# **USER MANUAL**

SERIES R-P I/O WITH PROTOCOL PROFINET IO



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CE

**ORIGINAL INSTRUCTIONS** 



# Introduction

The content of this documentation refers to products and technologies described in it.

All technical data contained in the document may be changed without notice.

The content of this documentation is subject to periodic review.

To use the product safely and effectively, read the following instructions carefully before use.

The product must be used only for the use for which it was designed and manufactured: any other use is under the full responsibility of the user.

Installation, programming and set-up are allowed only to authorized, physically and intellectually suitable operators.

Set-up must be performed only after correct installation and the user must follow all the operations described in the installation manual carefully.

Seneca is not responsible for failures, breakages and accidents caused by ignorance or failure to apply the stated requirements.

Seneca is not responsible for any unauthorized modifications.

Seneca reserves the right to modify the device, for any commercial or construction requirement, without the obligation to promptly update the reference manuals.

No liability for the contents of this document can be accepted.

Use the concepts, examples and other content at your own risk.

There may be errors and inaccuracies in this document that could damage your system, so proceed with caution, the author(s) will not take responsibility for it.

Technical specifications are subject to change without notice.

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# **Document revisions**

DATE	REVISION	NOTES	AUTHOR
20/02/2023	0	First revision	MM
02/03/2023	1	Supported devices: R-32DIDO-1-P, R-16DI-8DO-P, R-8AI-8DIDO-P Added chapter "Protection of digital outputs"	MM
16/03/2023	2	Added chapter on FW Update Moved chapter on configuring gsdml file parameters Added information on the procedure to restore the device to factory configuration Added I/O reaction time on R-32DIDO-P Added warning for complete hardware compilation on Tia portal	MM
31/05/2023	4	Default IP changed and Dip Switch chapter added for new firmware Deleted chapter "Restoring the device to factory configuration". Deleted chapter "CONNECTING THE DEVICE TO AN ETHERNET NETWORK" Added R-32DIDO-2-P model	MM
28/11/2023	5	Replaced model R-8AI-8DIDO-P with new hardware version	MM
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20/03/2024	8	Added new product R-SG3-P	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. R-P SERIES DEVICES

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

# 2.1. INFORMATION ABOUT THE PROFINET IO PROTOCOL

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

The device has been tested using the following PLCs: SIEMENS S7 1200 firmware revision 4.3 (Tia Portal 16) CODESYS Runtime 3.5 (Codesys 3.5)

# 2.2. R-32DIDO-P

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

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



# 2.2.1. PROTECTION OF DIGITAL OUTPUTS

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

The limit current is between 0.6 and 1.2 A.

#### 2.2.2. I/O UPDATE TIME

The update of the 32 digital I/Os is performed every 2ms.

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

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

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

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

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

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



# 2.4.1. ANALOG INPUT UPDATE TIME

Sampling time can be configured from 4ms to 400ms per each channel.

By activating 8 channels and setting a sampling time of 4 ms, you get an input update every: 4\*8 = 32 ms.

#### Note (only if thermocouple channels are enabled):

In the case of a thermocouple input, the Burnout check is carried out every 10 seconds. The duration of this check takes a sampling on each enabled thermocouple channel. For example, with 3 active thermocouples, every 10 seconds the following are used: 4ms x 3 channels = 12 ms for Burnout evaluation.



# IF ANALOG INPUT 1 IS CONFIGURED IN RTD PT100 MODE, THE MINIMUM SAMPLING TIME FOR THIS CHANNEL TO OBTAIN A CORRECT MEASUREMENT IS 25 ms

#### 2.4.2. DIGITAL I/O UPDATE TIME

The update time of the 8 digital I/Os is 4ms.

# 2.5. R-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
R-SG3-P	1 10/100 Mbit PORT
	(Switch mode)

The measurement, 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.



# 2.5.1. 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.

# 2.5.2. 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 R-SG3 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 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.

# 2.5.3. 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.

# 2.5.3.1. 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.

# 2.5.4. CONNECTION OF MORE LOAD CELLS IN PARALLEL

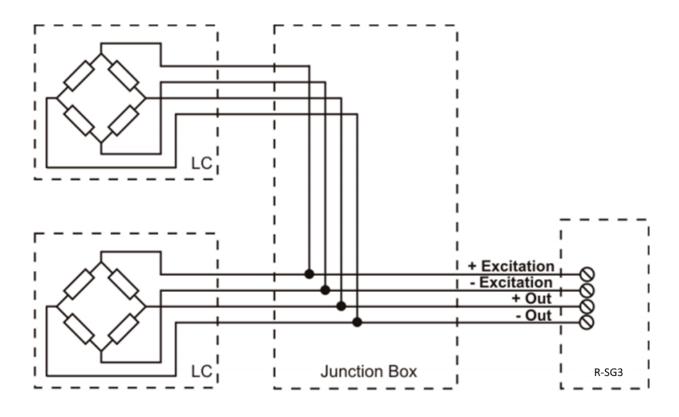
It is possible to connect up to a maximum of 8 load cells (and in any case without ever falling below the minimum 87 Ohms).

It is therefore possible to connect:

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

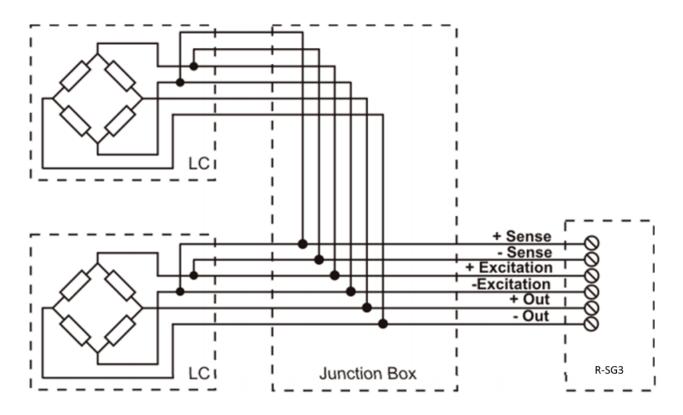
For the connection of 4 load cells Seneca recommends using the SG-EQ4 product.

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





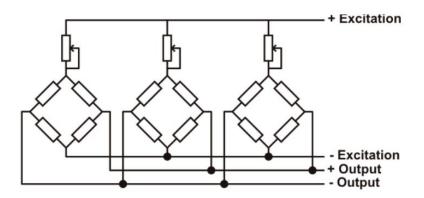
To connect 2 or more 6-wire cells in parallel with the SG-EQ4 junction box use the following diagram:



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

# 2.5.5. 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  $\Omega$  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.

# 3. DIP SWITCH

# 

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

# 

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



#### 3.1. MEANING OF THE DIP SWITCHES FOR THE R-8AI-8DIDO-2-P MODEL

# **ATTENTION!**

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

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

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

DIP1	DIP2	MEANING
OFF	OFF	Normal operation: The device loads the configuration from the flash.
ON	ON	Resets the device to its factory configuration:
		(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



#### 3.2. MEANING OF THE DIP SWITCHES FOR THE R-32DIDO-2-P MODEL

Below is the meaning of the SW1 dip switches:

# **ATTENTION!**

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

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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	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

# 

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



#### 3.3. MEANING OF THE DIP SWITCHES FOR THE R-SG3-P MODEL

Below is the meaning of the SW1 dip switches:

# **ATTENTION!**

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

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

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

DIP1	DIP2	MEANING
OFF	OFF	Normal operation: The device loads the configuration from the flash.
ON	ON	Resets the device to its factory configuration:
		(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. WEBSERVER

# ATTENTION!

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

# **ATTENTION!**

SOME MODELS ARE SUPPLIED WITHOUT AN IP ADDRESS (0.0.0.0) IN THIS CASE THE "STS" LED FLASHES.

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

The main purpose of the web server is to:

-Configure the Profinet name of the device without using an external development environment (Tia Portal, Codesys...)

-Allow the device firmware update

#### 4.1. ACCESS TO THE WEB SERVER

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

On first access the user name and password will be requested.

The default values are:

User Name: admin Password: admin



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

# **ATTENTION!**

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

# ATTENTION!

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

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• R-16DI-8DO × +					
← → × ③ Non sicuro   192.168.86.75					
🔢 App ★ Bookmarks 🕫 Ricerca 🧳 SmartFlow Flow Calco 🚇 🖩	deal Gas Law Equatic 📃 Altro [	Emulator/Driving	Accedi		lition: A 🛛 💟
	S SENECA	<b>R-1</b>	http://192.168.8 La connessione a	6.75 a questo sito non è privata	
	Status		Nome utente	admin	
	Setup		Password		
	Setup2			Accedi Annulla	
	Input Test	l,			
	Output Test				
	P2P Client				
	P2P Server				

# **ATTENTION!**

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

# 

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:

Siemens - C:\Users\Laborato	orio_iot\Docume	ents \Automation	n\Test_Prj\Test	_Prj	
Progetto Modifica Visualizza	Inserisci Onli	ne Strumenti	Tool Finestr	a ?	
Nuovo		ାର ∓ (≃ା ÷ 🗄		📭 🚿	Collega online 🖉 Inte
Apri Migrazione progetto	Ctrl+O				
Chiudi	Ctrl+W				
Elimina progetto	Ctrl+E				
, Salva	Ctrl+3		1		
Salva con nome	Ctrl+Maiusc+S				
Archivia					
Server di progetti	•				
Tard Reader/memoria USB	•				
Tile della memory card	•				
Avvia controllo di base della co	erenza				
C:\Users\Laboratorio_iot\Docum	nen\Test_Prj				
C:\Users\Laboratorio_iot\Docum	n\Progetto2				011001100110



#### 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 <u>www.seneca.it</u> site):

C:\Users\Laboratorio_iot\Documents	\Automation\Test_Prj\Test_Prj	
Progetto Modifica Visualizza Inserisci Online	Strumenti Tool Finestra ?	
📑 📑 🖬 Salva progetto 📑 🐰 🗐 🗎 🗙 🖺	🍸 Impostazioni	nline 🥳 Interrompi collegamento
Navigazione del progetto	Support package	
Dispositivi	Gestisci file di descrizione dispositivo	
	Avvia Automation License Manager	
	Visualizza testo di riferimento	
	🔲 Biblioteche globali 🕨 🕨	-
💌 🔄 Test_Prj		
😤 📑 Aggiungi nuovo dispositivo		
🗧 🛗 Dispositivi & Reti		
🕨 🔛 Dispositivi non raggruppati		
🕨 📷 Impostazioni Security		
Funzioni oltre i limiti del PLC		
<ul> <li>Magnetic state</li> </ul>		

