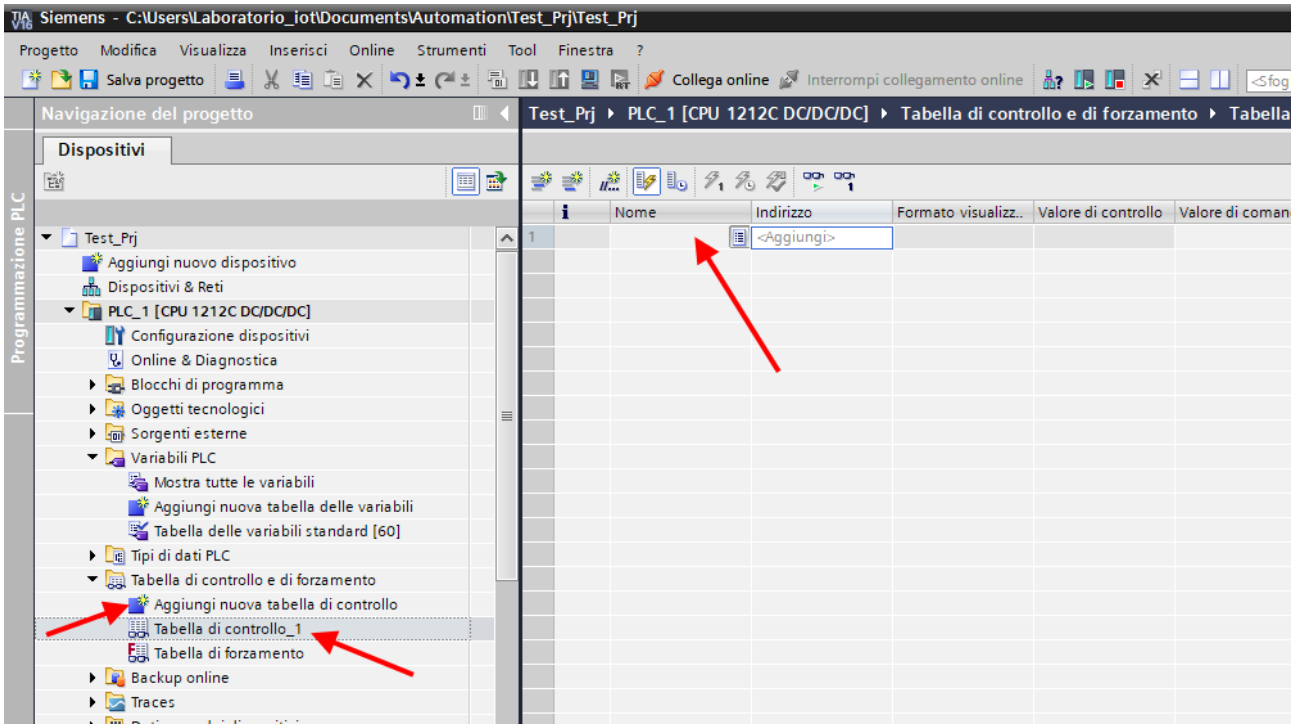
Add the variables related to the IO (10 digital inputs and 10 digital outputs). The addresses are written here:

Therefore the bytes from IB1 to IB10 contain the 10 inputs, the bytes from QB1 to QB10 the outputs. Define the following table by hand, set the output tags as writable:

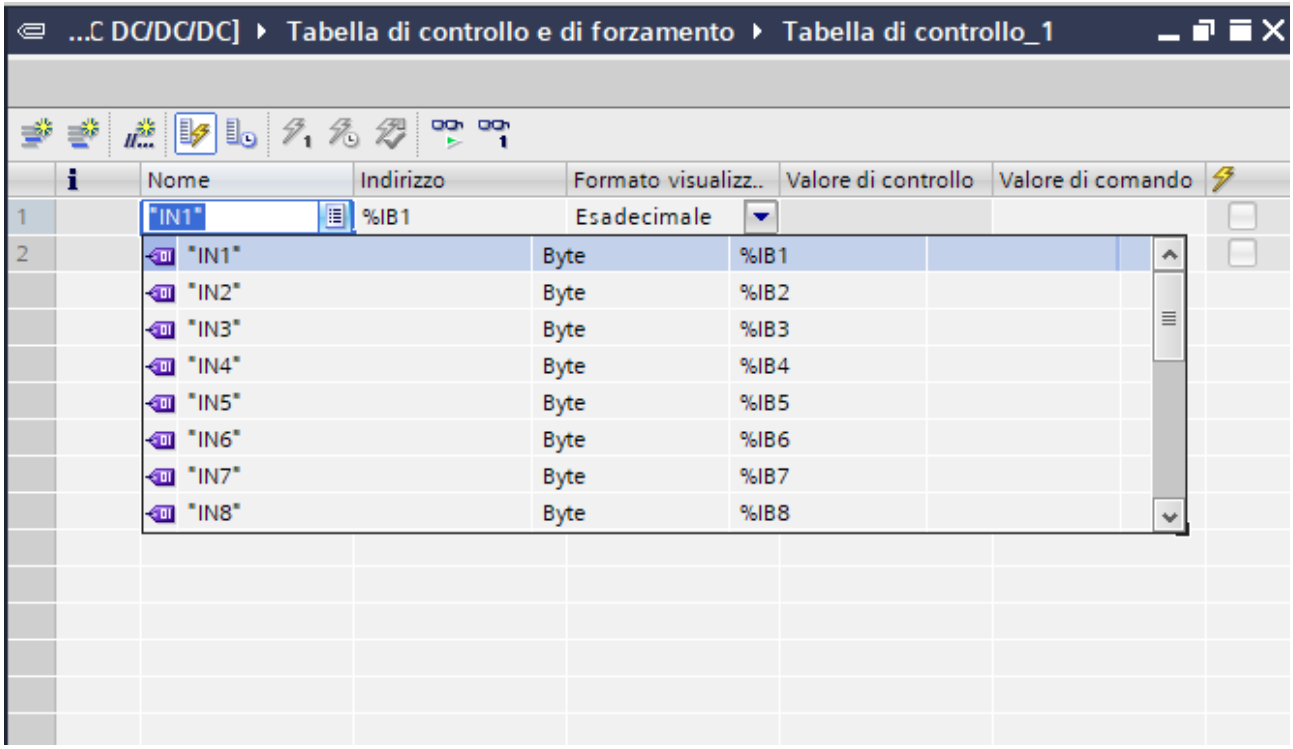


After this operation, define a new control table:

