



DOC343.52.90752

# **PROFINET and EtherNet/IP modules**

11/2021, Edition 2

**User manual**



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## Section 1 General information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

### 1.1 Safety information

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

### 1.2 Use of hazard information

#### **▲ DANGER**

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

#### **▲ WARNING**

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

#### **▲ CAUTION**

Indicates a potentially hazardous situation that may result in minor or moderate injury.

#### **NOTICE**

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

### 1.3 Product overview

The SC4500 controller is available with optional expansion modules:

- EtherNet/IP module—The controller can connect to a PLC through Industrial Ethernet Protocol including a EtherNet/IP solution. Line, Star and Ring topologies are available.
- PROFINET module—The controller can connect to a PLC through the Industrial Ethernet Protocol, which includes a PROFINET solution. Line, Star and Ring topologies are available.

The SC4500 controller PROFINET and EtherNet/IP modules are applicable to the network topologies that follow:

- Line (chain) topology—Connects the devices with integrated switches in the field. Refer to [Figure 1](#).
- Star topology—Devices connects to a central switch. Refer to [Figure 2](#).
- Ring topology—The network is closed in a ring shape to get redundancy. The media redundancy protocol (MRP) is used for PROFINET and device level ring (DLR) for EtherNet/IP. Refer to [Figure 3](#).

Figure 1 Chain topology

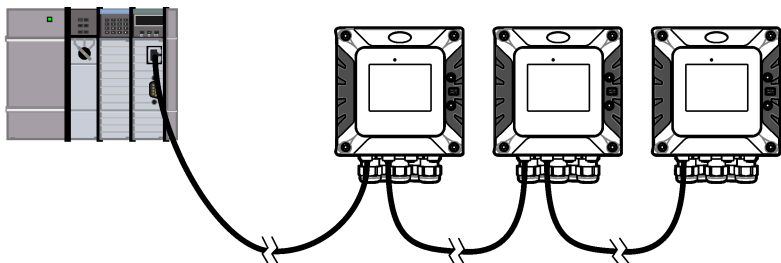


Figure 2 Star topology

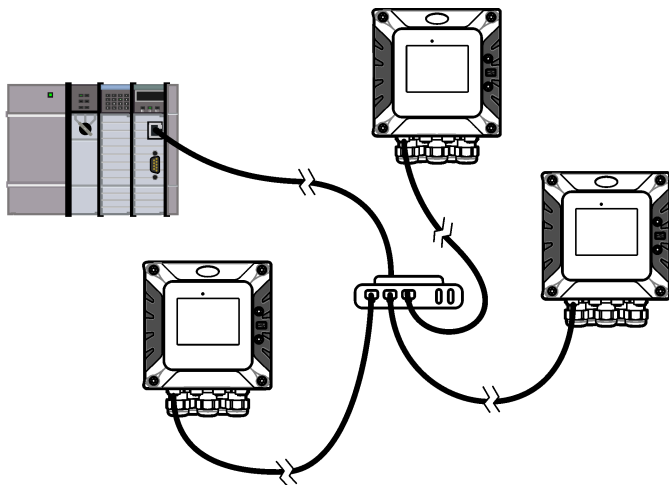
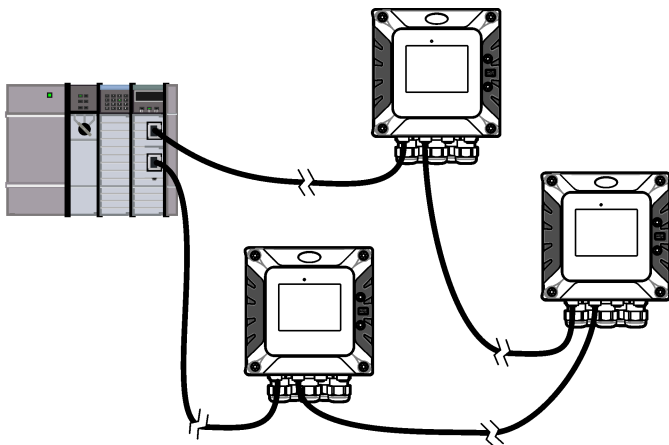


Figure 3 Ring topology



## Section 2 Commissioning checklist

Use the checklist that follows to complete the PROFINET or EtherNet/IP installation and configuration procedure. Do the tasks in the order given.

Task	Completed
<a href="#">Install the module</a> on page 5 in the controller.	
<a href="#">Electrical installation</a> on page 7—Make all of the necessary hardware connection (wiring).	
<a href="#">Configure the Ethernet ports</a> on page 8 on the controller	
<a href="#">Install the configuration file</a> on page 9 on the PLC environment. <ul style="list-style-type: none"><li>• PROFINET—GSDML file</li><li>• EtherNet/IP—ESD file</li></ul>	
<a href="#">Configure the PLC environment</a> on page 11	
<a href="#">Configure the module</a> on page 27 (PROFINET or EtherNet/IP) on the controller.	

## Section 3 Installation

### ⚠ DANGER



Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

### 3.1 Install the module

### ⚠ DANGER



Electrocution hazard. Always remove power to the instrument before making electrical connections.

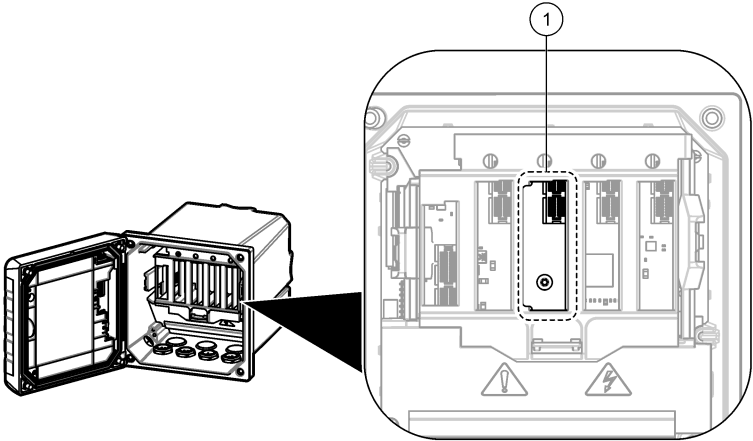
Make sure that the PROFINET or EtherNet/IP module is installed in the controller. Refer to the documentation supplied with the module<sup>1</sup>.

#### Notes:

- Make sure that the controller is compatible with the module. Contact technical support.
- Connect the module to the third slot on the right side of controller. Refer to [Figure 4](#).

<sup>1</sup> The module is factory installed based on the controller configuration.

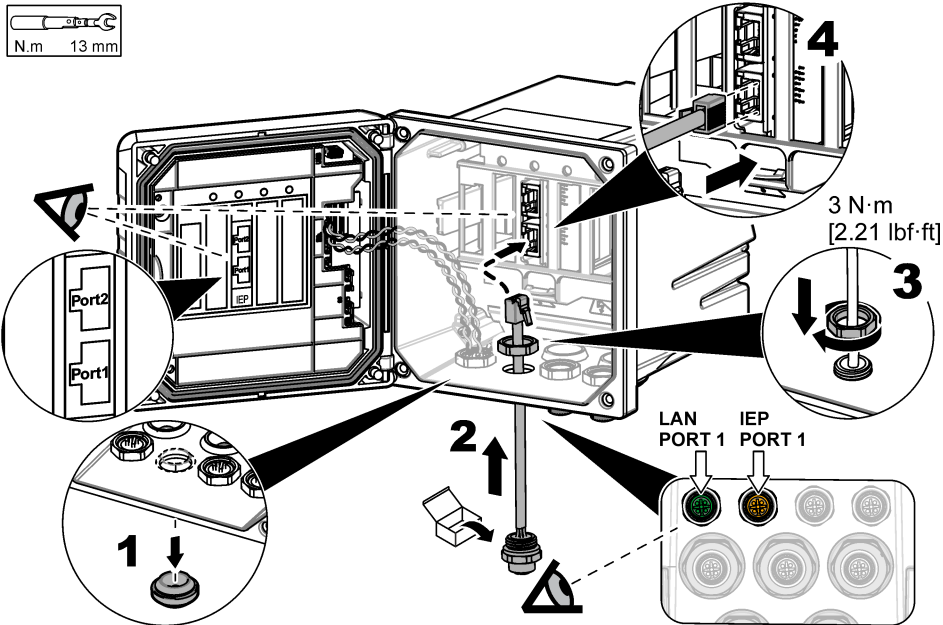
Figure 4 EtherNet/IP or PROFINET module slot



1 Module slot

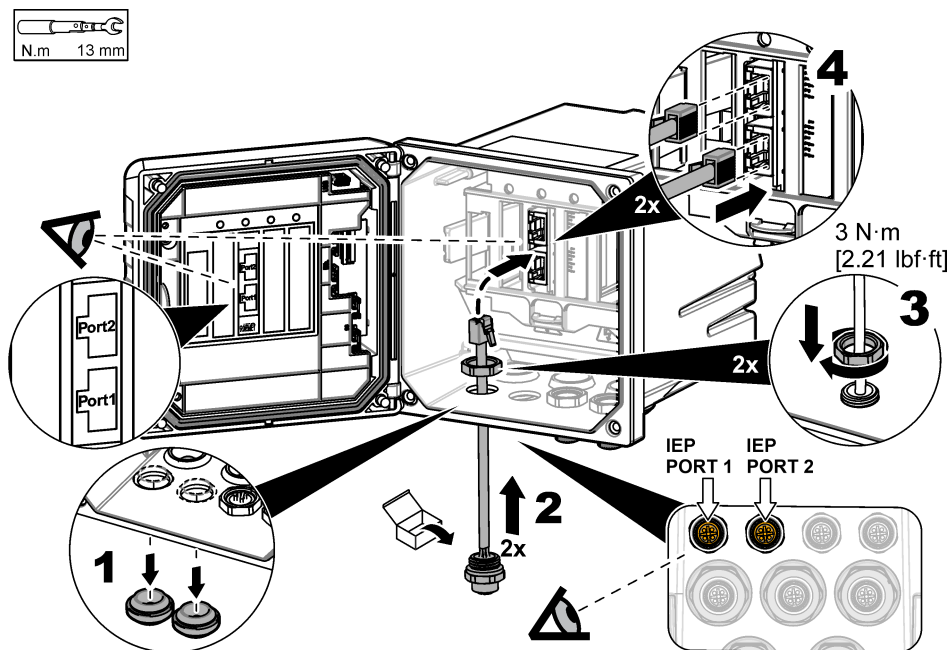
Configure the controller with 1 or 2 Industrial Ethernet ports based on the network configuration. For star topologies, configure the controllers with 1 Ethernet port. Refer to [Figure 5](#). For chain or ring topologies, configure the controller with 2 Ethernet ports. Refer to [Figure 6](#).

Figure 5 Controller with 1 Ethernet port—LAN + PROFINET or Ethernet/IP





**Figure 6 Controller with 2 Ethernet ports—PROFINET or EtherNet/IP only**



## 3.2 Electrical installation

### ⚠ DANGER



Explosion hazard. Do not connect or disconnect electrical components or circuits to the equipment unless power has been removed or the area is known to be non-hazardous.

#### Items to collect:

- SC4500 controller with PROFINET or EtherNet/IP module installed
- PLC
- PROFINET/Ethernet switch (optional, only for star topologies)
- LAPTOP with TIA or PLC environment installed
- PROFINET/Ethernet copper cable

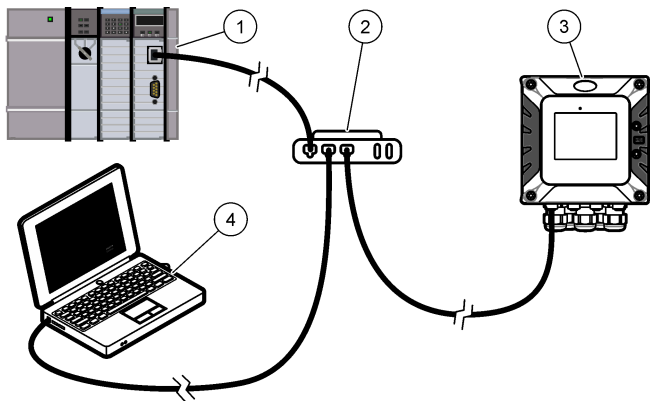
Use a Ethernet copper cable for the connection. The cable is a 4-wire shielded, green-colored cable that gives **100 Mbps** Fast Ethernet minimum at **100 meters** maximum. The cables used in industrial networks are CAT 5, 5E, CAT 6, 6A or CAT 7 category cables. The cables have an IP66 M12 connector or IP20 RJ45 connector.

