



CARLO GAVAZZI

IO-Link masters Profinet

YL212 and YN115

Instruction manual

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1. Introduction

This document provides installation, configuration, and embedded web interface information for the Carlo Gavazzi IO-Link Master (IOLM). In addition, it includes detailed information about PROFINET IO and Modbus/TCP.

The web interface provides a platform so that you can easily configure, review diagnostic pages, and access advanced features, such as the ability to:

- Upload the latest IOLM images or applications
- Set up user accounts with different user levels and passwords
- Load IODD files and configure IO-Link device parameters
- Implement manual or automatic data storage (upload or download)
- Implement device and/or data validation

1.1. Installation and Configuration Overview

The IOLM installation includes the following procedures.

1. Connect the power and Ethernet cable (Page 12).

Note: IOLM YN115, and YL212: If desired you can use the rotary switch to set the IP address (Page 13).

The IOLM installation includes the following procedures.

1. Connect the power and Ethernet cable (Page 12).

Note: IOLM YN115, and YL212: If desired you can use the rotary switch to set the IP address (Page 13).

2. Download, unzip, and upload the GSD file for the IO-Link Master (IOLM).
3. Insert the IOLM in the PROFINET IO system.
4. Configure the IP address for the IOLM.
5. Assign the PROFINET Device Name.
6. Set the IO Device Update Time.
7. Configure the IO-Link ports.
 - a. Configure IO-Link port modules.
 - b. Configure port status modules.
 - c. If desired, configure data storage, automatic or manual - upload or download.
 - d. If desired, configure device validation and data validation.
 - e. Use the Diagnostic pages to monitor or troubleshoot your devices.
8. Use Chapter 12. PROFINET IO Reference Information on Page 108 to complete configuration after attaching the IO-Link devices.

1.2. Locating the Latest Software and Documentation

You can use the link <http://www.gavazziautomation.com> to locate the latest images, utilities and documentation. For information about images and updating the IOLM, see Chapter 4. Updating Images and Applications on Page 41.

2. Hardware Installation

Use the appropriate hardware installation for your IOLM model:

- IOLM YL212 Hardware Installation on Page 8
- IOLM YN115 Hardware Installation on Page 12

Note: Refer to Chapter 5. Connecting Devices on Page 42 for information about connecting IO-Link or digital devices to the ports after you program the network information using the next chapter.

2.1. IOLM YL212 Hardware Installation

Use the following subsections to install the hardware and verify operation.

- Setting the Rotary Switch
- Connecting to the Network on Page 9
- Connecting the Power on Page 10
- Mounting the IOLM YL212 on Page 11

Note: Refer to 5.2. IOLM YL212 IO-Link Ports on Page 42 for information about connecting IO-Link or digital devices to the ports after you program the network information using the next chapter.

2.1.1. Setting the Rotary Switch

You can use the rotary switches under the configuration window on the IOLM to set the lower 3-digits (8 bits) of the static IP address.

If the rotary switches are set to a non-default position, the upper 9-digits (24 bits) of the IP address are then taken from the static network address. The switches only take effect during startup, but the current position is always shown on Help | SUPPORT page.

Using the rotary switches to set the IP address may be useful in the following situations:

- A permanent method to assign IP addresses while setting machines for a special application where a PC or laptop is not available.
- A temporary method to assign IP addresses to several IOLMs so that they do not have duplicate addresses to make setting the IP addresses using software easier. After using the web page to change the IP address, reset the rotary switches back to 000.
- An emergency method to return the IOLM back to factory defaults, so that software can be used to program the appropriate IP address, and then return the switches back to 000.

Note: If you set the network address using the rotary switches, the Rotary Switch setting overrides the network settings in the web interface when the IOLM is initially powered on or after cycling the power.

Switch Setting	Node Address
000 (Default setting)	Use the network configuration stored in the flash. The default network configuration values are: <ul style="list-style-type: none">• IP address = 192.168.1.250• Subnet mask = 255.255.255.0• IP gateway = 0.0.0.0 After completing the hardware installation, see Chapter 3. Configuring the IOLM with STEP 7 on Page 37 to set the network address using the web interface.
001-254	This is the last three digits in the IP address. This uses the first three numbers from the configured static address, which defaults to 192.168.1.xxx. Note: If software is used to change the IP address to another range before setting the rotary switches, the IOLM uses that IP address range. For example, if the IOLM is set to 10.0.0.250 and the first rotary switch is set to 2, the IP address would be 10.0.0.200.
255-887	Reserved.
888	Reset to factory defaults. If the IOLM is set to 888 and the IP address is changed using other methods, the IP address is returned to the default IP address if the IOLM is rebooted or power cycled.
889-997	Use the network configuration values stored in the flash (reserved).

Switch Setting	Node Address
998	Setting the rotary switches to 998 configures the IOLM to use DHCP addressing.
999	Use the default IP address. If the IOLM is set to 999 and the IP address is changed using other methods, the IP address is returned to the default IP address if the IOLM is rebooted or power cycled.

Use the following steps if you want to change the default rotary switch settings.

1. Gently pop open the window using a small flathead screwdriver.
2. Gently swing open the switch window from the top to the bottom, allowing it to pivot on the hinge on the bottom of the window.
3. Turn each dial to the appropriate position using a small flathead screwdriver.



The default setting is 000 as shown above. The arrow points to the switch location. 0 is located at the 9:00 position. Turn the dial clockwise to the appropriate setting.

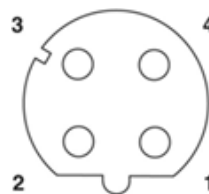
4. Close the window and make sure that it snaps shut tightly.

Note: Failure to close the configuration window properly may compromise IP67 integrity.

2.1.2. Connecting to the Network

The IOLM provides two Fast Ethernet (10/100BASE-TX) M12, 4-pin female D-coded connectors.

Pin	Signal
1	Tx+
2	Rx+
3	Tx-
4	Rx-



You can use this procedure to connect the IOLM to the network.

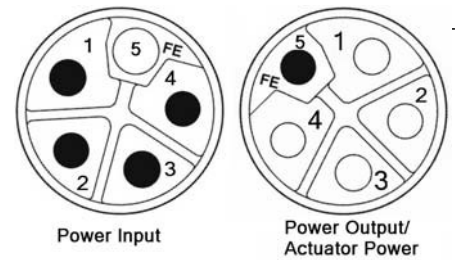
1. Securely connect one end of a shielded twisted-pair (Cat 5 or higher) M12 Ethernet cable to either Ethernet port.
2. Connect the other end of the cable to the network.
3. Optionally, use the other Ethernet port to daisy-chain to another Ethernet device.
4. If you did not connect both Ethernet ports, make sure that the unused port is covered with a connector cap to keep dust and liquids from getting in the connector.

Note: Ethernet ports must have an approved cable or protective cover attached to the connector to guarantee IP67 integrity.

2.1.3. Connecting the Power

The IOLM YL212 provides M12 (5-poles) L-coded input and output power connectors. Use a 24VDC power supply capable of the total output current required.

Note: Power connectors must have an approved cable or protective cover attached to the port guarantee to IP67 compliance.




Pin	Power Input (Male)	Power Output or Actuator Power (Female)	Description
1	US+	US+ or +V	IO-Link Master's system electronics and IO-Link devices
2	UA-	UA- or 0V	Actuator supply
3	US-	US- or 0V	IO-Link Master's system electronics and IO-Link devices
4	UA+	UA+ or +V	Actuator supply
5	FE		

Note: The IOLM requires a UL listed power supply with an output rating of 24VDC.

Power Supply	Values
Power Supply In - Maximum VS and VA	16A (Maximum)
IO-Link Connector Port 1 C/Q (Pin 4) L+/L- Sensor Supply (Pins 1 and 3)	200 mA (Maximum) 1.6A (Maximum)
IO-Link Connector Port 3 C/Q (Pin 4) L+/L- Sensor Supply (Pins 1 and 3)	200 mA (Maximum) 1A (Maximum)
IO-Link Connectors Ports 2 and 4 - 8 C/Q (Pin 4) L+/L- Sensor Supply (Pins 1 and 3)	200 mA (Maximum) 500 mA (Maximum)/up to 1A Output Budget Note: See IOLM YL212 IO-Link Ports on Page 45 for information about how to divide up the power output between ports.
IOLM Power	100mA @ 24VDC (VS)
Power Supply Out VS VA	16A † (Maximum) 16A †† (Maximum)
† VS output available is determined by subtracting the following from the available input current. - IO-Link Master module electronics current. - Total L+/L- current for all IO-Link ports. - Total C/Q current for all IO-Link ports. †† VA output available is the same as the available VA input current.	

You can use the following procedure to connect the IOLM to a power supply.

Note: Power should be disconnected from the power supply before connecting it to the IOLM. Otherwise, your screwdriver blade can inadvertently short your power supply terminal connections to the grounded enclosure.

1. Securely attach the power cable between the male power connector (PWR In) and the power supply.
 2. Either attach a power cable between the female power connector and another device to which you want to provide power or securely attach a connector cap to prevent dust or liquids from getting into the connector.
 3. Apply the power and verify that the following LEDs are lit indicating that you are ready to attach your IO-Link or digital I/O devices.
 - a. The US LED lights.
 - b. The ETH1/ETH2 LED lights on the connected port.
 - c. The MOD and NET LEDs are lit.
 - d. The IO-Link LEDs  flash (if no IO-Link device attached) or are lit if an IO-Link device is attached.
- Note:** It takes approximately 25 seconds after power up for the IO-Link Master to be ready for operation.
- e. If a PLC is connected, the NET LED is lit and green.

If the LEDs indicate that you are ready to go to the next installation step:

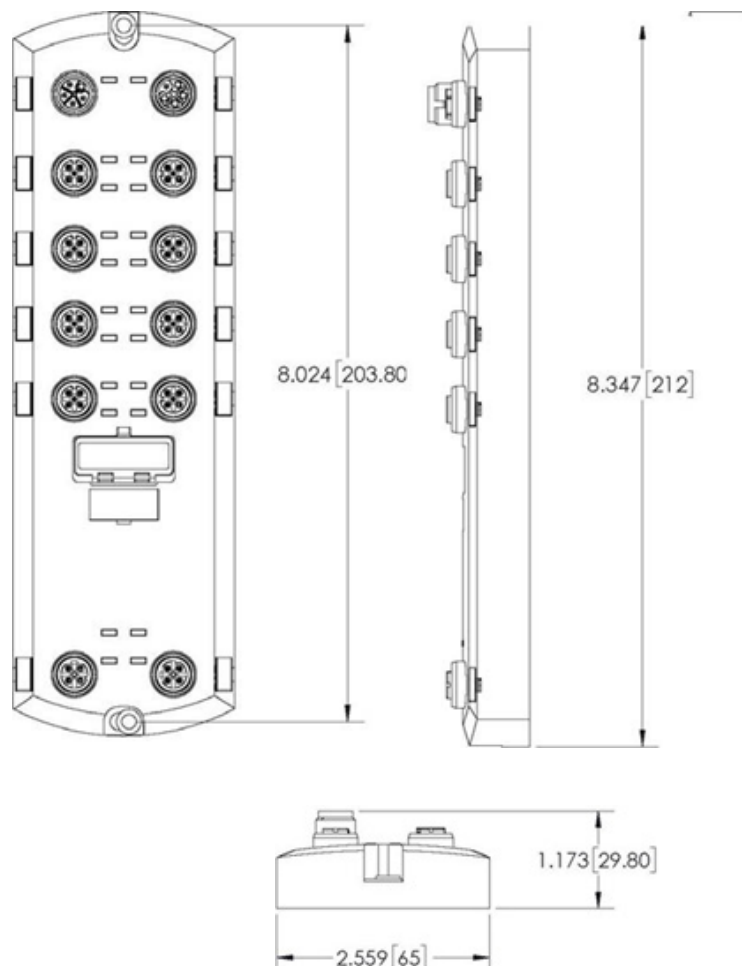
- Program the IP address using the web interface. Refer to Chapter 3. Configuring the IOLM with STEP 7 on Page 14 for configuring the network information.
- If using the rotary switches to set the IP address, then you are ready to attach devices using Chapter 5. Connecting Devices on Page 42.

If the LEDs do not meet the above conditions, you can refer to IOLM YL212 LEDs on Page 137 in the Troubleshooting and Technical Support chapter for more information.

2.1.4. Mounting the IOLM YL212

Use the following procedure to mount the IOLM. You can mount the IOLM on a mounting panel or a machine.

1. Verify that the mounting surface is level (flat) to prevent mechanical stress to the IOLM.
2. Attach the IOLM to the surface with two 6mm screws and washers, torque down to 8Nm.



2.2. IOLM YN115 Hardware Installation

Use the following information to install the hardware for the IOLM YN115.

- Connecting to the Network on Page 12
- Connecting the Power on Page 12
- Mounting on Page 13

Note: The IOLM YN115 must be installed in a suitable fire, electrical, mechanical enclosure.

Depending on your preference you can connect the IOLM YN115 using several methods:

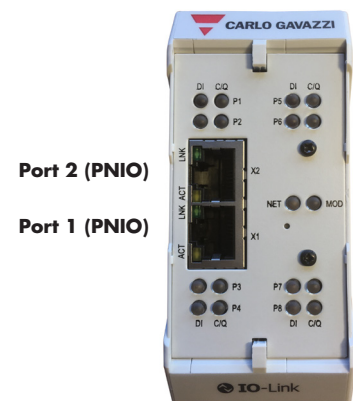
- First mount the IOLM YN115 and connect the power with it attached to the DIN rail.
- Remove the connector with a small flat screwdriver, connect the power, and insert the connector into the receptacle.

Note: Refer to 5.3. IOLM YN115 IO-Link Ports on Page 44 for information about connecting IO-Link or digital devices to the ports after you program the network information using the next chapter.

2.2.1. Connecting to the Network

The IOLM provides two Fast Ethernet (10/100BASE-TX) standard RJ45 connectors..

Pin	Signal
1	Tx+
2	Rx+
3	Tx-
6	Rx-



You can use this procedure to connect the IOLM to the network or IO controller.

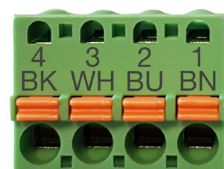
1. Securely connect one end of the RJ45 Ethernet cable to either Ethernet port.
2. Connect the other end to the network or an IO controller.
3. Optionally, use the other Ethernet port to daisy-chain to another Ethernet device.

Note: If you do not connect the IOLM to an IO controller, an IO controller needs to be connected to the network for PROFINET IO configuration.

2.2.2. Connecting the Power

The IOLM YN115 provides redundant power input with a single pluggable connector on the top of the IO-Link Master. The power plug is keyed for your safety so that it cannot be inserted into an IO-Link port using the headers and plugs keyed as supplied.

Signal	Pins	Description
V-	1 and 2	24VDC Power Supply Return
V+	3	Primary +24VDC Supply
V+	4	Secondary +24VDC Supply



Power Supply	Values
Power Supply In (V+)	3.7A (Maximum) †
IO-Link Connectors Ports 1 - 8 C/Q L+	200 mA (Maximum) 200 mA (Maximum)
IO-Link Master Power	155 mA @ 24VDC (VS)
† The sum of the following must not exceed V+ maximum input current: - IO-Link Mode module power - Actual C/Q current for each IO-Link port - Actual US current for each IO-Link port	

You can use this procedure to connect the IOLM to a UL Listed power supply and UL Listed power cord.

Note: Power should be disconnected from the power supply before connecting it to the IOLM. Otherwise, your screwdriver blade can inadvertently short your connections to the grounded enclosure.

1. Optionally, use a small screw driver to remove the power connector from the receptacle.
2. Depress the orange tab until it is flush with the connector to insert positive and negative solid or ferrule wires (12-24AWG) into the V+ and V- contacts.
3. If necessary, re-insert the connector into the power receptacle.
4. Apply the power and verify that the following LEDs are lit indicating that you are ready to program the IP address and then attach your IO-Link devices.
 - a. The X1/X2 LED lights on the connected port.
 - b. The MOD and NET LEDs are lit.
 - c. The IO-Link LEDs C/Q flash (if no IO-Link device attached) or are lit if an IO-Link device is attached.
 - d. If a PLC is connected, the NET LED is lit and green.

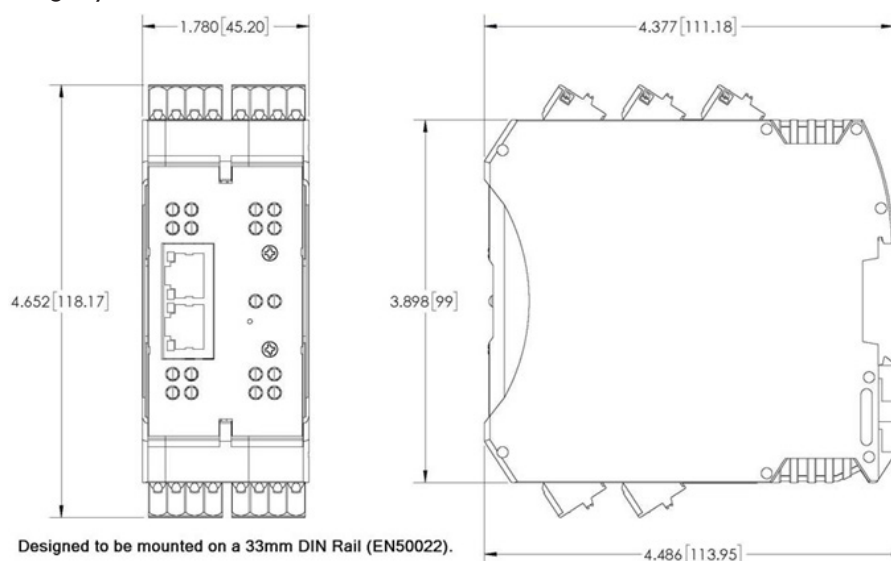
If the LEDs indicate that you are ready to go to the next installation step. Refer to Chapter 3. Configuring the IOLM with STEP 7 on Page 14 to configure the network information.

If the LEDs do not meet the above conditions, you can refer to IOLM YN1 15 LEDs on Page 138 in the Troubleshooting and Technical Support chapter for more information.

2.2.3. Mounting

You may want to mount the IOLM after programming the IP address and connecting the IO-Link and digital input/output devices.

1. Slide the metal latch down, hook the top of the IOLM YN1 15 to the DIN rail and release the latch.
2. Verify that is tightly mounted.



Note: You may want to connect the IO-Link devices before attaching the IOLM YN1 15 to the DIN rail. Use Chapter 5. Connecting Devices on Page 45 if you require IO-Link cabling information.

3. Configuring the IOLM with STEP 7

3.1. Overview

PROFINET IO configuration procedures vary between software versions but the following configuration steps are required in all cases. Refer to your STEP 7 documentation, if you require step-by-step procedures.

1. Download, unzip, and upload the GSD file for the IO-Link Master (IOLM).
2. Insert the IOLM in the PROFINET IO system.
3. Configure the IP address for the IOLM.
4. Assign the PROFINET Device Name.
5. Set the IO Device Update Time.
6. Configure the IO-Link ports.
 - a. Configure IO-Link port modules.
 - b. Configure port status modules.
 - c. If desired, configure data storage, automatic or manual - upload or download.
 - d. If desired, configure device validation and data validation.
7. Use Chapter 12. PROFINET IO Reference Information on Page 167 to complete configuration after attaching the IO-Link devices.

The following subsections provides PROFINET IO configuration procedures using STEP 7 V5.5 and TIA Portal V13:

- Installing the GSD File
- Configuring the IOLM
- IP Address Assignment on Page 16
- Device Name Assignment on Page 24
- Setting the IO Device Update Time on Page 26
- Configuring IO-Link Ports on Page 27

3.2. Installing the GSD File

Use the following procedure to install the GSD file for PROFINET IO using STEP 7 V5.5.

1. Unzip GSDML-V2.xx.zip to a working directory.
2. Use the appropriate steps:
STEP 7 V5.5:

- a. Open SIMATIC STEP 7 | HW Config.
- b. Use Menu Options | Install GSD Files to install the GSD file.

TIA Portal V13:

- a. Open the TIA Portal and switch to the Project view.
- b. Use Menu Options | manage general station description files (GSD) to install the GSD file.

Note: If an older version of the GSD file was installed before, you may need to remove the IOLM object.

3.3. Configuring the IOLM

Use the appropriate procedure for your environment.

- STEP 7 V5.5
- TIA Portal V13

3.3.1. STEP 7 V5.5

Select the IOLM from the Hardware Catalog window and insert it into a PROFINET-IO- System in the HW Config (PROFINET IO | Additional Field Device | Gateway | Carlo Gavazzi IO-Link Master |YN115) as shown in Figure 1.

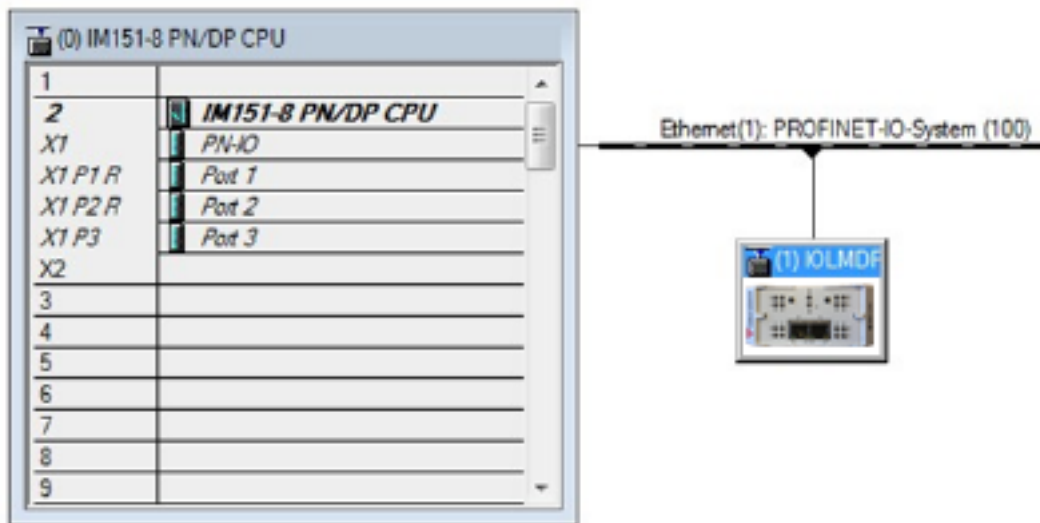
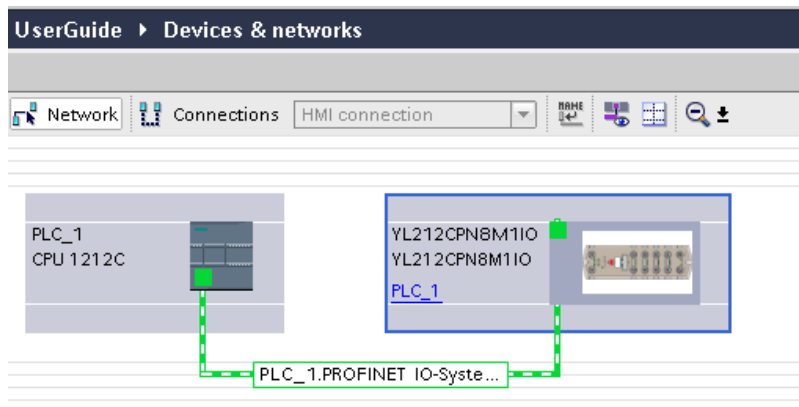


Figure 1: Inserting an IOLM YN115 into a PROFINET IO System

3.3.2. TIA Portal V13

Select the IOLM from the Hardware catalog window (Other field devices | PROFINET IO | Gateway | Carlo Gavazzi | YN115) and drag it into the Device configuration | Network view. Then connect the IOLM to the IO controller, as shown in the Figure below.