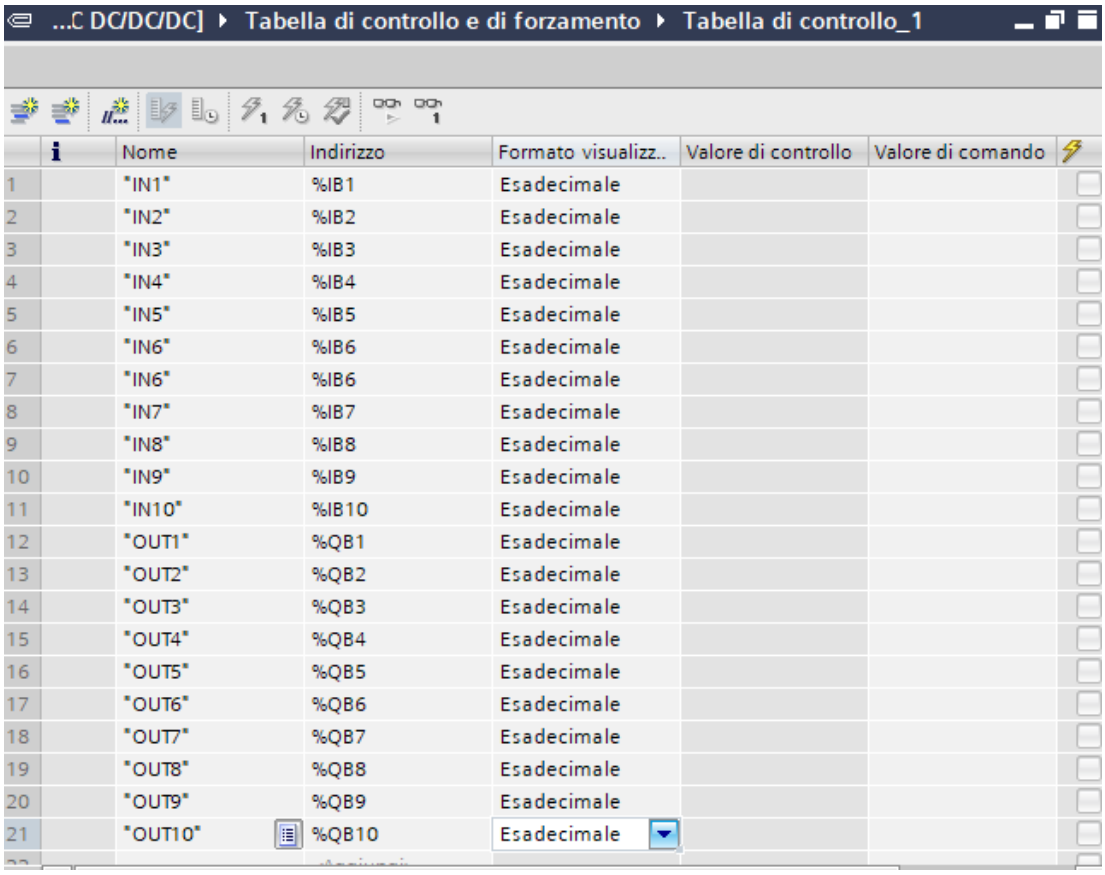
Click on "Add new control table" and then insert the variables



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

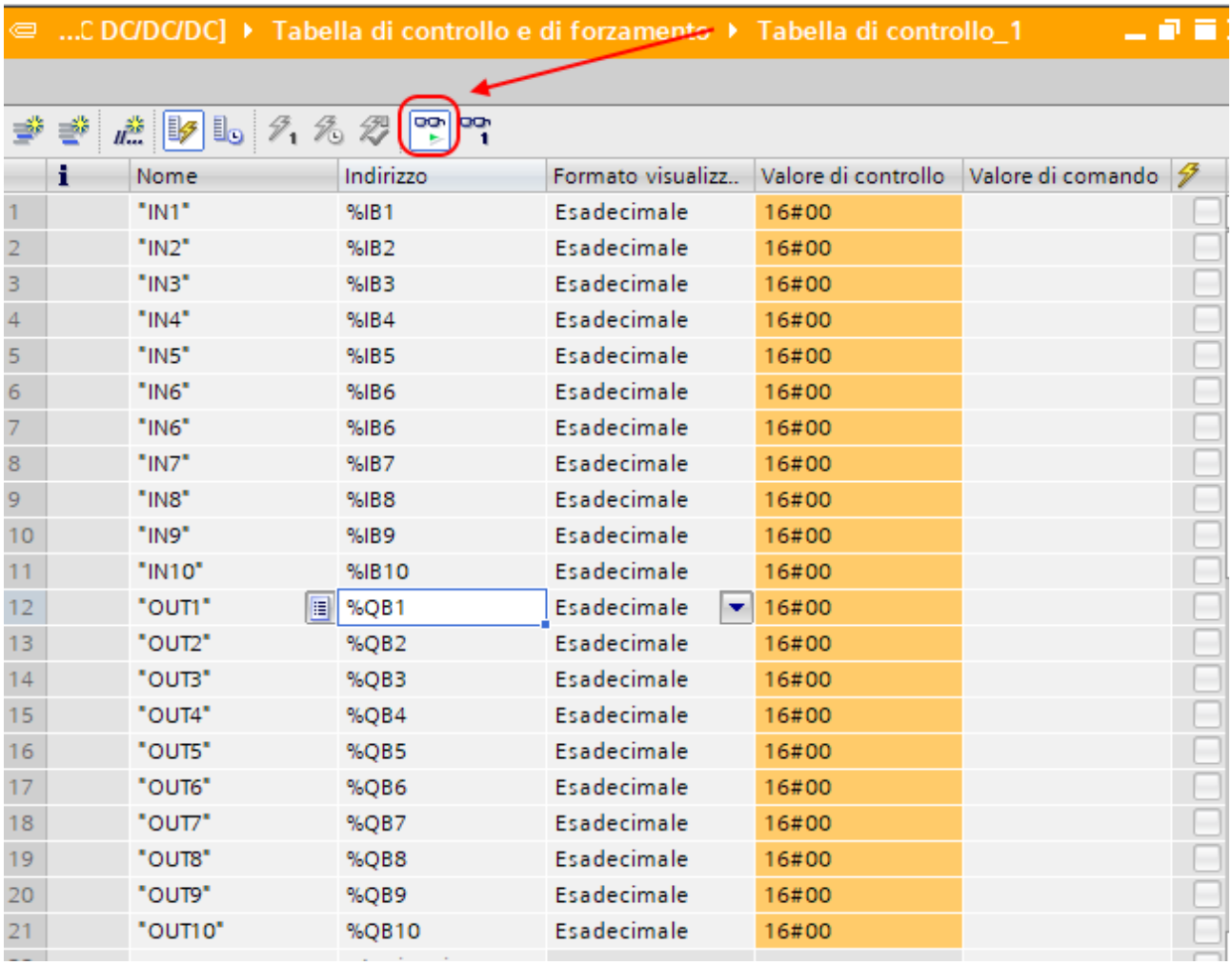


Once you have added all of them you will get:



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:



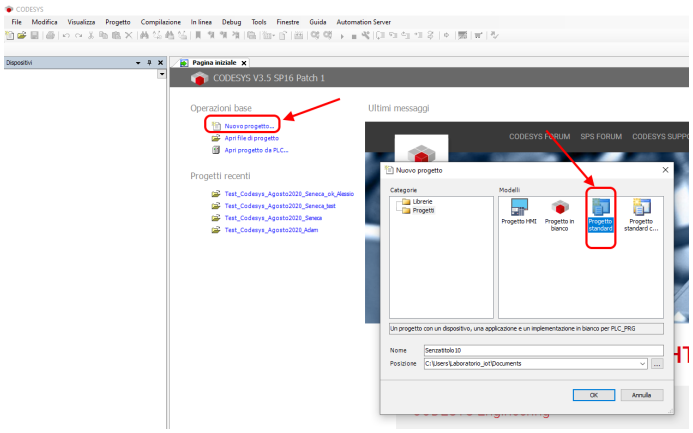
	Nome	Indirizzo	Formato visualizz..	Valore di controllo	Valore di comando
1	"IN1"	%IB1	Esadecimale	16#00	
2	"IN2"	%IB2	Esadecimale	16#00	
3	"IN3"	%IB3	Esadecimale	16#00	
4	"IN4"	%IB4	Esadecimale	16#00	
5	"IN5"	%IB5	Esadecimale	16#00	
6	"IN6"	%IB6	Esadecimale	16#00	
7	"IN6"	%IB6	Esadecimale	16#00	
8	"IN7"	%IB7	Esadecimale	16#00	
9	"IN8"	%IB8	Esadecimale	16#00	
10	"IN9"	%IB9	Esadecimale	16#00	
11	"IN10"	%IB10	Esadecimale	16#00	
12	"OUT1"	%QB1	Esadecimale	16#00	
13	"OUT2"	%QB2	Esadecimale	16#00	
14	"OUT3"	%QB3	Esadecimale	16#00	
15	"OUT4"	%QB4	Esadecimale	16#00	
16	"OUT5"	%QB5	Esadecimale	16#00	
17	"OUT6"	%QB6	Esadecimale	16#00	
18	"OUT7"	%QB7	Esadecimale	16#00	
19	"OUT8"	%QB8	Esadecimale	16#00	
20	"OUT9"	%QB9	Esadecimale	16#00	
21	"OUT10"	%QB10	Esadecimale	16#00	