Hach supplies two standard cable accessories and a kit that includes the connectors to make a custom cable. Refer to [Replacement parts and accessories](#) on page 43.

Make all of the electrical connections in the PROFINET or EtherNet/IP network. Refer to [Figure 7](#).

1. Connect the SC4500 controller to the industrial switch (M12 - RJ45 cable).
2. Connect the PLC to the industrial switch (RJ45 - RJ45 cable).
3. Connect the Laptop to the industrial switch (RJ45 - RJ45 cable).

Figure 7 Wiring example



1 PLC	3 SC4500 controller
2 Industrial switch	4 Laptop

Section 4 Startup

- 1. Supply power to the controller and PLC.
- 2. Set the PLC to on.

Section 5 Operation

5.1 Configure the Ethernet ports

Make sure that the Ethernet port configuration in the controller is set to one of the IEP (industrial Ethernet ports) options.

- 1. Push the main menu icon, then select **Controller > Connectivity > LAN > Ethernet ports**.
- 2. Select one of the options that follow based on the wiring configuration of the controller.

Option	Description
IEP only	The two Ethernet ports are configured for PROFINET or EtherNet/IP. Port 2 in the module is enabled. Refer to <a href="#">Figure 6</a> on page 7.
MIX IEP	One Ethernet port is configured for LAN connectivity and the other Ethernet port is configured for PROFINET or EtherNet/IP. Port 2 in the module is disabled. Refer to <a href="#">Figure 5</a> on page 6. <b>Note:</b> When Mix IEP is selected, <b>LAN port configuration</b> shows in the LAN menu. <b>LAN port configuration</b> setting is used only for LAN connectivity configuration, not for Industrial Ethernet port configuration.

## 5.2 Install the configuration file

Download the configuration file from the manufacturer's website. Install the file on the PLC environment.

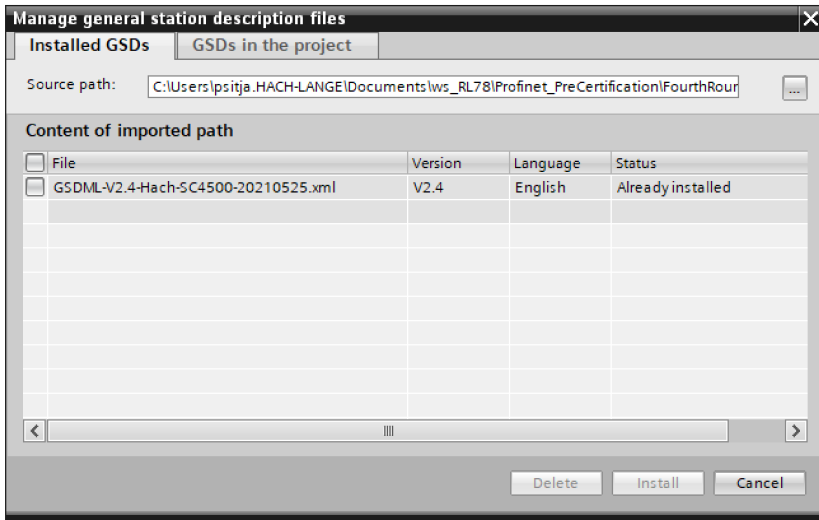
**Note:** Make sure to remove the old configuration file before a new configuration file is installed.

### 5.2.1 Install the PROFINET GSDML file

An example of installation in TIA (Totally Integrated Automation) portal from SIEMENS PLC software follows:

**Note:** Steps that follow is an example. Steps and commands may change based on the installed PLC solution.

1. Select **Options > Manage general station description files**
2. Search for the folder where the file was saved.
3. Select the file, then click Install.



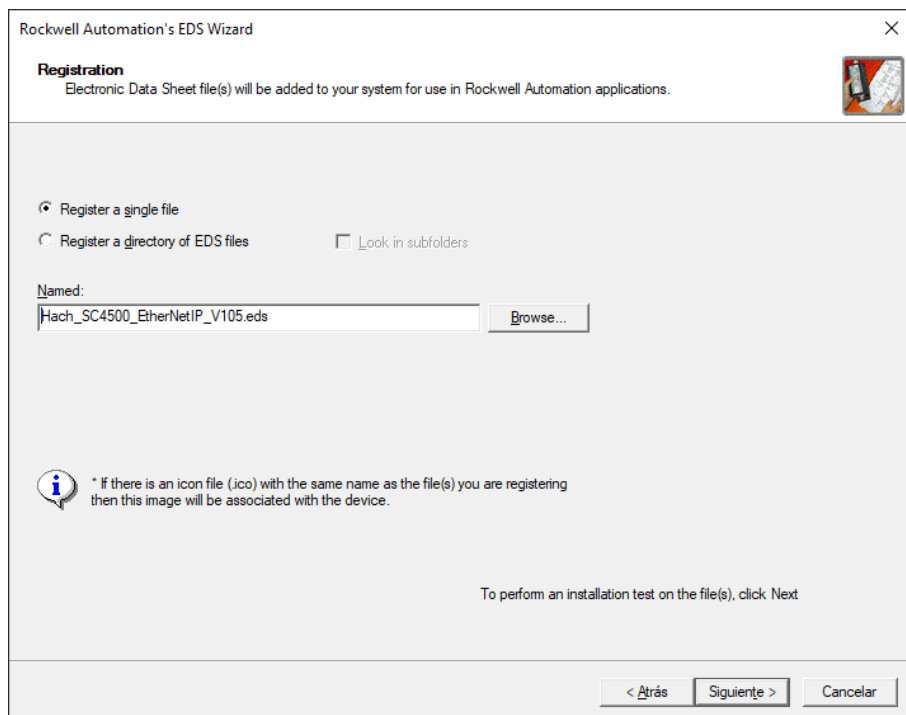
When the file is installed, "SC4500 Controller 1 port" and "SC4500 Controller 2 port" are available in the PLC hardware catalog view. Select **OTHER FIELD DEVICES > PROFINET IO > IO > HACH LANGE > HACH SC4500 CONTROLLERS** folder.

### 5.2.2 Install the EtherNet/IP EDS file

An example of installation in Studio 5000 Logix Designer software from Rockwell Automation Technologies Inc. follows:

**Note:** Steps that follow is an example. Steps and commands may change based on the installed PLC solution.

1. Select **Tools > EDS hardware Installation Tool**.
2. Follow the wizard instructions.
3. In the wizard, select the option **Register and EDS file(s)**. Then, select **Register a single file** and browse the downloaded ESD file.



4. Complete the Wizard instructions.

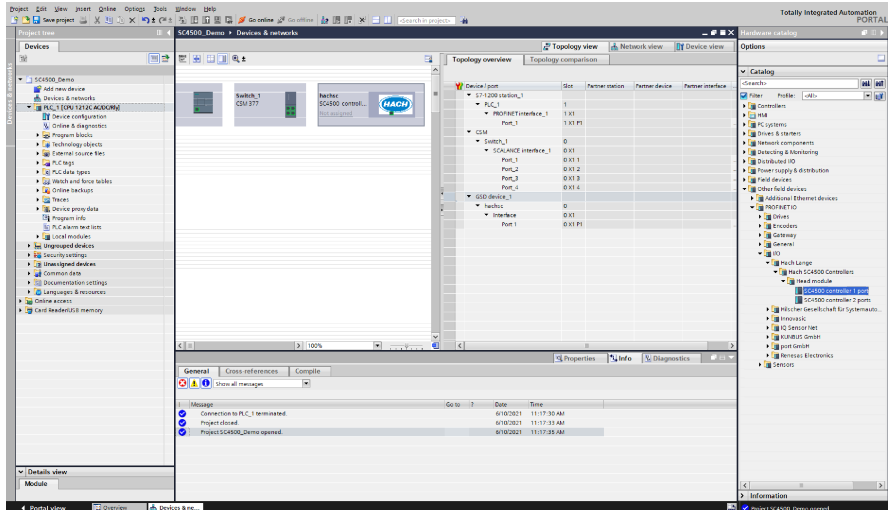
When the file is installed, the SC4500 module is available in the **Controller organizer** view.

## 5.3 Configure the PLC environment

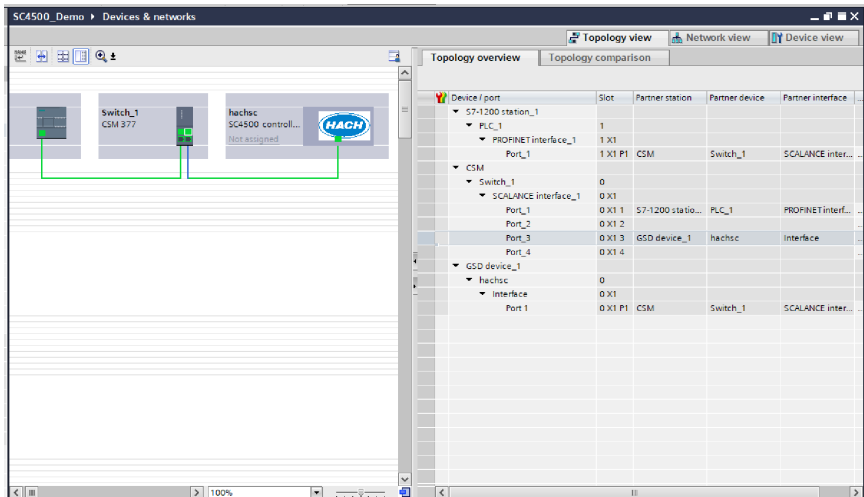
### 5.3.1 Configure the PROFINET environment

Configure the TIA portal as follows:

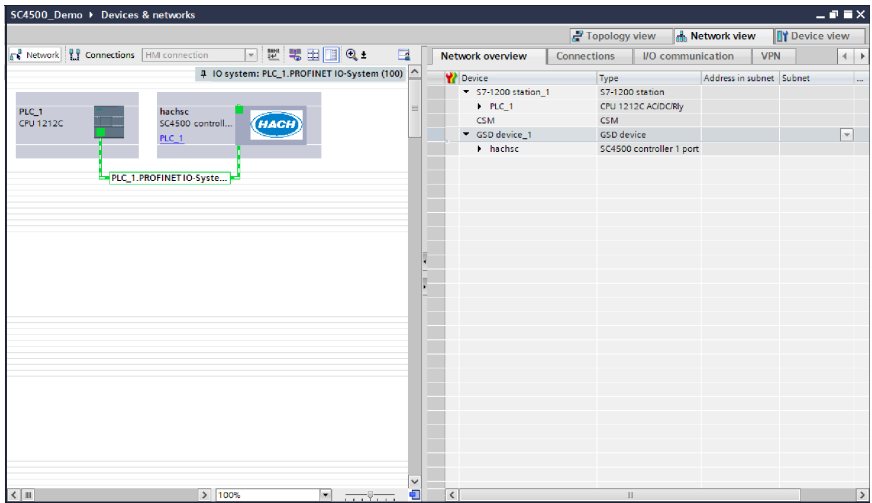
1. Add all of the items that configure the network topology from the **Catalog** devices.  
In the example: the PLC, industrial switch and SC4500 controller.
2. Select **Catalog > Other field devices > PROFINET IO > I/O > Hach Lange > Hach SC4500 controller**. The PROFINET catalog shows two SC4500 controller modules. Select the module based on the Ethernet port configured option: 1 port (MIX IEP) or 2 ports (IEP only).