3.4. IP Address Assignment

Carlo Gavazzi IOLM gateways support three methods for IP address assignment according to GSDML Specification.

- DCP - The IOLM supports IP address assignment via Discovery and basic Configuration Protocol (DCP). See 3.4.1. Assigning an IP Address via IO Controller (DCP) on Page 16 for procedures.
- DHCP - The IOLM supports the Dynamic Host Configuration Protocol for IP address assignment. See 3.4.2. Assigning an IP Address via DHCP on Page 18 for procedures.
- LOCAL - The IOLM supports a device specific method for IP address assignment. See 3.4.3. Assigning an IP Address Statically (LOCAL) on Page 19 for procedures.

3.4.1. Assigning an IP Address via IO Controller (DCP)

An IO controller can assign an IP address to the Carlo Gavazzi IOLM gateway via DCP. The IO controller and the Carlo Gavazzi IOLM gateway have to be on the same subnet. The IOLM default IP address is: 192.168.1.125 and the subnet mask is 255.255.255.0.

Use the appropriate procedure for your environment.

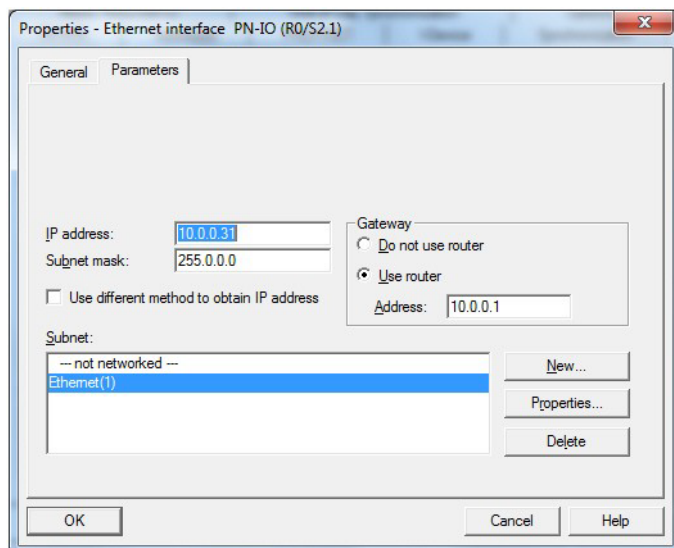
- STEP 7 V5.5
- TIA Portal V13 on Page 17

3.4.1.1. STEP 7 V5.5

Use the following procedure to assign an IP address via DCP.

1. Double-click the X1 PNIO-IO interface of the IO control to open the Properties window.
2. On the General tab, click the Properties button, which opens the Ethernet interface Properties window.
3. Uncheck the Use different method to obtain IP address option.
4. Manually enter the IP address and subnet mask for the IO controller.
In this example the IO controller was assigned an IP address of 10.0.0.31 and a subnet mask of 255.0.0.0.
5. Double-click the IOLM, check Assign IP address via IO controller as shown in Figure 3.
6. On the General tab, click the Ethernet button, which opens the Ethernet interface properties window, where you can specify what IP address the IO controller should assign to the IOLM.

Steps 2 through 4 are necessary in STEP 7 V5.5 so that both the IO controller and the IOLM are on the same subnet. Otherwise, the Assign IP address via IO controller function may not work correctly.



In this example, IP address 10.0.0.100 is assigned to the IOLM via the IO controller.

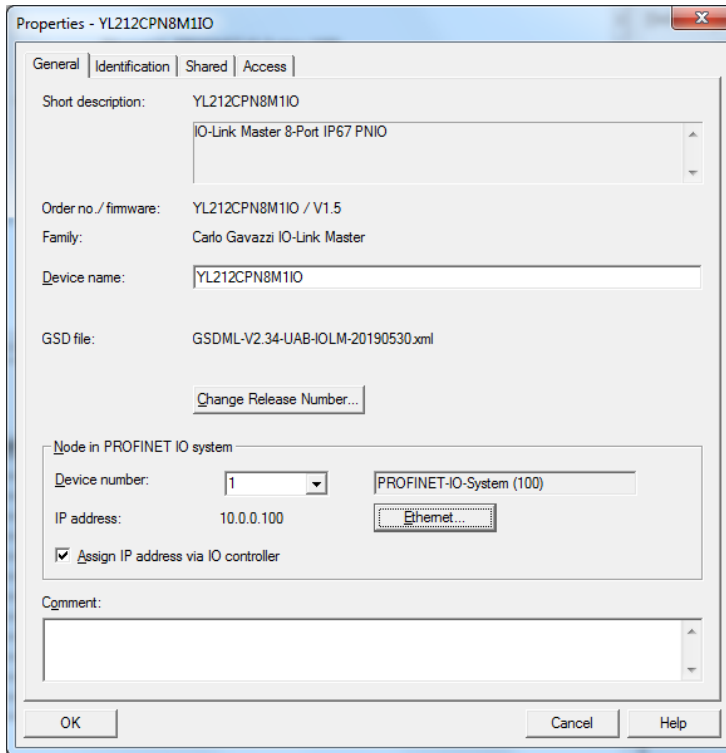
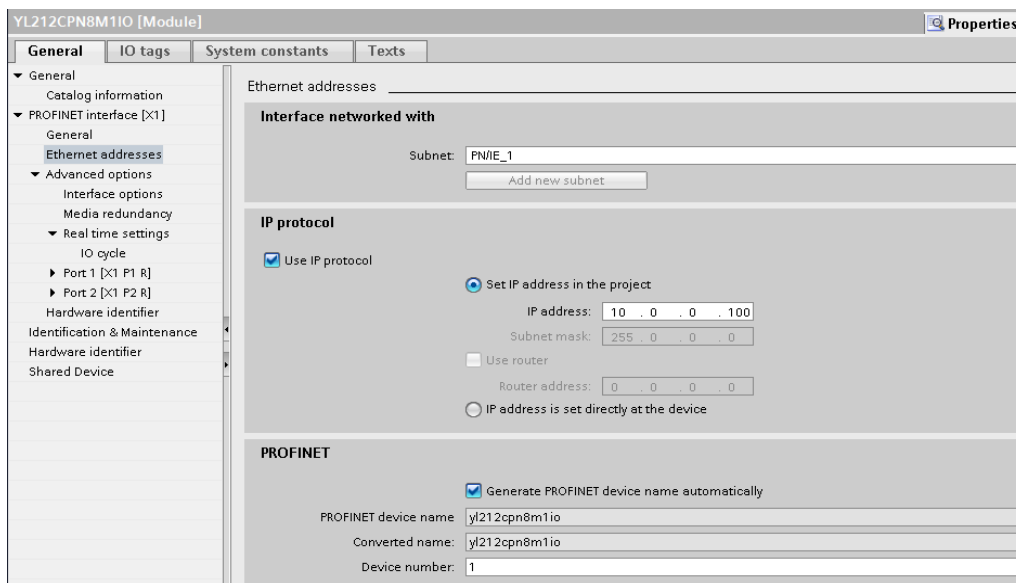


Figure 3: IOLM Properties

3.4.1.2. TIA Portal V13

Use the following procedure to assign an IP address via DCP.

1. Double-click the IOLM in the Device configuration | Network view.
2. On the Properties | General tag, select Ethernet addresses.
 - a. Make sure that the User IP protocol option is checked and the Set IP address in the project is selected.
 - b. Enter the desired IP address for the IOLM. In this example the IP address 10.0.0.100 is assigned to the IOLM via the IO controller.



3.4.2. Assigning an IP Address via DHCP

The Carlo Gavazzi IOLM gateway supports DHCP for IP address assignment. DHCP is disabled by default. Use the following steps to enable DHCP.

Note: The IOLM default IP address is: 192.168.1.250 and the subnet mask is 255.255.255.0. You may need to change your laptop or PC IP address range to access the IOLM web interface to change the IP address without changing your settings.

1. Open a web browser and enter the IOLM IP address.
2. Click Configuration | Network.
3. Click EDIT button.
4. Change IP Type from static to dhcp.

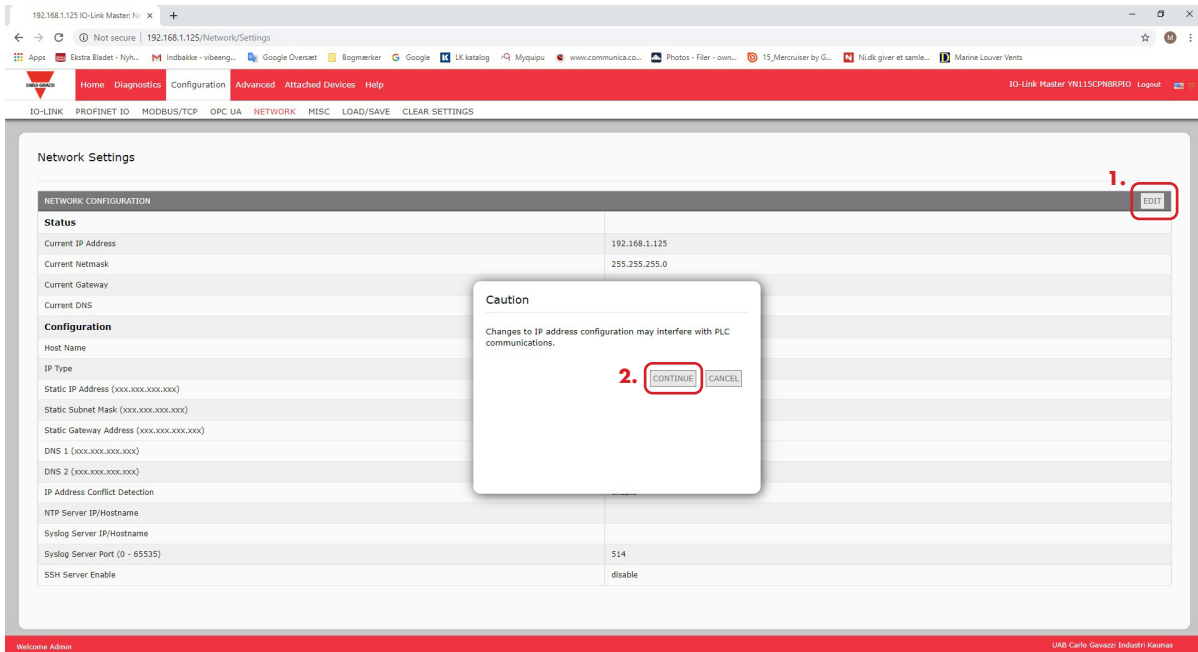
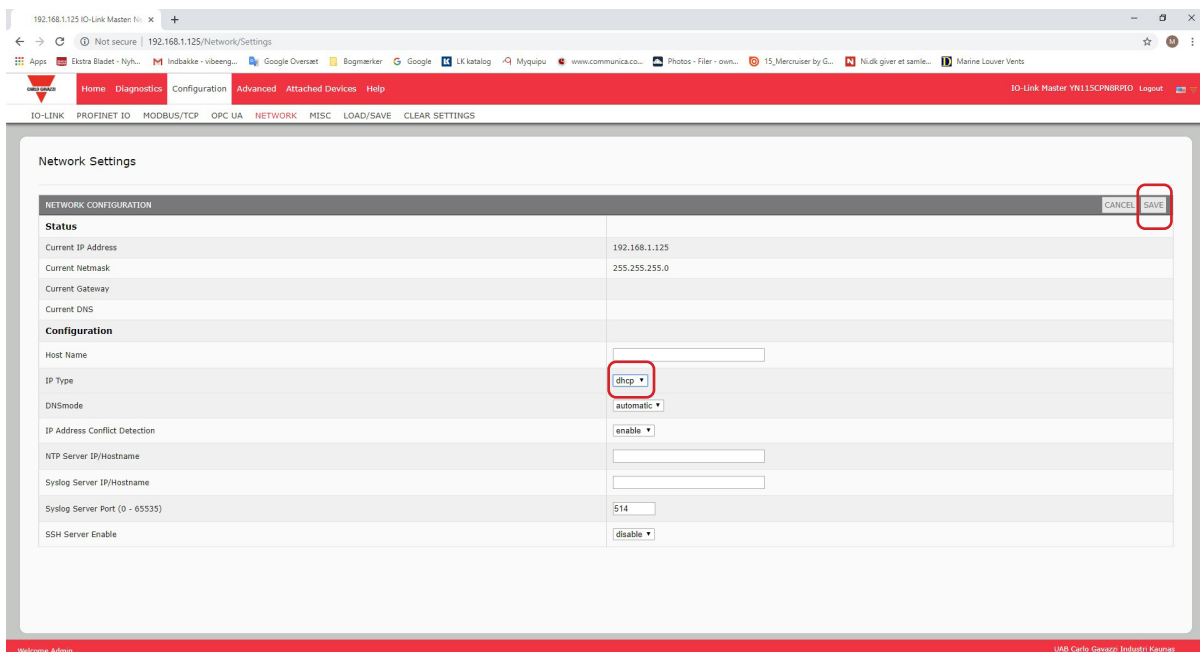


Figure 4: Web Network Configuration Page



5. Click the SAVE button.

Once DHCP is enabled, the IOLM attempts to obtain an IP address from a DHCP server. If a new IP address is assigned by a DHCP server, then the IOLM switches to the new IP address immediately. This may interfere with communications between the device and the IO controller.

The Obtain IP address from a DHCP server option in the Edit Ethernet Node window in STEP 7 (Figure 4) is not supported. DHCP can only be enabled or disabled via the web interface.

Note: An IO controller can overwrite DHCP IP assignment by assigning IP address via DCP.

The next configuration step is to assign the device name, go to 3.5. Device Name Assignment on Page 24.

3.4.3. Assigning an IP Address Statically (LOCAL)

IP addresses can also be assigned statically using one of the following methods:

- The LOCAL method as defined in the GSDML Specification
- Embedded web interface

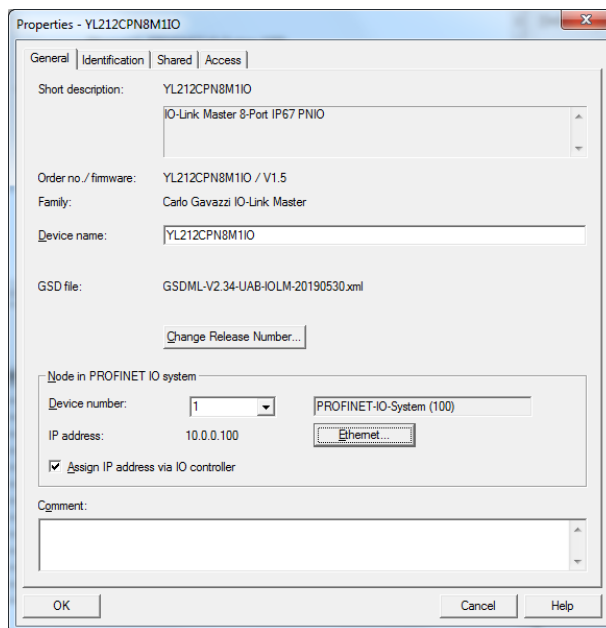
Use the appropriate procedure for your environment:

- STEP 7 V5.5
- TIA Portal V13 on Page 20

3.4.3.1. STEP 7 V5.5

Use the following procedure if you want to use the LOCAL method using STEP 7.

1. In the STEP 7 HW Config window, double-click the IOLM object to open up the Properties window.



2. Uncheck the Assign IP address via IO controller option and click OK.

3. Download and run the project.

The IO controller will not attempt to assign IP address to the IOLM. You must assign a static IP address to the IOLM manually.

4. Select the IOLM in HW Config, open the Edit Ethernet Node window (Figure 4) by using menu PLC | Ethernet | Edit Ethernet Node option.

5. Once opened, click the Browse button, which opens the Browse Network window.

The IOLM should be displayed as an Carlo Gavazzi IO-Link Master with a default IP address of 192.168.1.250.

6. Select the IOLM and click the OK button to return to the Edit Ethernet Node window.

7. Enter the desired IP configurations.

In Figure 4, the IOLM was configured to use a static IP address 10.0.0.100, subnet mask 255.0.0.0 and no router.

8. Click the Assign IP Configuration button, the IP configuration is assigned to the IOLM.

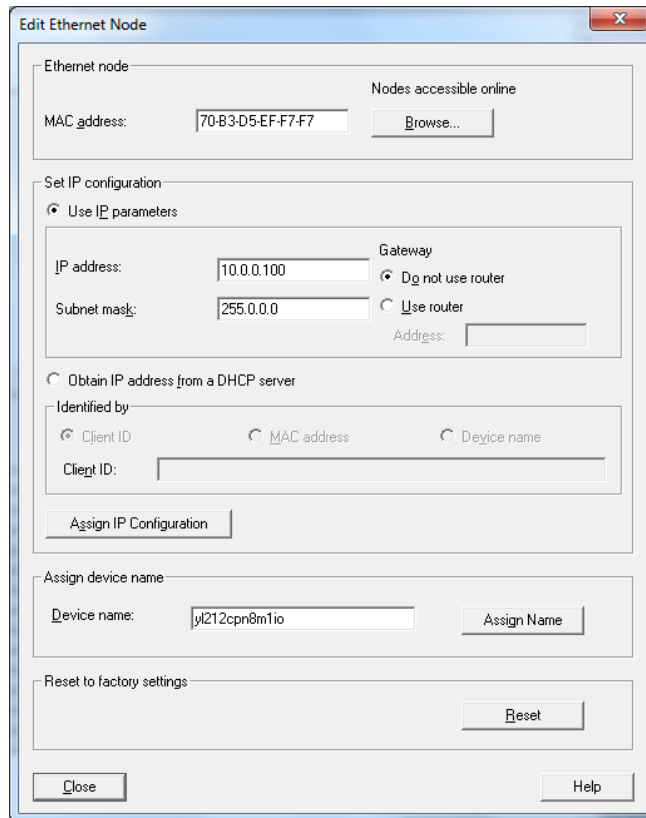


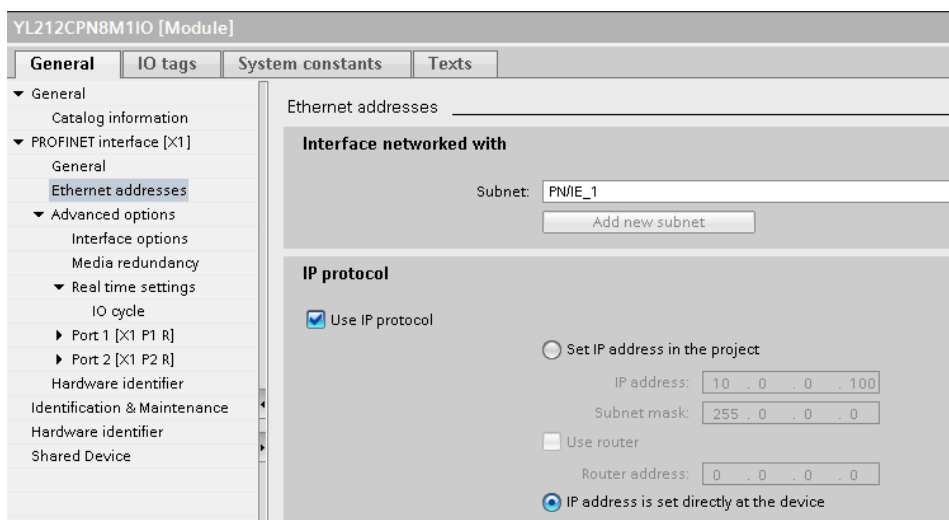
Figure 4: Configure IP Address and Device Name

The next configuration step is to assign the device name, go to 3.5. Device Name Assignment on Page 24.

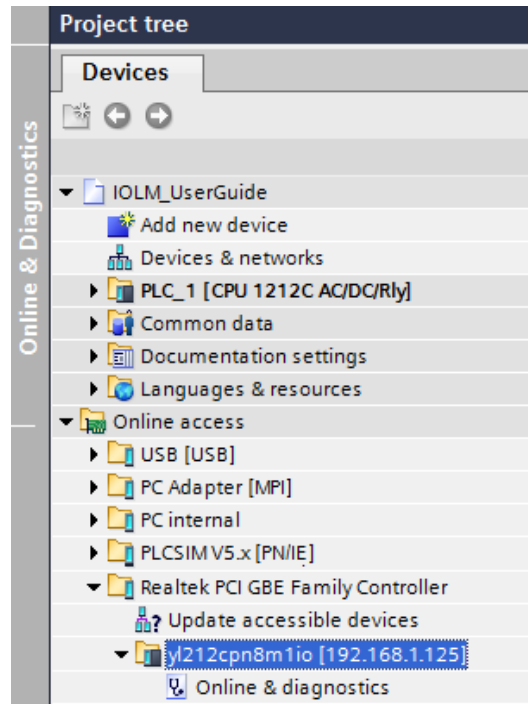
3.4.3.2. TIA Portal V13

Use the following procedure if you want to set the LOCAL method using TIA Portal.

1. Double-click the IOLM in the Device configuration | Network view.
2. On the Properties | General tag, select Ethernet addresses.
3. Make sure that the User IP protocol option is checked and the IP address is set directly at the device is selected.
4. Download and run the project. The IO controller will not attempt to assign IP address to the IOLM. You must assign a static IP address to the IOLM manually.