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

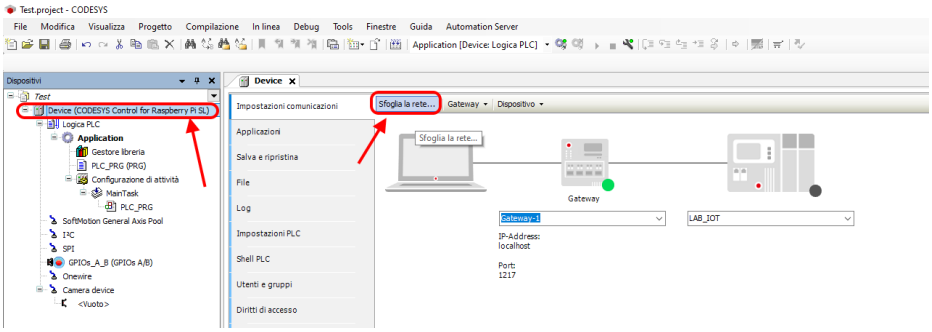
To control the outputs, it is necessary to enter 1 or 0 in the "Command value" column and then press the icon with the lightning bolt to order the writing.

9.2. STEP-BY-STEP CONFIGURATION EXAMPLE WITH A CODESYS™ 3.5 PLC

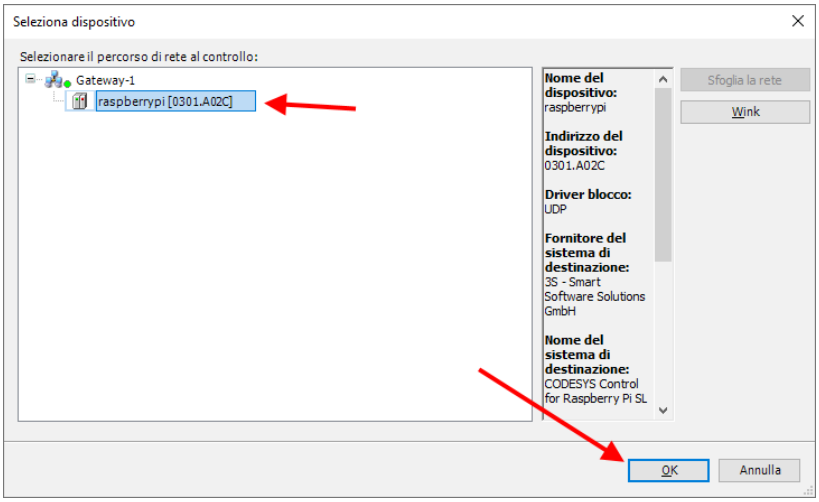
In Codesys, create a new standard project:



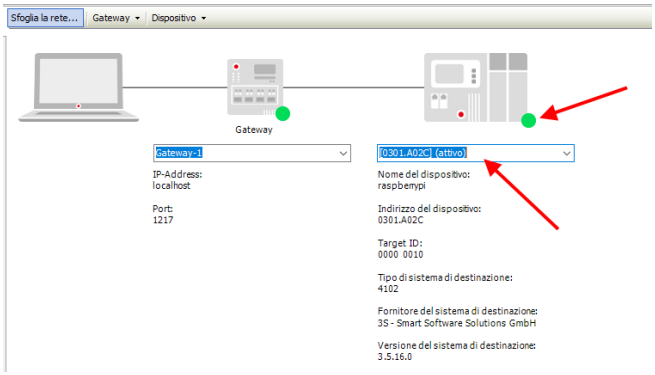
Configure the PLC by selecting it in the tree on the left and then browsing the network:



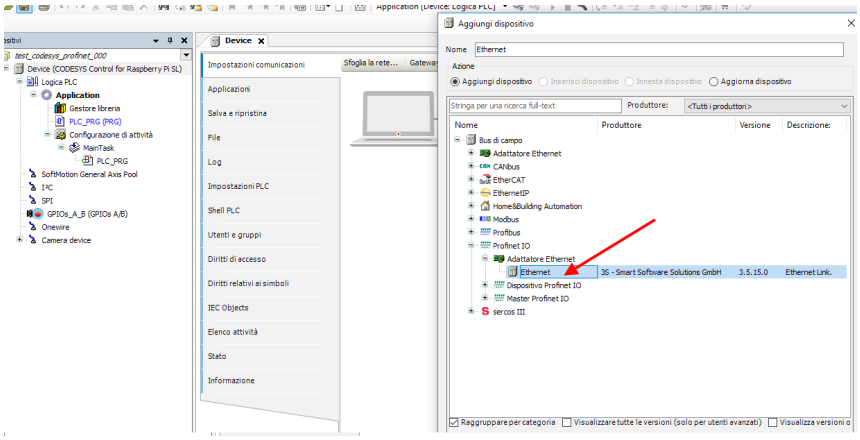
Select the PLC after scanning the network:



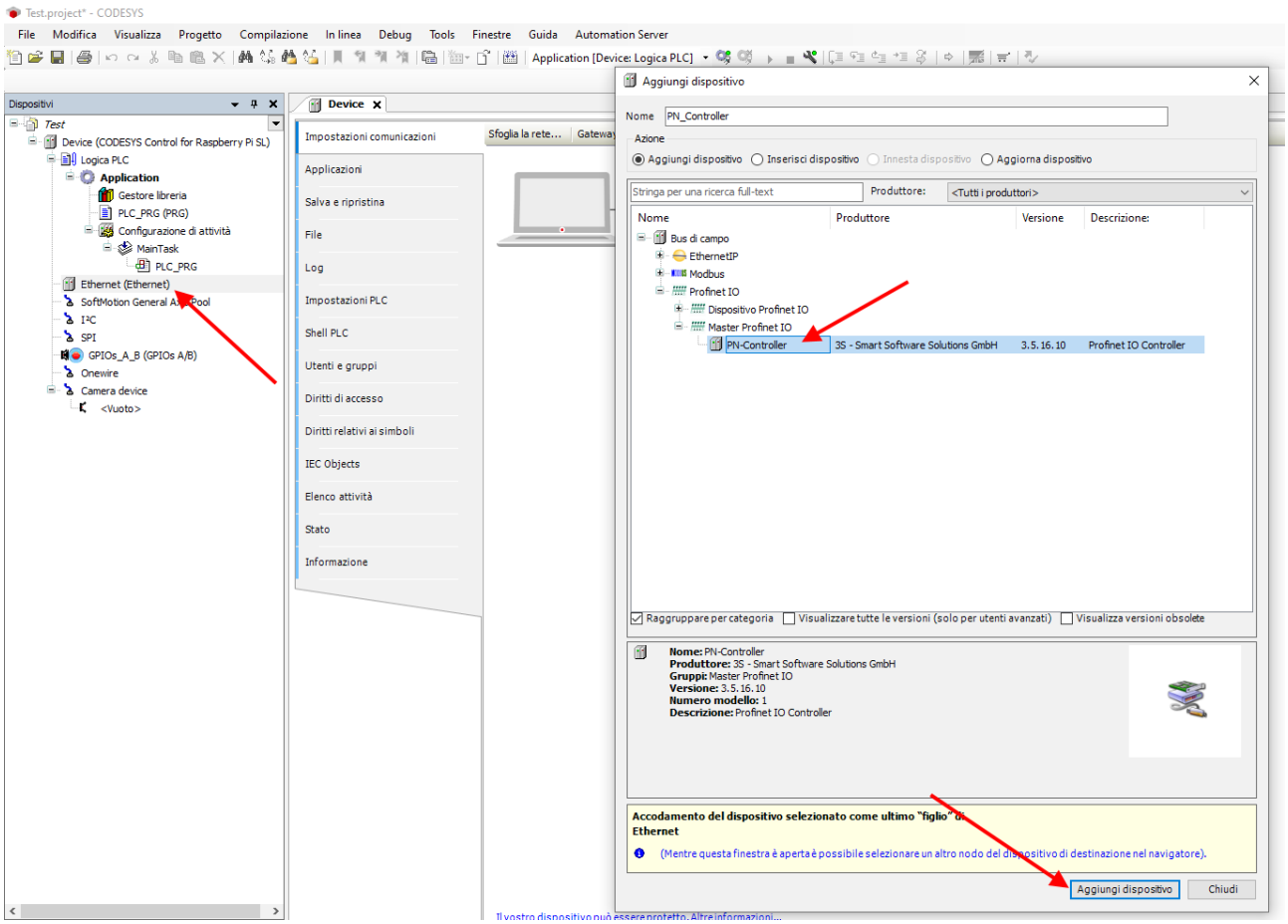
The PLC is now connected to the system:



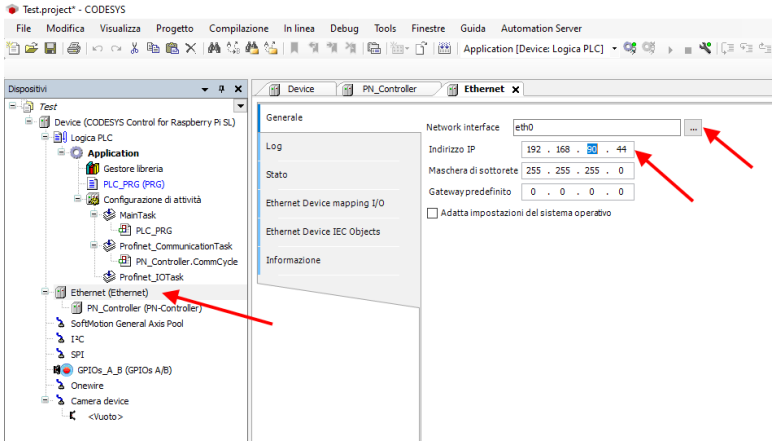
Now that the PLC has been detected, move on to insert a profinet port on standard Ethernet:
Right click on device and "add device":



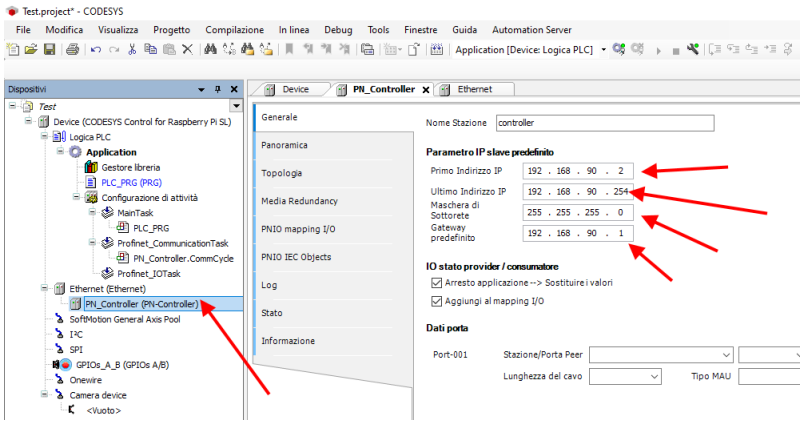
Then add the Profinet IO Master:



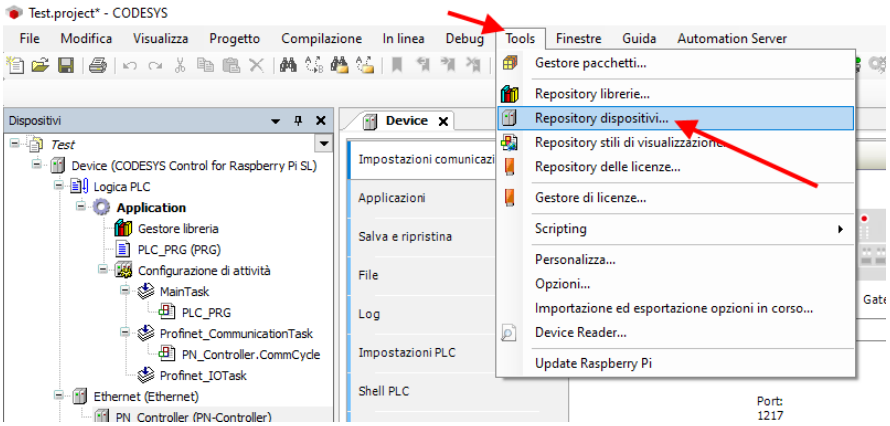
Double click on Ethernet, set the Ethernet port and the IP address of the PLC (in this case use 192.168.90.44):



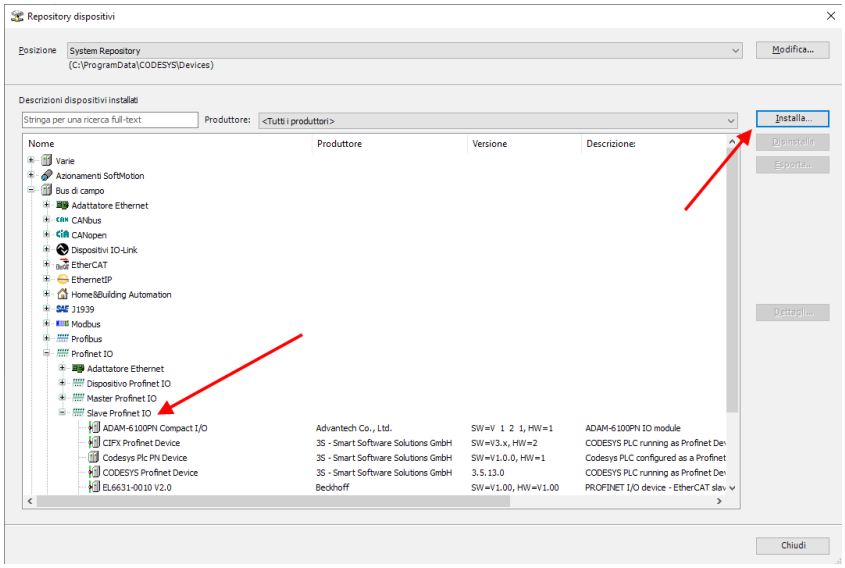
Set also the address range for the Profinet peripheral, double click on PN_Controller:



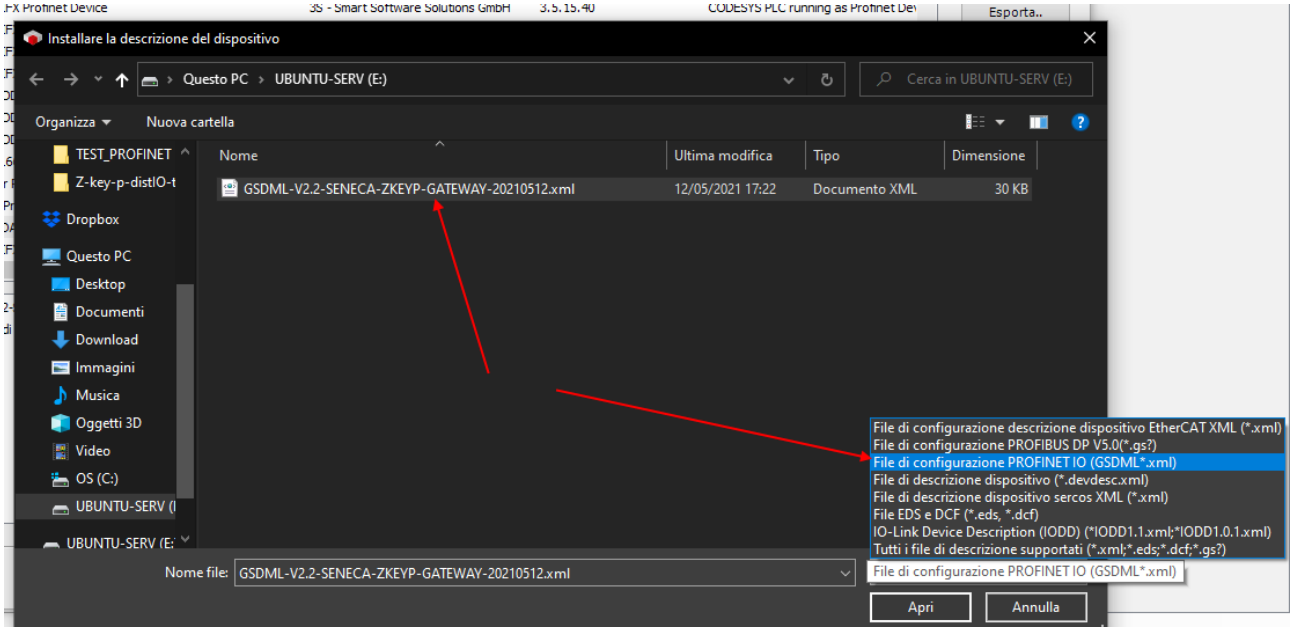
Now you need to connect the Seneca slave device PROFINET IO to the profinet master (controller).
First install the GSD file of the Seneca IO.
Select Tools->Device Repository:



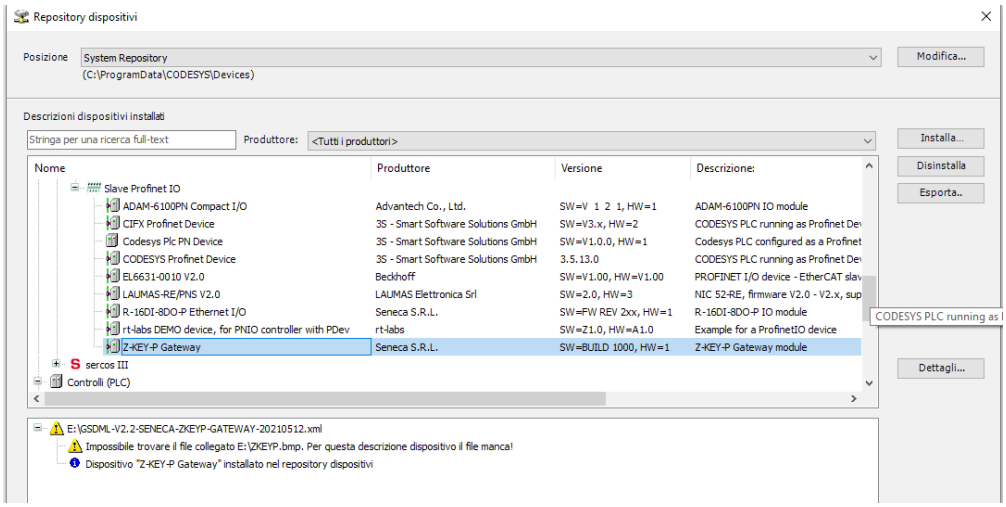
Now import the GSD file selecting Profinet IO Slave:



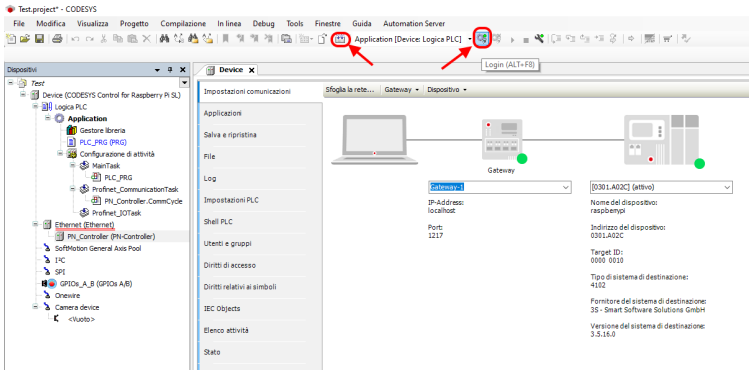
Press “Install”:



Now point to the correct folder and press OK.
Select the file type as GSDML “PROFINET IO configuration file”.
Codesys has now added the GSD file correctly.

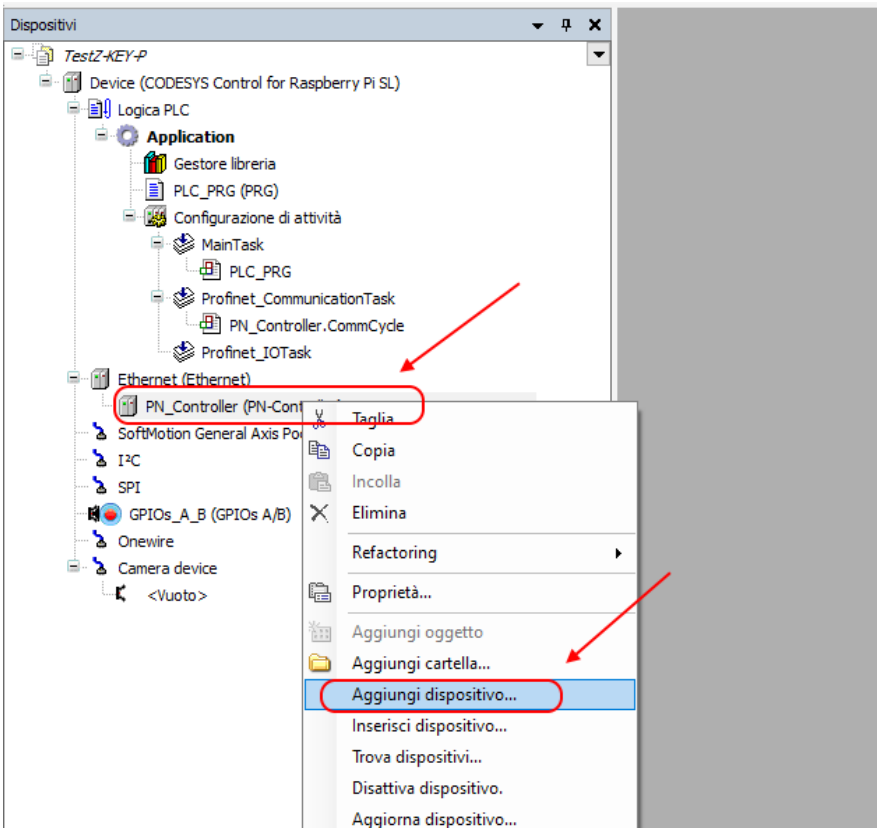


First compile the project and log in to the PLC:

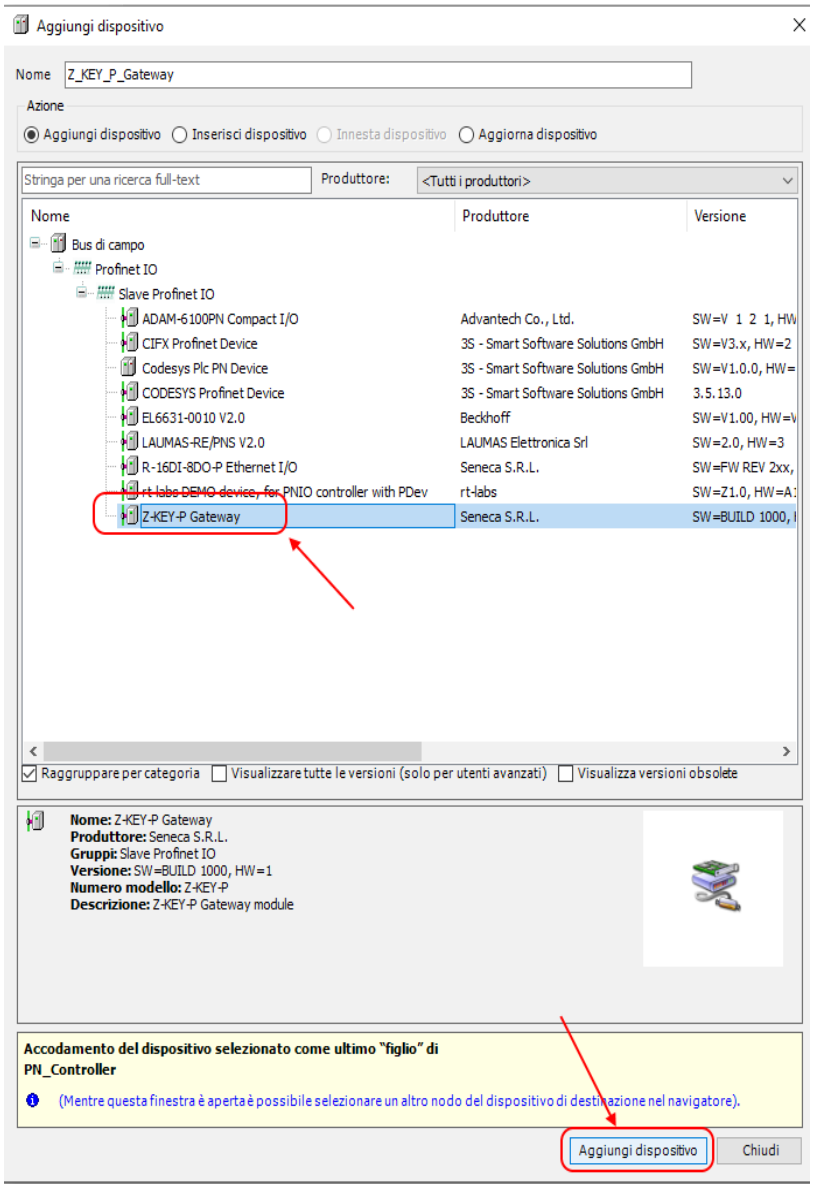


Now we have verified the correct functioning of the connection with the PLC.

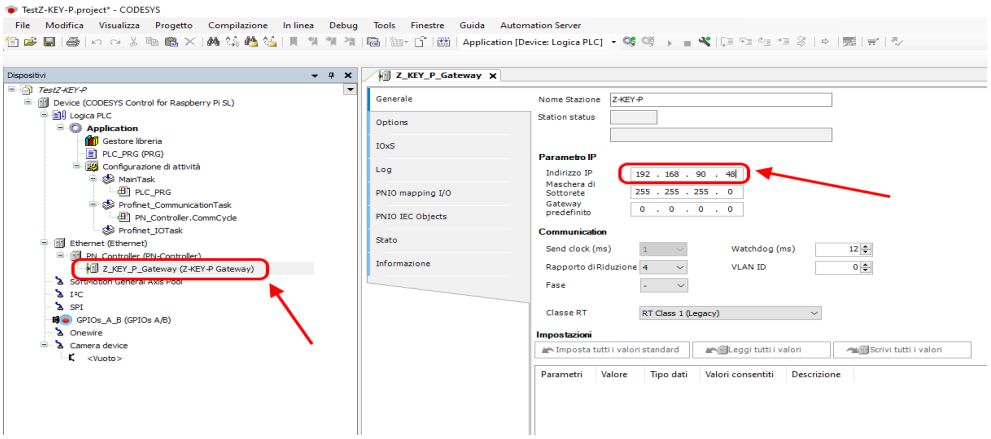
At this point add the Z-KEY-P device, right click under PN-Controller and choose Add Device:



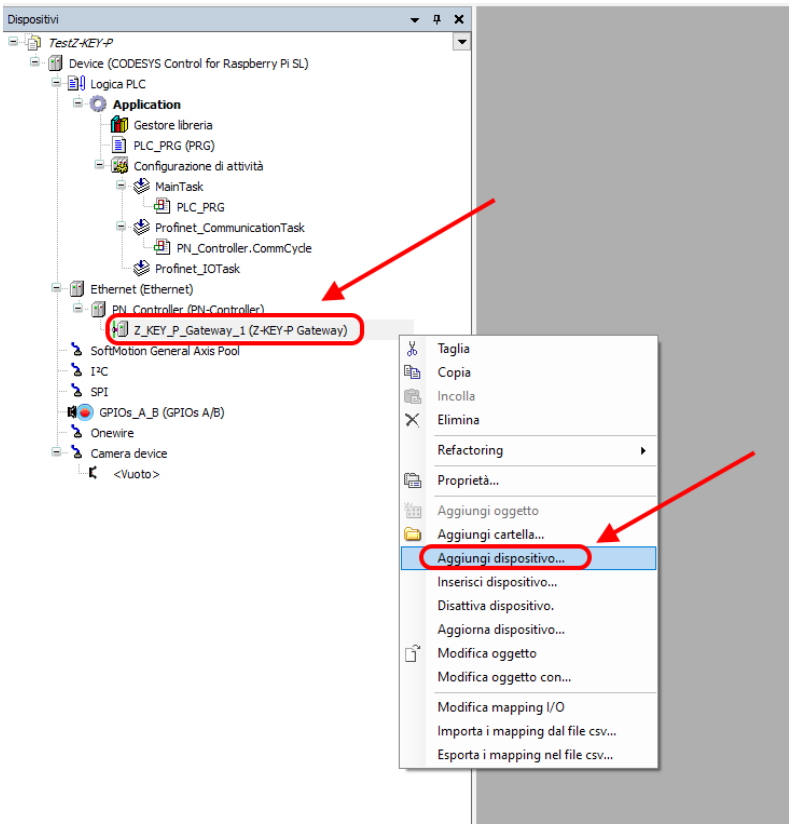
Then select the Z-KEY-P and press "Add Device":



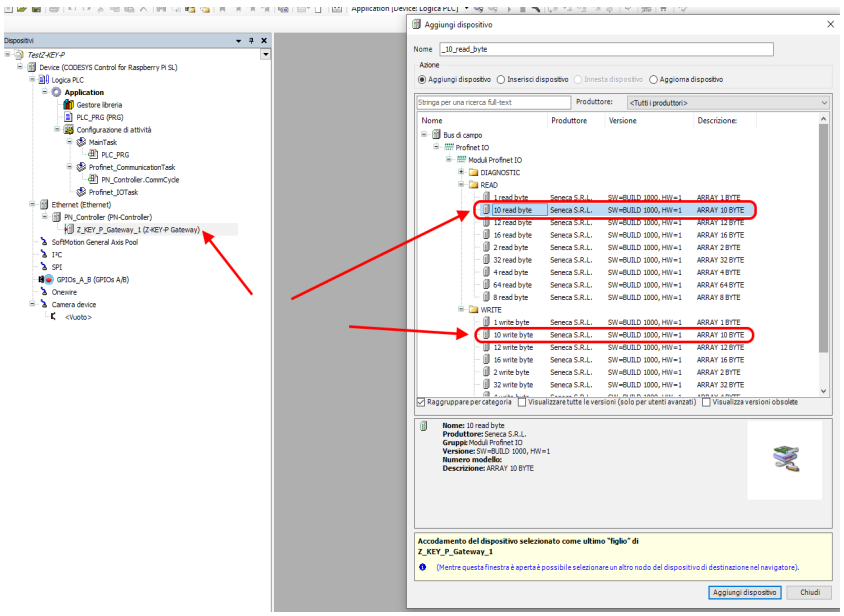
Click on the Z-KEY-P device and configure the ip address:

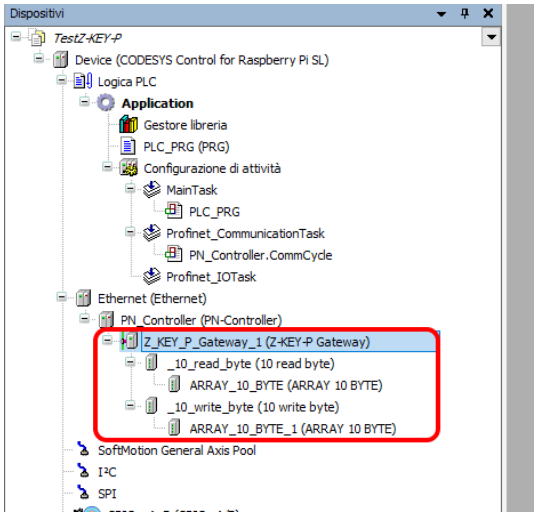


Now insert the configuration (10 bytes of reading for the Z-10-D-IN and 10 bytes of writing for the Z-10-D-OUT):
Right click on Z-KEY-P and select "Add device":