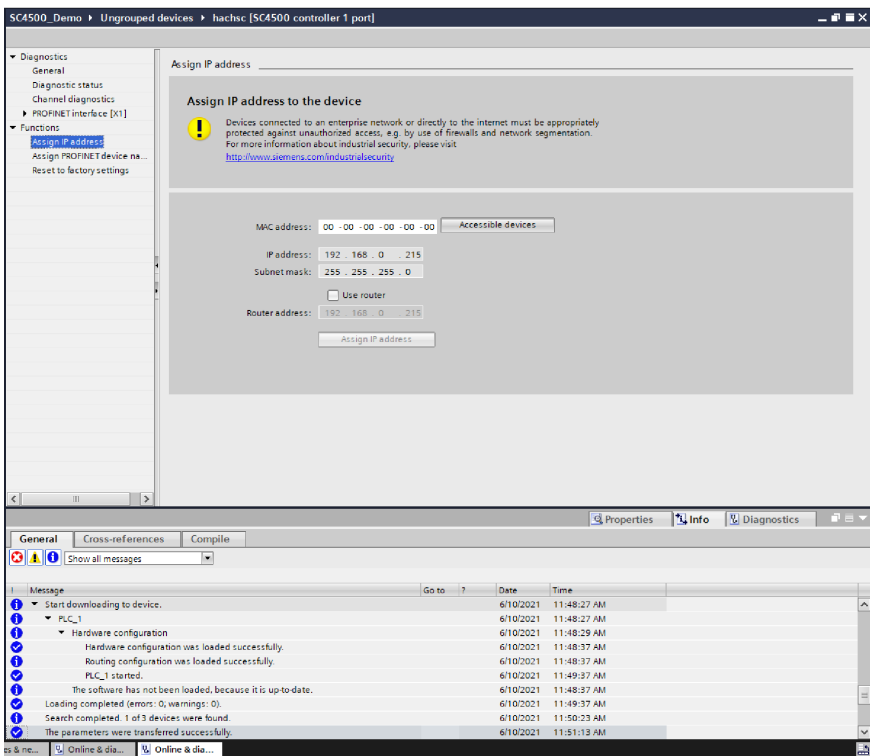
3. Add the network connections based on the network topology.



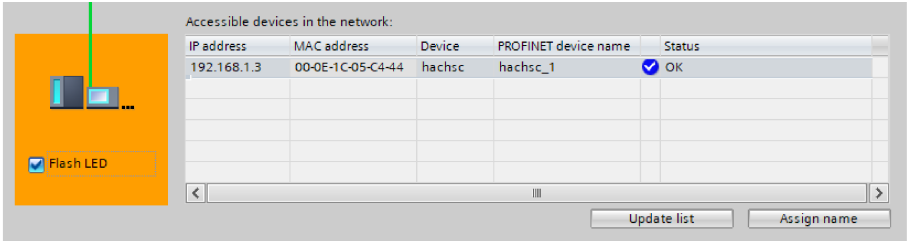
4. Assign the SC4500 controller to the PLC on the **Network overview**.



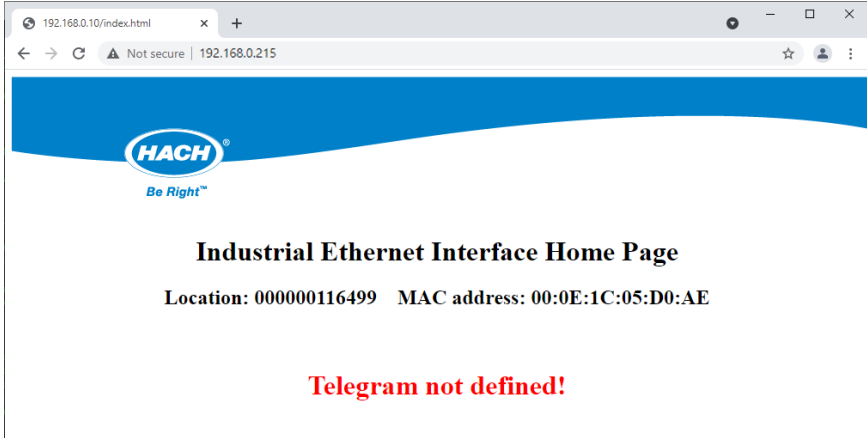
5. On the Online and Diagnostic view, select **Assign IP address** to set the IP address of the SC4500 controller.



6. Select the commands **Compile** and **Download to device** on the PLC menu.  
The SC4500 controller gets the assigned IP address and the Industrial Ethernet Interface web page is enabled. The Industrial Ethernet Interface web page gives information about the data sent through Telegram.
7. On the PLC menu, select **Accessible devices view**. Then, select **Flash LED** to identify the SC4500 controller with the installed module.  
The controller display will flash.



8. When the controller is identified, unselect the option **Flash LED**.
9. In a web browser, type the IP address to access the Industrial Ethernet Interface web page. The message "Telegram not defined!" shows.

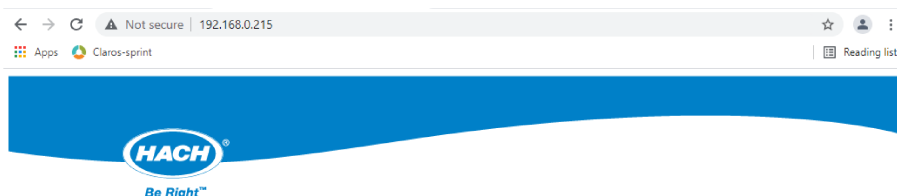


10. On the SC4500 controller, go to the main menu. Then, select **OUTPUTS > PROFINET > SIMULATION**. Set the simulation to ON.

The controller starts sending simulation values to the PLC. The controller continuously sends a simulation value in a loop from **Minimum** to **Maximum** during the set **Period**. When the value gets the **Maximum** set value, it decreases to the minimum and then again to maximum. **Error** and **Status** values set on the controller are also sent to the PLC.

Simulation	
Simulation	Yes >
Period	2 min >
Maximum	20.00 >
Minimum	10.00 >
Error	16 >

11. Go to the Industrial Ethernet Interface Home Page.



## Industrial Ethernet Interface Home Page

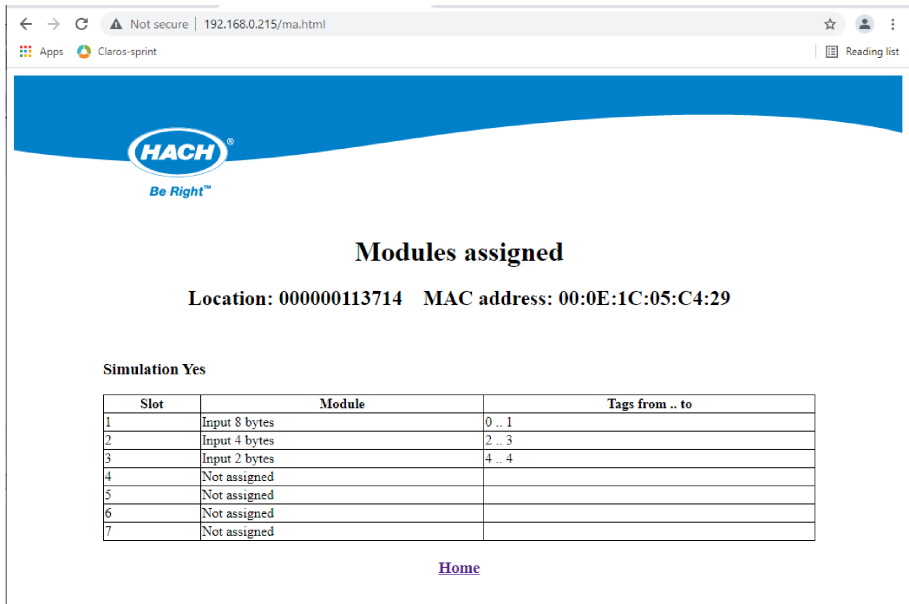
Location: 000000113714    MAC address: 00:0E:1C:05:C4:29

[Modules assigned](#)

[Telegram composition](#)



12. Select **Modules assigned** to see the information that the controller sends in simulation mode.



**HACH**  
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## Modules assigned

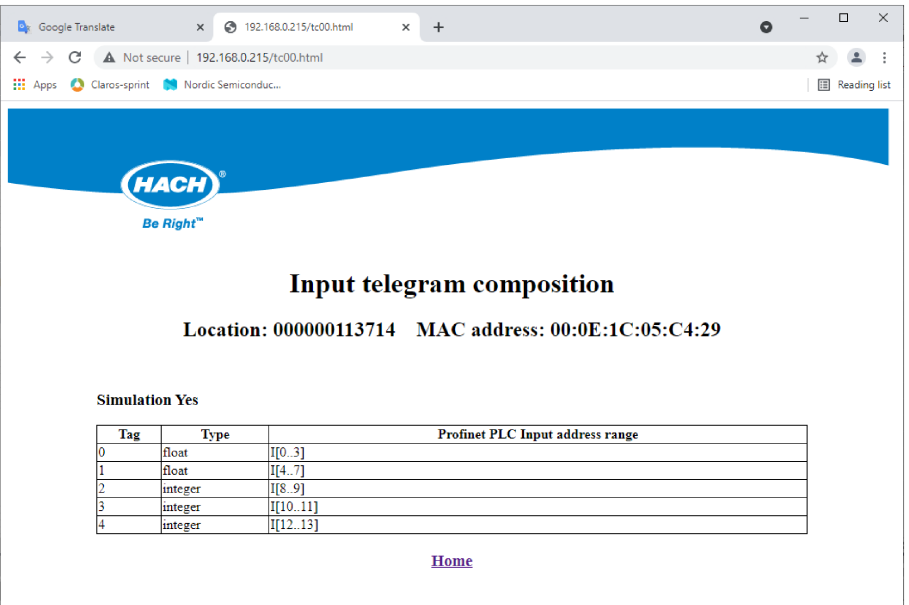
**Location:** 000000113714    **MAC address:** 00:0E:1C:05:C4:29

**Simulation** Yes

Slot	Module	Tags from .. to
1	Input 8 bytes	0 .. 1
2	Input 4 bytes	2 .. 3
3	Input 2 bytes	4 .. 4
4	Not assigned	
5	Not assigned	
6	Not assigned	
7	Not assigned	

[Home](#)

13. Select **Telegram composition** to see Telegram information on the type of data (integer or float) and their relative address in the PLC memory.



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## Input telegram composition

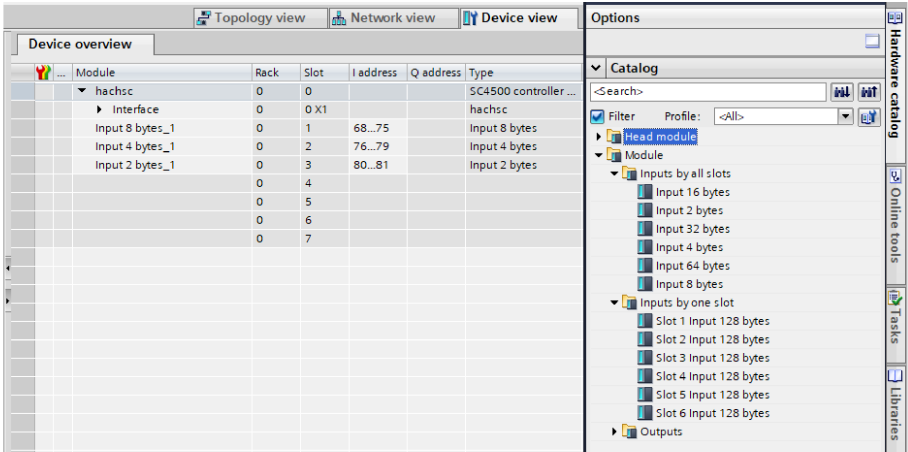
**Location:** 000000113714    **MAC address:** 00:0E:1C:05:C4:29

**Simulation** Yes

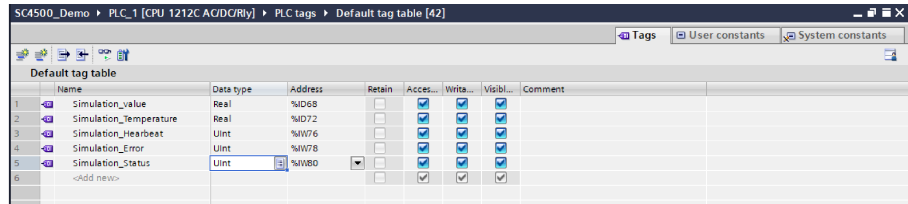
Tag	Type	Profinet PLC Input address range
0	float	I[0..3]
1	float	I[4..7]
2	integer	I[8..9]
3	integer	I[10..11]
4	integer	I[12..13]

[Home](#)

14. Add the inputs modules on the **Device overview** tab of the PLC based on the **Modules assigned** information.



15. Add the tags and variables based on the values that the controller simulation sends. Add the same settings as in the Industrial Ethernet web page. Refer to the table below.