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

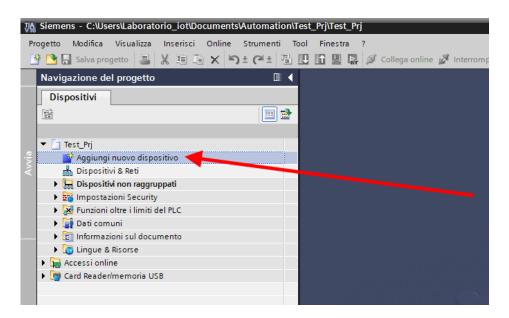
G	estione file di de	scrizione disposi	tivo			×
	GSD installati	GSD nel proge	tto			
	Percorso di origin C	\Users\Laboratorio_	iot\Desktop\TE	ST_PROFINET		
	Contenuto del pe	rcorso importato				
	🗹 File		Versione	Lingua	Stato	Informazioni
	GSDML-V2.2-SEN	IECA-R16DI8DO-2	V2.2	Inglese	Non ancora installato	
	<					>
					Cancella Installa	Annulla

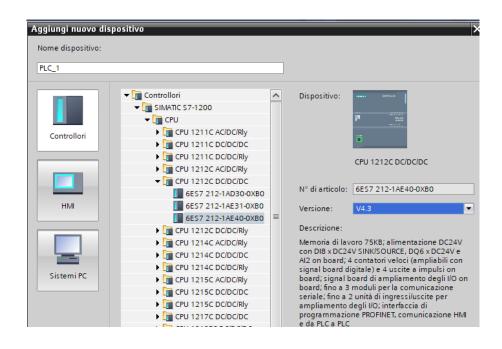
Click on "install".



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

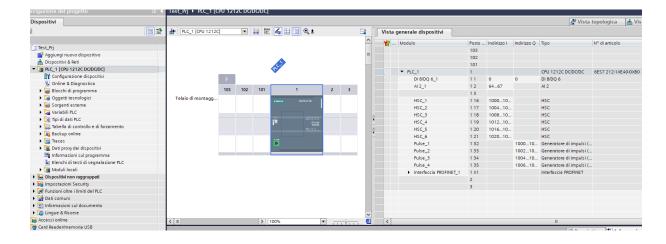
Now insert the Siemens PLC (in our example a SIEMATIC S7 1200), click on "Add new device ...":







Confirm and the PLC will be added to the rack:

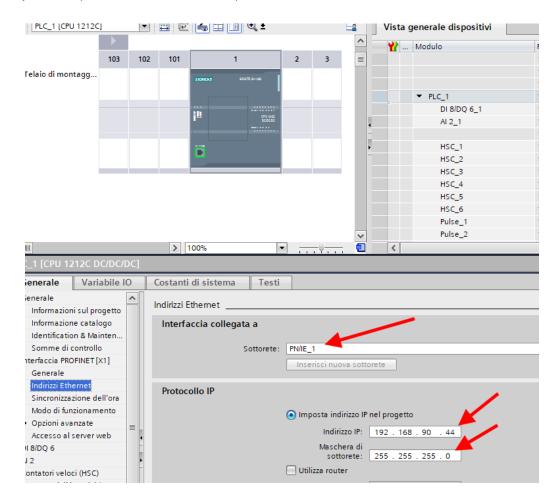


Now click on the PLC and select Profinet interface -> Ethernet addresses

Test_Prj → PLC_1 [C	DII 121								
	10 121	2000	babej						
A PLC_1 [CPU 12120	1		<u>四</u> 世	600			E		sta generale dispo
							_		
								<b>Y</b>	Modulo
	103	102	101	1		2	3	=	
Telaio di montagg									
									▼ PLC_1
				11	CPU della			-	DI 8/DQ
								•	AI 2_1
								-	1000
									HSC_1 HSC_2
	_			<b>—</b>					HSC_2
									HSC_4
									HSC_4
		/							HSC_6
		/							Pulse_1
	/								Pulse_2
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<ul> <li>Opzioni avanzate</li> </ul>		=							·
Accesso al server v	veb	4					Indirizzo		168.0.1
DI 8/DQ 6							Maschera		255 . 255 . 0
Al 2		•				-			200.200.0
<ul> <li>Contatori veloci (HSC)</li> </ul>						Utilizz	a router		



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



Move on to the network view:

V	Siemens - C:\Users\Laboratorio_iot\Documents\Automatio	n\Test_Prj\Test_Prj						
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Į,	Aggiungi nuovo dispositivo	PLC_1		PLC_1	CPU 1212C DC/0	DC/DC		
8	📩 Dispositivi & Reti	CPU 1212C						<b>\</b>
5	▼ []] PLC_1 [CPU 1212C DC/DC/DC]							
6	Configurazione dispositivi							•
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	Blocchi di programma	PN/E_1						
	<ul> <li>Oggetti tecnologici</li> </ul>							
	Sorgenti esterne							
	Variabili PLC		_					
	<ul> <li>Leg Tipi di dati PLC</li> </ul>							
	Taballa di controllo o di formamonto							



#### 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):

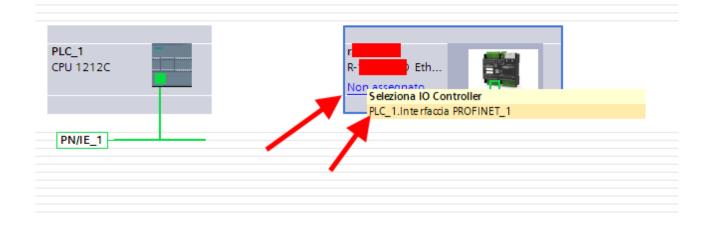
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🕨 🧰 Ulteriori dispositivi Ethernet		9
▼ Im PROFINET IO		
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LAUMAS Elettronica Srl		
▶ jīng rt-labs		
▼ La Seneca S.R.L.		18
Geneca R-series Devices     Modulo		
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Sensors	v	
✓ Informazione		1
	~	
Dispositivo:		
R- Ethernet I/O		
N° di articolo: R-	=	
Versione: (GSDML-V2.2 -SENECA-R -20200729.XML)		
Descrizione:		

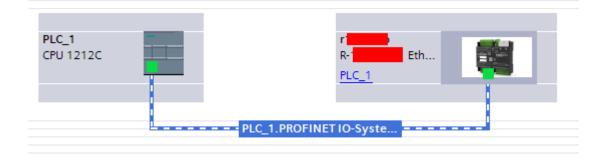


Drag the device to the network view:

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CPU 1212C R. Eth DP-NORM	GSD device_1	GSD device		
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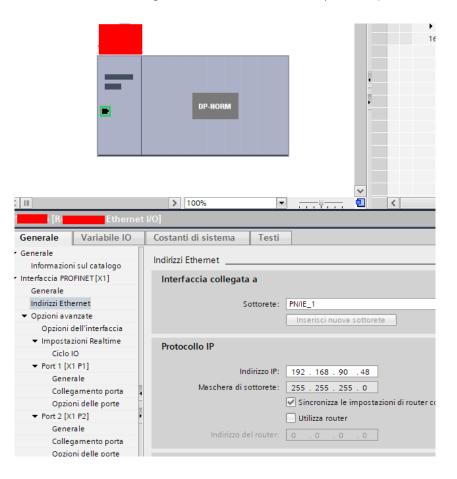
Now associate it to the PLC by clicking with the left mouse on "Not assigned" and then select the PLC:







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

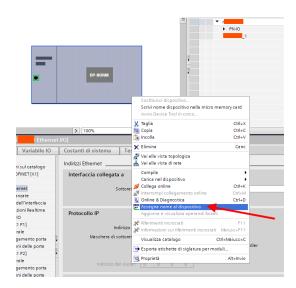


In Profinet the devices are identified by their name, so right click on the Seneca device and select "Assign device name"

# **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:

	gruppati 🕨 r 😕 [R- Ether	rnet I/O]						Vista topologica	Vista di rete	👔 Vista dispos
r R- Ethern	4	I Vist	a generale dispositivi					The topologica		al tions anopo
		-	Modulo	Telaio O	Posto 0 0 X1	Indirizzo I	Indirizzo Q	Tipo Ethern	N° di articolo R-16DI-8DO	Firmware FW REV 2
			- mag	0	1	12	1	16DI-SDO		
-	OP-INCIDIA		Nome Nome del componente. Il nome può essere modificato secondo le proprie esigenze.							
11	> 100%						1			
6DI-8DO_1 [16DI-8DO] Generale Variabile IO	Costanti di sistema Testi						3	Proprietà 🚺 Inform	nazioni 🛛 🗓 Dia	gnostica
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At the next start, the PLC will send the desired configuration to the device.



# 5.5. CONFIGURATION PARAMETERS OF THE GSDML FILE

# 5.5.1. R-32DIDO-P

#### SET DIGITAL IO INPUT/OUTPUT

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

#### SET DIGITAL INPUT NORMALLY HIGH/LOW

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

#### SET DIGITAL OUTPUT NORMALLY OPEN/CLOSE

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

# SET DIGITAL OUTPUT WATCHDOG

If selected as digital output, it sets the output watchdog mode.

If "Disabled", it disables the watchdog function for the selected output.

If "Enabled on Profinet Communication" the output goes into "Watchdog state" if there has been no generic Profinet communication within the set time.

#### SET DIGITAL OUTPUT WATCHDOG STATE

Sets the value that the digital output must adopt if the watchdog has been triggered.

# SET DIGITAL OUTPUT WATCHDOG TIMEOUT [s]

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

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

#### SET DIGITAL INPUTS FILTER DELAY [ms]

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

#### SET ALL DIGITAL INPUTS NPN/PNP

Sets the input operating mode to between npn "Sink" and pnp "Source"



# ENABLE DIGITAL OUTPUTS FAULT TIMEOUT

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

# SET DIGITAL OUTPUTS FAULT TIMEOUT [s]

Set the watchdog time of the digital outputs.