- In the TIA Portal Project view, navigate to Project tree | Online access, double-click the Ethernet adapter that is used as PROFINET IO network in your system, then double-click Update accessible devices.



- Once the accessible devices list is updated, find the IOLM by using the default IP address 192.168.1.250 or the previous IP address that the IOLM was assigned by IO controller.
- Double-click the Accessible device [192.168.1.250], then double-click the Online & diagnostics to open up the Online access view.
- Click Functions | Assign IP address, enter the desired IP configurations. In the following figure, the IOLM was configured to use a static IP address 10.0.0.100, subnet mask 255.0.0.0 and no router.
- Click the Assign IP address button, the IP configuration is assigned to the IOLM.



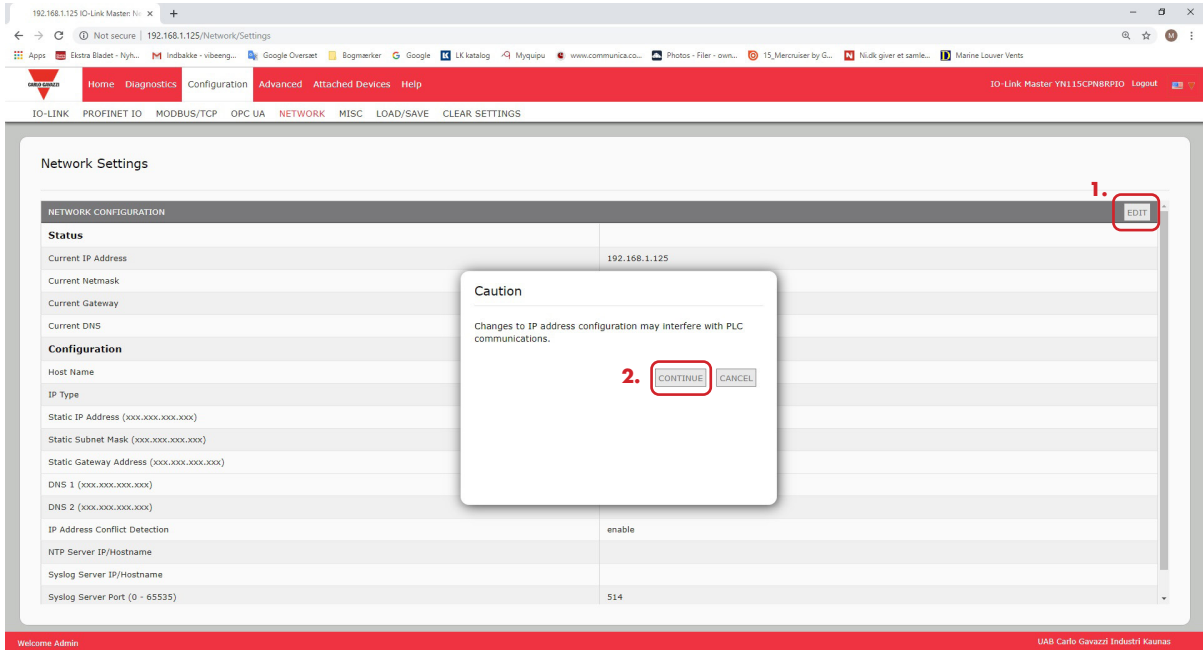
The next configuration step is to assign the device name, go to 3.5. Device Name Assignment on Page 24.

3.4.3.3. Assign IP Address Statically Using the Web Page

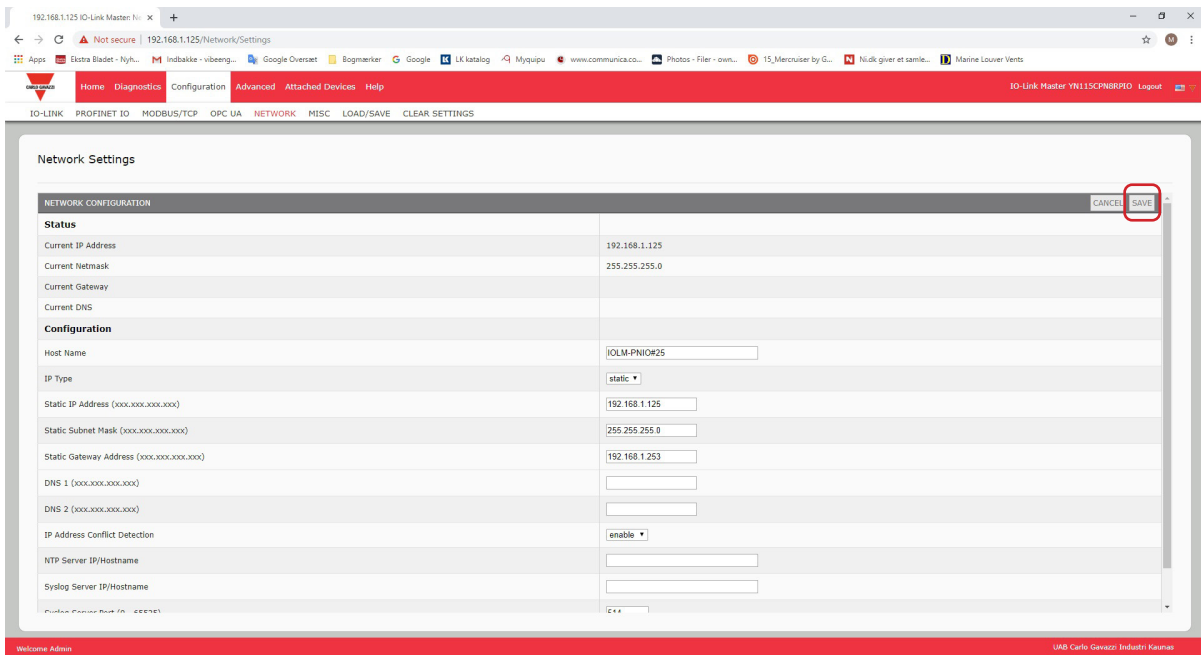
You can use the following procedure to configure a static IP address. The IOLM web interface switches to the new IP address immediately.

Note: The IOLM default IP address is: 192.168.1.250 and the subnet mask is 255.255.255.0. You may need to change your laptop or PC IP address range to access the IOLM web interface to change the IP address without changing your settings.

1. Open a web browser and enter the IOLM IP address.
2. Click Configuration | Network.
3. Click the EDIT button.



4. If necessary, change the IP Type to static.
5. Enter an IP address, subnet mask, and gateway address.
6. If applicable, enter the DNS1 and DNS2 addresses.



7. Click the SAVE button.

The next configuration step is to assign the device name, go to 3.5. Device Name Assignment on Page 24.

3.5. Device Name Assignment

Use one of the following methods to configure the Device Name.

- STEP 7 - refer to the following procedure
- Web interface - see 3.5.2. Using the Web Interface to Assign the Device Name on Page 25 for information about using the IOLM Configuration | PROFINET IO page.

3.5.1. Assign the Device Name in STEP 7

Use the appropriate procedure for your environment.

- STEP 7 V5.5
- TIA Portal V13 on Page 25

3.5.1.1. STEP 7 V5.5

Use the following procedure to configure the Device Name using STEP 7.

1. Select the IOLM, open the Edit Ethernet Node window using the PLC | Ethernet | Edit Ethernet Node menu.
2. Click the Browse button to open the Browse Network window.
The unit should be displayed as an IO-Link Master with an empty device name.
3. Select the unit and click the OK button to return to the Edit Ethernet Node window.
4. Set the device name. PROFINET IO Device Names are not case-sensitive. In this example, the device name was set to yl212cprn8m1io.

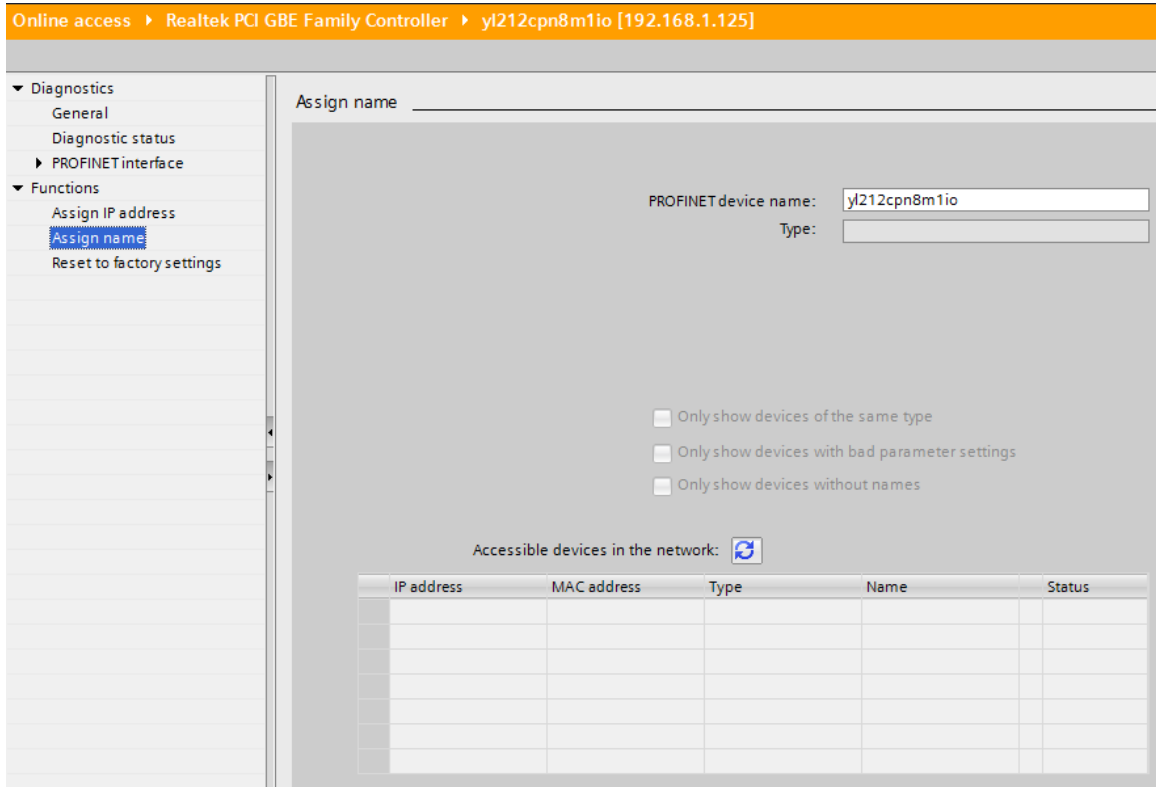
The screenshot shows the 'Edit Ethernet Node' dialog box with the following configuration:

- Ethernet node:** MAC address: 70-B3-D5-EF-F7-F7, Nodes accessible online: Browse...
- Set IP configuration:** Use IP parameters (selected). IP address: 10.0.0.100, Subnet mask: 255.0.0.0. Gateway: Do not use router (selected), Use router (unselected), Address: [empty].
- Obtain IP address from a DHCP server:** (unselected).
- Identified by:** Client ID (selected), MAC address (unselected), Device name (unselected). Client ID: [empty].
- Assign device name:** Device name: yl212cprn8m1io, Assign Name button.
- Reset to factory settings:** Reset button.
- Buttons:** Close, Help.

If there is a cyclic communication between the device and an IO controller, the cyclic communication has to be stopped before the device name can be changed.

3.5.1.2. TIA Portal V13

1. Use the same procedure in 3.4.3.2. TIA Portal V13 on Page 20 to access the Online access view.
2. Click Functions | Assign name, enter the device name and click the Assign name button. PROFINET IO Device Names are not case-sensitive. In this example, the device name was set to iolmldr8.

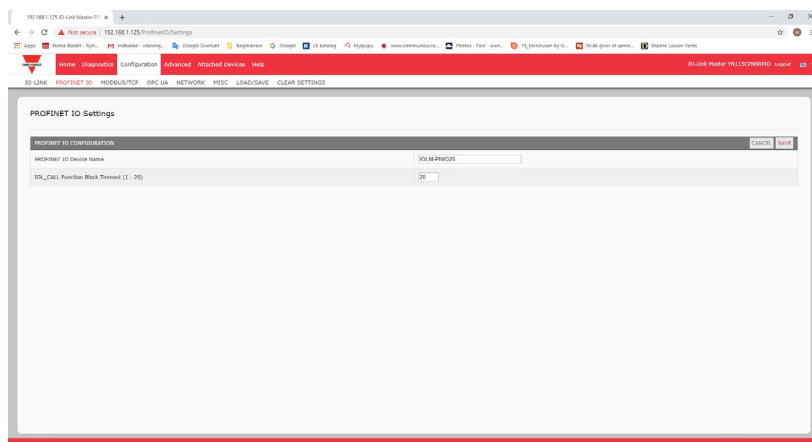


3.5.2. Using the Web Interface to Assign the Device Name

You can use the Configuration | Profinet IO Settings page to assign the device name for PROFINET IO with the IO-Link Master.

Note: Changes to device name using the web interface take effect immediately. It may interfere with the communication between the device and IO controller.

1. If necessary, open the IOLM web interface with your web browser using the IP address.
2. Click Configuration | PROFINET IO Settings.
3. Click the EDIT button.
4. Enter the PROFINET IO Device Name.
The PROFINET IO Device Name is the same as the name later used to configure PROFINET IO for the IOLM. The PROFINET IO Device Name is not case-sensitive.
5. If necessary, change the IOL_CALL Function Block Timeout (1-20) value to reflect your environment.



6. Click SAVE.

Parameter	Description
PROFINET IO Device Name (Default: empty)	<p>The device name must be specified according to DNS conventions.</p> <ul style="list-style-type: none"> Restricted to a total of 240 characters (letters, digits, dash or period) Parts of the name within the device name; in other words, a string between two periods, must not exceed a maximum of 63 characters. No special characters such as umlauts (ä, ö etc.), brackets, underscore, slash, blank etc. The dash is the only permitted special character. The device name must not begin or end with the "-" character. The device name must not begin with numbers. The device name must not have the structure n.n.n.n (n = 0...999). The device name must not begin with the character string "port-xyz-" (x, y, z = 0...9).
IOL_CALL Function Block Timeout (1-20) (Default: 20)	The timeout value in seconds for IOL_CALL function block.

3.6. Setting the IO Device Update Time

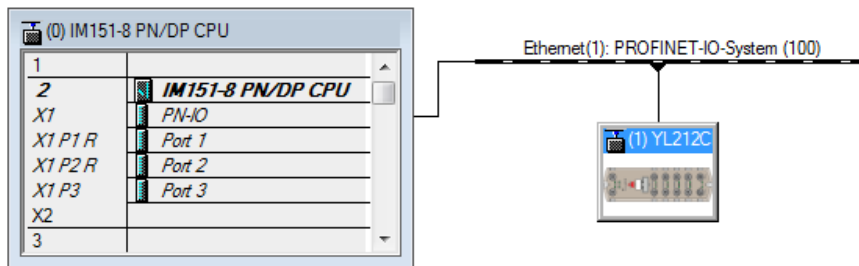
Use the appropriate procedure for your environment:

- STEP 7 V5.5
- TIA Portal V13 on Page 27

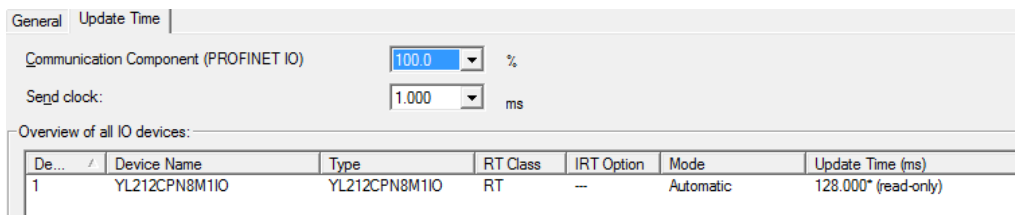
3.6.1. STEP 7 V5.5

Use the following procedure to set the IO Device Update Time.

1. Double-click the Ethernet(1): PROFINET-IO-System (100).



2. In the Properties - PROFINET IO-System window, select the Update Time tab, as shown in the image below.



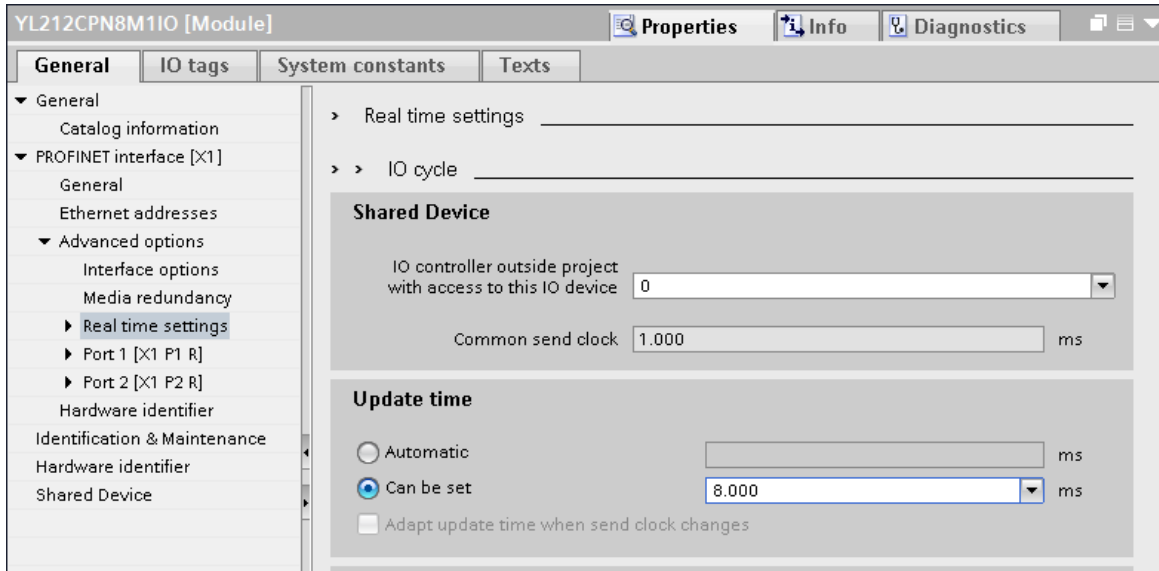
Configuring IO Device Update Timer

3. Set the desired update time. The fastest IO device update time is 8ms.

3.6.2. TIA Portal V13

Use the following procedure to set the IO Device Update Time.

1. Double-click the IOLM in the Device configuration | Network view.
2. On the Properties | General tag, select PROFINET interface [X1] | Advanced options | Real time settings.
3. Select the Can be set option and set the update time to the desired value from the list. The fastest IO device update time is 8ms.

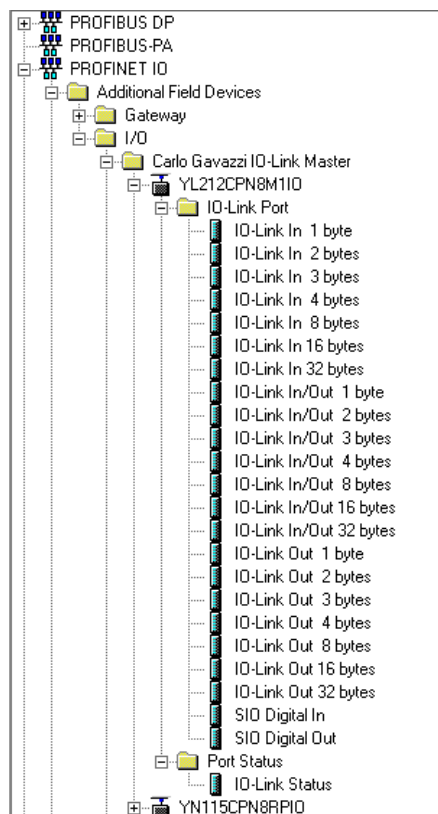


3.7. Configuring IO-Link Ports

The IO-Link Master gateway has two categories of IO modules:

- 3.7.1. IO-Link Port Modules on Page 28
- 3.7.2. Port Status Modules on Page 31

IO modules are used to configure IO-Link ports and exchange PDI and PDO data with various IO-Link devices and digital I/O devices. The following image shows available modules of the IOLM.



3.7.1. IO-Link Port Modules

An IO-Link port can be configured as one of the following:

- IO-Link Mode
- SIO Digital In Mode
- SIO Digital Out Mode.

IO-Link Port modules are used to configure the mode of an IO-Link port.

All the IO-Link modules start with the IO-Link (that is: IO-Link In, IO-Link Out and IO-Link In/Out) configure the corresponding IO-Link port as IO-Link Mode. An SIO Digital In module configures the IO-Link port as SIO Digital In Mode. Similarly, an SIO Digital Out module configures the port as SIO Digital Out Mode.

- An IO-Link module can be input only, output only or both. In addition, there are different modules with various IO data sizes (1 to 32 bytes). For example, the IO-Link In/Out 4 bytes module is for an IO-Link device that supports up to 4-byte PDI data and 4-byte PDO data. If you do not find an exact matching IO size, select the next size (larger). For instance, use IO-Link in 16-bytes module for an IO-Link device that has 10-byte PDI data. The unused PDI data is filled with zeros.
- For SIO Digital In module, the PDI data is fixed at 1-byte. A high voltage on the IO-Link port C/Q Pin results in a 0x01 PDI data; a low voltage on the C/Q Pin results in a 0x00 PDI data.
- For SIO Digital Out module, the PDO data is fixed at 1-byte. A zero output value from an SIO Digital Out module sets the IO-Link port C/Q pin to low voltage. Any non-zero output value sets the C/Q pin to high voltage.

IO-Link Port Module Input Data Format	
Byte Offset	Description
0	PDI Data Block byte 0
1	PDI Data Block byte 1
...	...
31	PDI Data Block byte 31

IO-Link Port Module Output Data Format	
Byte Offset	Description
0	PDO Data Block byte 0
1	PDO Data Block byte 1
...	...
31	PDO Data Block byte 31

IO-Link Port modules are allowed in Slot 1 to 8 on the IOLM YL212 and IOLM YN115 models. Slot 1 is corresponding to IO-Link Port 1. Slot 2 is for IO-Link Port 2, so on and so forth. If a slot is unpopulated, the corresponding IO-Link port is not configured. That port uses the previously configured settings, or default settings if it has not been configured before.