Tags	Type	Size	Slot	Slot size	Input address	Address
1 - Simulation_value	Float (Real)	4 bytes	Slot 1	8 bytes	68...75	%ID68
2 - Simulation_Temperature	Float	4 bytes				%ID75
3 - Simulation_Heartbeat	Integer (Uint)	2 bytes	Slot 2	4 bytes	76...80	%IW76
4 - Simulation_Error	Integer	2 bytes				%IW78
5 - Simulation_Status	Integer	2 bytes	Slot 3	2 bytes	80...81	%IW80

16. Select the option **Monitor all** in the popup menu in the Default table screen. If the connection is successful, the simulation data from the SC4500 controller shows.

Name	Data type	Address	Retain	Access	Write	Visible	Monitor value	Comment
Simulation_value	Real	%D68	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	17.16665	
Simulation_temperature	Real	%D72	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	26.5	
Simulation_heatbeat	Unit	%M76	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	52637	
Simulation_Error	Unit	%M78	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	16	
Simulation_Status	Unit	%M80	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5	

17. When the simulation is successful, stop the simulation on the controller. In the main menu of the controller select **Outputs > PROFINET > Simulation**. Set the simulation to off.

5.3.2 Configure the EtherNet/IP environment

Configure the EtherNet/IP Studio 5000 Logix Designer environment as follows:

- 1. On the SC4500 controller, go to the main menu. Then, select **OUTPUTS > EtherNet/IP > Addressing mode**. Select **Static**. The option **EtherNet/IP** shows in the EtherNet/IP menu.
- 2. Select the **EtherNet/IP** setting and add the IP address of the controller.

*Note: Select Static to manually add the IP address of the controller. Select DHCP mode to automatically add an IP address using DHCP server. Contact your network administrator for more information.*

EtherNet/IP	
Addressing mode	Static
Location	000000116499
Version	1.05
MAC Address	00:0E:1C:05:D0:AE
Input from PLC	

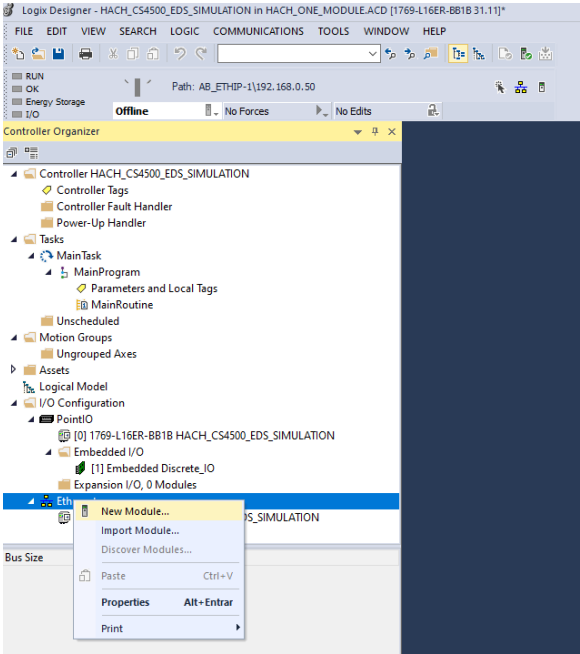
EtherNet/IP	
IP address	192.168.0.10
Subnet mask	255.255.255.0
Gateway address	0.0.0.0

3. Select **OUTPUTS > EtherNet/IP > Simulation**. Set the **Simulation** to on.

The controller starts sending simulation values to the PLC. The controller continuously sends a simulation value in a loop from **Minimum** to **Maximum** during the set **Period**. When the value gets the **Maximum** set value, it decreases to the minimum and then again to maximum. **Error** and **Status** values set on the controller are also sent to the PLC.



4. Open or create a new project In the Studio 5000 Logix Designer environment.
5. Add the controller module. In the **Controller organizer** select **I/O Configuration > Ethernet**. Right click on **Ethernet** and select **New module**.



A search window shows.

6. In the **Catalog** tab, add "SC4500" to find the controller module. Select the "HACH SC4500 Controllers", then select **Create**.

Select Module Type

Catalog | Module Discovery | Favorites

sc4500 Clear Filters Hide Filters

☒ Module Type Category Filters

- ☒ Analog
- ☒ Communication
- ☒ Communications
- ☒ Communications Adapter
- ☒ Controller

☒ Module Type Vendor Filters

- ☒ Advanced Energy Industries, Inc.
- ☒ Dailight
- ☒ Endress+Hauser
- ☒ FANUC CORPORATION
- ☒ FANUC Robotics America

Catalog Number	Description	Vendor	Category
SC4500	Hach SC4500 Controllers	Hach Lange SA...	Generic Device(keyable)

1 of 532 Module Types Found Add to Favorites

☐ Close on Create Create Close Help

The New module window shows.

7. In the **General** section, add a **Name** (in the example the controller serial number) and **Description** (optional) to identify the controller in the network. Add the controller **IP Address**.

New Module

**General**

Type: SC4500 Hach SC4500 Controllers

Vendor: Hach Lange SARL

Parent: Local

Name: SN116977

Description:

Ethernet Address

☐ Private Network: 192.168.1.10

☒ IP Address: 192 . 168 . 0 . 10

☐ Host Name:

Module Definition

Revision: 1.005

Electronic Keying: Compatible Module

Connections: Input / Output

Change ...

Status: Creating OK Cancel Help

8. Push on **Change** to examine the Module definition. The values must agree with the controller simulation values: input size 14 SINT.

Module Definition\*

Revision: 1 005

Electronic Keying: Compatible Module

Connections:

Name	Size
Input / Output	Input: 14 SINT
	Output: 0

OK Cancel Help

9. Go to the **Connection** section and configure the settings that follow:
- **Requested Packet Interval (RPI)**—Sets the PLC update rate in milliseconds. Range: 1.0 to 3200.0 (Default: 10.0). Very low values can flood the network and decrease network reliability.
  - **Connection over EtherNet/IP**—Set to **Unicast** to decrease the necessary network bandwidth.

New Module

General\*  
Connection  
Module Info  
Internet Protocol  
Port Configuration  
Network

Connection

Name	Requested Packet Interval (RPI) (ms)	Connection over EtherNet/IP	Input Trigger
Input / Output	10.0 1.0 - 3200.0	Unicast	Cyclic

☐ Inhibit Module

☐ Major Fault On Controller If Connection Fails While in Run Mode

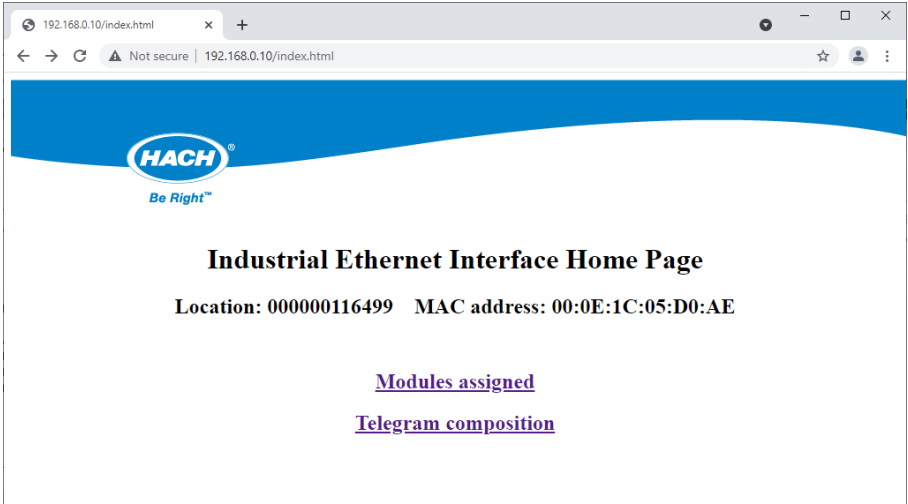
Module Fault:

Status: Creating

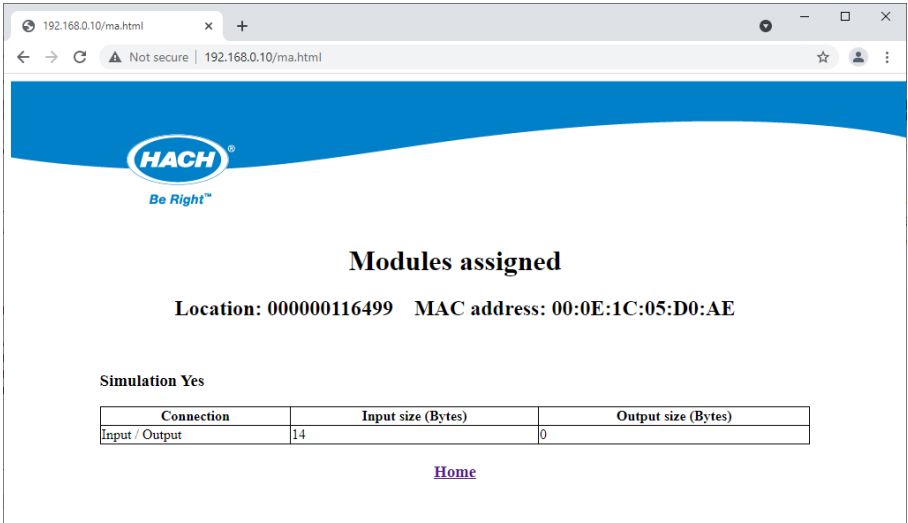
OK Cancel Help

10. Push OK.

11. In a web browser, type the IP address to access the Industrial Ethernet Interface web page.



12. Select **Modules assigned** to see the information that the controller sends in simulation mode.



13. Select **Telegram composition** to see Telegram information on the type of data (integer or float) and the Input Tag suffix.