# SET DIGITAL OUTPUT FAULT STATES OPEN/CLOSE

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

# SET DIGITAL OUTPUT NORMALLY OPEN/CLOSE

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

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

# SET DIGITAL IO INPUT/OUTPUT

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

# SET DIGITAL INPUT NORMALLY HIGH/LOW

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

# SET DIGITAL OUTPUT NORMALLY OPEN/CLOSE

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

# SET DIGITAL OUTPUT WATCHDOG

If selected as digital output, it sets the output watchdog mode.

If "Disabled", it disables the watchdog function for the selected output.

If "Enabled on Profinet Communication" the output goes into "Watchdog state" if there has been no generic Profinet communication within the set time.

# SET DIGITAL OUTPUT WATCHDOG STATE

Sets the value that the digital output must adopt if the watchdog has been triggered.

# SET DIGITAL OUTPUT WATCHDOG TIMEOUT [s]

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



# SET ANALOG MODE

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

# SAMPLING TIME

Set the sampling time of the channel, selectable between 4 ms and 400 ms, it is also possible to disconnect the input.

# SET ANALOG INPUT MOVING FILTER (10 SAMPLES)

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

#### SET ANALOG INPUTS MEASURE OFFSET

Set an offset for analog measurements

#### SET INPUT START/END SCALE

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

The value to enter is in the unit of measurement based on the type of input chosen [V], or [mV], or [uA], or [°C]

# SET INPUT START/END ENG. SCALE

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

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

#### SET ANALOG INPUTS TC TYPE

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

# SET ANALOG INPUTS TC COLD JUNCTION MODE

In the case of thermocouple measurement, it enables or disables the automatic cold junction offset of the device.

# SET ANALOG INPUTS TC COLD JUNCTION OFFSET



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

# SET ANALOG INPUTS TC BURNOUT MODE

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

# SET ANALOG INPUTS TC BURNOUT VALUE

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

# PT100 3 WIRE

Allows you to choose whether the temperature value detected by input 1 is used for cold junction compensation of all TCs (which have cold junction compensation enabled) or as a temperature measurement.

# 5.5.4. R-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 SENSIBILITY

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.



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"

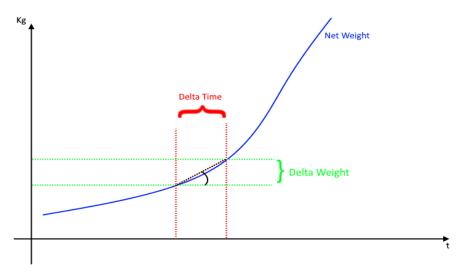
#### DELTA TIME [x100ms]

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.

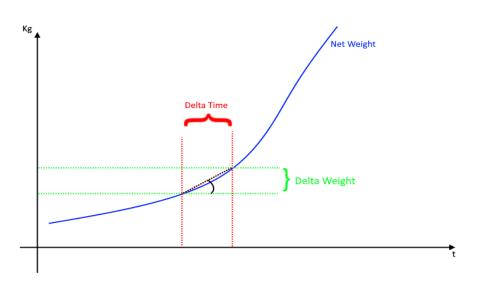
#### THRESHOLD AND STABLE WEIGHT

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

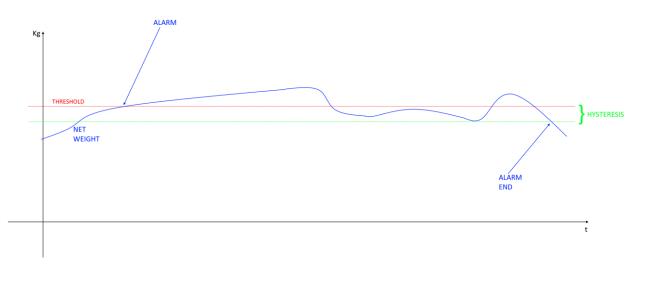
In this mode the output is activated if the weighing is in the stable weighing condition.

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

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

JA Siemens - C:\Users\Laboratorio_iot\Documents\Automation\T	Test_Prj\Test_Prj				
Progetto Modifica Visualizza Inserisci Online Strumenti To	fool Finestra ?				
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					0> <b>W</b>
Navigazione del progetto	Test_Prj → PLC_1 [CPU 1212C DC/DC/DC	C] ▶ Variabili PLC ▶ Tabella d	elle variabili s	tandard [36]	
Dispositivi					
E E E E E E E E E E E E E E E E E E E	🥩 🔮 🖻 🗄 😤 🛍				
5	Tabella delle variabili standard				
🗧 💌 🗋 Test_Prj 🔥	Nome	Tipo di dati Indirizzo	Ritenz Acces	Scrivi Visibil	Commento
😤 🃑 Aggiungi nuovo dispositivo	-1 <aggiungi></aggiungi>			<ul> <li>✓</li> </ul>	
🛗 Dispositivi & Reti					
▼ 1 PLC_1 [CPU 1212C DC/DC/DC]					
😨 🛛 🛐 Configurazione dispositivi					
🛎 🛛 🖞 Online & Diagnostica					
🕨 🔙 Blocchi di programma					
Oggetti tecnologici					
Sorgenti esterne					
🔻 🚂 Variabili PLC					
a Mostra tutte le variabili					
Aggiungi nuova tabella delle variabili					
Tabella delle variabili standard [36]					
🕨 🕅 Tipi di dati PLC					
🔻 🛄 Tabella di controllo e di forzamento					
Aggiungi nuova tabella di controllo					
🔛 Tabella di forzamento					

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

Vista generale dispositivi							
🔐 Modulo	Telaio	Posto	Indirizzo I	Indirizz	Тіро	N° di articolo	Fi
▼ r32didop	0	0			R-32DIDO-P Ethern	R-32DIDO-P	F\
► PN-IO	0	0 X1			r32didop		
32DIDO	0	1	14	14	32DIDO		

So:

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

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



Below is the default mapping of available IOs:

INPUT/OUTPUT	DEFAULT ADDRESS IO CONFIGURED AS AN INPUT	DEFAULT ADDRESS IO CONFIGURED AS AN OUTPUT
IO1	l1.0	Q1.0
IO2	l1.1	Q1.1
IO3	l1.2	Q1.2
104	l1.3	Q1.3
IO5	11.4	Q1.4
IO6	l1.5	Q1.5
107	I1.6	Q1.6
108	11.7	Q1.7
109	12.0	Q2.0
IO10	I2.1	Q2.1
IO11	12.2	Q2.2
IO12	12.3	Q2.3
IO13	12.4	Q2.4
IO14	12.5	Q2.5
IO15	12.6	Q2.6
IO16	12.7	Q2.7
IO17	13.0	Q3.0
IO18	I3.1	Q3.1
IO19	13.2	Q3.2
IO20	13.3	Q3.3
IO21	13.4	Q3.4
IO22	13.5	Q3.5
IO23	13.6	Q3.6
IO24	13.7	Q3.7
IO25	14.0	Q4.0
IO26	I4.1	Q4.1
IO27	14.2	Q4.2
IO28	14.3	Q4.3
IO29	14.4	Q4.4
IO30	14.5	Q4.5
IO31	14.6	Q4.6
IO32	14.7	Q4.7

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



### **ATTENTION!**

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

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

Ý	2	uiii 🔰 🗓 🖇	71 %	🖓 🍄 📬				
	i	Nome		ndirizzo	Formato visualizz	Valore di controllo	Valore di comando	9
1		"IN1"	9	611.0	Bool	TRUE		
2		"IN2"	٩	611.1	Bool	TRUE		
3		"IN3"	9	611.2	Bool	TRUE		
4		"IN4"	٩	611.3	Bool	TRUE		
5		"IN5"	٩	611.4	Bool	FALSE		
6		"IN6"	٩	611.5	Bool	FALSE		
7		"IN7"	٩	611.6	Bool	FALSE		
8		"IN8"	9	611.7	Bool	FALSE		
9		"IN9"	9	612.0	Bool	TRUE		
10		"IN10"	9	612.1	Bool	FALSE		
11		"IN11"	9	612.2	Bool	FALSE		
12		"IN12"	9	612.3	Bool	FALSE		
13		"IN13"	9	612.4	Bool	FALSE		
14		"IN14"	٩	612.5	Bool	FALSE		
15		"IN15"	9	612.6	Bool	FALSE		
16		"IN16"	9	612.7	Bool	FALSE		
17		"OUT17"	۹ 📃	%Q3.0	Bool 💌			
18		"OUT18"	9	%Q3.1	Bool			
19		"OUT19"	9	%Q3.2	Bool			
20		"OUT20"	9	%Q3.3	Bool			
21		"OUT21"	9	%Q3.4	Bool			
22		"OUT22"	9	%Q3.5	Bool			
23		"OUT23"	9	%Q3.6	Bool			
24		"OUT24"	9	%Q3.7	Bool			
25		"OUT25"	9	%Q4.0	Bool			
26		"OUT26"	9	%Q4.1	Bool			
27		"OUT27"	9	%Q4.2	Bool			
28		"OUT28"	9	%Q4.3	Bool			
29		"OUT29"	9	%Q4.4	Bool			
30		"OUT30"	9	%Q4.5	Bool			
31		"OUT31"	9	%Q4.6	Bool			
32		"OUT32"	9	%Q4.7	Bool			

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



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

Pro	getto_	R8AI8DIDO_000	PLC_1 [CPU 1	212C DC/DC/DC]	Tabella di con	trollo e di forzam	ento 🕨	Tabella d
ý	👻 u	ž 📝 🇓 🌮 1 🕅	s 🖉 😰 📬					
	i	Nome	Indirizzo	Formato visualizz	Valore di controllo	Valore di comando	9	Commer