3.7.1.1. IO-Link Port Settings (IO-Link Port Module Parameters)

Additional IO-Link port settings can be configured by using module parameters. Use the appropriate procedure for your environment:

- STEP 7 V5.5 on Page 30
- TIA Portal V13 on Page 31

IO-Link Port Module Parameters	
IO-Link Port Config	
Minimum Cycle Time <i>(Default: 4)</i> Valid range: 4-538ms	The minimum or fastest cycle time at which the IO-Link device may operate. You can leave the Minimum Cycle Time set to the default value and the IO-Link Master negotiates with the IO-Link device for its minimum cycle time. The IO-Link Diagnostics page displays the Actual Cycle Time, which is the negotiated cycle time.
Data Storage Config	
Automatic Data Storage Upload Enable <i>Default: Off</i>	When this option is initially set to On, the IOLM saves the data storage (if the data storage is empty) from the IO-Link device to that port. Some IO-Link devices update the data storage contents if you use the Teach buttons on the IO-Link device, but that is determined by the IO-Link device manufacturer. Automatic upload occurs when the Automatic Upload Enable option is set to On and one of these conditions exists: <ul style="list-style-type: none"> • There is no upload data stored on the gateway. • The IO-Link device executes a requests_ at upload function (generally because you have changed the configuration via Teach buttons). Do not enable both Automatic Upload and Automatic Download at the same time, the results are not reliable among IO-Link device manufacturers. When a port contains data storage for an IO-Link device and if you attach a device whose Vendor and Device ID do not match, the IO-Link LED on the IOLM flashes red to indicate a wrong device is attached. In addition, the IO-Link Diagnostics page displays DV: Wrong Sensor in the IOLink State field. You should not enable Automatic Upload until after you have configured the IO-Link device attached to the port unless you want to capture the default settings. Refer to 10.2. Data Storage on Page 136 for more information.
Automatic Data Storage Download Enable <i>Default: Off</i>	The data stored on the IOLM port is downloaded to the IO-Link device if: <ol style="list-style-type: none"> 1. This option is selected. 2. The data stored on the IOLM port contains the same Vendor ID and Product ID as the IO-Link device connected to the port. 3. The data stored on the IOLM port is different than that of the IO-Link device. 4. The IO-Link device requests an upload and the Automatic Upload Enable option is set to Off. If you change configuration parameters on the IO-Link device and want the parameters to remain loaded on the IO-Link device, you must disable the Automatic Download option because otherwise the IOLM will reload the data storage on the port down to the IO-Link device. Do not enable both Automatic Upload and Automatic Download at the same time, the results are not reliable among IO-Link device manufacturers.

IO-Link Port Module Parameters	
Validation Config	
Device Validation Mode <i>(Default: None)</i>	Device Validation Mode provides these options: <ul style="list-style-type: none"> • None - this disables Device Validation Mode. • Compatible - permits a compatible IO-Link device (same Vendor ID and Device ID) to function on the corresponding port. • Identical - only permits an IO-Link device to function on the corresponding port as defined in the following fields. <ul style="list-style-type: none"> - Vendor ID - Device ID - Serial Number
Vendor Id (0-65535)	This is required if you select a Device Validation Mode other than None.
Device Id (0-16777215)	This is required if you select a Device Validation Mode other than None.
Serial Num	This is required if you select Identical for the Device Validation Mode.
Data Validation Mode <i>(Default: None)</i>	There are three Data Validation Modes: <ul style="list-style-type: none"> • None - no data validation is performed on the port. • Loose - the slave device's PDI/PDO lengths must be less than or equal to the user-configured values. • Strict - the slave device's PDI/PDO lengths must be the same as the user-configured values.
PDI Length (0-32)	This is input length of the PDI data field. This is required if you select a Data Validation Mode other than None.
PDO Length (0-32)	This is input length of the PDO data field. This is required if you select a Data Validation Mode other than None.

3.7.1.1.1. STEP 7 V5.5

Use the following information to configure IO-Link port module parameters.

1. Double-click an IO-Link Port module.
2. Select the Parameters table.

Available parameters are shown in this figure and the table (Page 31) describes how to use the parameters.

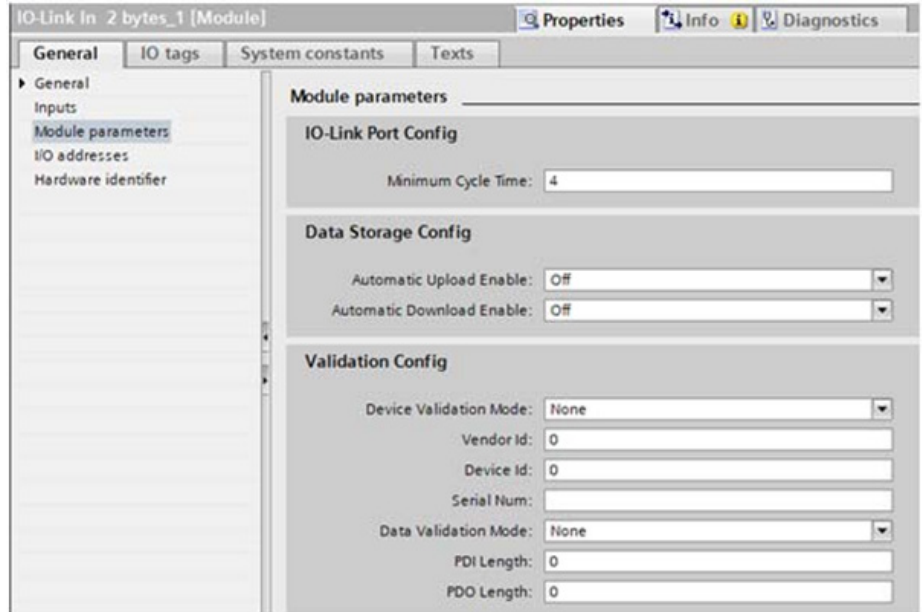
The screenshot shows the 'Parameters' tab of the IO-Link Port Config window. The left pane displays a tree view of the configuration options, and the right pane shows a table of these parameters and their current values.

Parameter	Value
IO-Link Port Config	
Minimum Cycle Time	4
Data Storage Config	
Automatic Upload Enable	Off
Automatic Download Enable	Off
Validation Config	
Device Validation Mode	None
Vendor Id	0
Device Id	0
Serial Num	
Data Validation Mode	None
PDI Length	0
PDO Length	0

3.7.1.1.2. TIA Portal V13

Use the following information to configure IO-Link port module parameters.

1. Open the IOLM Device view.
2. Click an IO-Link Port module.
3. On the Properties | General tag, select Module parameters. Available parameters are shown in the following figure and the table (Page 31) describes how to use the parameters.



3.7.2. Port Status Modules

There are two Port Status modules:

- IO-Link Status Module
- Digital I/O Module.

3.7.2.1. IO-Link Status Module

IO-Link Status module is a 4-byte input only module that provides status information of all IO-Link ports. The following table shows the data format of IO-Link Status module.

Byte Offset	Status Byte Description
0	IO-Link Active
1	IO-Link PDI Valid
2	IO-Link Auxiliary Input
3	IO-Link Error

Each IO-Link port is mapped into one bit of each byte in the IO-Link Status module as shown in this table.

Bit Map of IO-Link Active, IO-Link Error, and Auxiliary Input Modules								
Model	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
YL212	Port 8	Port 7	Port 6	Port 5	Port 4	Port 3	Port 3	Port 1
YN115	Port 8	Port 7	Port 6	Port 5	Port 4	Port 3	Port 3	Port 1

For IO-Link Active status byte (offset 0), a bit one means the corresponding IO-Link port is active. An IO-Link port is considered as active when it is configured correctly and has a working IO-Link device attached.

A bit one in IO-Link PDI Valid status byte (offset 1) means the PDI data from the corresponding IO-Link port is valid. PDI Valid is only applicable to IO-Link port modules that have input data.

- If there are any errors detected when communicating with the IO-Link device, the corresponding bit in the IO-Link Error status byte (offset 2) will be set to 1.
- If a high voltage is detected on the auxiliary input of an IO-Link port, the corresponding bit in the IO-Link Auxiliary Input status byte (offset 3) will be set to 1.

See the following table for the description of each byte of the IO-Link Status module.

Status Byte	Status Bit Description
IO-Link Active	<ul style="list-style-type: none"> • 0: IO-Link port is not active, no IO-Link device is detected. • 1: IO-Link port is active, an IO-Link device is detected and operational.
IO-Link PDI Valid	<ul style="list-style-type: none"> • 0: IO-Link port PDI data is not valid. • 1: IO-Link port PDI data is valid.
IO-Link Auxiliary Input	<ul style="list-style-type: none"> • 0: Low voltage detected on the auxiliary pin of an IO-Link port. • 1: High voltage detected on the auxiliary pin of an IO-Link port.
IO-Link Error	<ul style="list-style-type: none"> • 0: No error detected • 1: An error detected. The further information about the error is available in PROFINET IO channel diagnostics.

3.7.2.2. Auxiliary Input Parameters

Use the appropriate procedure for your environment:

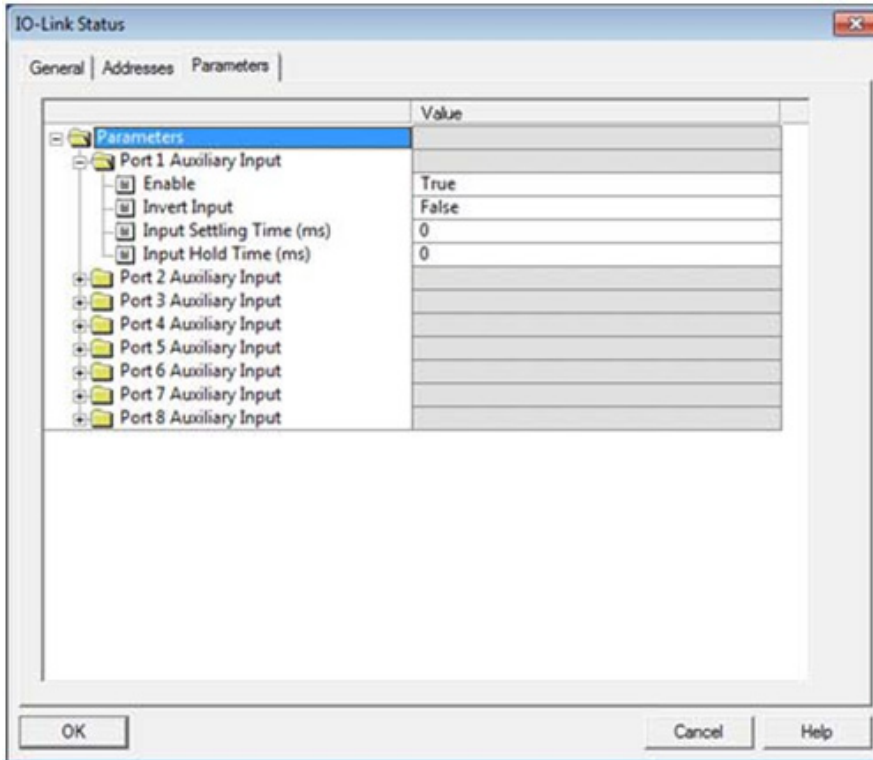
- STEP 7 V5.5
- TIA Portal V13 on Page 33

Port N Auxiliary Input Parameters	
Enable (Default: False)	If enabled, the auxiliary input of Port n will be used. <ul style="list-style-type: none"> • True (Enabled – Enable auxiliary input) • False (Disable – Do not use auxiliary input)
Invert Input (Default: False)	If enabled, this inverts the auxiliary input of port n. <ul style="list-style-type: none"> • False (Disabled - Do not use auxiliary input) • True (Enabled – Invert auxiliary input)
Input Settling Time (ms) (Default: 0)	The auxiliary input settling time that remains constant before that input is considered/accepted
Input Hold Time (ms) (Default: 0)	This is how long the IO-Link Master keeps the input at its present value. For example, if the IO-Link Master detects the input to go to high, and the hold time is X milliseconds, then the IO-Link Master reports the input as high for X milliseconds, even though the input itself may have gone away already. If X is zero, then you get the behavior currently in the field.

3.7.2.2.1. STEP 7 V5.5

Use this procedure to set the auxiliary input parameters.

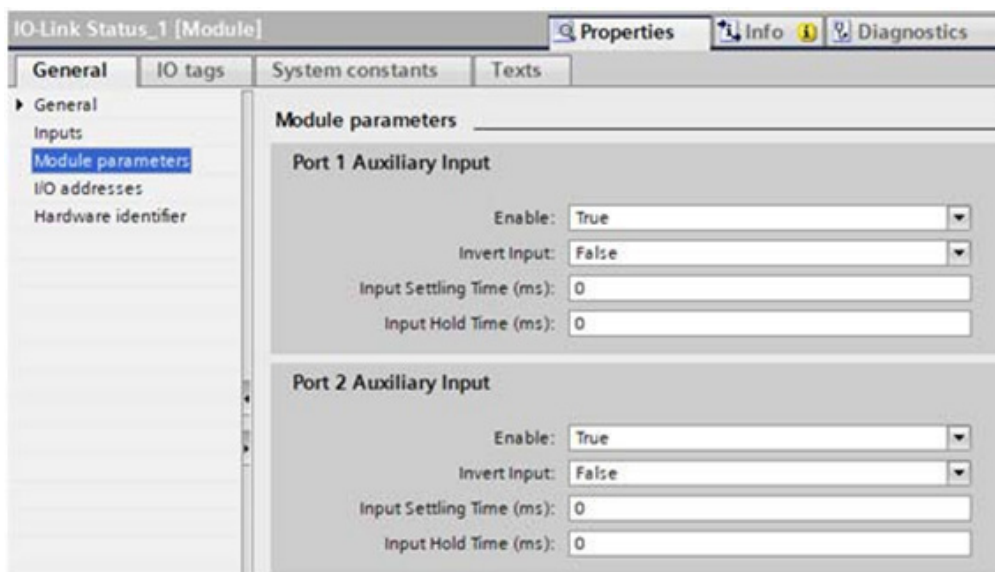
1. Double-click the IO-Link Status module.
2. Select the Parameters table. Available parameters are shown in the next image and the table (Page 35) describes Auxiliary Input parameters.



3.7.2.2.2. TIA Portal V13

Use this procedure to set the auxiliary input parameters.

1. Open the IOLM Device view.
2. Click the IO-Link Status module.
3. On the Properties | General tag, select Module parameters. Available parameters are shown in the next image and the table (Page 32) describes Auxiliary Input parameters.



3.7.3. Configuring IO-Link Ports with the Web Interface

IO-Link port settings (for example, port mode, minimum cycle time, data storage, validation, and device validation) should be configured through STEP 7 by adding correct modules and setting modules' parameters. Optionally, the same settings can be changed through the web interface.

Note: Any changes made through the web interface are overwritten when an application relation is established between a gateway and an IO controller.

This page provides special features such as Data Storage, Device Validation, and Data Validation.

Note: Do not configure Data Storage until the IO-Link device is configured. Data Storage, Device Validation, and Data Validation are discussed in Chapter 10. Utilizing IOLM Features on Page 82.

You can use this procedure to configure IO-Link settings for each IO-Link port.

If an IO-Link device is attached to the port, no configuration is required for operation. If a digital input or output device is attached, it is necessary to change the Port Mode.

1. If necessary, open the IO-Link Master web interface with your web browser using the IP address.
2. Click Configuration | IO-Link Settings.
3. Click the EDIT button for the port or ports that you want to configure.

Note: You can click each EDIT button and open all ports to quickly configure port parameters.

4. Make appropriate selections for the device that you connected to that port.

Make sure you select the DigitalIn option for a digital input device and the DigitalOut option for a digital output device for the Port Mode.

The IOLM negotiates the Minimum Cycle Time so it is not necessary to set a cycle time unless you need a specific cycle time.

You can use the help system if you require definitions or values for the options or refer to the following table.

Note: Do not configure Data Storage until the IO-Link device is configured.

Note: Do not enable Automatic Download and then attempt device configuration as Automatic Download changes the settings back to what is stored on the IOLM. Data Storage, Device Validation, and Data Validation are discussed in Chapter 9. Utilizing IOLM Features on Page 75.

5. Click the SAVE button for each port.
6. Return to the IO-Link Diagnostics page to verify that your changes have taken affect.

The Configuration | IO-Link Settings page supports the following options.

The screenshot displays the 'IO-Link Settings' web interface. The page is organized into several sections:

- Minimum Cycle Time (4 - 538):** A table with a single row containing a text input field with the value '4' and a unit dropdown set to 'ms'.
- Auxiliary Input Settling Time (0 - 10000):** A table with a single row containing a text input field with the value '0' and a unit dropdown set to 'ms'.
- Auxiliary Input Hold Time (0 - 10000):** A table with a single row containing a text input field with the value '0' and a unit dropdown set to 'ms'.
- SIO Input Settling Time (0 - 10000):** A table with a single row containing a text input field with the value '0' and a unit dropdown set to 'ms'.
- SIO Input Hold Time (0 - 10000):** A table with a single row containing a text input field with the value '0' and a unit dropdown set to 'ms'.
- Data Storage Config:**
 - Storage Contents:** A text input field containing the word 'empty'.
 - Automatic Upload Enable:** A dropdown menu set to 'OFF'.
 - Automatic Download Enable:** A dropdown menu set to 'OFF'.
- Data Storage Manual Ops:** A section containing three buttons: 'CLEAR', 'UPLOAD', and 'DOWNLOAD'.
- Validation Config:**
 - Device Validation Mode:** A dropdown menu set to 'None'.
 - Vendor Id (0 - 65535):** A text input field with the value '0'.
 - Device Id (0 - 16777215):** A text input field with the value '0'.

IO-LINK Settings Page	
Port Name	User defined port or device description. <ul style="list-style-type: none"> • Standard ASCII characters • Max length = 80 characters
Port Mode <i>Default: IO-Link</i>	Selected IO-Link port mode. Valid settings are: <ul style="list-style-type: none"> • Reset - Select to disable a port or to reset/restart an IO-Link port. • IO-Link - Select to connect and operate an IO-Link device on the port. • Digital In - Select if a DI device is attached to the port. • Digital Out - Select if a DO device is attached to the port.
Invert SIO <i>Default: False</i>	If enabled and the Port Mode is Digital In or Digital Out, this option inverts the SIO value. <ul style="list-style-type: none"> • False (Disabled - Do not invert SIO) • True (Enabled - Invert SIO) <p>Note: <i>This option does not affect the Auxiliary Input.</i></p>
Invert Auxiliary Input	If this option is enabled, the Auxiliary bit is inverted.
Default Digital Output <i>Default: Off</i>	If the port mode is Digital Out, defines the default digital output value that is used at startup and when there is no active PDO controller. <ul style="list-style-type: none"> • Off (low voltage) - 0 • On (high voltage) - 24V
Minimum Cycle Time <i>Default: 4</i>	The minimum, or fastest, cycle time at which the IO-Link device may operate. The valid range is 4-538 ms. You can leave the Minimum Cycle Time set to the default value and the IO-Link Master negotiates with the IO-Link device for its minimum cycle time. The IO-Link Diagnostics page displays the Actual Cycle Time, which is the negotiated cycle time.
Auxiliary Input Settling Time (0 - 10000)	The auxiliary input settling time that remains constant before that input is considered/accepted
Auxiliary Input Hold Time (0 - 10000)	This is how long the IO-Link Master keeps the input at its present value. For example, if the IO-Link Master detects the input to go to high, and the hold time is X milliseconds, then the IO-Link Master reports the input as high for X milliseconds, even though the input itself may have gone away already. If X is zero, then you get the behavior currently in the field.
SIO Input Settling Time (0 - 10000)	The SIO input settling time that remains constant before that input is considered/accepted.
SIO Input Hold Time (0 - 10000)	This is how long the IO-Link Master keeps the input at its present value. For example, if the IO-Link Master detects the input to go to high, and the hold time is X milliseconds, then the IO-Link Master reports the input as high for X milliseconds, even though the input itself may have gone away already. If X is zero, then you get the behavior currently in the field.