192.168.0.10/tc00.html

Not secure | 192.168.0.10/tc00.html

### Input telegram composition

Location: 000000116499    MAC address: 00:0E:1C:05:D0:AE

Simulation Yes

Tag	Type	EtherNet/IP PLC Input Tag suffix
0	float	I[0..3]
1	float	I[4..7]
2	integer	I[8..9]
3	integer	I[10..11]
4	integer	I[12..13]

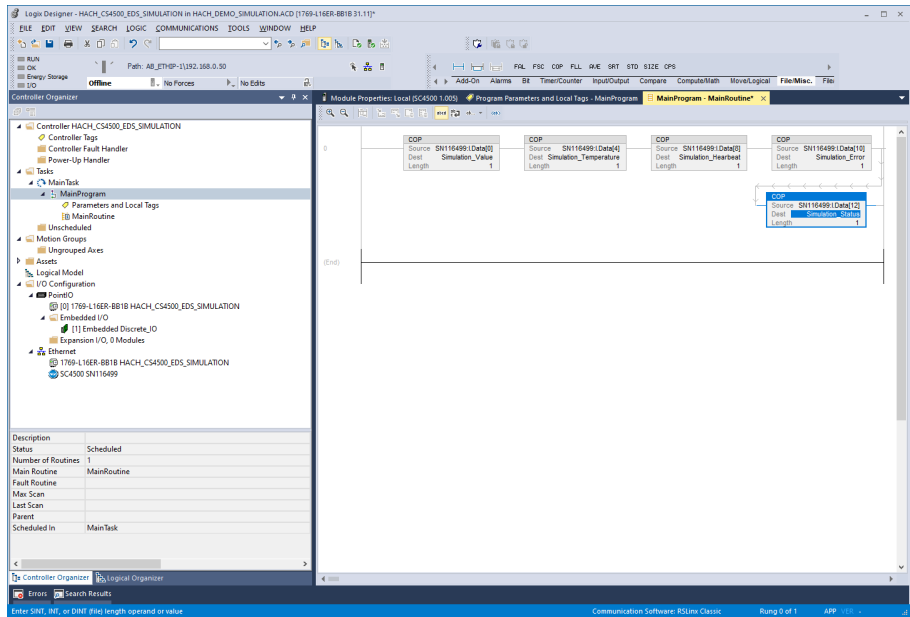
[Home](#)

14. In the Studio 5000 Logix Designer environment, on the **Controller organizer** tab, select **Tasks > Main Task > MainProgram > Parameter and local tags**. Add the tags based on the Telegram composition of the simulation.



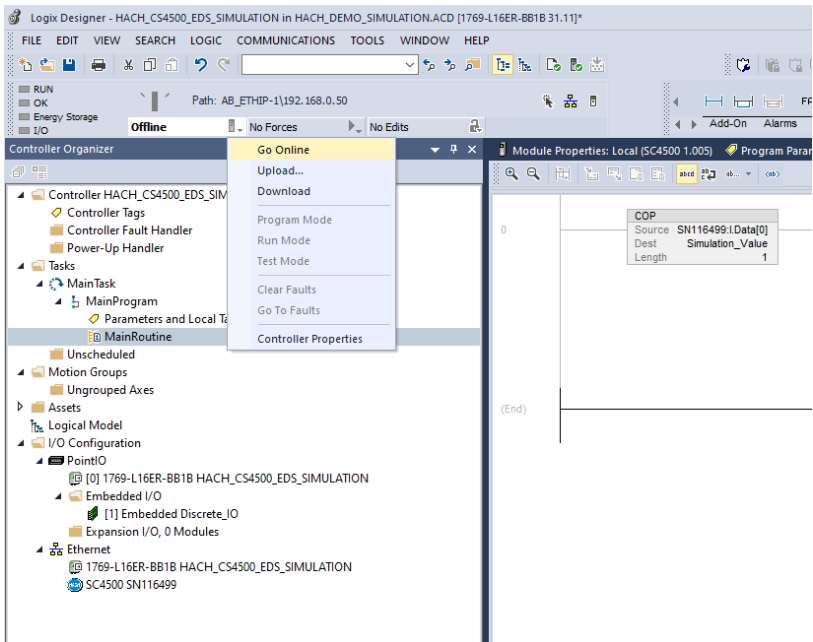
15. On the **Controller organizer** tab, select **Tasks > Main Task > MainProgram > MainRoutine**. For each parameter of the simulation, add a COP module with the data that follow (refer to the table below):

- Source—Add the controller name, then the I.Data based on the bytes size.
- Dest—Add the parameter Tag.
- Length—Add the bit size of the Tag.

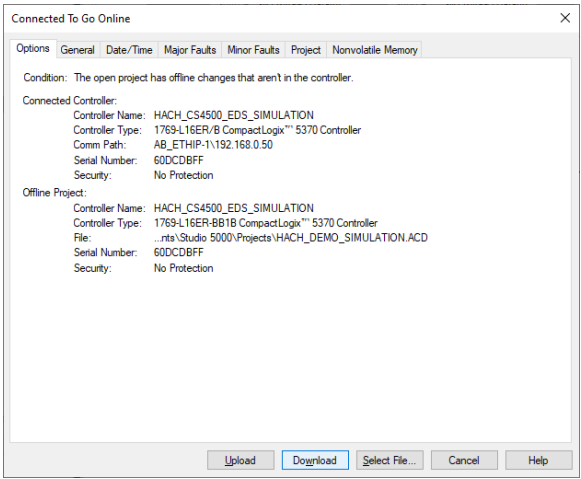


Tags	Type	Size	I.Data
1 - Simulation_value	Float (Real)	4 bytes	0
2 - Simulation_Temperature	Float	4 bytes	4
3 - Simulation_Heartbeat	Integer (INT)	2 bytes	8
4 - Simulation_Error	Integer	2 bytes	10
5 - Simulation_Status	Integer	2 bytes	12

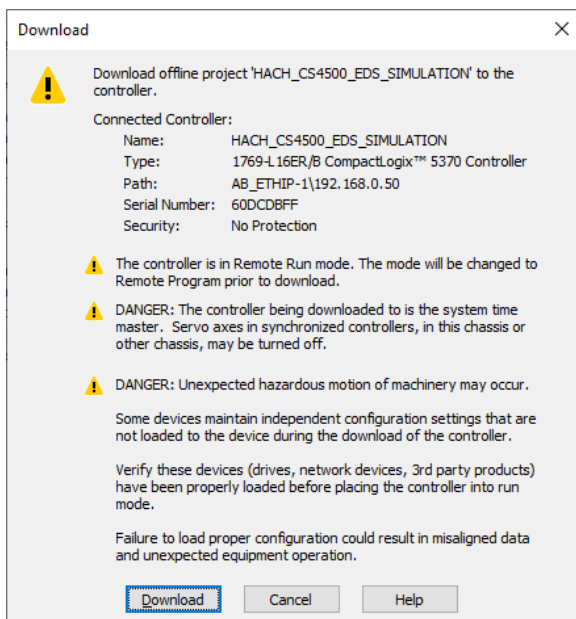
16. Select the option **Go Online**.



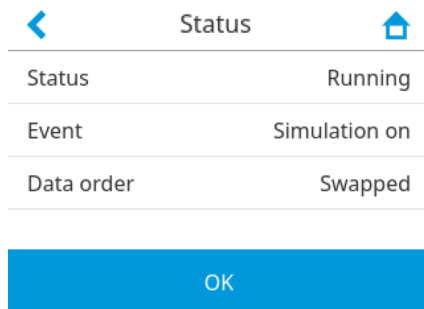
17. Select **Download**.



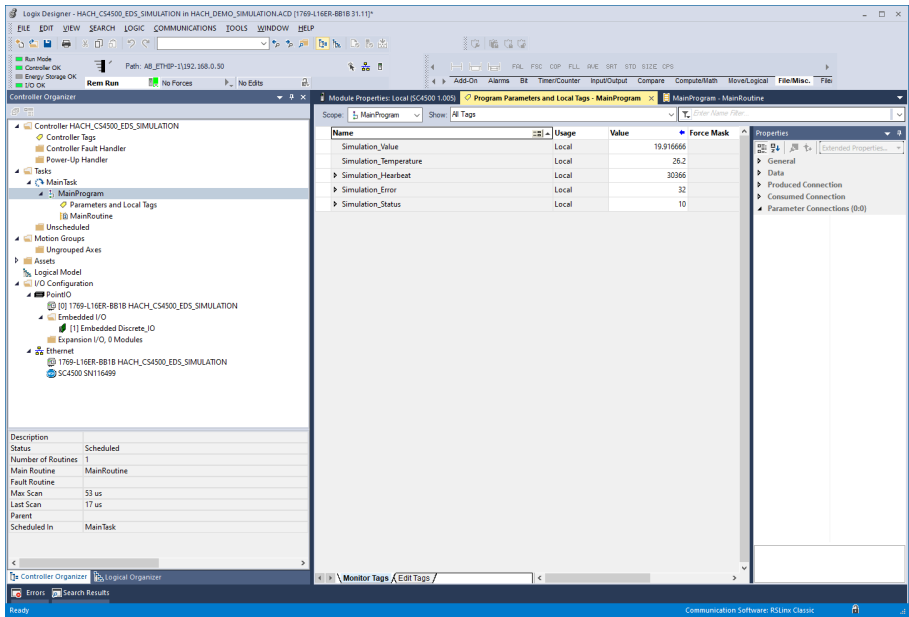
## 18. Select **Download**.



19. On the SC4500 controller, go to the main menu. Select **OUTPUTS > EtherNet/IP > Status** to examine the connection condition.



20. Go to **Program Parameters and Local Tags**. On the bottom of the window, select the tab **Monitor tags**. If the connection is successful, the simulation data from the SC4500 controller shows.



21. When the simulation is successful, stop the simulation in the controller. In the main menu of the controller, select **Outputs > EtherNet/IP > Simulation**. Set the simulation to off.

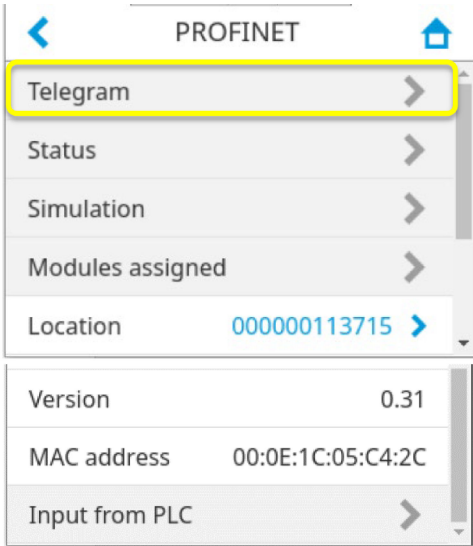
# 5.4 Configure the module

## 5.4.1 Configure the PROFINET module

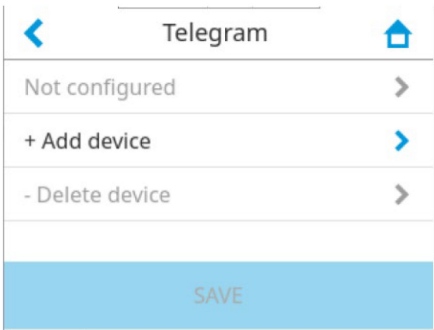
Configure the PROFINET and the Telegram data in the controller to send sensor or device data to the PLC. Refer to [PROFINET Telegram composition](#) on page 38.

Configure the PROFINET settings as follows:

1. Push the main menu icon, then select **Outputs > PROFINET > Telegram**.



2. Select **Add device**. Select one of the available devices. Push **OK**.



3. On the Telegram menu, select the device. Select **Add tags**.

For this example, the tags that follow are selected: Classified Error, Classified Status 1, Dissolved oxygen [mg/L], Heartbeat and Temperature [°C]

The screenshot shows the 'Add tag' menu with a list of tags. The first three tags are checked: 'Classified Error', 'Classified Status 1', and 'Classified Status 3'. The 'OK' button is at the bottom.

Tag	Selected
Classified Error	<input checked="" type="checkbox"/>
Classified Status 1	<input checked="" type="checkbox"/>
Classified Status 2	<input type="checkbox"/>
Classified Status 3	<input type="checkbox"/>

The screenshot shows the 'Add tag' menu with a list of tags. The first three tags are checked: 'Dissolved oxygen [mg/L]', 'Heartbeat', and 'Measurement indicator [%]'. The 'OK' button is at the bottom.

Tag	Selected
Dissolved oxygen [mg/L]	<input checked="" type="checkbox"/>
Dissolved oxygen [ppm]	<input type="checkbox"/>
Heartbeat	<input checked="" type="checkbox"/>
Measurement indicator [%]	<input type="checkbox"/>

The screenshot shows the 'Add tag' menu with a list of tags. The 'Temperature [°C]' tag is checked. The 'OK' button is at the bottom.

Tag	Selected
Measurement indicator [%]	<input type="checkbox"/>
Service indicator [days]	<input type="checkbox"/>
Temperature [°C]	<input checked="" type="checkbox"/>
Temperature [°F]	<input type="checkbox"/>

4. Push **OK**, then **Save**.

5. In the **PROFINET** menu, select **Modules assigned**.

The controller shows the slots information used to configure the TIA environment.