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

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

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

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

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

Siemens - C:\Users\Laboratorio_iot\Documents\Automation	\Test_Prj\Te	est_Prj								
Progetto Modifica Visualizza Inserisci Online Strumenti	Tool Fine:	stra ?								
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Navigazione del progetto	Test_Pr	j → PLC_1 [CPU 1212C DC/DC/	DC] 🕨 Variabil	PLC → Tabella	delle va	riabili st	andard	[36]		
Dispositivi										
🖬 🖬 🗐 🖬	1	🖻 🗄 😤 🛍								
PL C	Tabe	ella delle variabili standard								
🚊 💌 🛅 Test_Prj 🖉	· · · ·	Nome	Tipo di dati	Indirizzo	Ritenz	Acces	Scrivi	Visibil	Commento	
😤 📑 Aggiungi nuovo dispositivo	1	<aggiungi></aggiungi>	1			<b>~</b>	<ul> <li></li> </ul>	<ul> <li>Image: A start of the start of</li></ul>		[
Dispositivi & Reti										
PLC_1 [CPU 1212C DC/DC/DC]										
Configurazione dispositivi										
🛎 😓 Online & Diagnostica										
🕨 📴 Blocchi di programma										
Oggetti tecnologici										
Sorgenti esterne	-									
🔻 🔁 Variabili PLC										
a Mostra tutte le variabili										
Aggiungi nuova tabella delle variabili										
💥 Tabella delle variabili standard [36] 🛌										
🕨 📑 Tipi di dati PLC										
🔻 🛄 Tabella di controllo e di forzamento										
🗳 Aggiungi nuova tabella di controllo										
🔛 Tabella di forzamento					_			_		

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

 Modulo	Telaio	Posto	Indirizzo I	Indirizzo Q	Тіро	N° di articolo
▼ r16di8do	0	0			R-16DI-8DO Ethern	R-16DI-8DO
PN-IO	0	0 X1			r16di8do	
16DI-8DO_1	0	1	12	1	16DI-8DO	
		-				
				<b>A</b>		



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

Dispositivi											
8		19	+ <u>₩</u> ?? # €							-	
		Tabell	a delle variabili stan	dard						1	
Test_Prj	^		lome	Tipo di dati	Indirizzo	Ritenz	Acces_	Scrivi	Visibil Co	mento	
Aggiungi nuovo dispositivo	1	-0	DI(1)	Bool	%11.0					1	
📥 Dispositivi & Reti	2	-0	DI(2)	Bool	%1,1						
PLC_1 [CPU 1212C DC/DC/DC]	3	-0	DI(3)	Bool	%11.2						inputs
Configurazione dispositivi	4	-0	DI(4)	Bool	%11.3					-	
😼 Online & Diagnostica	5	-0	DI(5)	Bool	%11.4					-	
🕨 😽 Blocchi di programma	6	-0	DI(6)	Bool	%1.5						
🕨 🎑 Oggetti tecnologici	. 7	-0	DI(7)	Bool	%/1.6						
🕨 🔙 Sorgenti esterne	8	-0	DI(8)	Bool	%11.7						
🕶 🚂 Variabili PLC	9	-0	DI(9)	Bool	%12.0						
a Mostra tutte le variabili	20	-0	DI(10)	Bool	%12.1						
🚔 Aggiungi nuova tabella delle variabili	11	-0	DI(11)	Bool	%12.2						
💥 Tabella delle variabili standard [60]	13	-0	DI(12)	Bool	%12.3						
Tipi di dati PLC	1	-0	DI(13)	Bool	%12.4						
🕶 🦕 Tabella di controllo e di forzamento	1.	•	DI(14)	Bool	%/2.5						
Aggiungi nuova tabella di controllo	1	-0	DI(15)	Bool	%12.6						
🔛 Tabella di forzamento	10	-0	DI(16)	Bool	%12.7						outputs
Backup online	17	1	001	Bool	%Q1.0		<b>S</b>	<b>M</b>		<b>1</b>	/
🕨 📴 Traces	1.8	-0	DO2	Bool	%Q1.1						
Dati proxy dei dispositivi	19	-0	DO3	Bool	%Q1.2						
Informazioni sul programma	20	-0	DO4	Bool	%Q1.3						
📓 Elenchi di testi di segnalazione PLC	21		DO5	Bool	%Q1.4					1000	
🕨 🫅 Moduli locali	22	-0	D06	Bool	%Q1.5						
Periferia decentrata	23	-0	D07	Bool	%Q1.6						
🕶 🚂 Dispositivi non raggruppati	24		DOS	Bool	%Q1.7						
<ul> <li>r16di8do [R-16DI-8DO Ethemet I/O]</li> </ul>	25		<aggiungi></aggiungi>								
Configurazione dispositivi					VIII I				-		

After this operation, define a new control table:

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

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Navigazione del progetto		Test_Pr	j → PLC_1 [	CPU 1212C DC/DC/DC]	<ul> <li>Tabella di contr</li> </ul>	rollo e di forzame	nto 🕨 Tabella
Dispositivi							
Ē	■ ➡	<b>*</b>	1	Ø1 90 ₽ ₽ ₽ ₽			
5		i	Nome	Indirizzo	Formato visualizz	Valore di controllo	Valore di coman
e ▼ Test_Prj	^	1		Aggiungi>			
Aggiungi nuovo dispositivo							
🗄 Dispositivi & Reti							
■ PLC_1 [CPU 1212C DC/DC/DC]							
Configurazione dispositivi							
🚊 🛛 🖳 Online & Diagnostica							
🕨 🕞 Blocchi di programma							
🕨 🕒 🙀 Oggetti tecnologici	=						
Sorgenti esterne							
🔻 📜 Variabili PLC							
la Mostra tutte le variabili							
🚔 Aggiungi nuova tabella delle var	iabili						
😤 Tabella delle variabili standard [6	50]						
🕨 📴 Tipi di dati PLC							
🔻 🛄 Tabella di controllo e di forzamento							
Aggiungi nuova tabella di contro	llo						
Tabella di controllo_1							
🔠 Tabella di forzamento							
Backup online							
🕨 🔄 Traces							
<ul> <li>Image of the second seco</li></ul>							



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

° ₹	12 1/2 10 🖉 1	% \$7 ₽° °°					
i	Nome	Indirizzo	Formato visua	lizz	Valore di controllo	Valore di comando	9
		🔳 <aggiungi></aggiungi>					
	■ "DI(1)"	E	Bool	%11	.0	^	
	"DI(2)"	E	Bool	%11	.1	=	
	- "DI(3)"	E	Bool	%11	.2	=	
	"DI(4)"	E	Bool	%11	.3		
	"DI(5)"	E	Bool	%11	.4		
	- "DI(6)"	E	Bool	%11	.5		
	- DI(7)	E	Bool	%11	.6		
	- DI(8)"	E	Bool	%11	.7	*	

Once you have added all of them you will get:

ê 🔮	.# 📭 🗛 🖞	91 96 17 🚏 📬						
	Nome	Indirizzo		Valore di controllo	Valore di comando	4	Commento	Commento della variabil
-	"DI(1)"	%11.0	Bool			6		
	"DI(2)"	%11.1	Bool					
	"DI(3)"	%11.2	Bool					
	"DI(4)"	%11.3	Bool					
	"DI(4)"	%11.3	Bool					
	"DI(5)"	%11.4	Bool					
	"DI(6)"	%11.5	Bool					
	"DI(7)"	%11.6	Bool					
	"DI(8)"	%11.7	Bool					
)	"DI(8)"	%11.7	Bool					
	"DI(9)"	%12.0	Bool					
	"DI(10)"	%12.1	Bool					
	"DI(11)"	%12.2	Bool					
	"DI(12)"	%12.3	Bool					
i	"DI(13)"	%12.4	Bool					
5	"DI(14)"	%12.5	Bool					
	"DI(15)"	%12.6	Bool					
3	"DI(16)"	%12.7	Bool					
)	"DO1"	%Q1.0	Bool					
)	"DO2"	%Q1.1	Bool					
	"DO3"	%Q1.2	Bool					
	"DO4"	%Q1.3	Bool					
	"DO5"	%Q1.4	Bool					
	"DO6"	%Q1.5	Bool					
5	"DO7"	%Q1.6	Bool					
6	"DO8"	🔳 %Q1.7	Bool 💌					



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:

🎦 🖬 Salva progetto 📑 🐰 🧾 📺 🗙 🍤 🖄				-			nto 🕨 Tabella di cor	
Dispositivi		Test				iono e ur roizanie		
			N AN INC.					
ti in the second se		2	* 🔐 🐓 🏎	91 98 12 💬 📬				
		i	Nome	Indirizzo			Valore di comando 🔗	Commer
Test_Prj		1	"DI(1)"	11.0	Bool	FALSE		
📑 Aggiungi nuovo dispositivo		2	"DI(2)"	%11.1	Bool	FALSE		
📩 Dispositivi & Reti		З	"DI(3)"	%11.2	Bool	FALSE		
PLC_1 [CPU 1212C DC/DC/DC]	<b>V</b> 🔍	4	"DI(4)"	%11.3	Bool	FALSE		3
🕎 Configurazione dispositivi		5	"DI(4)"	%11.3	Bool	FALSE		
🛂 Online & Diagnostica		6	"DI(5)"	%11.4	Bool	FALSE		
🕨 🔙 Blocchi di programma		7	"DI(6)"	%11.5	Bool	FALSE		
🕨 🚂 Oggetti tecnologici	-	8	"DI(7)"	%11.6	Bool	FALSE		
Sorgenti esterne		9	"DI(8)"	%11.7	Bool	FALSE		
🔻 🔁 Variabili PLC		10	"DI(8)"	%11.7	Bool	FALSE		
🍇 Mostra tutte le variabili		11	"DI(9)"	%12.0	Bool	FALSE		
🚔 Aggiungi nuova tabella delle variabili		12	"DI(10)"	%12.1	Bool	FALSE		
🍯 Tabella delle variabili standard [60]		13	"DI(11)"	%12.2	Bool	FALSE		
🕨 🛅 Tipi di dati PLC		14	"DI(12)"	%12.3	Bool	FALSE		
🔻 詞 Tabella di controllo e di forzamento		15	"DI(13)"	%12.4	Bool	FALSE	E	
💣 Aggiungi nuova tabella di controllo		16	"DI(14)"	%12.5	Bool	FALSE	E	
🚜 Tabella di controllo_1		17	"DI(15)"	%12.6	Bool	FALSE		
🔛 Tabella di forzamento		18	"DI(16)"	%12.7	Bool	FALSE		
Backup online		19	"DO1"	%Q1.0	Bool	FALSE		1
Traces		20	"DO2"	%Q1.1	Bool	FALSE		1
Dati proxy dei dispositivi		21	"DO3"	%Q1.2	Bool	FALSE	E	1
Informazioni sul programma		22	"DO4"	%Q1.3	Bool	FALSE	6	3
Elenchi di testi di segnalazione PLC		23	"DO5"	%Q1.4	Bool	FALSE	E	
Moduli locali		24	"DO6"	%Q1.5	Bool	FALSE		1
Periferia decentrata		25	"DO7"	%Q1.6	Bool	FALSE		
Dispositivi non raggruppati		26	"DO8"	%Q1.7	Bool	FALSE		
▼ 🔄 r16di8do [R-16DI-8DO Ethernet I/O]		27		<aggiungi></aggiungi>				