IO-LINK Settings Page (Continued)

Data Storage Config	
Storage Contents	Indicates that the data storage for the port is empty or displays the Vendor ID and Product ID of the data stored on that port.
Automatic Data Storage Upload Enable <i>Default: Off</i>	<p>When this option is initially set to On, the IOLM saves the data storage parameters (if the data storage is empty) from the IO-Link device to the IOLM. Automatic upload occurs when the Automatic Upload Enable option is set to On and one of these conditions exists:</p> <ul style="list-style-type: none"> • There is no upload data stored on the gateway and the IO-Link device is connected to the port. • The IO-Link device has the DS_upload bit on (generally because you have changed the configuration via Teach buttons or web page). <p>When a port contains data storage for an IO-Link device and if you attach a device whose Vendor and Device ID do not match, the IO-Link LED on the IOLM flashes red to indicate a wrong device is attached. In addition, the IO-Link Diagnostics page displays DS: Wrong Sensor in the IOLink State field.</p> <p>Note: <i>Not all device parameters are sent to data storage, this is determined by the IO-Link device manufacturer.</i></p>
Automatic Data Storage Download Enable <i>Default: Off</i>	<p>The data storage parameters on the IOLM are downloaded to the connected IO-Link device if:</p> <ol style="list-style-type: none"> 1. The Automatic Download option is enabled. 2. The data stored on the IOLM port contains the same Vendor ID and Product ID as the IO-Link device connected to the port. 3. Data storage parameters are also downloaded to the IO-Link device if configuration changes are made on the device causing the DS_upload bit to turn on and automatic upload is not enabled. 4. The IO-Link device requests an upload and the Automatic Upload Enable option is set to Off. <p>If you change configuration parameters on the IO-Link device and want the parameters to remain loaded on the IO-Link device, you must disable the Automatic Download option because otherwise the IOLM will reload the data storage on the port down to the IO-Link device.</p>
Data Storage Manual Ops	<p>The Manual Data Storage Ops option provides the following functionality, if data storage is supported by the IO-Link device.</p> <ul style="list-style-type: none"> • CLEAR - this clears any stored data for an IO-Link device on this port. • UPLOAD - this uploads and stores the IO-Link device configuration on the IOLM. • DOWNLOAD - this downloads the stored IO-Link device configuration from the IOLM to the IO-Link device attached to this port if the Vendor ID and Device ID match.
Validation Config	
Device Validation Mode <i>(Default: None)</i>	<p>Device Validation Mode provides these options:</p> <ul style="list-style-type: none"> • None - this disables Device Validation Mode. • Compatible - permits a compatible IO-Link device (same Vendor ID and Device ID) to function on the corresponding port. • Identical - only permits an IO-Link device to function on the corresponding port as defined in the following fields. <ul style="list-style-type: none"> - Vendor ID - Device ID - Serial Number <p>Note: <i>Connecting an IO-Link device that is different than the configured with Data Validation enabled will generate a DV: wrong sensor error.</i></p>

IO-LINK Settings Page (Continued)	
Vendor Id (0-65535)	This is required if you select a Device Validation Mode other than None. The Vendor ID can be manually entered in this field or click the GET ATTACHED button and the IO-Link Master populates the Vendor ID in this field.
Device Id (0-16777215)	This is required if you select a Device Validation Mode other than None. The Device ID can be manually entered in this field or click the GET ATTACHED button and the IO-Link Master populates the Device ID in this field.
Serial Num	This is required if you select Identical for the Device Validation Mode. The Serial Number can be manually entered in this field or click the GET ATTACHED button and the IO-Link Master populates the serial number in this field.
Data Validation Mode (Default: None)	There are three Data Validation Modes: <ul style="list-style-type: none"> • None - no data validation is performed on the port. • Loose - the slave device's PDI/PDO lengths must be less than or equal to the user-configured values. • Strict - the slave device's PDI/PDO lengths must be the same as the user-configured values.
PDI Length (0-32)	This is input length of the PDI data field. This is required if you select a Data Validation Mode other than None. The PDI Length can be manually entered in this field or click the GET ATTACHED button and the IO-Link Master populates the PDI length in this field.
PDO Length (0-32)	This is input length of the PDO data field. This is required if you select a Data Validation Mode other than None. The PDO Length can be manually entered in this field or click the GET ATTACHED button and the IO-Link Master populates the PDO length in this field.
GET ATTACHED (Button)	After opening a port for editing, you can click the GET ATTACHED button to automatically populate the following fields with data from the IO-Link device: <ul style="list-style-type: none"> • Vendor Id • Device Id • Serial Num • PDI Length • PDO Length

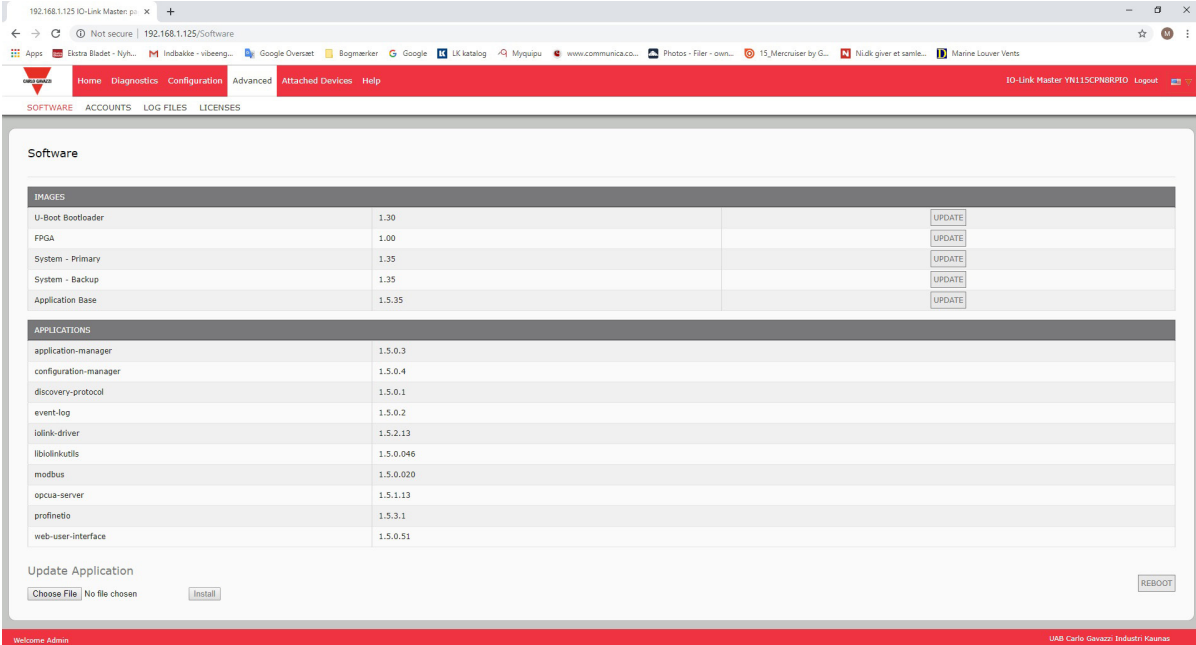
4. Updating Images and Applications

This chapter provides an overview of the software (images and applications) on the IOLM. In addition it contains procedures to update images (Page 41) and application sub-assemblies (Page 42).

After verifying that the IOLM contains the latest software, the next step is to configure the port characteristics using Chapter 3. Configuring the IOLM with STEP 7 on Page 14.

4.1. Images and Application Sub-Assemblies Overview

The IOLM is loaded with the latest images at the factory but you may need to update images or application sub-assemblies to have access to the latest features. You can view all image and application versions in the IOLM ADVANCED | Software page.



The screenshot shows the 'Software' page in the IOLM web interface. The page is divided into two main sections: 'IMAGES' and 'APPLICATIONS'. Each section contains a table with columns for the component name and its version number. To the right of each row in the 'IMAGES' section, there is an 'UPDATE' button. Below the 'APPLICATIONS' section, there is an 'Update Application' section with a 'Choose File' button, a 'No file chosen' message, an 'Install' button, and a 'REBOOT' button.

IMAGES		
U-Boot Bootloader	1.30	UPDATE
FPGA	1.00	UPDATE
System - Primary	1.35	UPDATE
System - Backup	1.35	UPDATE
Application Base	1.5.35	UPDATE

APPLICATIONS	
application-manager	1.5.0.3
configuration-manager	1.5.0.4
discovery-protocol	1.5.0.1
event-log	1.5.0.2
iolink-driver	1.5.2.13
libiolinkutils	1.5.0.046
modbus	1.5.0.020
opcua-server	1.5.1.13
profinetio	1.5.3.1
web-user-interface	1.5.0.51

Update Application
Choose File | No file chosen | Install | REBOOT

4.1.1. Images

The following table discusses IOLM images.

IOLM Images	
U-Boot Bootloader	U-Boot is a high-level Bootloader that has networking and console command line capabilities. Among other things, it implements a TFTP server. This verifies that a Linux kernel image exists in NAND, then copies it to RAM and starts the IOLM. The U-Boot version is displayed after the image name.
FPGA	The FPGA partition/image contains configuration data used by programmable hardware within the IOLM unit. FPGA images are unique to the hardware and protocol type. Make sure you download the correct image for your platform.
ulmage - Primary/ Backup	The ulmage contains the Linux kernel and the RAM-resident root file system. It does not contain industrial protocol support or application-specific features. There is a Primary and Backup version loaded on the IOLM. The IOLM automatically reloads the Backup ulmage if the file system corrupted. The ulmage version is displayed after the Primary/Backup ulmage.
Application Base	The Application Base image comprises a flash-resident file system containing applications and protocol support. The Application Base is built from a collection of application subassemblies – each of which may be updated individually between releases of the application base as a whole. The application sub-assemblies in the Application Base image are displayed in the lower portion of the SOFTWARE page. The Application Base assembly has a 3-tuple version number: (for example, 1.3.18).

4.1.2. Application Subassemblies

Application sub-assemblies are the components of the Application Base image. Application sub-assemblies have a 4-tuple version number (for example, 1.3.18.3). The first two values in a subassembly version correspond to the version of the application base assembly for which it was built and tested.

For example, a subassembly with version 1.3.18.3 was tested with application base version 1.3.18. When using the Software page, an application subassembly can install only if its version number matches that of the installed application base assembly. A subassembly with a version of 1.20.2.4 only installs if the application base version is 1.20.2. It will not install on a device with application base version 1.21.5.

IOLM Application Sub assemblies	
application-manager	The Application Manager version loaded on the IOLM.
configuration-manager	The Configuration Manager version loaded on the IOLM.
discovery-protocol	The Discovery Protocol version loaded on the IOLM.
event-log	The Event log version loaded on the IOLM.
iolink-driver	The IO-Link driver version loaded on the IOLM.
libiolinkutils	The IO-Link utilities library version loaded on the IOLM.
modbus	If applicable, the Modbus/TCP interface version loaded on the IOLM.
opcua-server	If applicable, the opcua-server interface version loaded on the IOLM.
profinetio	The PROFINET IO version loaded on the IOLM.
web-help	The web interface help version loaded on the IOLM.
web-user-interface	The web interface version loaded on the IOLM.

4.2. Using the Web Interface to Update Software

The upper portion of the Advanced | Software page is used to update the IOLM images. The lower portion of this page is used for updating application sub-assemblies that are integrated in the Application Base. Typically, the latest application sub-assemblies are available in the Application Base image. There may times when a feature enhancement or bug fix is available in an application subassembly and not yet available in the Application Base image.

4.2.1. Updating Images

Use this procedure to upload images using the SOFTWARE page.

1. Download the latest image from the Carlo Gavazzi web site.

Note: Make sure that you download the appropriate software for your model. For example, the FPGA images are unique for different hardware models and protocol.

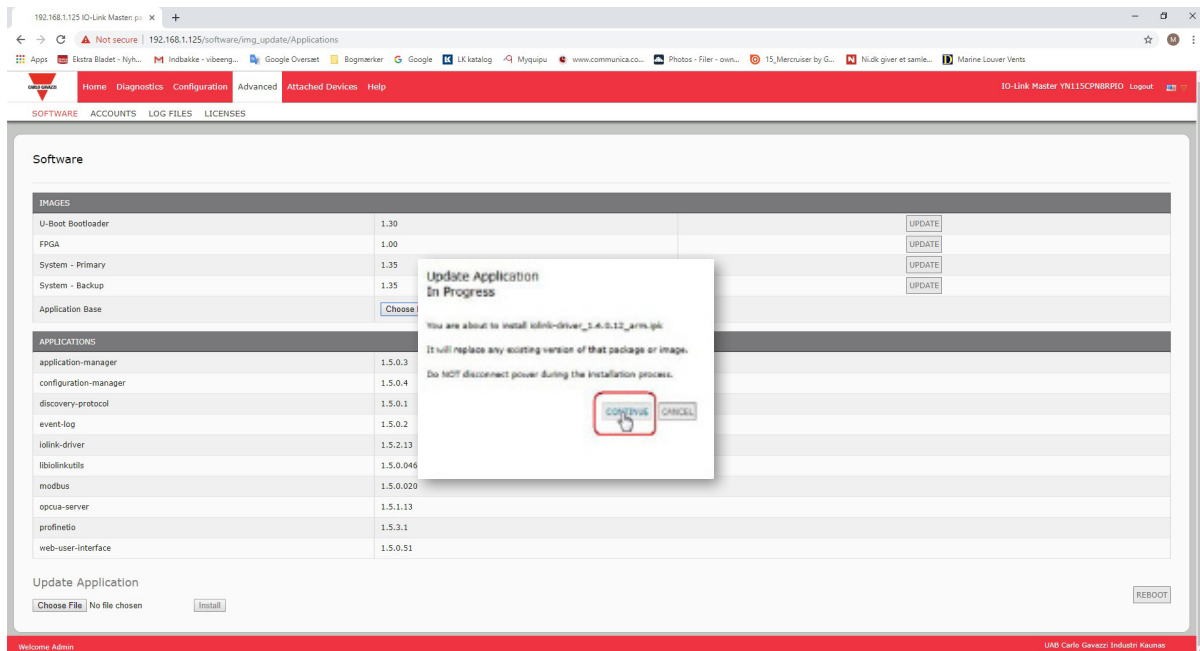
2. Open your browser and enter the IP address of the IOLM.

3. Click Advanced | SOFTWARE.

4. Click the UPDATE button next to the image you want to update.

5. Click the Browse button, navigate to the file location, highlight the image, and click Open.

6. Click the Install button.



7. Click the CONTINUE button to the Update Image message.

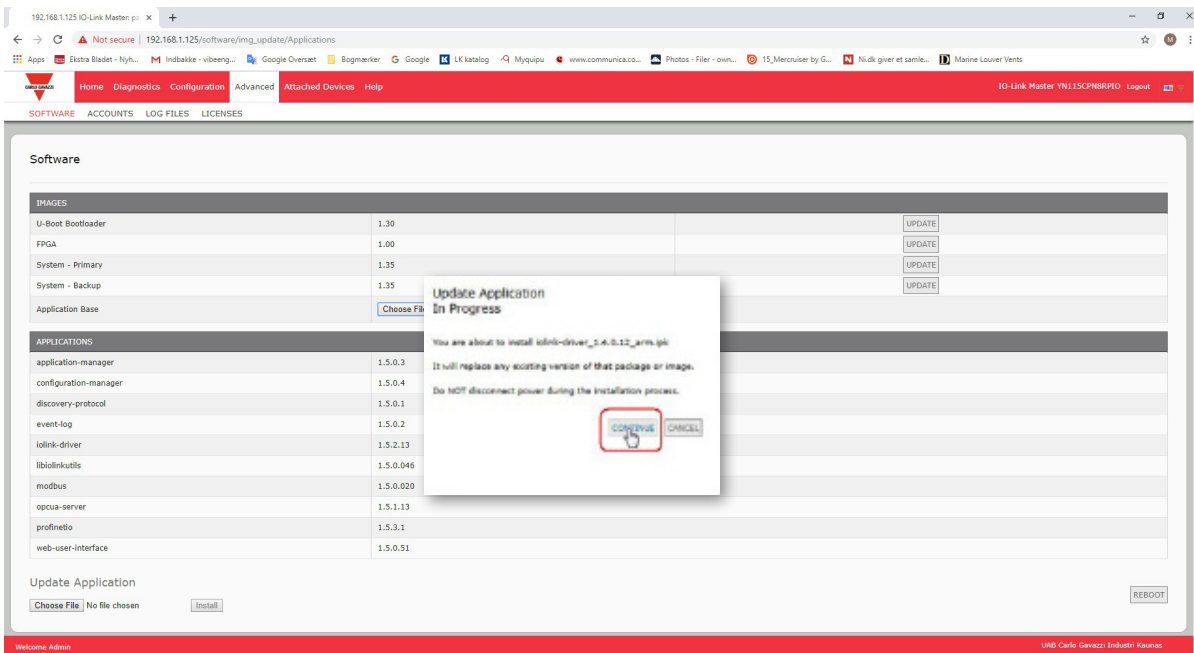
8. Click OK to close the Update Image Successful message.

Note: Some images may require the IOLM web server to restart.

4.2.2. Updating Application Subassemblies

Use this procedure to upload applications using the Software page.

1. Download the latest application from the Carlo Gavazzi web site.
2. Open your browser and enter the IP address of the IOLM.
3. Click Advanced and SOFTWARE.
4. Click the Browse button under Update Application navigate to the file location, highlight the application, and click Open.
5. Click the Install button.
6. Click the CONTINUE button to the Update Application message.
7. Click OK to close the Update Application Successful message.



5. Connecting Devices

This chapter discusses connecting devices to the IOLM. Use the appropriate discussion for your IOLM model.

- Overview
- IOLM YL212 IO-Link Ports on Page 42
- IOLM YN115 IO-Link Ports on Page 44

5.1. Overview

The C/Q pin for the IO-Link ports in SIO mode for all models:

- DI – sinking input
The DI pin on the IO-Link ports for all models is a sinking input.
- DO – PNP/NPN (push/pull) output

Note: IOLM YN115 Only - with two dedicated DIO ports:

- The extra DI is the same as the DI on the IO-Link ports – sinking input.
- The extra DIO is as follows:
DI – sinking input
DO – PNP output

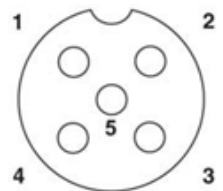
The following table provides definitions of the terminology used above.

Term	Definition
PNP output	Is an output that can source current. That is; the (+) side of the device is connected to the output and the (-) side of the device is connected to (-) of the supply. The device is powered when the output LED is on.
NPN output	Is an output that sinks current. That is: the (-) of the device is connected to the output and the (+) side of the device is connected to (+) side of the supply. The device is powered when the output LED is off.
Sinking input	Sinks current into the IO-Link Master so a positive voltage will cause the input to turn on. Note: Using NPN with inputs is not correct as NPN described an output situation – however some vendors describe their inputs as accepting a certain type of sensor output - so in this case a sinking input will accept a PNP output sensor.

5.2. IOLM YL212 IO-Link Ports

The IOLM YL212 provides eight IO-Link ports with M12, 5-pin female/A coded connectors. Each port has robust over-current protection and short circuit protection on its L+/L- power output and C/Q IO-Link signal. The pin-out for each IO-Link port is per the IO-Link standard and is provided in the following table:
This table provides signal information for the IO-Link connectors.

Pin	Signal	Description
1	L+	IO-Link device power supply (+24V)
2	DI	Digital input
3	L-	IO-Link device power supply (0V)
4	C/Q	Communication signal, which supports SDCL (IO- Link) or SIO (standard input/output) digital I/O
5	FE	Functional Earth (electronics wiring)



The standard SDCI (IO-Link) transmission rates are supported:

- COM1 at 4.8Kbps
- COM2 at 38.4Kbps
- COM3 at 230.4Kbps

There are active over-current limiter electronics for each port in the IOLM YL212 that detects the overload/short-circuit condition within a few milliseconds and shuts off the output power to protect the port and the devices connected to it. The port's power output self-recovers and restores to normal immediately after the overload or short-circuit condition is removed.

The over-current limiter circuit for L+/L- pins is separate circuits than the over-current limiter circuit for the C/Q output pin. When a port is affected by overload/short-circuit condition, it does not affect the operation of the other ports. All other ports will continue to operate normally without any glitch or interruption. The current output capacity, cutoff current, and power sharing/budgeting for L+/L- and C/Q signal for the ports on the IOLM YL212 are as follows.

Port	L+/L-			C/Q		
	Output Current Capacity (max.)	Overload Cutoff Current	Short-Circuit Protection	Output Current Capacity (max.)	Overload Cutoff Current	Short-Circuit Protection
Port 1: Independent over-current limiter circuits/IC for L+/L- and C/Q pins	1.6 A	1.65 A	Yes	200 mA	400 mA	Yes
Port 3: Independent over-current limiter circuits/IC for L+/L- and C/Q pins	1 A	1.05 A	Yes	200 mA	400 mA	Yes
Ports 2 and 4 (Pair) Ports 5 and 7 (Pair) Ports 6 and 8 (Pair) There's one independent over-current limiter that protects L+/L- pins on each pair of ports, for example: Port 2 and 4. This allows you to do power budgeting on pair of ports that allows flexibility in the application. The combined overload cutoff current on a pair of ports is 1.05 A for the L+/L- pins. As long as the cutoff current of 1.05 A is not exceeded, the current output could be budgeted between a pair of ports such as, Port 2 and 4 any way you want. For example, Port 2 output can be at 900 mA and Port 4 output can be at 100 mA. Or, Port 2 could be left open and Port 4 output can be at 1 A.	500 mA/ port pair (1 A output power budget per port pair)	1.05 A/port pair	Yes	200 mA*/ port	400 mA*/ port	Yes

* Each port's C/Q pin has its own independent over-current limiter circuit and are not combined. The current output of C/Q pin for each port is also independently controlled and cannot be budgeted with other ports.

Use the following procedure to attach IO-Link or digital input/output devices to the ports.

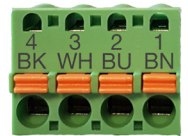
- Securely attach the IO-link cable between the IO-Link or digital input/output device and the IO-Link port.
Note: Make sure that you tighten the cables properly to maintain IP67 integrity.
- If necessary, securely attach a connector cap to prevent dust or liquids from getting into any unused ports. Connector caps were shipped with the IOLM.
Note: IO-Link ports must have an approved cable or protective cover attached to the port to guarantee IP67 compliance.
- If necessary, configure IO-Link port parameters using the Configuration | IO-Link Settings page to configure the port mode.
 - If an IO-Link device is attached to the port, the IO-Link LED should now be lit green and the device is receiving power.
 - If a digital input or output device is attached to the IO-Link port, after the port is configured for digital input or output on the IO-Link Settings page, the IO-Link LED does not light but when an event occurs:
 - Digital input causes the DI LED to flash.
 - Digital output causes the IO-Link LED to flash.

You can refer to the help system or 3.7. Configuring IO-Link Ports on Page 27 for configuration information.

5.3. IOLM YN115 IO-Link Ports

The following provides information about the IO-Link ports.

Pin	Signal	Description	Value
1	L+	Power Supply Output (+)	200mA @ 24V (Maximum)
2	DI	Power Supply Output (-)	
3	L-	Digital Input	Not applicable
4	C/Q	Communication signal, which supports SDCI (IO- Link) or SIO (standard input/output) digital I/O	200mA @ 24V (Maximum)



The standard SDCI (IO-Link) transmission rates are supported:

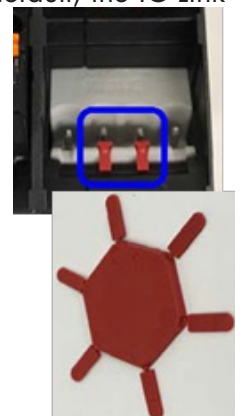
- COM1 at 4.8Kbps
- COM2 at 38.4Kbps
- COM3 at 230.4Kbps

The IOLM YN115 provides removable, pluggable terminals to connect your IO-Link devices.

Note: The connectors on the IOLM YN115 IO-Link ports are keyed headers that prevent inserting the power plug in an IO-Link port.

Use the following procedure to attach IO-Link or digital input/output devices to the ports.

- Optionally, use a small screw driver to remove the IO-Link plug from the receptacle. By default, the IO-Link ports are keyed headers on Pins 2 and 3 of the receptacle.
Note: Do not remove the red coding sections from the headers on the IO-Link receptacle or the fully keyed power connector could be inserted in an IO-Link receptacle.
- Optionally, key the port plug using the following information.
 - Locate the top of the Coding Profile Star, which is the side that has the mold markings.
 - Slide the Coding Profile tab (mold marking facing out) into one of the end slots.
 - Slightly twist the star so that it snaps off the star.
 - Then repeat for the slot on the opposite end.