The screenshot shows the 'PROFINET' menu with a list of options. The 'Modules assigned' option is highlighted with a yellow box. The 'OK' button is at the bottom.


Option	Action
Telegram	>
Status	>
Simulation	>
Modules assigned	>
Location	00000113715 >

The screenshot shows the 'Modules assigned' menu with a list of slots and their assigned modules. The 'OK' button is at the bottom.

Slot	Module
Slot 1	Input 8 bytes
Slot 1 tags from	0
Slot 1 tags to	3
Slot 2	Input 4 bytes
Slot 2 tags from	3
Slot 2 tags to	4
Slot 3	Input 2 bytes
Slot 3 tags from	4
Slot 3 tags to	4
Slot 4	Not assigned

6. Go to the Industrial Ethernet Interface Home Page.

7. Select **Modules assigned** to see the information that the sensor sends.




### Modules assigned

Location: 000000113714    MAC address: 00:0E:1C:05:C4:29

Slot	Module	Tags from .. to
1	Input 8 bytes	0 .. 2
2	Input 4 bytes	3 .. 4
3	Input 2 bytes	4 .. 4
4	Not assigned	
5	Not assigned	
6	Not assigned	
7	Not assigned	

[Home](#)

8. Select **Telegram composition** to see Telegram information on the type of data (integer or float) and their relative address in the PLC memory.



### Input telegram composition

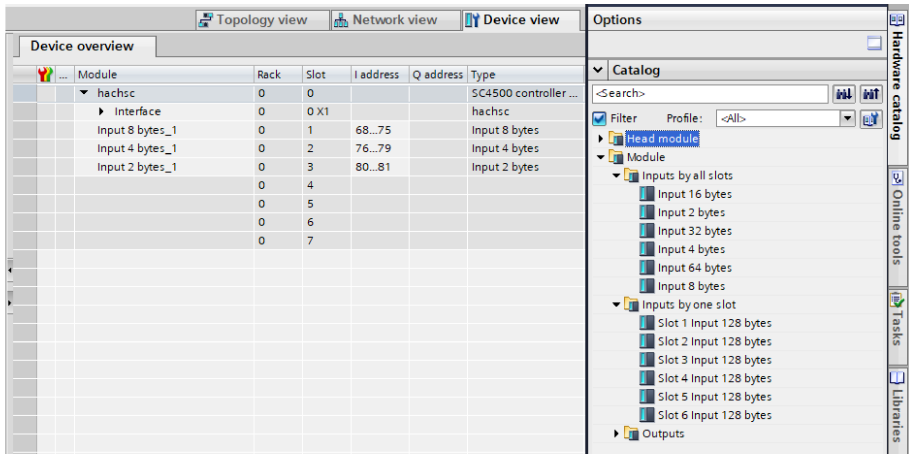
Location: 000000113714    MAC address: 00:0E:1C:05:C4:29

LDO2    Serial number: 121560000026

Tag	Type	Profinet PLC Input address range
0	integer	I[0..1]
1	integer	I[2..3]
2	float	I[4..7]
3	integer	I[8..9]
4	float	I[10..13]

[Home](#)

9. Add the inputs modules on the **Device overview** of the PLC based on the **Modules assigned** information.



10. On the PLC, do one of the steps that follow:

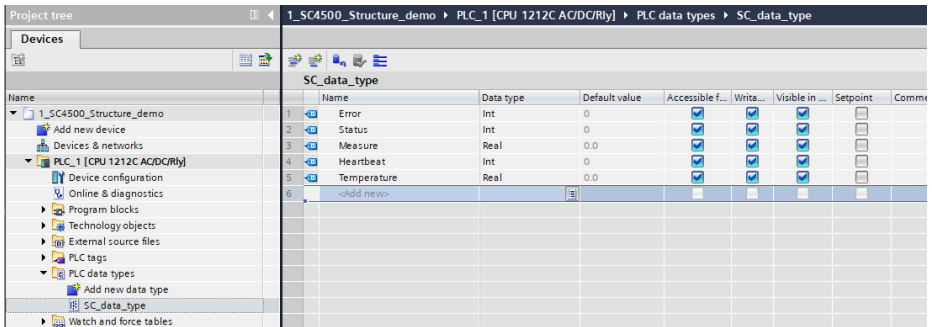
- a. Go to **PLC tags** and select **Default tag table**. Add the tags and variables based on the sensor values. Add the same settings as in the Industrial Ethernet web page. Refer to the table below.

	Name	Data type	Address	Retain	Access	Write	Visible	Comment
1	LDO_Error	UInt	%IW68	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	LDO_Status	UInt	%IW70	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	LDO_mg/L	Real	%IW72	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	LDO_Heartbeat	UInt	%IW76	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
5	LDO_Temperature	Real	%IW78	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
6	<Add new>							

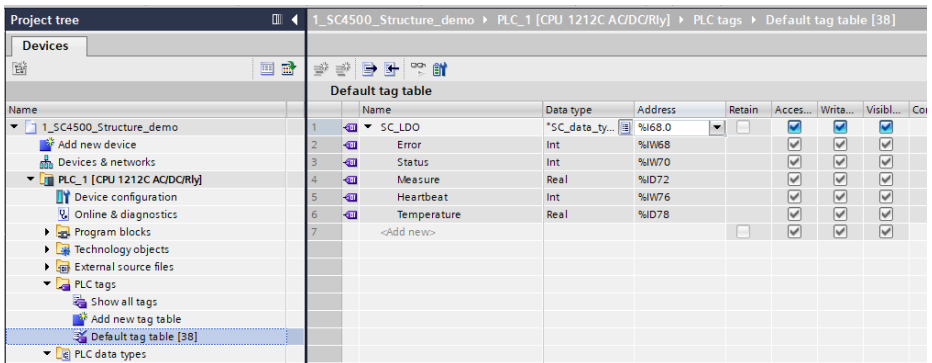
Tags	Type	Size	Slot	Slot size	Input address	Address
1 - LDO_Error	Integer (UInt)	2 bytes	Slot 1	8 bytes	68...69	%ID68
2 - LDO_Status	Integer	2 bytes			70...71	%ID70
3 - LDO_mg/L	Float (Real)	4 bytes			72...75	%IW72
4 - LDO_Heartbeat	Integer	2 bytes	Slot 2	4 bytes	76...77	%IW76
5 - LDO_Temperature	Float	2 bytes	Slot 3	2 bytes	78...81	%IW78
		2 bytes				



- b. Use the data structure to group the data types. Go to **PLC data types**. Select **Add new data type** and add a name for the data type ("SC\_data\_Type" in the example). Add the Tags and variables based on the sensor values.



On the **Default tag table**, add the data structure and select the data type name. Add the address of the data structure.



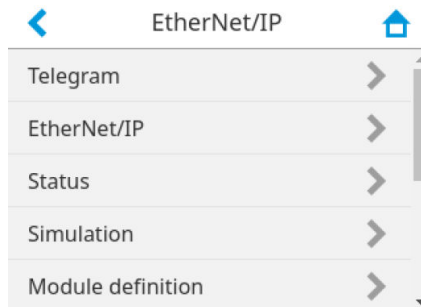
11. Select the option **Monitor all** in the popup menu in the Default table screen. If the connection is successful, the data from the SC4500 controller shows.

## 5.4.2 Configure the EtherNet/IP module

Configure the EtherNet/IP and the Telegram data in the controller to send sensor or device data to the PLC. Refer to [EtherNet/IP Telegram composition](#) on page 40.

Configure the EtherNet/IP settings as follows:

1. Push the main menu icon, then select **Outputs > EtherNet/IP > Telegram**.



2. Select **Add device**. Select one of the available devices. Push **OK**.

Telegram	Add device
Not configured >	sc4500 <input type="checkbox"/>
+ Add device >	pHD211441502 - pHD sc V2 <input type="checkbox"/>
- Delete device >	GLDO121560000026 - LDO sc <input checked="" type="checkbox"/>
	000123456789 - High voltage <input type="checkbox"/>
SAVE	OK

3. On the Telegram menu, select the device. Select **Add tags**.

For this example, the tags that follow are selected: Classified Error, Classified Status 1, Dissolved oxygen [mg/L], Heartbeat and Temperature [°C].

Add tag
Classified Error <input checked="" type="checkbox"/>
Classified Status 1 <input checked="" type="checkbox"/>
Classified Status 2 <input type="checkbox"/>
Classified Status 3 <input type="checkbox"/>
OK

Add tag
Dissolved oxygen [mg/L] <input checked="" type="checkbox"/>
Dissolved oxygen [ppm] <input type="checkbox"/>
Heartbeat <input checked="" type="checkbox"/>
Measurement indicator [%] <input type="checkbox"/>
OK

Add tag
Measurement indicator [%] <input type="checkbox"/>
Service indicator [days] <input type="checkbox"/>
Temperature [°C] <input checked="" type="checkbox"/>
Temperature [°F] <input type="checkbox"/>
OK

4. Push **OK**, then **Save**.

5. In the **EtherNet/IP** menu, select **Module definition**.

The controller shows the bytes data based on the selected Telegram tags.

<

Module definition

🏠

Connection	Input / Output
Input size (Bytes)	14
Output size (Bytes)	0

OK


6. Go to the Industrial Ethernet Interface Home Page.

7. Select **Modules assigned** to see the information that the sensor sends.

192.168.0.10/ma.html

Not secure | 192.168.0.10/ma.html

☆ 👤 ⋮



Be Right™

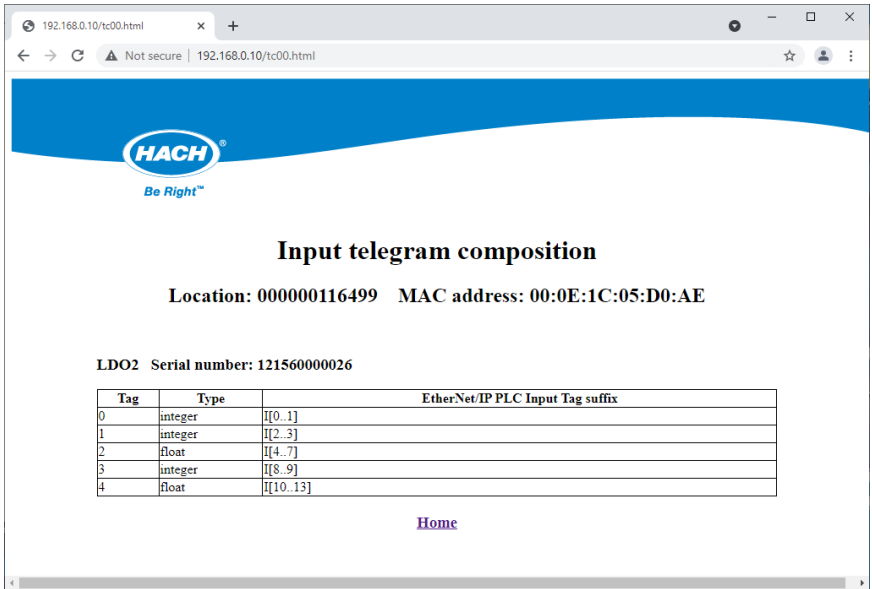
### Modules assigned

Location: 000000116499    MAC address: 00:0E:1C:05:D0:AE

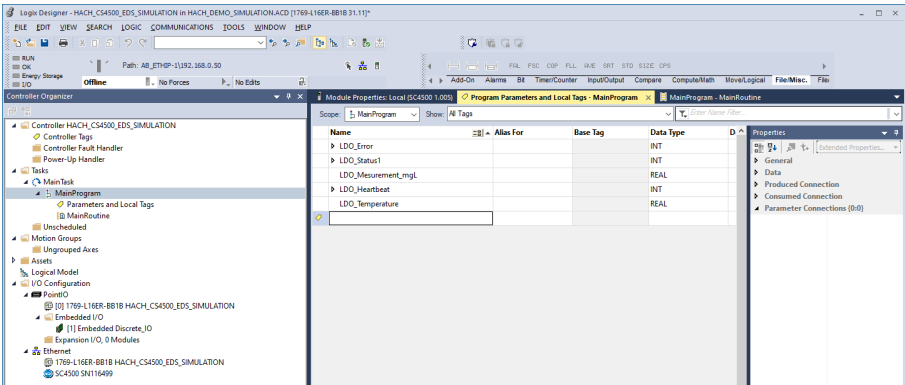
Connection	Input size (Bytes)	Output size (Bytes)
Input / Output	14	0

[Home](#)

8. Select **Telegram composition** to see Telegram information on the type of data (integer or float) and the Input Tag suffix.