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



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

🥩 👻 i	Nome	ndirizzo	Formato visualizz	Valore di controllo	Valore di comando	43	Com
1	"DI(1)"	%11.0	Bool	FALSE	valore di comando		com
2	"DI(2)"	%11.1	Bool	FALSE			
2	"DI(3)"	%11.2	Bool	FALSE			
4	"DI(4)"	%11.3	Bool	FALSE			
	"DI(4)"	%11.3	Bool	FALSE			
5		%11.4		-			
6	"DI(5)"		Bool	FALSE			
7	"DI(6)"	%11.5	Bool	FALSE			
B	DI(7)	%11.6	Bool	FALSE			
9	"DI(8)"	%11.7	Bool	FALSE			
10	"DI(8)"	%11.7	Bool	FALSE			
11	"DI(9)"	%12.0	Bool	FALSE			
12	"DI(10)"	%I2.1	Bool	FALSE			
13	"DI(11)"	%I2.2	Bool	FALSE	,		
14	"DI(12)"	%12.3	Bool	FALSE			
15	"DI(13)"	%12.4	Bool	FALSE			
16	"DI(14)"	%12.5	Bool	FALSE	1		
17	"DI(15)"	%12.6	Bool	FALSE			
18	"DI(16)"	%12.7	Bool	FALSE	$\cap$		
19	"DO1"	🔳 %Q1.0	Bool 💌	TRUE	TRUE	M 🖌	
20	"DO2"	%Q1.1	Bool	TRUE	TRUE	🛛 🗹 🦉	<u> </u>
21	"DO3"	%Q1.2	Bool	FALSE	$\smile$		
22	"DO4"	%Q1.3	Bool	FALSE			
23	"DO5"	%Q1.4	Bool	FALSE			
24	"DO6"	%Q1.5	Bool	FALSE			
25	"DO7"	%Q1.6	Bool	FALSE			
26	"DO8"	%Q1.7	Bool	FALSE			
27		<aggiungi></aggiungi>					

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



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

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

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	Test Pri → PLC 1 [CPU 1212C DC/DC/D				
	Test_Fig V FEC_T [CF0 1212C DODOL		lelle vallabili s	tanuaru (50)	
Dispositivi					
	🥩 🔮 🖻 🗄 😤 🖬				
2	Tabella delle variabili standard				
🖁 💌 🗋 Test_Prj 📃 🔨	Nome	Tipo di dati Indirizzo	Ritenz Acces	Scrivi Visibil	Commento
😤 📑 Aggiungi nuovo dispositivo	1 <aggiungi></aggiungi>				
Dispositivi & Reti					
PLC_1 [CPU 1212C DC/DC/DC]					
Configurazione dispositivi					
🛎 😓 Online & Diagnostica					
🕨 🔙 Blocchi di programma					
Oggetti tecnologici					
Sorgenti esterne					
🔻 🔚 Variabili PLC					
a Mostra tutte le variabili					
🗳 Aggiungi nuova tabella delle variabili					
💥 Tabella delle variabili standard [36] 🥿					
🕨 🛄 Tipi di dati PLC					
🔻 🥅 Tabella di controllo e di forzamento					
Aggiungi nuova tabella di controllo					
📖 Tabella di forzamento					

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

Vista generale dispositivi						
· 省	Modulo	Telaio	Posto connettore	Indirizzo I	Indirizzo Q	Тіро
	▼ r8ai8didop	0	0			R-8AI-8DIDO-P Ethe
	PN-IO	0	0 X1			r8ai8didop
	8AIN Integer value_1	0	1	6883		8AIN Integer value
	8DIDO_1	0	2	1	1	8DIDO
	8AIN_1	0	3	84115		8AIN
	AIN Burn State_1	0	4	2		AIN Burn State

So byte 11 contains the 8 digital inputs (those as inputs), byte Q1 the 8 outputs (those configured as outputs). Bytes from I68 to I83 show the values of the 8 analog inputs (2 bytes per input).

Bytes from I84 to I15 show the values of the 8 analog inputs floating point (4 bytes per input).

Byte I2 shows the burnout status of the analog inputs configured by thermocouple.



Below is the default mapping of the available digital IOs:

INPUT/OUTPUT	DEFAULT ADDRESS IO CONFIGURED AS AN INPUT	DEFAULT ADDRESS IO CONFIGURED AS AN OUTPUT
IO1	l1.0	Q1.0
IO2	l1.1	Q1.1
IO3	l1.2	Q1.2
104	l1.3	Q1.3
IO5	l1.4	Q1.4
IO6	l1.5	Q1.5
107	I1.6	Q1.6
IO8	11.7	Q1.7

The default mapping of the analog IOs is as follows:

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

FLOATING POINT ANALOG INPUT	DEFAULT ADDRESS INPUT
AIN1	ID18
AIN 2	ID22
AIN 3	ID26
AIN 4	ID30
AIN 5	ID34
AIN 6	ID38
AIN 7	ID42
AIN 8	ID44

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#### 5.9. R-SG3-P I/O DATA

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

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-	Progetto Modifica Visualizza Inserisci Online Strumenti Tool Finestra ?										
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	Navigazione del progetto		Test_Prj → PLC_1 [CPU 1212C DC/DC/L	OC] ► Variabili	PLC  Tab	ella delle va	riabili s	tandard	[36]		
	Dispositivi										
	- E	12	2 2 B B 🐨 🖤 🛍								
EC			Tabella delle variabili standard								
e	▼ 🚺 Test_Prj	^	Nome	Tipo di dati	Indirizzo	Ritenz	Acces	Scrivi	Visibil	Commento	
9.	💕 Aggiungi nuovo dispositivo		1 <aggiungi></aggiungi>	1			<b>V</b>	<ul> <li>✓</li> </ul>			-
Ē	Dispositivi & Reti										_
l e	PLC_1 [CPU 1212C DC/DC/DC]										
l	Configurazione dispositivi										
l ž	😵 Online & Diagnostica										
	🕨 🔙 Blocchi di programma										
	Oggetti tecnologici	_									
	Sorgenti esterne	=									
	🔻 🚂 Variabili PLC										
	la Mostra tutte le variabili										
	🗳 Aggiungi nuova tabella delle variabili										
	💥 Tabella delle variabili standard [36] 🥿										
	Tipi di dati PLC										
	▼ Image: Tabella di controllo e di forzamento										
	🗳 Aggiungi nuova tabella di controllo										
	Tabella di forzamento										

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

#### Vista generale dispositivi ✓ Catalogo N° di articolo 📸 ... Modulo Telaio... Posto ... Indirizzo I Indirizz... Tipo ▼ ze-r-sg3-p ZE/R-SG3-P Etherne... ZE/R-SG3-P <Trova> 0 0 PN-IO 0 0 X1 ze-r-sg3-p 🛃 Filtro Profilo: <Tutti> Weight (Integer)\_1 1 0 68...81 Weight (Integer) 🕶 🛅 Modulo DIN/DOUT\_1 0 2 1 1 DIN/DOUT ANALOG OUTPUT 0 з 🚺 Analog Output 0 4 🛨 🚺 CMD 0 5 🚺 Command 0 6 🗕 📊 DIAGN 🚺 Diagnostic 🕶 🛅 Weight (Float) 🚺 Weight (Float)

#### WEIGHT (INTEGER)

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

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Where:

WEIGHT INTEGER	DEFAULT ADDRESS INPUT
NET WEIGHT	ID2
GROSS WEIGHT	ID4
TARE WEIGHT	ID6
NUM. PIECES	IW8

#### DIN/DOUT

Name	Data Type	Display as Bits
Digital Inputs (12)	Unsigned8	Bit 0: Digital Input 1 Bit 1: Digital Input 2

Name	Data Type	Display as Bits
Digital Outputs (12)	Unsigned8	Bit 0: Digital Output 1 Bit 1: Digital Output 2

INPUT/OUTPUT	DEFAULT ADDRESS IO CONFIGURED AS AN INPUT	DEFAULT ADDRESS IO CONFIGURED AS AN OUTPUT
IO1	11.0	Q1.0
102	l1.1	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