Note: *This image shows that both the first position and last positions have been keyed.*

3. Depress the orange tab until it is flush with the connector to insert the IO-Link device negative wire into the L- contact.
4. Depress the orange tab until it is flush with the connector to insert the IO-Link device positive wire into the L+ contact.
5. If applicable, depress the orange tab until it is flush with the connector to insert the DI wire into the DI contact.
6. Depress the orange tab until it is flush with the connector to insert the IO-Link wire into the C/Q contact.
 - If an IO-Link device is attached to the port, the IO-Link LED should now be lit green and the device is receiving power.
 - If a digital input or output device is attached to the IO-Link port, after the port is configured for digital input or output on the IO-Link Settings page, the IO-Link LED does not light but when an event occurs:
 - Digital input causes the DI LED to flash.
 - Digital output causes the IO-Link LED to flash.
7. If necessary, configure IO-Link parameters for each port.
You can refer to the help system or 3.7. Configuring IO-Link Ports on Page 27 for configuration information.

6. IO-Link Port Configuration

This chapter discusses port configuration, which includes these topics:

- Preparing for Port Configuration
- IO-Link Configuration Page on Page 48
- PROFINET IO Settings Configuration Page on Page 53
- Modbus/TCP Settings Configuration Page on Page 54
- OPC UA Settings Configuration Page on Page 59

Although you can make configuration changes using the web interface, PROFINET IO configuration parameters overwrite the values on the following Configuration pages:

- IO-Link Settings
- PROFINET IO Settings
- Network Settings

6.1. Preparing for Port Configuration

Before beginning port configuration, you may want to verify that the connected device is functioning.

1. If necessary, log into the IO-Link Master.
2. Click Diagnostics | IO-Link Diagnostics.
3. Review the Port Status and IO-Link State.

Port Status	Operational, PDI Valid	An IO-Link device is operating on the port that has received valid PDI data.
	Operational	An IO-Link device is operating on the port that has not received valid PDI data.
	Inactive	One of the following conditions exists: <ul style="list-style-type: none"> • A valid IO-Link device is not connected to the port. • A digital input or output device is connected to the port but the configured Port Mode is not correct.
IO-Link State	Operate	Port is functioning correctly in IO-Link mode but has not received valid PDI data. This may also display during a data storage upload or download.
	Init	The port is attempting initialization.
	Reset	One of the following conditions exists: <ul style="list-style-type: none"> • The Port Mode configuration is set to Reset. • The Port Mode configuration is set to DigitalIn or DigitalOut.
	DS: Wrong Sensor	Hardware failure (IO-Link LED also flashes red) because there is Data Storage on this port, which does not reflect the attached device.
	DV: Wrong Sensor	Hardware failure (IO-Link LED also flashes red) because Device Validation is configured for this port and the wrong device is attached.
	DS: Wrong Size	Hardware failure (IO-Link LED also flashes red) because the size of the configuration on the device does not match the size of the configuration stored on the port.
	Comm Lost	Temporary state after a device is disconnected and before the port is re-initialized.
	Pre-operate	Temporary status displayed when the device: <ul style="list-style-type: none"> • Is starting up after connection or power-up. • Uploading or downloading automatic data storage.

Note: If a digital input or output device is connected to an IO-Link port, there is no valid data until the port is set to the correct Port Mode.

4. Review the Device IO-Link Version.

- If the field is blank, it is not a valid IO-Link device, which could mean that it is a digital device and the port has not been configured for digital input or digital output.
- The field displays the Device IO-Link version.

5. Optionally, review the following to see if you need to change the Configured Minimum Cycle Time:

- Actual Cycle Time
- Device Minimum Cycle Time
- Configured Minimum Cycle Time

The Configured Minimum Cycle Time is the minimum cycle time that the IO-Link Master allows the port to operate at. The Actual Cycle Time is negotiated between the IO-Link Master and the device and will be at least as long as the greater of the Configured Minimum Cycle Time and the Device Minimum Cycle Time.

6. Verify that the Auxiliary Input Bit Status field displays On, if the device is connected to DI.

The screenshot shows the 'IO-Link Diagnostics' page in a web browser. The page has a navigation bar with 'Home', 'Diagnostics', 'Configuration', 'Advanced', 'Attached Devices', and 'Help'. Below the navigation bar, there are tabs for 'IO-LINK', 'PROFINET IO', 'MODBUS/TCP', and 'OPC UA'. The main content area is titled 'IO-Link Diagnostics' and contains a table with columns for PORT 1 through PORT 8. The table lists various parameters for each port and the device, such as Port Name, Port Mode, Port Status, IO-Link State, Device Vendor Name, Device Product Name, Device Serial Number, Device Hardware Version, Device Firmware Version, Device IO-Link Version, Actual Cycle Time, Device Minimum Cycle Time, Configured Minimum Cycle Time, Data Storage Capable, Automatic Data Storage Configuration, Auxiliary Input (AI) Bit Status, Device PDI Data Length, PDI Data Valid, and Last Rx PDI Data (MS Byte First). A red text overlay is placed over the table, stating 'This does not display the complete Diagnostics page'.

IO-LINK PORT STATUS	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5	PORT 6	PORT 7	PORT 8
Port Name	IO-Link Port 1	IO-Link Port 2	IO-Link Port 3	IO-Link Port 4	IO-Link Port 5	IO-Link Port 6	IO-Link Port 7	IO-Link Port 8
Port Mode	IOLink	IOLink	IOLink	IOLink	IOLink	IOLink	IOLink	IOLink
Port Status	Inactive	Inactive	Inactive	Inactive	Inactive	Operational, PDI valid	Inactive	Inactive
IO-Link State	Init	Init	Init	Init	Init	Operate	Init	Init
Device Vendor Name						Carlo Gavazzi		
Device Product Name						CA30CAN25BRP1110		
Device Serial Number						LS32665000010		
Device Hardware Version						v01.00		
Device Firmware Version						v01.01		
Device IO-Link Version						1.1		
Actual Cycle Time						5.0ms		
Device Minimum Cycle Time						5.0ms		
Configured Minimum Cycle Time						4ms		
Data Storage Capable						Yes		
Automatic Data Storage Configuration	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled
Auxiliary Input (AI) Bit Status	Off	Off	Off	Off	Off	Off	Off	Off
Device PDI Data Length						4		
PDI Data Valid						Yes		
Last Rx PDI Data (MS Byte First)						03 2d 00 02		

For additional information about the IO-Link Diagnostics page, see the help system or 11.1. IO-Link Port Diagnostics on Page 97.

6.2. IO-Link Configuration Page

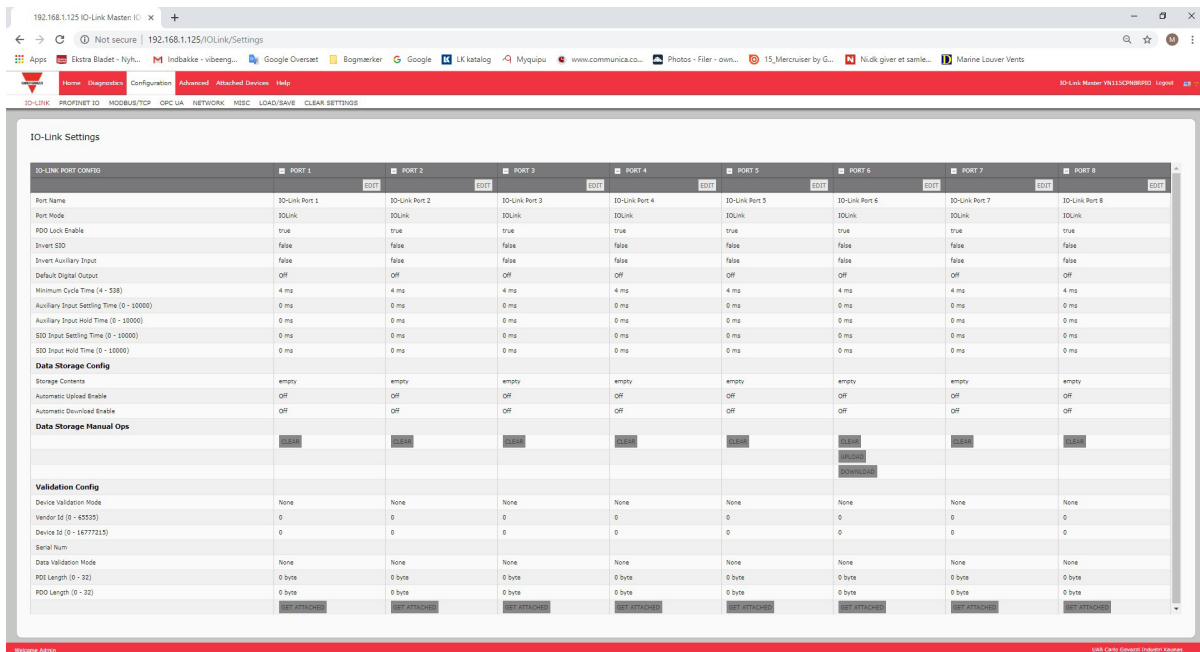
You can use the Configuration | IO-Link Settings page to configure IO-Link port settings. When the IO-Link device is attached to a port, it begins operating without requiring any configuration. The IOLM and attached IO-Link device automatically negotiate the Minimum Cycle Time. If required by an application, you can set a specific Minimum Cycle Time.

This page provides special features such as Data Storage, Device Validation, and Data Validation.

Although you can make configuration changes using the web page, PROFINET IO configuration parameters overwrite the values on the IO-Link Settings page. See Chapter 3. Configuring the IOLM with STEP 7 on Page 37 for detailed configuration procedures.

This subsection discusses:

- Editing IO-Link Port Settings on Page 48

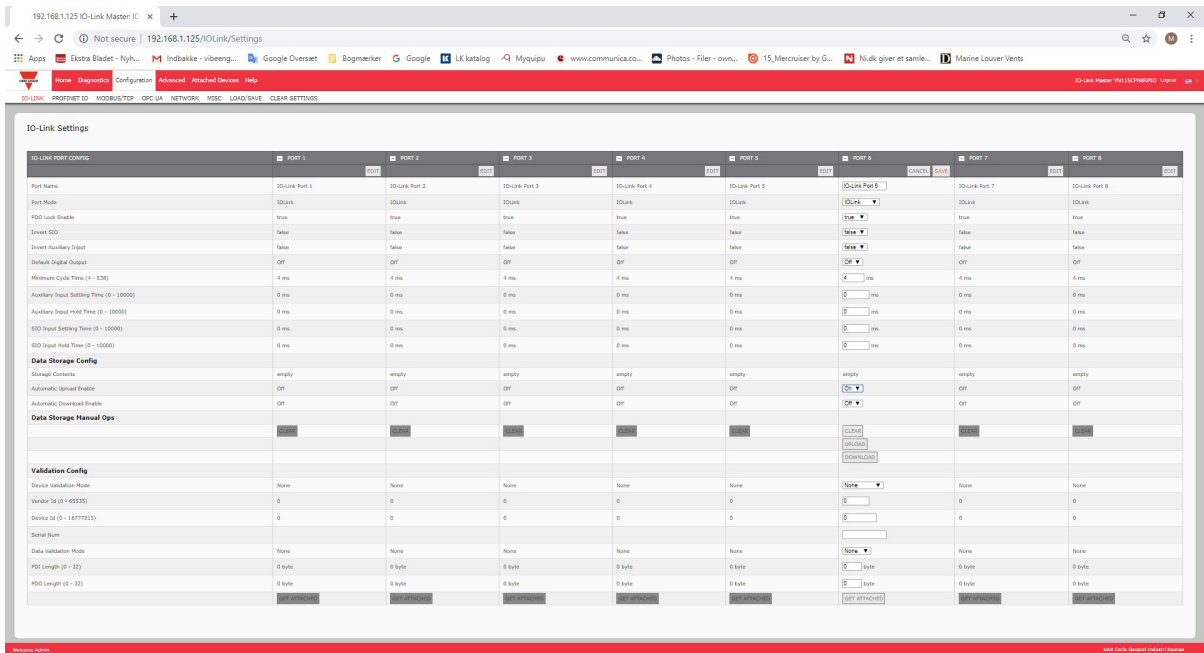


6.2.1. Editing IO-Link Port Settings

You can use this procedure to configure IO-Link settings for each IO-Link port.

If an IO-Link device is attached to the port, no configuration is required for operation. If a digital input or output device is attached, it is necessary to change the Port Mode.

1. If necessary, open the IO-Link Master web interface with your web browser using the IP address.
2. Click Configuration | IO-Link Settings.
3. Click the EDIT button for the port or ports that you want to configure.



Note: You can click each EDIT button and open all ports to quickly configure port parameters.

4. Make appropriate selections for the device that you connected to that port. Make sure you select the DigitalIn option for a digital input device and the DigitalOut option for a digital output device for the Port Mode. The IOLM negotiates the Minimum Cycle Time so it is not necessary to set a cycle time unless you need a specific cycle time. You can use the help system if you require definitions or values for the options or refer to the following subsection (IO-Link Settings Parameters).

Note: Do not enable Automatic Download and then attempt device configuration as Automatic Download changes the settings back to what is stored on the IOLM. Data Storage, Device Validation, and Data Validation are discussed in Chapter 9. Utilizing IOLM Features on Page 75.
5. Click the SAVE button for each port.

6.2.2. IO-Link Settings Parameters

The Configuration | IO-Link Settings page supports the following options.

IO-LINK Settings Page	
Port Name	User defined port or device description. <ul style="list-style-type: none"> Standard ASCII characters Max length = 80 characters
Port Mode <i>Default: IO-Link</i>	Selected IO-Link port mode. Valid settings are: <ul style="list-style-type: none"> Reset - Select to disable a port or to reset/restart an IO-Link port. IO-Link - Select to connect and operate an IO-Link device on the port. Digital In - Select if a DI device is attached to the port. Digital Out - Select if a DO device is attached to the port.
Invert SIO <i>Default: False</i>	If enabled and the Port Mode is Digital In or Digital Out, this option inverts the SIO value. <ul style="list-style-type: none"> False (Disabled - Do not invert SIO) True (Enabled - Invert SIO) <p>Note: This option does not affect the Auxiliary Input.</p>
Invert Auxiliary Input	If this option is enabled, the Auxiliary bit is inverted.
Default Digital Output <i>Default: Off</i>	If the port mode is Digital Out, defines the default digital output value that is used at startup and when there is no active PDO controller. <ul style="list-style-type: none"> Off (low voltage) - 0 On (high voltage) - 24V
Minimum Cycle Time <i>Default: 4</i>	The minimum, or fastest, cycle time at which the IO-Link device may operate. The valid range is 4-538 ms. You can leave the Minimum Cycle Time set to the default value and the IO-Link Master negotiates with the IO-Link device for its minimum cycle time. The IO-Link Diagnostics page displays the Actual Cycle Time, which is the negotiated cycle time.
Auxiliary Input Settling Time (0 - 10000)	The auxiliary input settling time that remains constant before that input is considered/accepted
Auxiliary Input Hold Time (0 - 10000)	This is how long the IO-Link Master keeps the input at its present value. For example, if the IO-Link Master detects the input to go to high, and the hold time is X milliseconds, then the IO-Link Master reports the input as high for X milliseconds, even though the input itself may have gone away already. If X is zero, then you get the behavior currently in the field.
SIO Input Settling Time (0 - 10000)	The SIO input settling time that remains constant before that input is considered/accepted.
SIO Input Hold Time (0 - 10000)	This is how long the IO-Link Master keeps the input at its present value. For example, if the IO-Link Master detects the input to go to high, and the hold time is X milliseconds, then the IO-Link Master reports the input as high for X milliseconds, even though the input itself may have gone away already. If X is zero, then you get the behavior currently in the field.

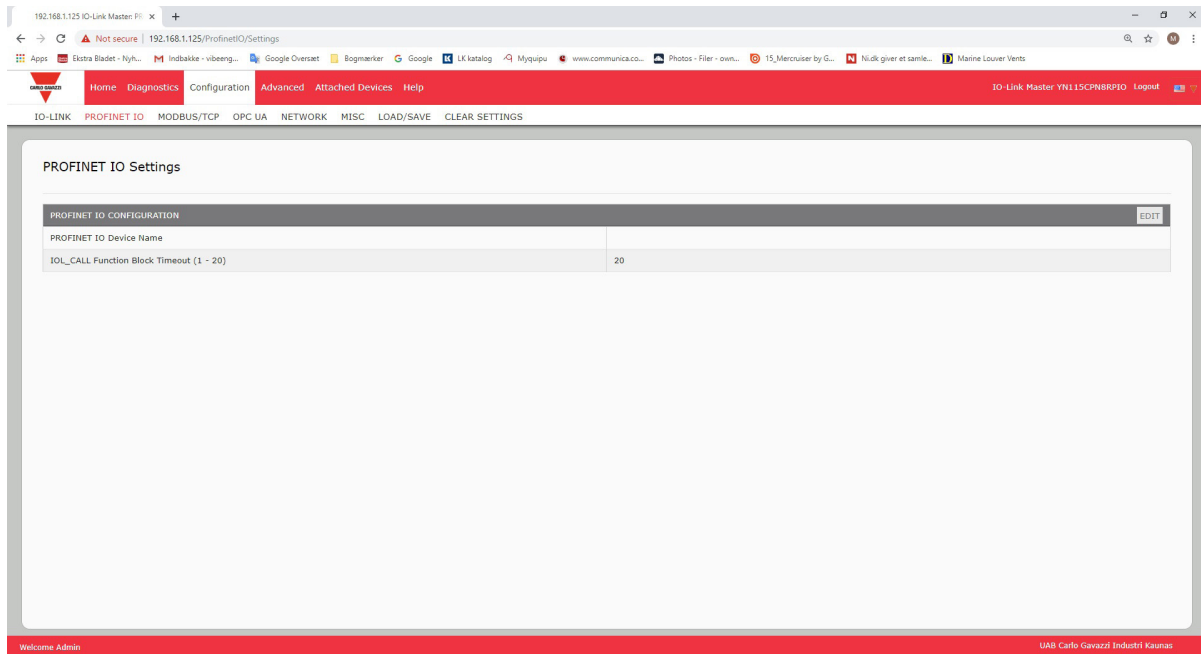
IO-LINK Settings Page (Continued)

Data Storage Config	
Storage Contents	Indicates that the data storage for the port is empty or displays the Vendor ID and Product ID of the data stored on that port.
Automatic Data Storage Upload Enable <i>Default: Off</i>	<p>When this option is initially set to On, the IOLM saves the data storage parameters (if the data storage is empty) from the IO-Link device to the IOLM. Automatic upload occurs when the Automatic Upload Enable option is set to On and one of these conditions exists:</p> <ul style="list-style-type: none"> • There is no upload data stored on the gateway and the IO-Link device is connected to the port. • The IO-Link device has the DS_upload bit on (generally because you have changed the configuration via Teach buttons or web page). <p>When a port contains data storage for an IO-Link device and if you attach a device whose Vendor and Device ID do not match, the IO-Link LED on the IOLM flashes red to indicate a wrong device is attached. In addition, the IO-Link Diagnostics page displays DS: Wrong Sensor in the IOLink State field.</p> <p>Note: <i>Not all device parameters are sent to data storage, this is determined by the IO-Link device manufacturer.</i></p>
Automatic Data Storage Download Enable <i>Default: Off</i>	<p>The data storage parameters on the IOLM are downloaded to the connected IO-Link device if:</p> <ol style="list-style-type: none"> 1. The Automatic Download option is enabled. 2. The data stored on the IOLM port contains the same Vendor ID and Product ID as the IO-Link device connected to the port. 3. Data storage parameters are also downloaded to the IO-Link device if configuration changes are made on the device causing the DS_upload bit to turn on and automatic upload is not enabled. 4. The IO-Link device requests an upload and the Automatic Upload Enable option is set to Off. <p>If you change configuration parameters on the IO-Link device and want the parameters to remain loaded on the IO-Link device, you must disable the Automatic Download option because otherwise the IOLM will reload the data storage on the port down to the IO-Link device.</p>
Data Storage Manual Ops	<p>The Manual Data Storage Ops option provides the following functionality, if data storage is supported by the IO-Link device.</p> <ul style="list-style-type: none"> • CLEAR - this clears any stored data for an IO-Link device on this port. • UPLOAD - this uploads and stores the IO-Link device configuration on the IOLM. • DOWNLOAD - this downloads the stored IO-Link device configuration from the IOLM to the IO-Link device attached to this port if the Vendor ID and Device ID match.
Validation Config	
Device Validation Mode <i>(Default: None)</i>	<p>Device Validation Mode provides these options:</p> <ul style="list-style-type: none"> • None - this disables Device Validation Mode. • Compatible - permits a compatible IO-Link device (same Vendor ID and Device ID) to function on the corresponding port. • Identical - only permits an IO-Link device to function on the corresponding port as defined in the following fields. <ul style="list-style-type: none"> - Vendor ID - Device ID - Serial Number <p>Note: <i>Connecting an IO-Link device that is different than the configured with Data Validation enabled will generate a DV: wrong sensor error.</i></p>

IO-LINK Settings Page (Continued)	
Vendor Id (0-65535)	This is required if you select a Device Validation Mode other than None. The Vendor ID can be manually entered in this field or click the GET ATTACHED button and the IO-Link Master populates the Vendor ID in this field.
Device Id (0-16777215)	This is required if you select a Device Validation Mode other than None. The Device ID can be manually entered in this field or click the GET ATTACHED button and the IO-Link Master populates the Device ID in this field.
Serial Num	This is required if you select Identical for the Device Validation Mode. The Serial Number can be manually entered in this field or click the GET ATTACHED button and the IO-Link Master populates the serial number in this field.
Data Validation Mode (Default: None)	There are three Data Validation Modes: <ul style="list-style-type: none"> • None - no data validation is performed on the port. • Loose - the slave device's PDI/PDO lengths must be less than or equal to the user-configured values. • Strict - the slave device's PDI/PDO lengths must be the same as the user-configured values.
PDI Length (0-32)	This is input length of the PDI data field. This is required if you select a Data Validation Mode other than None. The PDI Length can be manually entered in this field or click the GET ATTACHED button and the IO-Link Master populates the PDI length in this field.
PDO Length (0-32)	This is input length of the PDO data field. This is required if you select a Data Validation Mode other than None. The PDO Length can be manually entered in this field or click the GET ATTACHED button and the IO-Link Master populates the PDO length in this field.
GET ATTACHED (Button)	After opening a port for editing, you can click the GET ATTACHED button to automatically populate the following fields with data from the IO-Link device: <ul style="list-style-type: none"> • Vendor Id • Device Id • Serial Num • PDI Length • PDO Length

6.3. PROFINET IO Settings Configuration Page

The following table provides information about the Configuration | PROFINET IO page options. You can refer to 3.5. Device Name Assignment on Page 24 for PROFINET IO configuration procedures. You must have Administrator or Operator privileges to change any settings on this page.