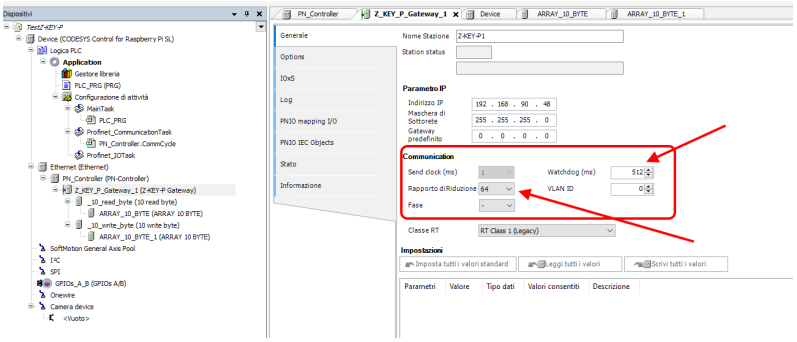


Add the 10 read bytes and the 10 write bytes:

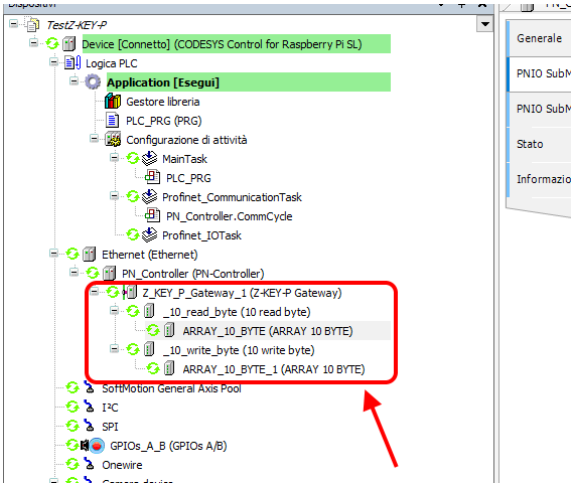




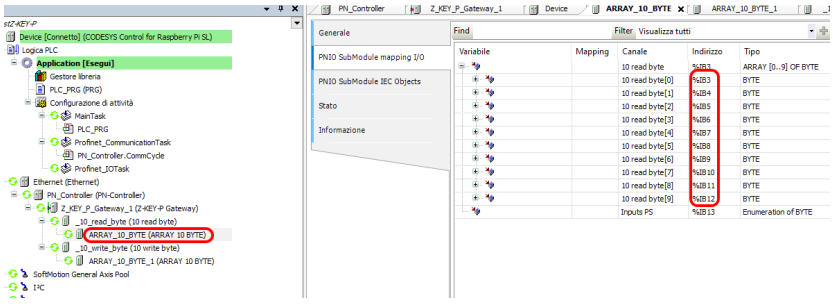
The PLC (Raspberry-pi) is quite slow and not real time, consequently it cannot manage the profinet at maximum speed so we modify the values by setting safety parameters:



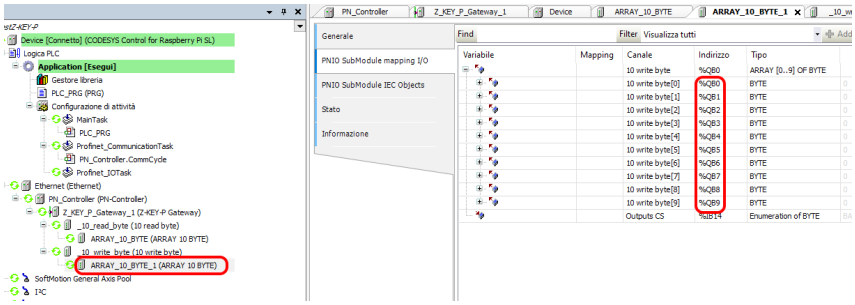
Check that everything is correct by compiling and running the PLC.



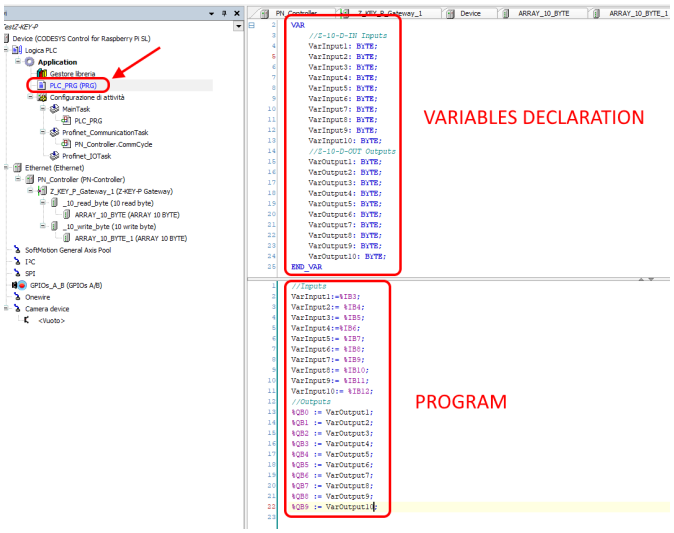
Now see how it is possible to read and write the Modbus IO from IO Profinet.
To write and read the status of the IO you have to insert a few code lines under PRG.
In the program, read the inputs from the %IB3 address to the %IB12 address as it is obtained from here:



And write in the address from %QB0 to %QB9 as it is obtained from here:

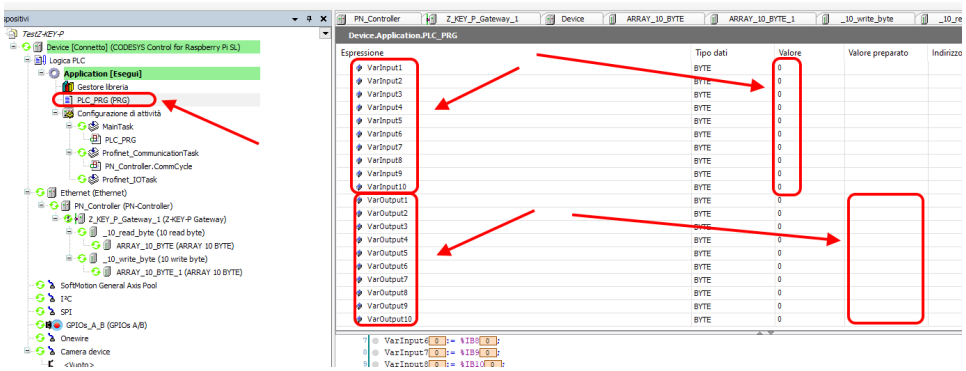


Declare an 8-bit variable (Byte) for each of the 10 inputs and a bit variable (Byte) for each of the 10 outputs.
In the program, instead, read the inputs from% IB3 to% IB12 and write the outputs from% QB0 to% QB9:

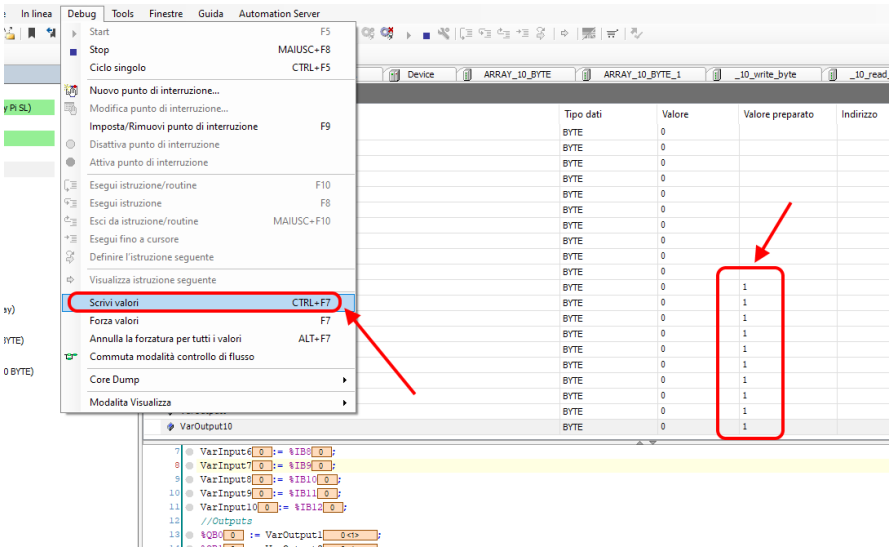


Go into login and start.