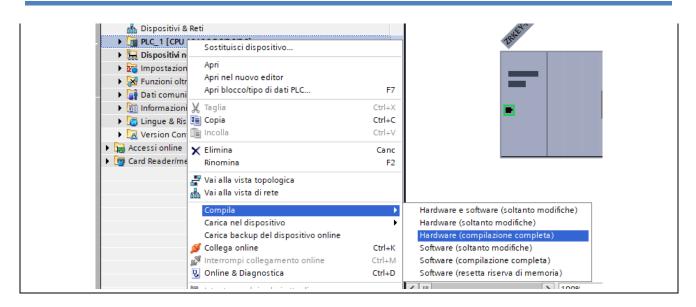
#### 5.10. COMPILATION AND SENDING OF THE PROJECT TO THE SIEMENS PLC

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

### **ATTENTION!**

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





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

mento avanzato							
	Nodi di accesso confi	ourati di "PLC_1"					
	Dispositivo		Posto c	Tipo di int	erfa Indirizzo	Sottorete	
	PLC_1		1 X1	PN/IE	192.168.90.44		
	rec_r	Cr01212C000		THE	192.100.90.4	+ INNI	
		Tipo di interfaccia Po	G/PC:	PN/IE		•	
		Interfaccia P	G/PC:	💹 Broadcon	n NetLink (TM) Gigab	it Ethernet 💌	۲
×	Collegamento c	on l'interfaccia/la sotto	rete:	PN/IE_1		•	۲
		1° gate		-			۲
		i gate	way:				V
	Selezionare il sistema	di destinazione:			Visualizza tutti i	nodi compatibili	
			- r-				
	Dispositivo	Tipo di dispositivo		interfaccia	Indirizzo	Dispositivo d	li de
			PN/IE	interfaccia	Indirizzo 192.168.90.44	Dispositivo d	li de
	Dispositivo	Tipo di dispositivo		interfaccia	Indirizzo	Dispositivo d	li de
ил — 1 — — Т	Dispositivo	Tipo di dispositivo	PN/IE	interfaccia	Indirizzo 192.168.90.44	Dispositivo d	li de
и. — —  - — — — — 7	Dispositivo	Tipo di dispositivo	PN/IE	interfaccia	Indirizzo 192.168.90.44	Dispositivo d	li de
EED lampeggia	Dispositivo	Tipo di dispositivo	PN/IE	interfaccia	Indirizzo 192.168.90.44	Dispositivo d	di de
e LED lampeggia	Dispositivo	Tipo di dispositivo	PN/IE	interfaccia	Indirizzo 192.168.90.44	Dispositivo d	li de
ED lampeggia	Dispositivo	Tipo di dispositivo	PN/IE	interfaccia	Indirizzo 192.168.90.44	Dispositivo d	
LED lampeggia	Dispositivo	Tipo di dispositivo	PN/IE	interfaccia	Indirizzo 192.168.90.44	Dispositivo d	
	Dispositivo plc_1	Tipo di dispositivo	PN/IE	interfaccia	Indirizzo 192.168.90.44 Indirizzo di accesso	Dispositivo d	icer
nazioni sullo stato o	Dispositivo plc_1	Tipo di dispositivo	PN/IE	interfaccia	Indirizzo 192.168.90.44 Indirizzo di accesso	Dispositivo d	icer
LED lampeggia	Dispositivo plc_1	Tipo di dispositivo 57-1200 	PN/IE PN/IE		Indirizzo 192.168.90.44 Indirizzo di accesso	Dispositivo d	icer
nazioni sullo stato o ispositivo accessibi cerca terminata. Sc	Dispositivo plc_1 	Tipo di dispositivo 57-1200 	PN/IE PN/IE		Indirizzo 192.168.90.44 Indirizzo di accesso	Dispositivo d	icer

Once the project has been sent, RUN the PLC:

ompi collegamento online	#{		📕 🖈 🖃 💷 Sfoglia proget
ti → r16di8do [R-16Đi-1	800	Etl	Avvia CPU

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





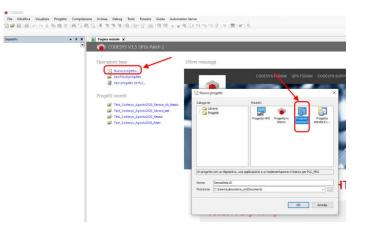
If everything is correct you will get a green icon next to the Seneca device:

Navigazione del progetto		
Dispositivi		
1 · · · · · · · · · · · · · · · · · · ·		1
▼ Test_Prj		
Aggiungi nuovo dispositivo	-	Ē
🚠 Dispositivi & Reti		
▼ 1 PLC_1 [CPU 1212C DC/DC/DC]		
Configurazione dispositivi	_	
😧 Online & Diagnostica		
🕨 🔙 Blocchi di programma		
🕨 🙀 Oggetti tecnologici		
🕨 🔚 Sorgenti esterne		1
🕨 🔁 Variabili PLC		
🕨 🛅 Tipi di dati PLC		
🕨 🥅 Tabella di controllo e di forzamento		
🕨 🙀 Backup online		
🕨 🔄 Traces		
Dati proxy dei dispositivi		
📴 Informazioni sul programma		_
🛓 Elenchi di testi di segnalazione PLC		
🕨 🧰 Moduli locali	$\checkmark$	
Periferia decentrata	$\checkmark$	_
<ul> <li>Lispositivi non raggruppati</li> </ul>	$\cap$	
▼ 🚔 r 📕 [R-	$\mathbf{\mathbf{\nabla}}$	
Configurazione dispositivi		
🖳 Online & Diagnostica		
r [R- Ethernet I/O]	$\leq$	
16DI-8DO_1	$\mathbf{\mathbf{\nabla}}$	
Impostazioni Security	$\sim$	
Funzioni oltre i limiti del PLC		
Dati comuni		
Informazioni sul documento		
Lingue & Risorse		
Garden La Constantina		-



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

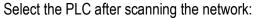
Create a new standard project:



#### 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:

Test.project - CODESYS	
File Modifica Visualizza Progetto Compilazio	one In linea Debug Tools Finestre Guida Automation Server
11 ☞ 🖬 증   ∞ ∝ % ☜ ា ×   ឝ % #	🔥 🌜   🎚 책 책 🖏 1월 • 🔓   🔠   Application (Device Logica PLC) • ଓ 🧐 🖒 🗉 🔏 (고 연 년 년 8)   4 )   第   국   7
Dispositivi 👻 🕂 🗙	Device X
Test     Test     ODESYS Control for Raspberry Pi SL	Impostazioni comunicazioni Sfogla la rete Gateway • Dispositivo •
E Digica PLC	Applicazioni Sfoglia la rete
Gestore libreria     ELC_PRG (PRG)	Salva e ripristina
🖻 🎆 Configurazione di attività 🖹 🎲 MainTask	File Giteway
PLC_PRG	Log Cotemary 1 V LAB_JOT V
3 12C 3 SPI	Impostazion IPLC IP-Address: localhost
- Bo GPIOs_A_B (GPIOs A/B)	Shell PLC Port 1217
Genera device ↓	Utenti e gruppi
	Diritti di accesso



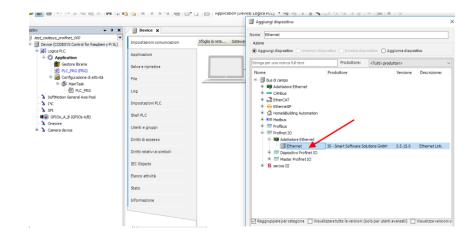
Seleziona dispositivo	2
Selezionare il percorso di rete al controllo:	
Gateway-1	Nome del dispositivo: raspberrypi Wink
	Indirizzo del dispositivo: 0301.A02C
	Driver blocco: UDP
	Fornitore del sistema di destinazione:
	Gestinazione: 3S - Smart Software Solutions GmbH
	Nome del sistema di destinazione: CODESYS Control for Raspberry Pi SL
	<u>O</u> K Annulla



The PLC is now connected to the system:

Sfoglia la rete Gateway 👻	Dispositivo -	
	Gateway	
	Gateway-1	[0301.A02C] (attivo)
	IP-Address: localhost	Nome del dispositivo: raspbenypi
	Port: 1217	Indirizzo del dispositivo: 0301.A02C
		Target ID: 0000 0010
		Tipo di sistema di destinazione: 4102
		Fornitore del sistema di destinazione: 3S - Smart Software Solutions GmbH
		Versione del sistema di destinazione: 3.5.16.0

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:





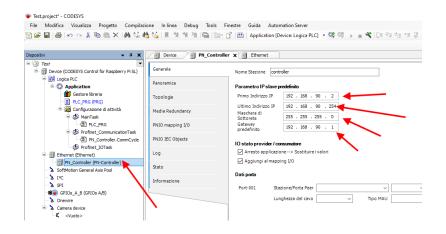
🋍 🚅 📰 🚑 🗠 여 🕹 🖻 🛍 🗙 🖊 🕼	<b>N</b> (A. 11) (11) (11) (12) (13) (13)	🕞 🛱 🕅 Application (Dev	ice: Logica PLC] 👻 👒 🕠 🕞 🔳 🍕	8 ICE 91 44 45 8	호蒙글장		
			Aggiungi dispositivo	<b>•</b>   <b>•</b> - <b>-</b> - <b>- - - -</b>	-   Mare		×
	Device X		Nome PN Controller				
Dispositivi	Device X Impostazioni comunicazioni Applicazioni Salva e ripristina File Log Impostazioni PLC Shell PLC Utenti e gruppi Diritti di accesso Diritti relativi ai simbolii IEC Objects Elenco attività Stato	Sfogla la rete Gatewar	Nome     PN_Controller       Adore <ul> <li>Agglungi dispositivo ○ Inserisci</li> <li>Stringa per una ricerca full-text</li> <li>Nome</li> <li>Ibra di campo</li> <li>IbrenetIP</li> <li>IbrenetIP</li> <li>IbrenetID</li> <li>Im Profinet IO</li> <li>Im Profinet IO</li> <li>Im Naster Profinet IO</li> <li>Im Naster Profinet IO</li> <li>Im PN-Controller</li> </ul>	Produttore: Produttore	<tutti i="" produttori=""> Versi</tutti>	one Descrizione:	×
	Informazione		Raggruppare per categoria Vi     Nome: PN-Controller     Produttore: 35 - Snart Softw     Gruppk Master Profine: No Softw     Gruppk Master Profine: 10 Cont     Descrizione: Profine: 10 Cont     Descrizione: Profine: 10 Cont     Accodamento del dispositivo sele:     Ethernet     (Mentre questa finestra è aperta	are Solutions GmbH troller zionato come ultimo "fig	io Di	vo di destinazione nel navigatore).	hiudi

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

File Modifica Visualizza Progetto Compilaz	tione In linea Debug Tools	Finestre Guida Automation Server
E 🖨 🖬 🎯 🗠 🗠 🖇 🖻 🛍 🗙 🗚 😘 🕯	🎽 🌿   川 利 利 利 🎘   陆   油・	📑 🔚 🛛 Application [Device: Logica PLC] 🝷 🥰 👀 🕞 🔳 🔏 🗐 🗐
Dispositivi - 4 ×	Device PN_Control	er 📝 🗃 Ethernet 🗙
■     Test     ▼       ■     Devec (CODESTS Control for Raspberry PI S.)       ■     ■     Dependence       ■     ■     Dependence       ■     ■     Depication       ■     ■     Depication       ■     ■     Depication       ■     ■     Depication       ■     ■     Configuration of attività       ■     ●     Depication of attività       ■     ●     ●       ■     ■     C.PRG       ■     ●     ●       ■     ●     ●       ■     ●     Definet_CommunicationTask       ■     ●     ●       ■     ●     Definet_CommunicationTask	Generale Log Stato Ethernet Device mapping I/O Ethernet Device IEC Objects Informazione	Network interface eth0 m Indirizo IP 192 . 168 . 20 . 44 Maschera di sottorete 255 . 255 . 0 Gatewaypredefinito 0 . 0 . 0 . 0 Adatta impostazioni del sistema operativo
Software (Brane)     PN_controler (PH-Controler)     Software (Brane)     Software (Brane)     Software (Brane)     Software (Brane)     Software (Brane)     Conenire     Software device     C (Votob >		