PROFINET IO Settings Page	
PROFINET IO Device Name	<p>The PROFINET IO Device Name is the same as the name later used to configure PROFINET IO for the IO-Link Master.</p> <p>The device name must be specified according to DNS conventions.</p> <ul style="list-style-type: none"> • Restricted to a total of 240 characters (letters, digits, dash or period) • Parts of the name within the device name; in other words, a string between two periods, must not exceed a maximum of 63 characters. • No special characters such as umlauts (ä, ö etc.), brackets, underscore, slash, blank etc. The dash is the only permitted special character. • The device name must not begin or end with the "-" character. • The device name must not begin with numbers. • The device name must not have the structure n.n.n.n (n = 0...999). • The device name must not begin with the character string "port-xyz-" (x, y, z = 0...9).
IOL_CALL Function Block Timeout (1-20)	The IOL_CALL Function Block Timeout range is 1 - 20 and the default is 20.

6.4. Modbus/TCP Settings Configuration Page

You can use the Configuration | Modbus/TCP Settings page to configure Modbus/TCP with the IO-Link Master. Additional Modbus information is available in the following chapters:

- Chapter 12. Modbus/TCP Interface on Page 112 This subsection includes these topics:
- Chapter 13. Functionality Descriptions on Page 118
- Editing Modbus/TCP Settings on Page 55
- Modbus/TCP Settings Parameters on Page 56

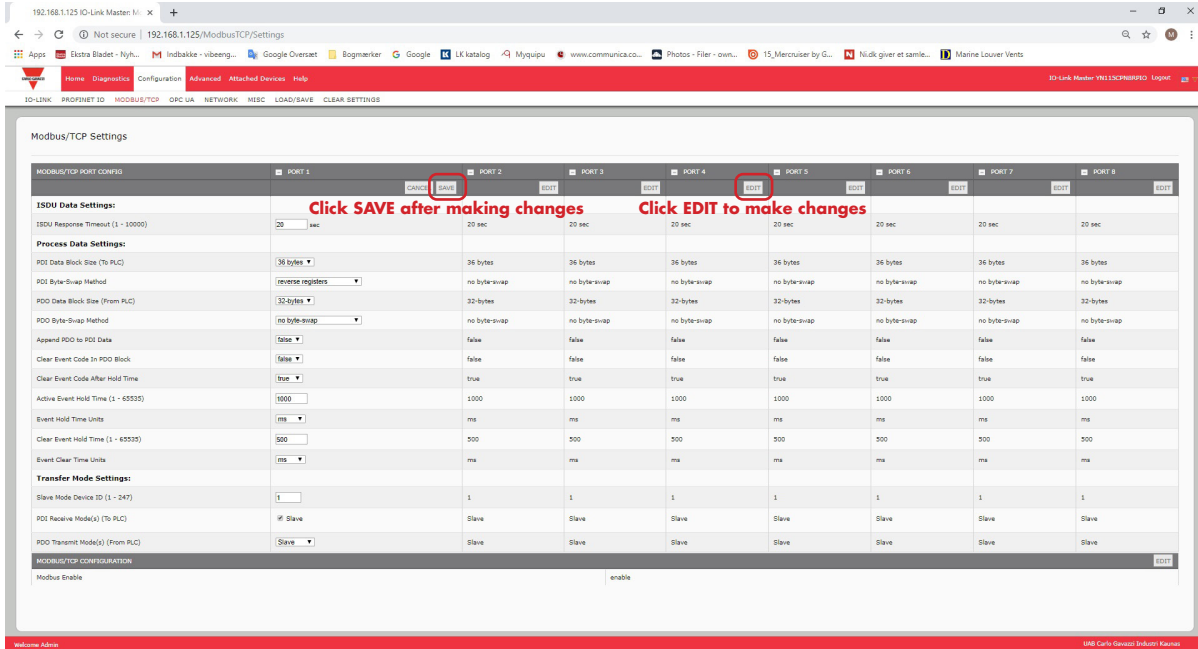
The screenshot shows the 'Modbus/TCP Settings' page in a web browser. The page has a navigation menu at the top with options like 'Home', 'Diagnostics', 'Configuration', 'Advanced', 'Attached Devices', and 'Help'. Below the navigation is a breadcrumb trail: 'IO-LINK > PROFINET IO > MODBUS/TCP > OPC UA > NETWORK > MISC > LOAD/SAVE > CLEAR SETTINGS'. The main content area is titled 'Modbus/TCP Settings' and contains a table with columns for 'MODBUS/TCP PORT CONFIG' and 'PORT 1' through 'PORT 8'. Each port column has an 'EDIT' button. The table is divided into three sections: 'ISDU Data Settings', 'Process Data Settings', and 'Transfer Mode Settings'. The 'Modbus Enable' checkbox at the bottom is currently set to 'disable'.

MODBUS/TCP PORT CONFIG	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5	PORT 6	PORT 7	PORT 8
ISDU Data Settings:								
ISDU Response Timeout (1 - 10000)	20 sec	20 sec	20 sec	20 sec	20 sec	20 sec	20 sec	20 sec
Process Data Settings:								
PDI Data Block Size (To PLC)	36 bytes	36 bytes	36 bytes	36 bytes	36 bytes	36 bytes	36 bytes	36 bytes
PDI Byte-Swap Method	no byte-swap	no byte-swap	no byte-swap	no byte-swap	no byte-swap	no byte-swap	no byte-swap	no byte-swap
PDO Data Block Size (From PLC)	32-bytes	32-bytes	32-bytes	32-bytes	32-bytes	32-bytes	32-bytes	32-bytes
PDO Byte-Swap Method	no byte-swap	no byte-swap	no byte-swap	no byte-swap	no byte-swap	no byte-swap	no byte-swap	no byte-swap
Append PDO to PDI Data	false	false	false	false	false	false	false	false
Clear Event Code In PDO Block	false	false	false	false	false	false	false	false
Clear Event Code After Hold Time	true	true	true	true	true	true	true	true
Active Event Hold Time (1 - 65535)	1000	1000	1000	1000	1000	1000	1000	1000
Event Hold Time Units	ms	ms	ms	ms	ms	ms	ms	ms
Clear Event Hold Time (1 - 65535)	500	500	500	500	500	500	500	500
Event Clear Time Units	ms	ms	ms	ms	ms	ms	ms	ms
Transfer Mode Settings:								
Slave Mode Device ID (1 - 247)	1	1	1	1	1	1	1	1
PDI Receive Mode(s) (To PLC)	Slave	Slave	Slave	Slave	Slave	Slave	Slave	Slave
PDO Transmit Mode(s) (From PLC)	Slave	Slave	Slave	Slave	Slave	Slave	Slave	Slave
MODBUS/TCP CONFIGURATION								
Modbus Enable	disable							

Note: Modbus is disabled by default. To use Modbus, click the EDIT button and select Enable.

6.4.1. Editing Modbus/TCP Settings

1. If necessary, open the IO-Link Master web interface with your web browser using the IP address.
2. Click Configuration | Modbus/TCP.
3. Click the EDIT button for the port that you want to configure.



Note: You can click each EDIT button and open all ports to quickly configure port parameters.

4. Make appropriate selections for the IO-Link device that you will connect to that port. You can use the help system if you require definitions or values for the options or Modbus/TCP Settings Parameters on Page 104.
5. Scroll to the top of the page and click the SAVE button. Make sure that the port now displays the EDIT button. If it displays the SAVE and CANCEL buttons, that means that one of the parameters contains an incorrect value. If necessary, scroll down the page, make the needed corrections, and click SAVE.

6.4.2. Modbus/TCP Settings Parameters

The following table provides detailed information about the Modbus/TCP Settings page.

Modbus/TCP Settings Page	
ISDU Data Settings	
ISDU Response Timeout <i>Default = 20 seconds</i>	The time that the IO-Link Master's Modbus/TCP interface waits for a response to an ISDU request. The timeout needs to set long enough to allow all commands within the ISDU request to be processed. Valid range: 1-10,000 seconds
Process Data Settings	
PDI Data Block Size <i>Default: 36-bytes</i>	The configurable PDI data block length. Optional lengths are: <ul style="list-style-type: none"> • 4-bytes (header only) • 8-bytes (4 bytes data) • 16-bytes (12 bytes data) • 24-bytes (20 bytes data) • 36-bytes (32 bytes data)
PDI Byte-Swap Method <i>Default: No byte-swap</i>	If enabled, the IO-Link Master swaps the data bytes in word (2 byte) format or dword (4 byte) format. Options include: <ul style="list-style-type: none"> • No byte-swap – data passed through as received • Word (16-bit) byte-swap – data is byte-swapped in word format • Dword (32-bit) byte-swap – data is byte-swapped in dword format • Reverse registers – data passed through after being reversed <p>Note: Because both IO-Link and Modbus/TCP use big-endian byte ordering, byte swapping typically is not required for word and dword data. Byte swapping is most commonly required when receiving byte (8-bit) data and it is desired to place the first data byte in the least significant byte position of the holding register. For these cases, word (16 bit) byte-swap is typically used.</p>
Include Digital I/O in PDI Data Block <i>Default: False</i>	If enabled, the IO-Link Master includes the current digital I/O pins D1 to D4 status in the PDI data block header. <ul style="list-style-type: none"> • False – Do not include the digital I/O pins status • True (enable check box) – Include the digital I/O pins status in PDI data block header <p>Note: Does not affect the Auxiliary Input.</p>
PDO Data Block Size (From PLC) <i>Default: 32-bytes</i>	The configurable PDO data block length. Optional lengths are: Event code not included: <ul style="list-style-type: none"> • 4-bytes = 2 data words • 8-bytes = 4 data words • 16-bytes = 8 data words • 24-bytes = 12 data words • 32-bytes = 16 data words • 34-bytes = 16 data words, 1 pad word Event code included: <ul style="list-style-type: none"> • 4-bytes = event code word, 1 data word • 8-bytes = event code word, 3 data words • 16-bytes = event code word, 7 data words • 24-bytes = event code word, 11 data words • 32-bytes = event code word, 15 data words • 34-bytes = event code word, 16 data words

Modbus/TCP Settings Page (Continued)

<p>PDO Byte-Swap Method <i>Default: No byte-swap</i></p>	<p>If enabled, the IO-Link Master swaps the data bytes in word (2 byte) format or dword (4 byte) format. Options include:</p> <ul style="list-style-type: none"> • No byte-swap – data passed through as received • Word (16-bit) byte-swap – data is byte-swapped in word format • Dword (32-bit) byte-swap – data is byte-swapped in dword format • Reverse registers – data passed through after being reversed <p>Note: Because both IO-Link and Modbus/TCP use big-endian byte ordering, byte swapping typically is not required for word and dword data. Byte swapping is most commonly required when sending byte (8-bit) data to the IO-Link device and it is desired to send the least significant byte of the holding register first. For these cases, word (16 bit) byte-swap is typically used.</p>
<p>Append PDO to PDI Data <i>Default: False</i></p>	<p>If selected, the IO-Link Master appends any PDO data to the end of the PDI data.</p> <ul style="list-style-type: none"> • False = Do not append PDO data • True (enable check box) = Append PDO data
<p>Clear Event Code in PDO Block <i>Default: False</i></p>	<p>If enabled, the IO-Link Master expects the first word of the PDO block to be used for event code handling.</p> <p>Values are:</p> <ul style="list-style-type: none"> • True (enable check box) = expect event code • False = no event code, expect only PDO data
<p>Clear Event Code After Hold Time <i>Default: True</i></p>	<p>If enabled, the IO-Link Master clears any event code reported in the PDI data block after the Event Active Hold Time.</p> <p>Values are:</p> <ul style="list-style-type: none"> • True (enable check box) = clear event code after hold time • False = do not clear event code after hold time.
<p>Active Event Hold Time <i>Default: 1000 ms</i></p>	<p>If Clear Event Code After Hold Time is enabled, the time period an event code is reported in the PDI block before it is cleared.</p> <p>Valid range: 1-65535</p> <p>Valid Units are:</p> <ul style="list-style-type: none"> • ms (milliseconds) • sec (seconds) • min (minutes) • hours • days
<p>Event Hold Time Units</p>	<p>Valid Units:</p> <ul style="list-style-type: none"> • ms (milliseconds) • sec (seconds) • min (minutes) • hours • days
<p>Clear Event Hold Time <i>Default: 500 ms</i></p>	<p>Once an event code has been cleared, the time an event code stays cleared in the PDI block before another event code can be reported.</p> <p>Valid range: 1-65535</p> <p>Valid Units:</p> <ul style="list-style-type: none"> • ms (milliseconds) • sec (seconds) • min (minutes) • hours • days

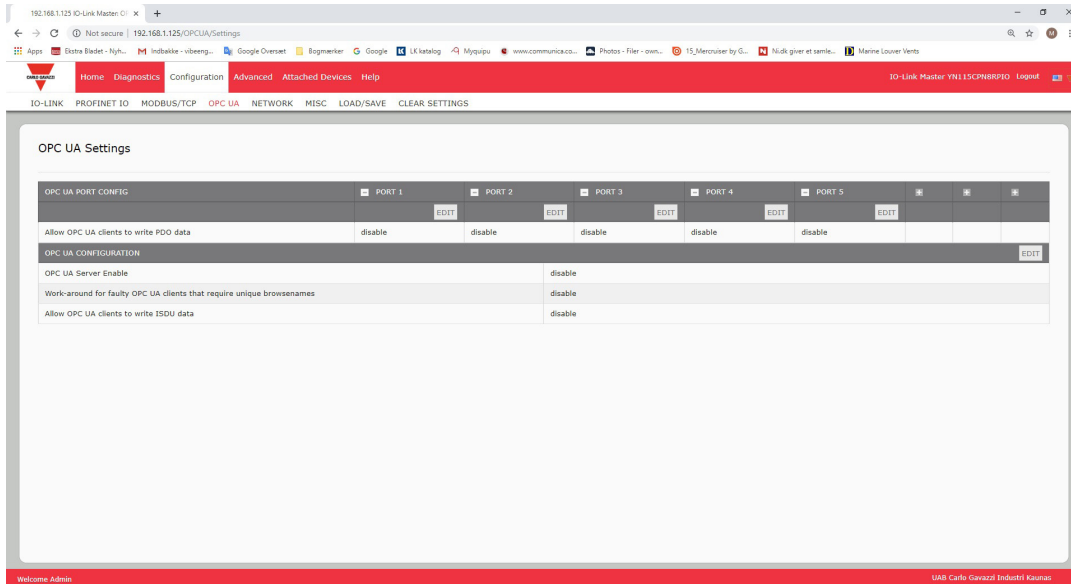
Modbus/TCP Settings Page (Continued)	
Event Clear Time Units	Valid Units: <ul style="list-style-type: none"> • ms (milliseconds) • sec (seconds) • min (minutes) • hours • days
Include Digital Output(s) in PDO Data Block <i>Default: False</i>	If enabled, the IO-Link Master expects the digital output settings to be included in the PDO data block. <ul style="list-style-type: none"> • False – The digital pin setting(s) are not included in the PDO data block • True (enable check box) – The digital pin setting(s) are included in the PDO data block
Transfer Mode Settings	
Slave Mode Device ID <i>Default: 1</i>	The Modbus Device ID used to access this IO-Link port. Range: 1-247
PDI Transmit Mode <i>Default: Slave</i>	Determines which PDI Receive (To PLC) Modes are enabled. The selectable modes are: <ul style="list-style-type: none"> • Slave • Master
PDO Transmit Mode <i>Default: Slave</i>	Selectable Modes are: <ul style="list-style-type: none"> • Disabled • Slave • Master
Modbus Master PLC IP Address	The IP address of the Modbus slave.
Modbus Master PLC Device ID (1-247) <i>(Default: 1)</i>	The Modbus Device ID used to access the slave.
Modbus Master PLC PDI Data Address (base 1) (1-65535) <i>(Default: 1)</i>	The address of the slave's PDI (determined by the slave).
Modbus Master PLC Max Update Rate (0-10000) <i>(Default: 0)</i>	How often to write PDI to the slave.
Modbus Master PLC PDO Data Address (base 1) (1-65535) <i>(Default: 1)</i>	The address of the slave's PDO (determined by the slave).
Modbus Master PLC Poll Rate (40- 65535) <i>(Default: 40)</i>	How often to read PDO from the slave.

6.5. OPC UA Settings Configuration Page

Use the Configure | OPC UA Settings page to configure OPC UA with the IOLM.

This subsection includes these topics:

- Edit OPC UA Settings on Page 59
- OPC UA Settings Parameters on Page 60

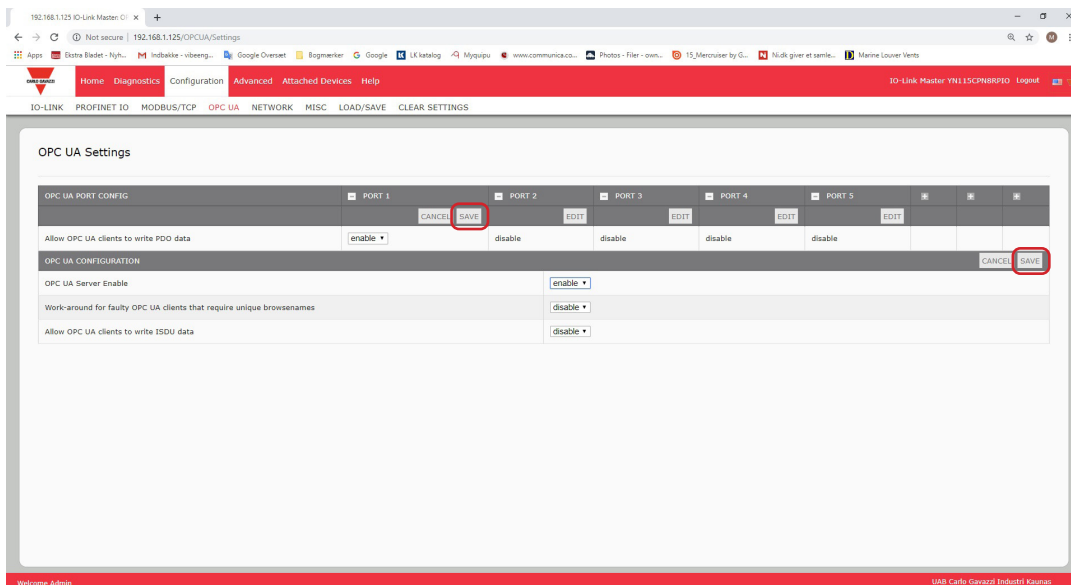


Note: OPC UA is disabled by default.

6.5.1. Edit OPC UA Settings

You can use this procedure to edit OPC UA settings.

1. If necessary, open the IO-Link Master web interface with your web browser using the IP address.
2. Click Configuration | OPC UA.
3. Click the EDIT button.



4. Make the appropriate selections for your environment. You can use the help system if you require definitions or values for the options or 6.5.2. OPC UA Settings Parameters on Page 63.
5. Click the SAVE button.

6.5.2. OPC UA Settings Parameters

The following table provides information about the OPC UA Setting page.

Option	OPC UA Configuration Descriptions
OPC UA Port CONFIG	
Allow OPC UA clients to write PDO data (Default = disable)	Determines whether OPC UA clients are allowed to write PDO data to the IO-Link devices.
OPC UA CONFIGURATION	
OPC UA Server Enable (Default = disable)	This option controls whether or not the OPC UA server runs on the IO-Link Master.
Work-around for faulty OPC UA clients that require unique browsenames (Default = disable)	Enables an alternative set of browsenames where each node's browsename is unique. Normally only browsepaths are required to be unique.
Allow OPC UA clients to write ISDU data (Default = disable)	Determines whether OPC UA clients are allowed to write ISDU data to the IO-Link devices.

7. Loading and Managing IO-Link Files

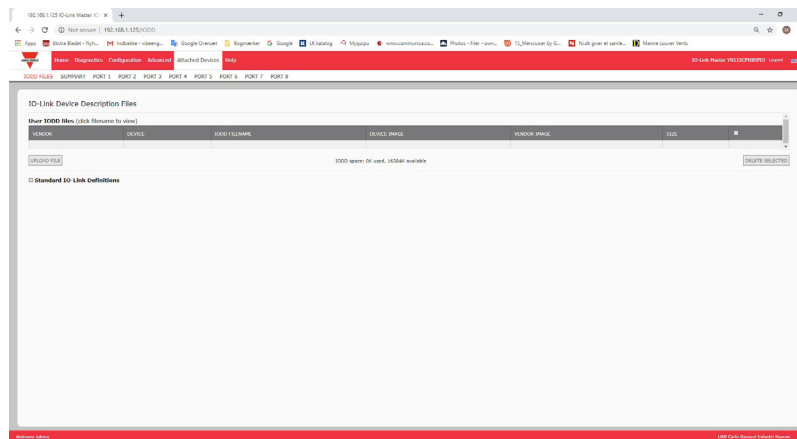
There are several Attached Devices pages that support IO-Link Device Description (IODD) file management.

- IO-Link Device Description Files Page - load IODD files from the IO-Link device manufacturer onto the IOLM.
- IO-Link Device Configuration Summary Page on Page 66 - verify the correct files were loaded for each IO-Link device or use the page to retrieve information about the baud rate, SIO mode, and device number.
- The Port pages are discussed in Chapter 8. Configuring IO-Link Devices on Page 67.

7.1. IO-Link Device Description Files Page

Use the IO-Link Device Description Files page to update (upload) and delete IO-Link Device Description (IODD) files associated with this IOLM. In addition, you can review the IODD xml file by clicking the IODD FILENAME in the table after loading the IODD file.

Note: You will need to download the appropriate IODD files from your IO-Link device manufacturer.



The IOLM provides 15790K of space to store IODD files. The IOLM includes the following default IODD files, which cannot be deleted.

- IODD-StandardDefinitions1.0.1.xml
- IODD-StandardUnitDefinitions1.0.1.xml
- IODD-StandardDefinitions1.1.xml
- IODD-StandardUnitDefinitions1.1.xml

Note: You can use the Configuration | Save/Load feature to backup your IODD files. You can save the configuration file from an IOLM that has IODD files installed and then load that configuration file to another IOLM to quickly load the IODD files.