The value of the inputs/outputs can be read here:



while to write the outputs you just need to set the value in the bytes in the "prepared value" column. For example, set all the outputs to 1, then confirm on Debug → Write values:

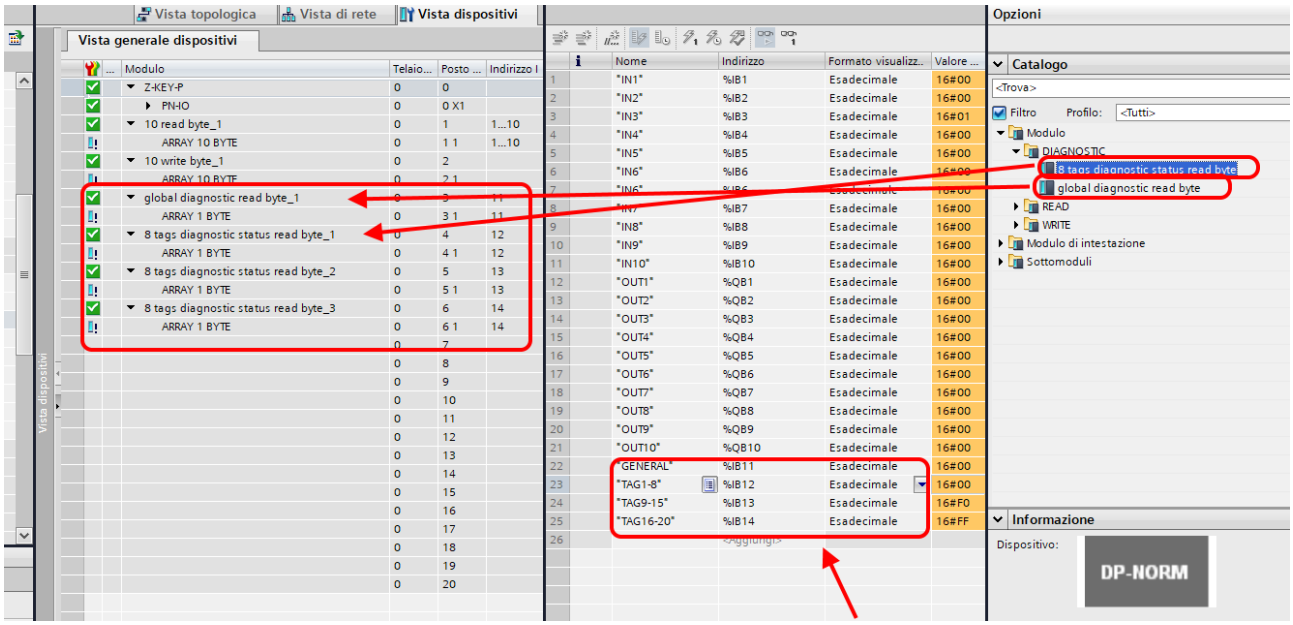


And then with "Write values" all the outputs of the Z-10-D-OUT are activated.

10. MODBUS DIAGNOSTICS

The diagnostics management takes the timeout or exceptions to the Modbus requests of the tags into account. Z-KEY-P will introduce the OK status (0x35) or the FAIL status (0x15) in the “data status” field of the Profinet packets if at least one tag is in FAIL status.

There are also specific Bytes to obtain the status of the Modbus communication from Profinet so that the PLC can possibly perform some specific operations in case of fail.
If at least one ModBUS tag is in fail the "Global diagnostic" byte goes to 1, if all the tags are read correctly the byte goes to 0.



It is also possible to obtain the status of the individual tags using the "8 tags Diagnostic read byte" bytes.
Each bit represents the status of a tag, where the first byte represents the first 8 tags, the second the other 8 etc.

If the bit is:
0 -> TAG OK
1 -> TAG FAIL

Having a maximum of 20 Slots available, it is not possible to obtain the diagnostics of each single tag on all 500.

11. RESETTING THE DEVICE TO ITS FACTORY CONFIGURATION

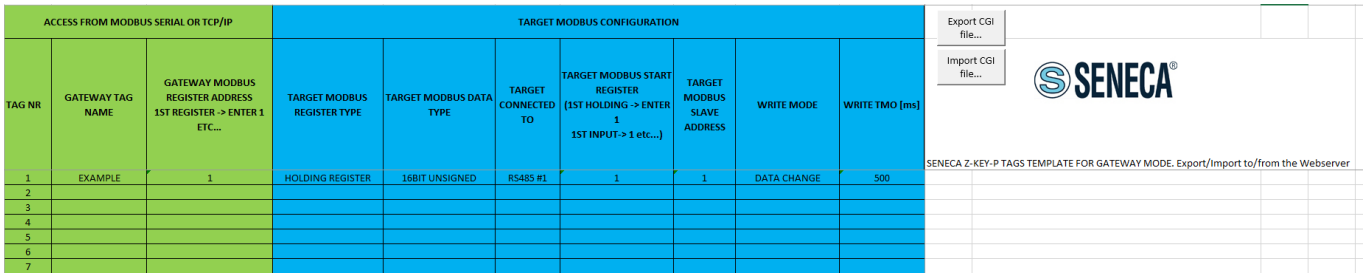
The factory configuration removes all configured tags and resets all parameters to default.

To reset the device to the factory configuration it is necessary to follow the procedure below:

1) Remove power from the device
2) Set all DIP switches to ON
3) Power up the device and wait at least 10 seconds
4) Remove power from the device
5) Set all DIP switches to OFF
6) At the next restart the device will have loaded the factory configuration

12. EXCEL TEMPLATE

In the case of entering many variables, it is convenient to use the excel template downloadable from the Seneca website in the Z-KEY-P section.
It is possible to insert the tags and then export them to the device's webserver.



	ACCESS FROM MODBUS SERIAL OR TCP/IP		TARGET MODBUS CONFIGURATION						
TAG NR	GATEWAY TAG NAME	GATEWAY MODBUS REGISTER ADDRESS 1ST REGISTER -> ENTER 1 ETC...	TARGET MODBUS REGISTER TYPE	TARGET MODBUS DATA TYPE	TARGET CONNECTED TO	TARGET MODBUS START REGISTER (1ST HOLDING -> ENTER 1 1ST INPUT-> 1 etc...)	TARGET MODBUS SLAVE ADDRESS	WRITE MODE	WRITE TMO [ms]
1	EXAMPLE	1	HOLDING REGISTER	16BIT UNSIGNED	RS485 #1	1	1	DATA CHANGE	500
2									
3									
4									
5									
6									
7									

Export CGI file...
Import CGI file...
SENECA
SENECA Z-KEY-P TAGS TEMPLATE FOR GATEWAY MODE. Export/Import to/from the Webserver

13. MODBUS TCP-IP SERVER AND MODBUS PASS-THROUGH

By querying Z-KEY-P and R-KEY-LT-P through port 502 at slave address 254, it responds with the values of the tags in real-time.
By querying Z-KEY-P and R-KEY-LT-P via port 502 at the slave address from 1 to 253, the device converts Modbus TCP-IP requests into Modbus RTU (Pass-Through mode)
Address 255 is reserved for device configuration.