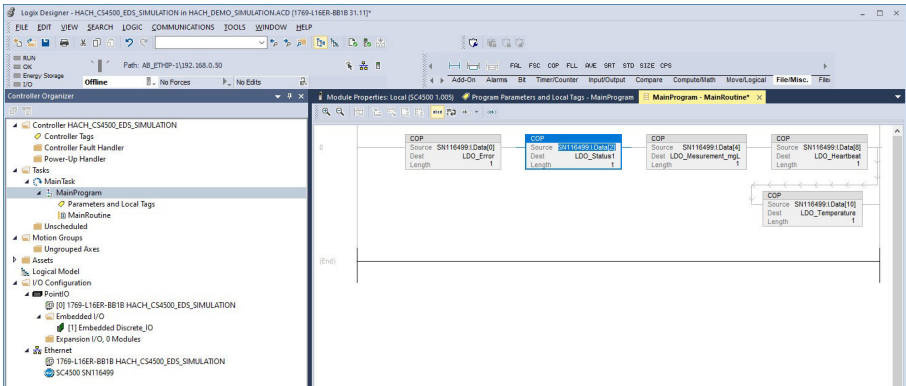
9. In the Studio 5000 Logix Designer environment, on the **Controller organizer** tab, select **Tasks > MainTask > MainProgram > Parameter and local tags**. Add the tags based on the Telegram composition.



As an alternative, use the data structure to add the Telegram composition. Refer to .

10. On the **Controller organizer** tab, select **Tasks > Main Task > MainProgram > MainRoutine**.  
For each Tag add a COP module with the data that follow (refer to the table below):

- **Source**—Add the controller name followed with the I.Data based on the bytes size.
- **Dest**—Add the parameter Tag. Initial element to be overwritten by the source.
- **Length**—Number of destination elements to copy.



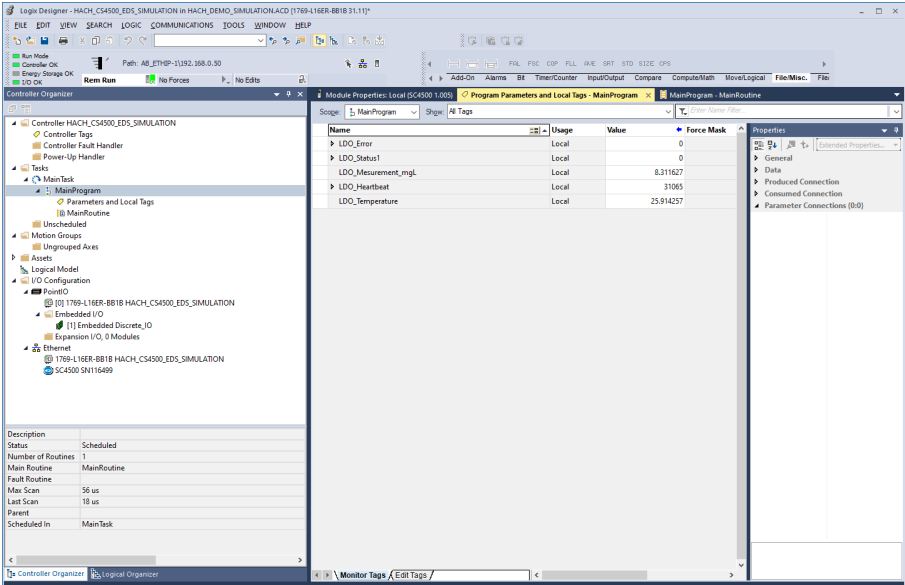
Tags	Type	Size	I.Data
1 - LDO_Error	Integer (INT)	2 bytes	0
2 - LDO_Status	Integer	2 bytes	2
3 - LDO_Measurement_mgL	Float (Real)	4 bytes	4
4 - LDO_Heartbeat	Integer	2 bytes	8
5 - LDO_Temperature	Float	4 bytes	10

11. Select the option **Go Online**.

12. Select **Download**.

13. Select **Download**.

**14. Go to Program Parameters and Local Tags.** On the bottom of the window, select the tab **Monitor tags**. If the connection is successful, the data from the sensor shows.

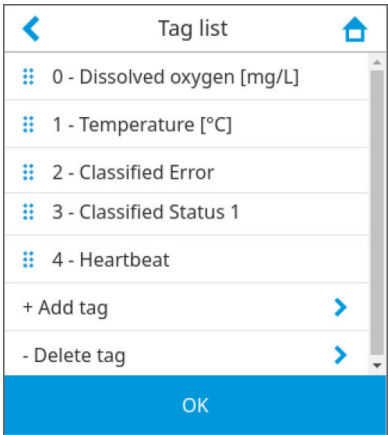


**5.4.2.1 Configure the EtherNet/IP data structure**

Use the data structure to group the data types. When the data structure is used in the Ethernet/IP module, make sure to set the order in the controller based on the variable type: all float values first and then all of the integer values.

To configure the EtherNet/IP module with a data structure, do the steps that follow:

1. Do steps 1 to 3 on .
2. On the controller, select Main menu > **Outputs > EtherNet/IP > Telegram > [device/sensor] > Tag list**. Use the drag and drop function to change the tag position. Push and hold near the blue dots icon of the tag, then move the tag to the new position. Move the tags so that the float and integer values are together.



3. Push OK, then Save.

4. Do steps 5 to 8 on .

On the **Telegram composition**, make sure that the Telegram information shows the type of data (integer or float) in order.

**Note:** If the data type is mixed in the Telegram composition, the data structure will show an error in the PLC.



### Input telegram composition

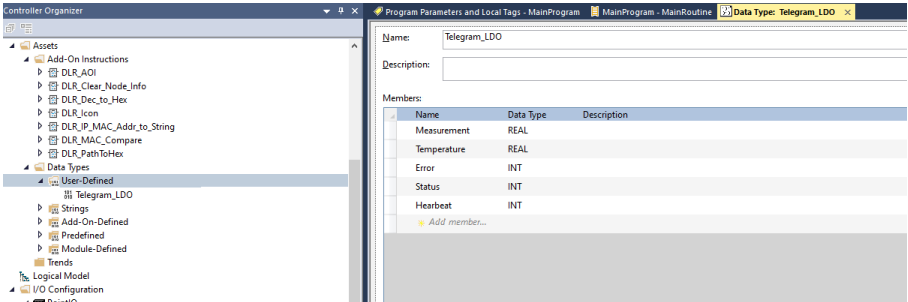
Location: 000000116499    MAC address: 00:0E:1C:05:D0:AE

LDO2    Serial number: 121560000026

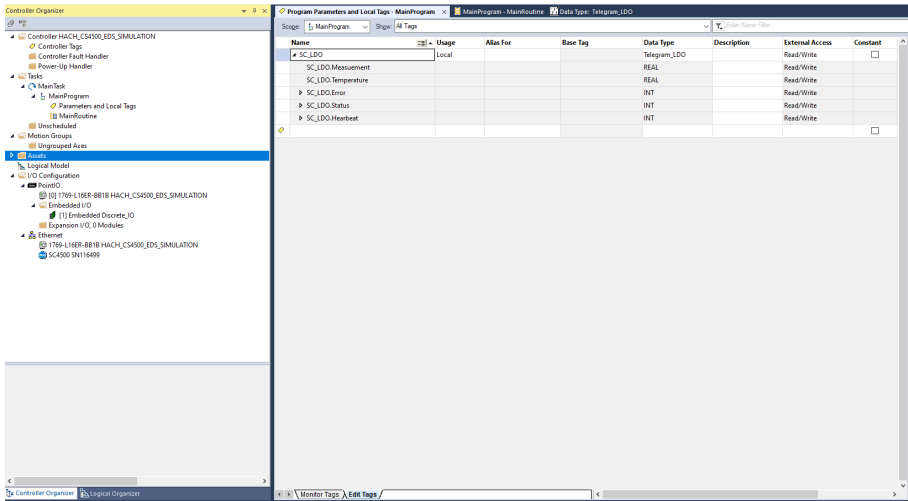
Tag	Type	EtherNet/IP PLC Input Tag suffix
0	float	I[0..3]
1	float	I[4..7]
2	integer	I[8..9]
3	integer	I[10..11]
4	integer	I[12..13]

[Home](#)

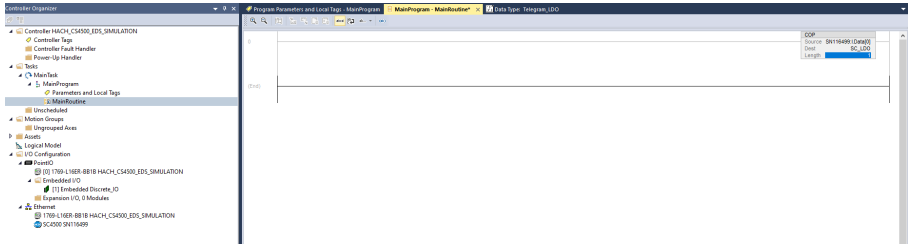
5. In the Studio 5000 Logix Designer environment, on the **Controller organizer** tab, select **Data Types > User-Defined**. Right-click on **User-defined**, then select **New data type**. Add the Data type name and the members based on the Telegram composition.



6. On the **Controller organizer** tab, select **Tasks > Main Task > MainProgram > Parameter and local tags**. Select **Edit tags**, then add the name of the data structure on the **Data type** field.



7. On the **Controller organizer** tab, select **Tasks > Main Task > MainProgram > MainRoutine**. Add a COP module with the data structure.



8. Do steps 11 to 14 on .

## Section 6 PROFINET Telegram composition

The format of the PROFINET tags can be integer (2 bytes), unsigned integer (2 bytes) or float (4 bytes).

The data transmission between the SC4500 controller and the PLC can have a maximum of 7 slots, where each slot has a quantity of bytes used in the Telegram.

The size of data sent from the SC4500 controller to PLC is calculated with the input modules. The size of data sent from PLC to SC4500 is calculated with the output modules.

The algorithm in the PROFINET module uses the rules that follow:

- The minimal number of slots are used.
- The byte modules are used from higher to lower without repetition. The modules available are 128 bytes, 64 bytes, 32 bytes, 16 bytes, 8 bytes, 4 bytes and 2 bytes.
- Because the module cannot be higher than 128 bytes and it cannot be repeated, there is one module of 128 bytes for each slot.
- The maximum capacity of the Telegram is 768 bytes for input data and 128 bytes for output data.



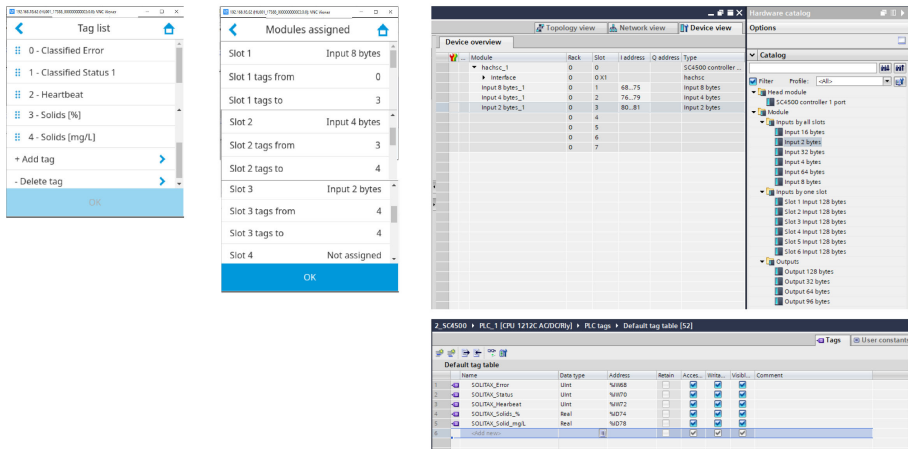
The **Modules assigned** option in the **PROFINET** menu on the controller shows the Telegram configuration in the SC4500 PROFINET module. The menus show the slots with each input module and assigned tags. Refer to [Figure 8](#).