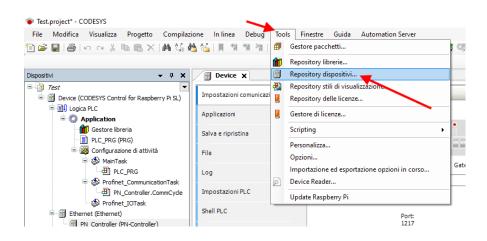
Set also the address range for the Profinet peripheral, double click on PN\_Controller:





#### 6.1.2. INSTALLING THE GSD

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



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

osizione	System Repository (C:\ProgramData\CODESYS\Devi	ces)				√ <u>M</u> odif	fica
escrizioni	i dispositivi installati						
Stringa pe	r una ricerca full-text	Produttore:	<tutti i="" produttori=""></tutti>			✓ <u>I</u> nsta	alla
Nome			Produttore	Versione	Descrizione:	Disin:	
🖲 🗊 Va	arie					Espe	
🕸 🔗 🕸	zionamenti SoftMotion						
🖹 🗊 BL	us di campo						
🖻 - 🗒	Adattatore Ethernet						
	RM CANbus						
	CANopen						
	Dispositivi IO-Link						
	a EtherCAT						
	EthernetIP						
	Home&Building Automation						
	🕊 J1939						
	15 Modbus						
	# Profibus						
	Profinet IO						
	🗧 🚟 Adattatore Ethernet						
	E - IIII Dispositivo Profinet IO						
	* · · · · · · · · · Master Profinet IO						
e	🖹 🎹 Slave Profinet IO 🖊						
	ADAM-6100PN Compact	t/O	Advantech Co., Ltd.	SW=V 1 2 1, HW			
	CIFX Profinet Device		3S - Smart Software So				
	Codesys Plc PN Device		3S - Smart Software So				
	CODESYS Profinet Device	2	3S - Smart Software So		CODESYS PLC running as Profinet De		
	EL6631-0010 V2.0		Bedkhoff	SW=V1.00, HW=			
<					>	,	

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:

<b>₩</b> ∎ @ !!!!!!#\$\$\ <b>#</b> \$\$\	6 64 10 19 19 19 10 10 10	C Device: Logica	1	11 11 응   이 國   ㅠ   장
positvi 👻 🖣 🗙	Device X	· · · · · · · · · · · · · · · · · · ·	Login (ALT+F8)	
Test     Test     Option (CODESYS Control for Raspberry PI SL)	Impostazioni comunicazioni	Sfoglia la rete Gateway • Dispos	āvo •	
Digica PLC     Application	Applicazioni			
Gestore Ibreria     DEC_PRG (PRG)	Salva e ripristina			
Configurazione di attività Si MainTask	File		Gateway	• •
PLC_PRG     Second Action PLC_PRG     S	Log	Eater	ay-1 ~	[0301.A02C] (attivo)
PN_Controller.CommCyde	Impostazioni PLC	IP-Adi localh	dress: ost	Nome del dispositivo: raspbenypi
Ethernet (Ethernet)	Shell PLC	Port: 1217		Indirizzo del dispositivo: 0301.402C
SoftMotion General Axis Pool     IPC	Utenti e gruppi			Target ID: 0000 0010
- SPI B GPIOS A B (GPIOS A/B)	Diritti di accesso Diritti relativi ai simboli			Tipo di sistema di destinazione: 4102
A Onewire     Camera device	IEC Objects			Fornitore del sistema di destinazione: 35 - Smart Software Solutions GmbH
	Elenco attività			Versione del sistema di destinazione: 3.5.16.0
	Stato			a sector



#### 6.1.3. INSTALLATION OF THE SENECA PROFINET IO

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

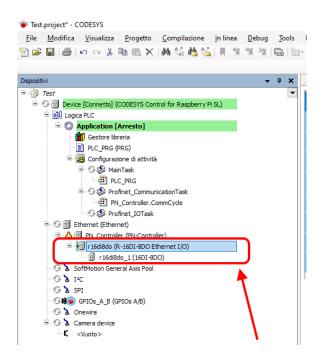
Dispositivi		- ∓ ×	Device PN_Co	ntroller 🗙 🗃 Ethernet	
Test     Test     Device [Connetto] (CODESYS Contr     Device [Connetto] (CODESYS Contr     Device PLC	ol for R	aspberry Pi SL)	Generale	Nome Stazione cont	troller
Application [Arresto]			Panoramica	Parametro IP slave	predefinito
Gestore Ibreria			Topologia	Primo Indirizzo IP	192 . 168 . 9
PLC_PRG (PRG)				Ultimo Indirizzo IP	192 . 168 .
= 🥵 Configurazione di attivita			Media Redundancy	Maschera di	255 . 255 . 2
All PLC PRG			PNIO mapping I/O	Sottorete Gateway	
= 🗇 🥸 Profinet Communic	ationTa	isk	Pivio mapping yo	predefinito	192 . 168 .
PN_Controller.Con			PNIO IEC Objects		
🖓 🥩 Profinet_IOTask				IO stato provider / or Arresto applicazi	
🗏 😳 🚮 Ethernet (Ethernet)			Log		
PN_Controller (PN-Controlle	er) X	Taglia	Stato	Aggiungi al mapp	oing 1/0
- 😳 🏅 SoftMotion General Axis Pool - 😳 🏅 IPC	en en	Copia		Dati porta	
	18	Incolla	Informazione		
GPIOS A B (GPIOS A/B)		Elimina		Port-001 Sta	azione/Porta Peer
- G à Onewire	×	Elimina		Lu	nghezza del cavo
B 😌 🍐 Camera device		Refactoring +			
K <vuoto></vuoto>	63	Proprietà	1		
	¥33	Aggiungi oggetto	-		
		Aggiungi oggetto Aggiungi cartella			
	1	Trova dispositivi			
	*	Acknowledge Diagnosis	-		
		Acknowledge Diagnosis Subtree			
	100	Modifica oggetto			
		Modifica oggetto con			
			-		
		Modifica mapping I/O			
		Importa i mapping dal file csv			
		Esporta i mapping nel file csv	essaggi – Errori 0 totali, 0 avviso		🗘 0 errore(i) 🕚

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

Nome dispositivo		Tipo di dispositivo	Nome stazione	
r16di8do		R-16DI-8DO Ethernet I/O	r16di8do	16#8000000
····· r16di8do_1	dentificazione. Verificare l'indirizzo I	16DI-8DO Vendor-ID: 0x002A, Product-ID: 0x0202	lab-iot	16#01000000 error: IP address conflic
	dentificazione. Verificare l'indirizzo I	Volidor 15. oxodes (, 110ddor 15. oxodes	lab-iot	error: IP address conflic error: IP address conflic
				/
	<> Reset Lampequio LEI	Deterr⊡ Show only unnamed stations	□ Mostra	a differenze rispetto al prog
				,



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



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

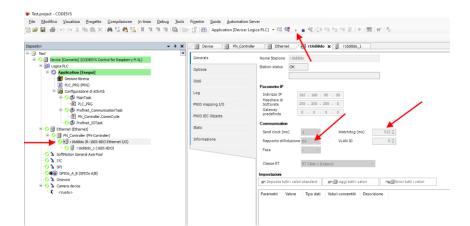
If you want to change the IO configuration parameters, you can set them from here:

Dispositivi	<b>-</b> ∓ ×	Device	PN_Controller	Ethernet 🕅 r16d	8do 🗡 👔 r1	6di8do_1 🗙	
Fest     For the connection (CODESYS Control for Raspberry Pi SL)	•	Generale		Informazioni Modulo			
E 🗐 Logica PLC	PNIO Module mapping I/O		Numero d'ident. 16#01000000				
= 🔘 Application [Esegui]							
Bestore Ibreria     BLC PRG (PRG)		PNIO Module I	EC Objects	Numero slot	1		
Configurazione di attività				Impostazioni			
□ S S MainTask		Stato		Imposta tutti i valori standaro	10.00	i tutti valori	<b>1</b>
D PLC PRG		Informazione		Imposta tutti i valori standaro	M. Willredd	n cucce valori	- 11 I I I
🖶 😏 🎲 Profinet CommunicationTask		2. Contraction of		Parametri	Valore	Tipo dati	Valori con
PN_Controller.CommCycle				Set Digital Inputs Filter Delay [ms]			
- 😏 🥩 Profinet_IOTask				Set Digital Inputs Filter Delay (n	13 O	Unsigned 16	030
😑 😏 🔟 Ethernet (Ethernet)				Set All Digital Inputs NPN/PNP		0100010010	
PN_Controller (PN-Controller)				Set All Digital Inputs NPN/PNP	PNP 0	30 Bit	
🖻 😏 🗐 r 16di8do (R-16DI-8DO Ethernet I/O)				Enable Digital Outputs Fault Timeou		_	
😏 🗐 r 16di8do_1 (16DI-8DO)				Enable Digital Outputs Fault Tin		Bit	01
🚱 🖢 SoftMotion General Axis Pool				Set Digital Outputs Fault Timeout [s			
- G \$ 12C				Set Digital Outputs Fault Timeo	ıt [s] 0	Unsigned 16	065535
- 😌 🏅 SPI				Set Digital Output Fault States			
- 🖸 🛤 🥃 GPIOs_A_B (GPIOs A/B)				DO.1	0	Bit	01
😏 🍐 Onewire				DO.2	0	Bit	01
🖹 😏 🏅 Camera device				DO.3	0	Bit	01
				DO.4	0	Bit	01
				DO.5	0	Bit	01
				DO.6	0	Bit	01
				DO.7	0	Bit	01
				DO.8	0	Bit	01
				Set Digital Output Normally Open/C			
				DO.1	0	Bit	01
				DO.2	0	Bit	01
				DO.3	0	Bit	01
				D0.4	0	Bit	01
				DO.5	0	Bit	01
				D0.6	-	Bit	01
				D0.7	0	Bit	01
				DO.8	0	Bit	0:

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:

File Modifica Visualizza Progetto Compilazio	ne Inlinea Debug Tools	Finestre Guida Autom	ation Server					
) 📽 🖬 📾 🗠 🗠 🐁 📾 📾 🗙 🛤 🎼 🕊	🚰   III, M. M. M. 🖷 🛅 -	📑 🔛 Application [De	vice: Logica PLC]	• <b>05</b> 05 → =	19 10 19	ta *a \$   ¢  ∰	(日間)	
spositivi 👻 🖛 🗙	👔 r16di8do_1 🗙 🗃 Etherne	et 🔐 PN_Controller	r 16d8do	Device		i 🎲 MainTask	1	Profinet_Communi
Test	Generale	Find		Filter Visualizza tu	tti	- 4	Add FB	or IO Channel
Device (CODESYS Control for Raspberry Pi SL)     Device (CODESYS Control for Raspberry Pi SL)     Device (CODESYS Control for Raspberry Pi SL)	Generale					-		
Graphication	PNIO Module mapping I/O	Variabile	Mapping	Canale	Indirizzo	Tipo	Unità	Descrizione
Gestore Ibreria		8-*		DI Channel 116	%IW2	UINT		
PLC_PRG (PRG)	Stato	- ** B- **		Inputs PS	%186	Enumeration of BYTE		
Configurazione di attività	Informazione	- 19 - 19		DO Channel 18	%Q80	USINT		
🖹 🎲 MainTask	Informazione	<b>*</b>		Outputs CS	%187	Enumeration of BYTE		
A PLC PRG								
PN Controller.CommCyde								
Profinet IOTask								
Ethernet (Ethernet)								
PN_Controller (PN-Controller)								
r 16di8do (R-16DI-8DO Ethernet I/O)								
1 r16di8do 1 (16DI-8DO)								
SoftMotion General Axis Pool								
- \$ PC								
- SPI								
- B GPIOs_A_B (GPIOs A/B)								
Onewire								
- A Camera device								
K <vuoto></vuoto>								

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:

Test.project - CODESYS File Modifica Visualizza Progetto Compilaz	one In linea Debug Tools Finestre Guida Automation Server	
e 🕞 🖬 🕼 🗠 🗠 🖇 🖻 🕮 🗙 🛤 🎼 d	🌢 😘 । 📕 🦄 🎕 🦓 🖓 । 🖼 । 🛅 • 🔐 । 🔠 । Application [Device: Logica PLC]	• 🕫 🕫 🕞 📲 % 🖓 🕾 🖻 •
Dispositivi 👻 🕂 🗙	👔 r16d8do_1 📑 Ethernet 📑 PN_Controller 🙀 r16d8do	Device PLC_PRG X
■         Test         ■           ■         ■         Decec (COESYS Control for Rappberry P.S.)           ■         ■         Logica P.C.           ■         ■         Configuration           ■         ■         Configuration           ■         ■         Configuration           ■         ■         Configuration           ■         ●         ©           ■         ■         Configuration           ■         ●         ●           ●         ●         Outpartial           ■         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●           ●         ●         ●	RRCRAW ELC PRG Varinguts : WORD; Veringuts : WORD; Veringuts : BYR; Veringuts : BYR; OUTPUTS	VARIABLES DECLARATION
High riddeb (r-HOR ROD Element (D))     High riddeb (riddeb)     High riddeb (riddeb)     High riddeb (riddeb)     Lick (riddb)     Lick (riddeb)	1 VesInputs:-1772; 2 VGD0:-VesOutputs; PROGRAM	

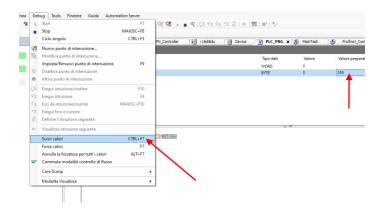
Go into login and start.



The value of the inputs can be read here:

Test.project - CODESYS								
File Modifica Visualizza Progetto Compilazione In linea								
🎦 🚅 📓 🗠 🗠 🌣 🏗 🗈 🗙 👫 🏰 🎽 📲 🌹	🎢 🎢 🖳 🖄	🕒 📑 🖽 Application [Device: Log	ca PLC] + 🔍 💖 🕨	🖬 📲 🗐 🖉	*표 응   수   및	B   ㅠ'   카/		
Dispositivi	<b>→</b> 쿠 X	r16d8do_1 🕤 Ethernet	PN_Controller	r 16di8do	Device	📄 PLC_PRG 🗙 🌸	MainTask	Profinet
■ <sup>[</sup> <sub>2</sub> ] Test	-	Device.Application.PLC_PRG						
Device [Connetto] (CODESYS Control for Raspberry Pi SL)		Espressione				Tipo dati	Valore	Valore pre
= 1 Logica PLC		@ VarInputs				WORD	0	
Application [Esegui]		VarOutputs				BYTE	0	
Gestore libreria      PLC_PRG (PRG)								
Configurazione di attività								
R- G & MainTask								
- (B) PLC_PRG								
= 😏 🥵 Profinet_CommunicationTask								
PN_Controller.CommCycle								
- 😏 🕸 Profinet_JOTask								
= 😔 🚮 Ethernet (Ethernet)		1 @ VarInputs 0 :-%I%	20:			A V		
South Controller (PN-Controller)		2 🔿 %QB0 👩 :-VarOutput:	0 RETURN					
= 3 🗐 r 16di8do (R-16DI-8DO Ethernet I/O)								
- 5 🗐 r16d8do_1 (16DI-8DO)								
SoftMotion General Axis Pool								

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



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

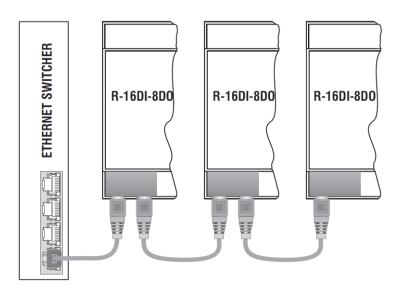


### 7. CABLE HARNESS FOR MODELS WITH DOUBLE ETHERNET PORT

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

#### 7.1. CHAIN ETHERNET CONNECTION (DAISY CHAIN)

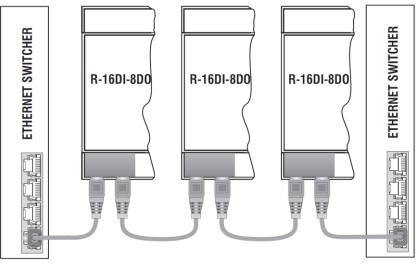
Using the daisy chain connection it is not necessary to use switches to connect the devices. An example (in this case on R-16DI-8DO-P) of connection of 3 devices is as follows:



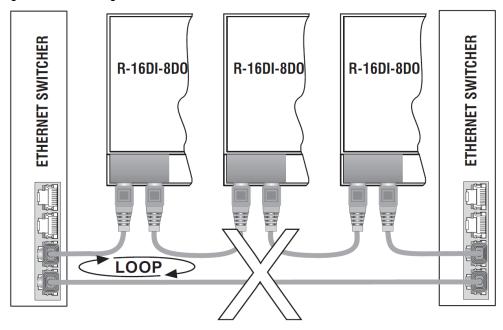




If it is necessary to connect the devices to the switches, correct wiring is as follows:



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





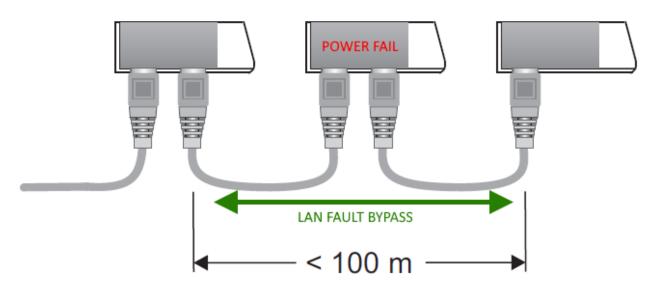
#### 7.2. LAN FAULT-BYPASS FUNCTION

The LAN fault-bypass function allows you to keep the connection between the two Ethernet ports of the device ON, in the event of power failure problems.

If a device turns off, the chain is not interrupted and the devices downstream of the switched-off one will still be accessible.

This function has a limited duration: the connection remains active for a few days, typically 4.

The Lan fault-bypass function requires that the sum of the lengths of the two cables connected to the switched off module is less than 100m.



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

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

The software can be downloaded from:

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

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



*	IP	Mode	MAC	Ping	Name	Hostname	Firmware	CRC	Commands	
<b>()</b>	192.168.86.95	DHCP	00:A7:C5:F1:11:92	2 ms	R-16DI-8DO	192.168.86.95	997.1014	OK	Assign	
⊕	192.168.90.199	STATIC	C8:F9	Different Subnet	Z-KEY	192.168.90.199	126.0	ОК	Assign	
۲	192.168.85.8	STATIC	C8:F9	4 ms	Z-KEY	1	119.0	OK	Assign	
⊕	192.168.85.106	STATIC	C8:F9	4 ms	Z-PASS2-S	2	2940.343	ОК	Assign	
۲	192.168.84.156	STATIC	00:22	2 ms	Cloud BOX	1 6	7800.112	ОК		
⊕	192.168.85.198	STATIC	C8:F9	2 ms	Z-PASS2-S	2	2940.335	ОК	Assign	
۲	192.168.84.192	STATIC	C8:F9	2 ms	Z-TWS4	2	2940.331	ОК	Assign	
⊕	192.168.85.7	STATIC	C8:F9	2 ms	Z-PASS2		3900.240	ОК	Assign	
⊕	192.168.85.200	STATIC	C8:F9	3 ms	Z-TWS4	2	2940.220	ОК		
⊕	192.168.85.69	STATIC	00:50	2 ms	Cloud BOX		7800.200	ОК		
۲	192.168.84.155	STATIC	00:22	2 ms	Cloud BOX	c sca	7800.111	ОК		
⊕	192.168.85.103	STATIC	C8:F9	2 ms	Z-PASS2	1 3	3900.250	ОК	Assign	
<b>()</b>	192.168.100.101	DHCP	C8:F9	Different Subnet	Z-PASS2	192.168.100.101	3900.240	ОК	Assign	

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

Assign IP	x
	IP
Static IP	192.168.86.95
Netmask	Gateway
255.255.255.0	192.168.86.1
Assign	Cancel

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

## ATTENTION!

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



#### 9. FIRMWARE UPDATE

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

## **ATTENTION!**

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

### **ATTENTION!**

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

# **ATTENTION!**

SOME MODELS ARE SUPPLIED WITHOUT AN IP ADDRESS (0.0.0.0) IN THIS CASE THE "STS" LED FLASHES.

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