For example:

- 5 tags selected: tag 0 (2 bytes), tag 1 (2 bytes), tag 2 (2 bytes), tag 3 (4 bytes) and tag 4 (4 bytes). Total 14 bytes.
- Slot 1. Module Input 8 bytes. Tags assigned to this module: tag 0, tag 1, tag 2 and tag 3 (2 bytes).
- Slot 2. Module Input 4 bytes. Tags assigned to this module: tag 3 (2 bytes) and tag 4 (2 bytes).
- Slot 3. Module Input 2 bytes. Tags assigned to this module: tag 4 (2 bytes).

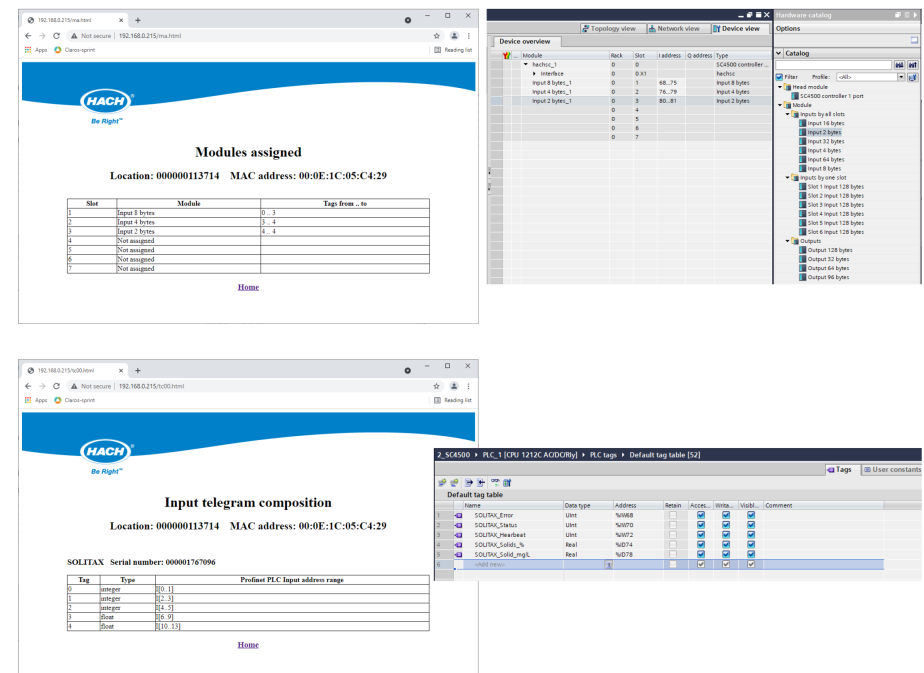
**Note:** Use the drag and drop function to change the elements on the Telegram list. Push and hold on the element and move the device or tag to the new position. Make sure to update the PLC configuration accordingly after the elements are moved.

**Figure 8 Example of Modules Assigned and Telegram composition**



As an alternative, use the Industrial Ethernet web page to know the assigned slots and the telegram composition. Use a browser and enter the module IP address. Refer to [Figure 9](#).

Figure 9 Industrial Ethernet Interface web page



## Section 7 EtherNet/IP Telegram composition

The format of the EtherNet/IP tags can be integer (2 bytes), unsigned integer (2 bytes) or float (4 bytes).

The data transmission between the SC4500 controller and the PLC is done with an Input/Output connection. The Input/Output connection is bidirectional. The originator (PLC or HMI) sends data to the target (SC4500 controller) and the target sends data to the originator. This type of connection is also called Exclusive Owner connection or Controlling connection.

The input data size is the data sent from the SC4500 to the PLC. The input data size is calculated based on the tags configured in the controller. The output data size is the data sent from the PLC to the SC4500. The output data size is 0 bytes if there are no inputs selected and 32 bytes for each 8 selected inputs from the PLC. The maximum capacity of the Telegram is 768 bytes for input data and 128 bytes for output data.

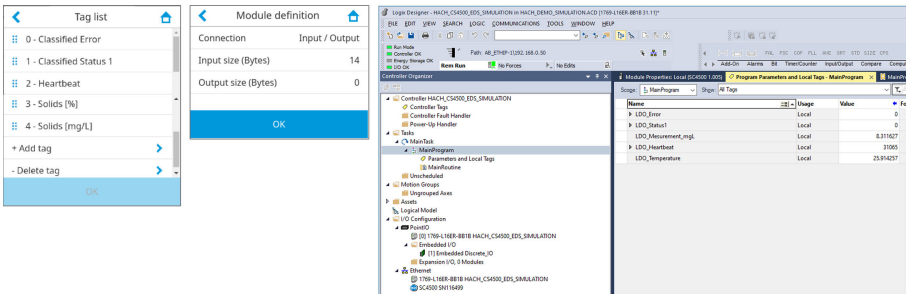
The input and output size are configured in the **Outputs > EtherNet/IP > Module definition** view of the PLC.

For example:

- 5 tags selected: tag 0 (2 bytes), tag 1 (2 bytes), tag 2 (2 bytes), tag 3 (4 bytes) and tag 4 (4 bytes). Total 14 bytes.

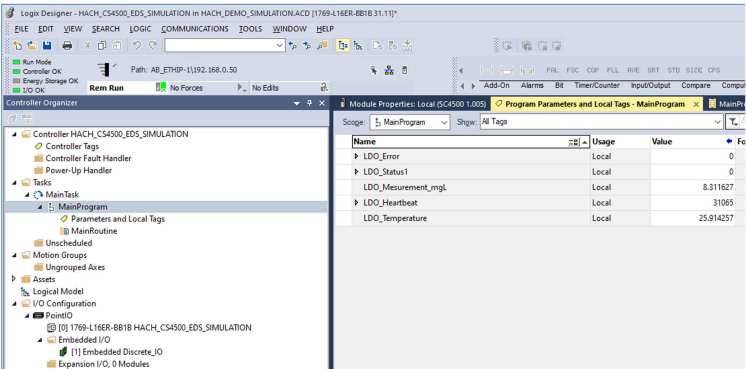
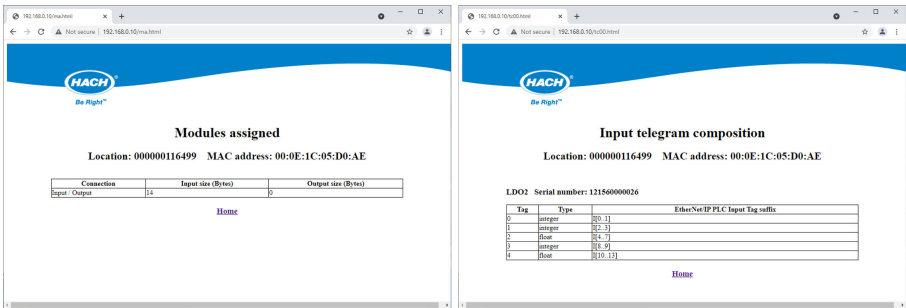
**Note:** Use the drag and drop function to change the elements on the Telegram list. Push and hold on the element and move the device or tag to the new position. Make sure to update the PLC configuration accordingly after the elements are moved.

Figure 10 Example of Module definition and Telegram composition



As an alternative, use the Industrial Ethernet web page to know the modules assigned and the telegram composition. Use a browser and enter the module IP address. Refer to Figure 9 on page 40.

Figure 11 Industrial Ethernet Interface web page



## Section 8 LED status, diagnostic and messages

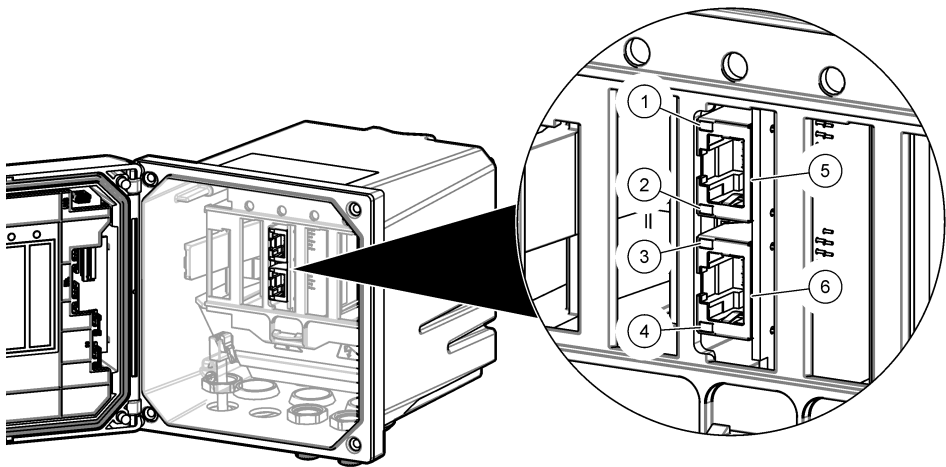
On the PLC, put the system in Online mode and examine the status of the network.  
On the controller, push the main menu icon and select **Output > PROFINET / EtherNet/IP > Status**.  
Examine the Status messages:

- **Idle**—Module state when the PLC is in stop mode.
- **Pending**—Configuration process and the connection is opened.

- **Exception**—Unexpected behavior
- **Running**—Connection is established

As an alternative, examine the LEDs in the PROFINET module.

**Figure 12 Module LEDs**



1 Network status LED	4 Link/Activity LED
2 Link/Activity LED	5 Port 2
3 Module status LED	6 Port 1

Network status LED	Module status LED	Status	PROFINET Event	EtherNet/IP event	Comments
Off	Off				The module has no power.
Off	On	Pending	Waiting Ethernet Link	Waiting Ethernet Link	No ethernet cable connected to module Ethernet cable plugged on Port 2 in Mix IEP option.
On	On	Running	PLC connection or Simulation on	PLC connection or Simulation on	PLC in RUN mode without/with simulation on.
Blinking	Blinking	Running	Identify node		Identify the node on the Network.
1 flash	On	Idle	PLC in STOP mode	PLC is not in RUN mode	
2 flashes	On	Pending	Broken PLC connection	Broken PLC connection	

Network status LED	Module status LED	Status	PROFINET Event	EtherNet/IP event	Comments
3 flashes	On	Pending	Station name not set		Station Name error
4 flashes	On	Pending	IP address not set	Duplicate IP address IP address not set	IP address error
5 flashes	On	Running / Pending	Telegram not defined Modules assigned mismatch or Head module mismatch or PLC slots not set	No connections established or Telegram not defined	Configuration error
2 flashes	2 flashes	Exception	Unexpected behavior	Unexpected behavior	Unexpected error

## Section 9 Replacement parts and accessories

### ⚠ WARNING



Personal injury hazard. Use of non-approved parts may cause personal injury, damage to the instrument or equipment malfunction. The replacement parts in this section are approved by the manufacturer.

**Note:** Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.

### Replacement parts

Description	Item no.
M12/RJ45 connector kit (Ethernet cable)	LXZ524.99.00009
M12/M12 connector kit (Ethernet cable)	LXZ524.99.00010
Ethernet cable M12 to M12, 10 m	LXZ524.99.00011
Ethernet cable M12 to RJ45, 5 m	LXZ524.99.00012

### Accessories

Description	Item no.
SC4500 PROFINET upgrade Kit	LXZ525.99.C0001
SC4500 EtherNet/IP upgrade Kit	LXZ525.99.C0002





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