7.1.1. Preparing IODD Files to Upload

After downloading the IODD files for the IO-Link device from the IO-Link sensor or actuator manufacturer, you may need to unzip the file and locate the appropriate xml file for the device.

- Some IODD zip files contain the xml files and supporting image files for a single product. This type of zip file can be immediately loaded onto the IOLM.
- Some IODD zip files contain the files for multiple products. If you upload this type of IODD zip file, the IOLM loads the first xml file and the associated image files, which may or may not correspond to the IO-Link device connected to the port. If you need to zip the appropriate files, the following information may be useful:
 - Unzip the package and locate the xml file needed for your IO-Link device.
 - Open the xml file and search for the productID, which identifies the IO-Link device.
 - Zip the xml file along with the supporting images. There are several ways to locate the supporting images:
 - Locate the appropriate images using the xml file.
 - Load only the xml file and the IOLM notifies you what files are missing. Use the UPDATE feature to upload the missing images.
 - Zip the xml with all of the images and the IOLM ignores (and not upload) any unused files and notifies which files did not upload.

Note: Image files are not required for IO-Link device configuration.

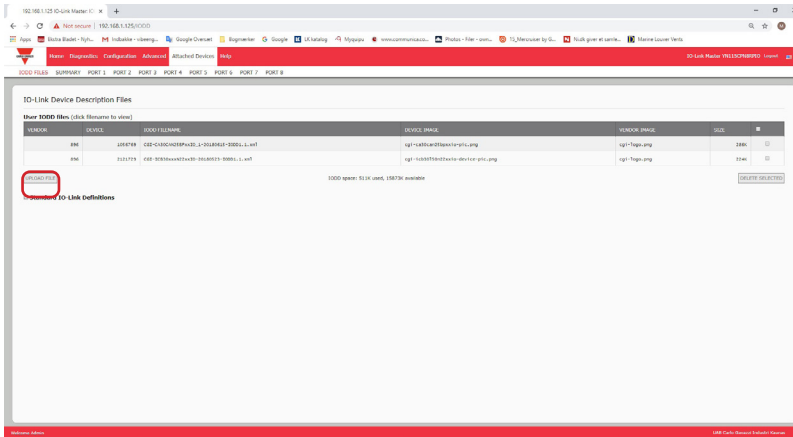
Use the appropriate discussion for your IODD files.

- Uploading IODD Zip Files
- Uploading xml Files or Supporting Files on Page 63

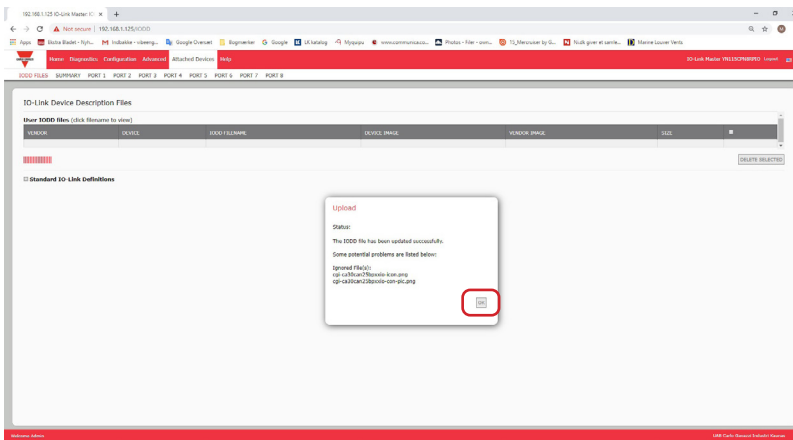
7.1.2. Uploading IODD Zip Files

You can use the following procedure to upload IODD zip files.

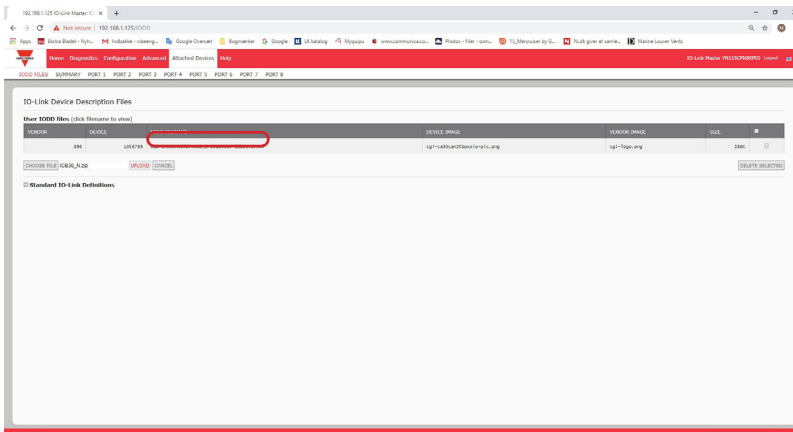
1. Click Attached Devices and IODD FILES.
2. Click the UPLOAD FILE button.
3. Click the CHOOSE FILE button and browse to the file location.
4. Highlight the zip file, click Open and then the UPLOAD button.



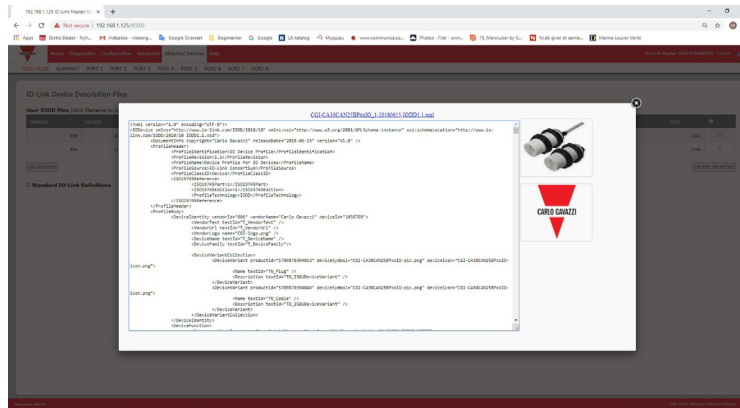
5. If necessary, click OK



Note: Only images referenced in the xml file load to the IOLM and the remaining files are ignored.



6. If desired, you can view the xml file by clicking the IO-Link FILENAME in the table.



7. Click the hyperlink at the top of the page if you want to view the xml file in your browser.
8. Optionally, verify that the correct xml file was loaded using the Summary page (Page 73).

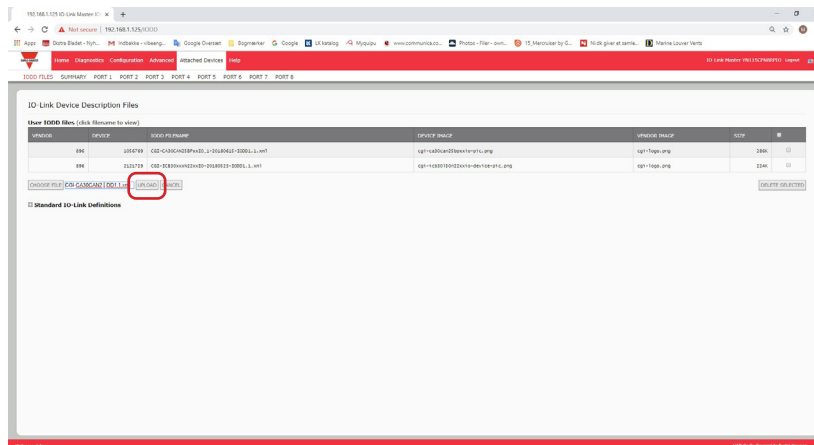
7.1.3. Uploading xml Files or Supporting Files

You can use the following procedure to upload xml, or supporting image files.

1. Click Attached Devices and IO-Link FILES.
2. Click the UPLOAD FILE button.
3. Click the CHOOSE FILE button and browse to the file location.
4. Highlight the xml or image file and click Open.

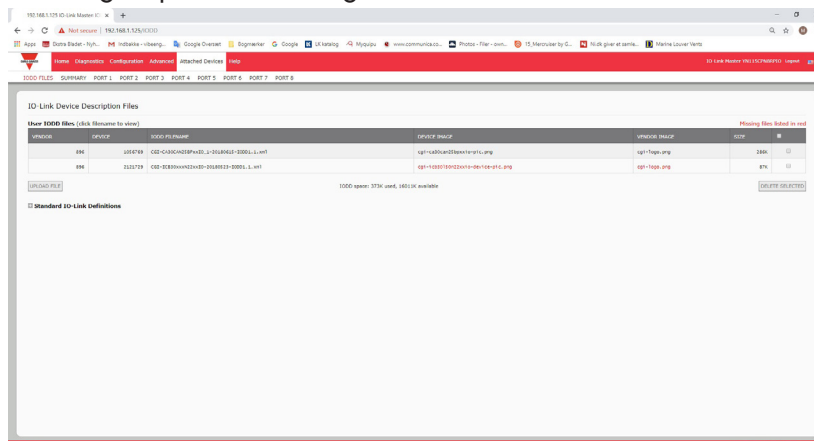
Note: The xml file must be loaded before the IOLM will load the associated image files.

5. Click the UPLOAD button.

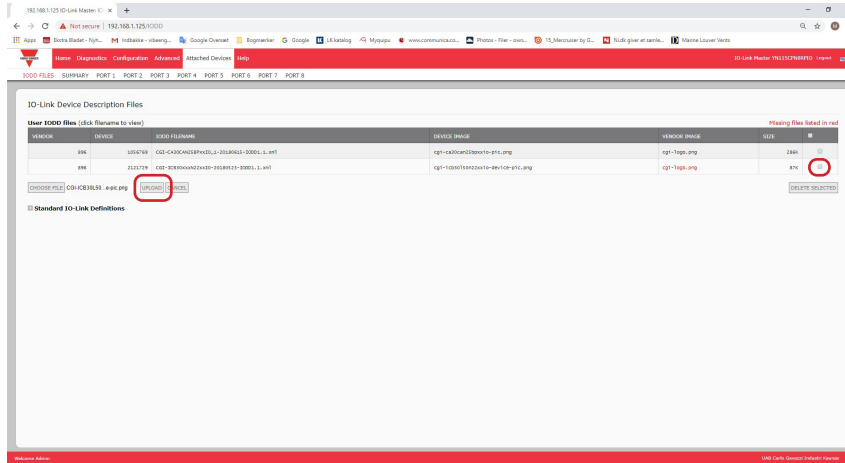


Note: The IOLM notifies you what files are missing. The missing files do not affect the operation of the IO-Link Port page but the product image and logo for the IO-Link device company do not display.

6. Optionally, use the following steps to load image files:



- Select the row in the table that contains the xml file by clicking the check box.
- Click the UPLOAD FILE button.
- Click the Choose File button and browse to the file location.
- Highlight the file and click Open.

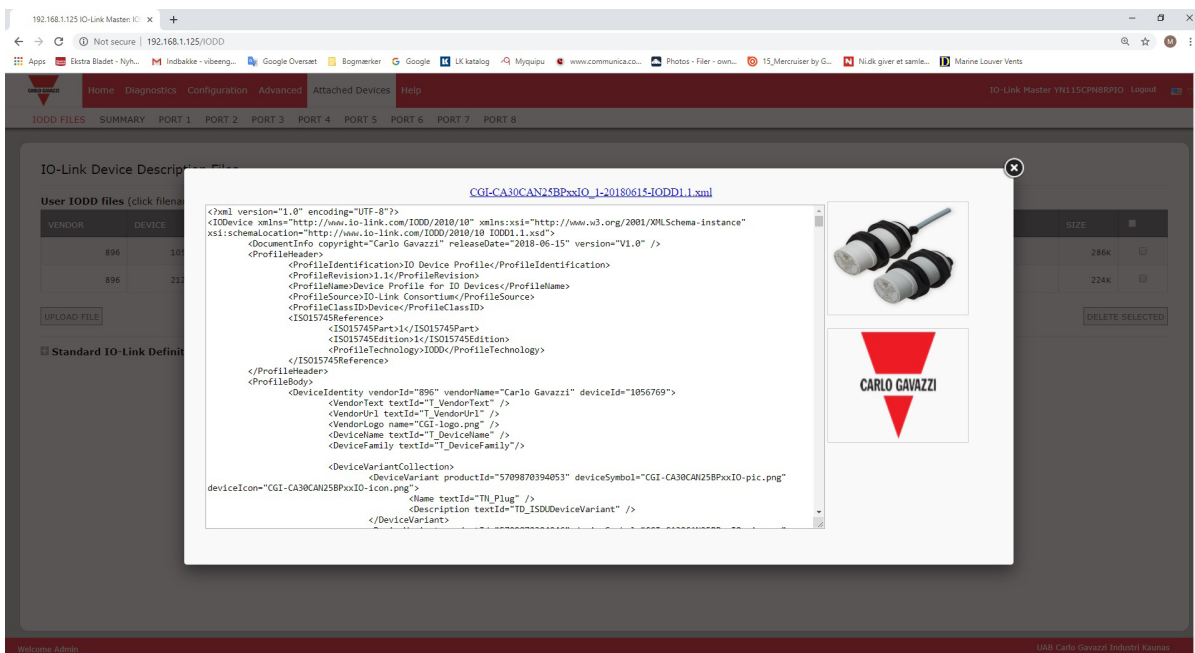


- Click the UPLOAD button.
- Optionally, verify that the correct xml file was loaded using the Summary page (Page 66).

7.1.4. Viewing and Saving IODD Files

Use the following procedure to view the contents of an IODD file.

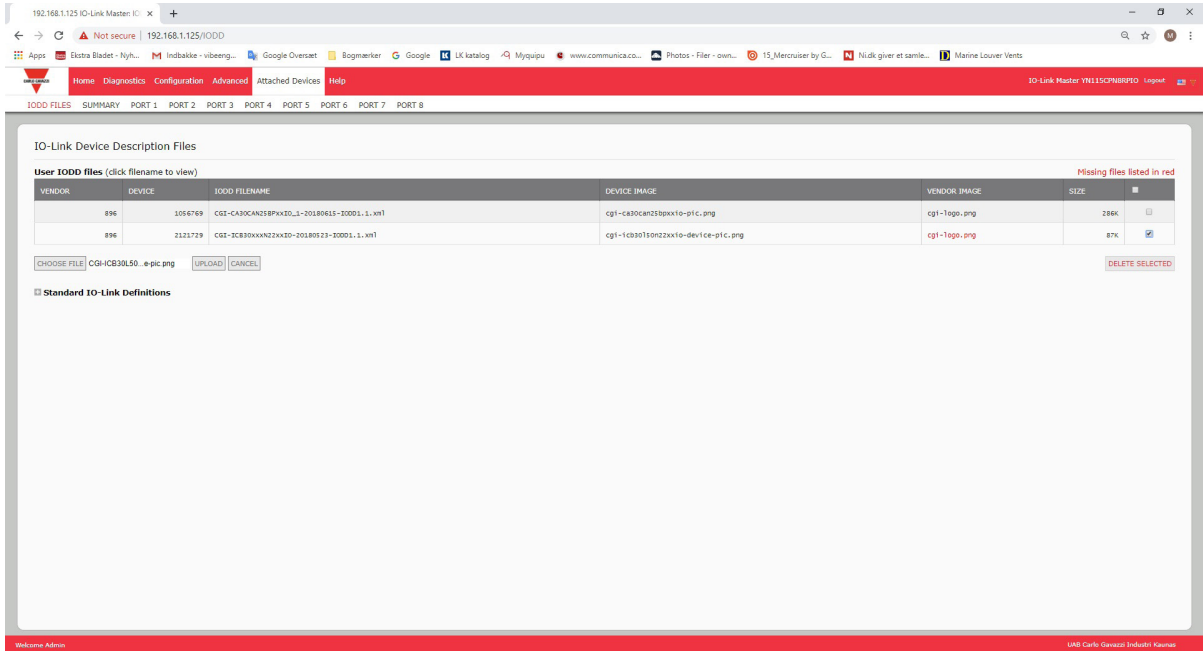
- If necessary, click Attached Devices and IODD Files.
- Click the IODD FILENAME in the table that you want to review. A pop up window displays the contents of the IODD file.
- Optionally, click the file name hyperlink at the top of the window to view the formatted file or if you want to save a copy of the file to another location.



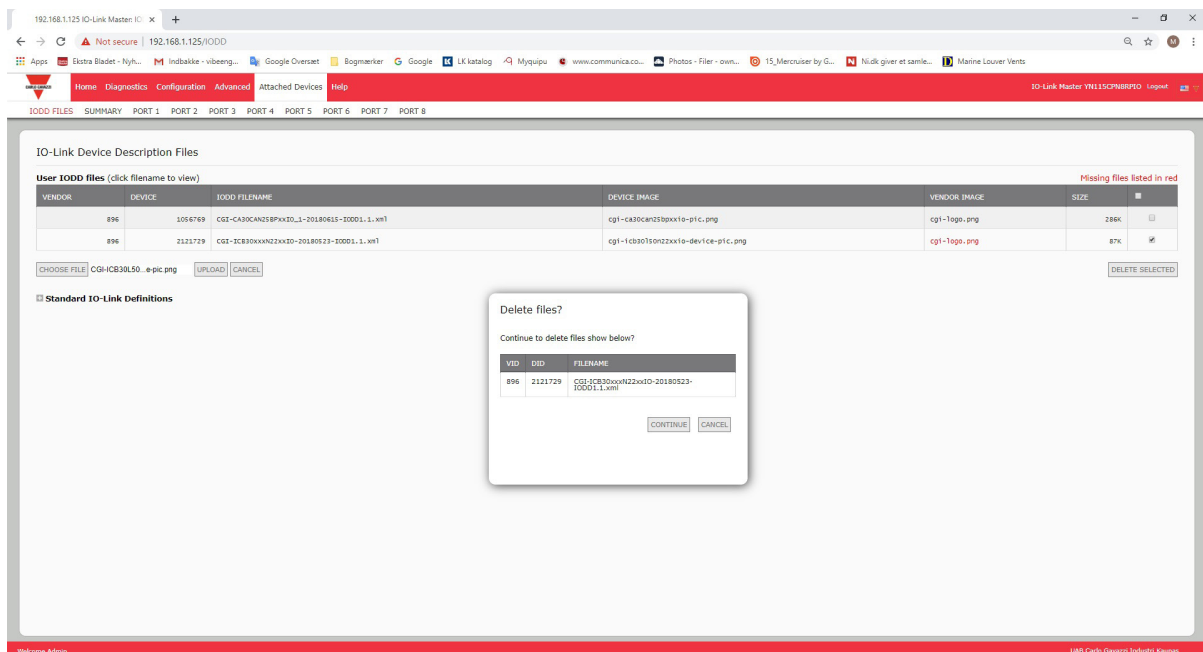
7.1.5. Deleting IODD Files

Use the following procedure to delete an IODD file set from the IOLM.

1. If necessary, click Attached Devices and IODD Files.
2. Check the corresponding row of the IODD file that you want to delete.
3. Click the DELETE SELECTED button.



4. Click CONTINUE to the Delete files? message.



7.2. IO-Link Device Configuration Summary Page

The IO-Link Device Configuration Summary page provides basic device configuration (device profile) information for ports with valid IO-Link devices attached. The Configuration Summary page retrieves information that resides on the IO-Link device from the manufacturer.

A file name displayed in the IODD Name field for a port indicates that a valid IODD file is associated with that device. If the field is empty, that indicates that a valid IODD file has not been loaded.

You can review complete IODD file information on a port by port basis by clicking the MORE button next to the port in question or by clicking the PORT menu selection in the navigational bar.

Use the following steps to access the IO-Link Device Configuration Summary page.

1. Click Attached Devices.
2. Click SUMMARY.

3. Click the MORE button or the corresponding Port (in the navigational bar) to configure the IO-Link device parameters for a specific device. See Chapter 8. Configuring IO-Link Devices on Page 67 for more information.

The screenshot shows a web browser window displaying the IO-Link Device Configuration Summary page. The browser address bar shows the URL 192.168.1.125/Summary. The page has a red navigation bar with links for Home, Diagnostics, Configuration, Advanced, Attached Devices, and Help. Below the navigation bar, there is a sub-navigation bar with links for IODD FILES, SUMMARY, and PORT 1 through PORT 8. The main content area is titled "IO-Link Device Configuration Summary" and contains a table with the following structure:

DEVICE SETTINGS	PORT 1	MORE	PORT 2	MORE	PORT 3	MORE	PORT 4	MORE	PORT 5	MORE	PORT 6	MORE	PORT 7
Vendor Name											Carlo Gavazzi		
VENDOR											896		
DEVICE											1056769		
Description											Capacitive Proximity sensor, Non-flush mountable		
IO-Link Version											1.1		
Hardware Version											v01.00		
Firmware Version											v01.01		
Baud Rate											38400		
SIO Mode											Yes		
Min Cycle Time											5 ms		
IODD Name											CGI-CA30CAN25BPxxIO_1-2 0180615-IODD1.1.xml		
Serial Number											LS32665000010		

A red warning message is displayed across the table: "No IO-Link device attached to the ports that do not display data".

8. Configuring IO-Link Devices

This chapter discusses using the Attached Devices | Port pages to change IO-Link device parameters.

Note: Optionally, you can use traditional methods such as: PLC interfaces or HMI/SCADAs, depending on your protocol to configure the IO-Link devices.

8.1. Port Pages Overview

You can use the Attached Devices | Port page for a port to review and easily edit the IO-Link device configuration or view Process Data.

Parameter Name	Index	Subindex	Value	Description	R/W	Unit	Min	Max	Comments	Gradient	Offset	DataType	SimpleDatatype	BitLength	FixedLength	DisplayFormat
Identification																
Vendor Name	16		Carlo Gavazzi		RO							StringT			64	
Vendor Text	17		www.gavazzi-automation.com		RO							StringT			64	
Product Name	18		CA30CAN25BPM110		RO							StringT			64	
Product ID	19		3709070394003		RO							StringT			64	
Product Text	20		Capacitive Proximity Sensor		RO							StringT			64	
Serial Number	21		LS32665000010		RO							StringT			16	
Hardware Version	22		V01.00		RO							StringT			64	
Firmware Version	23		V01.01		RO							StringT			64	
Application Specific Tag	24		****Conveyor belt		RW							StringT			32	
Function Tag	25		Mixer		RW							StringT			32	
Location Tag	26		line 5 machine 34		RW							StringT			32	

Parameter
+ Observation
- Diagnosis

Expand or collapse parameter groups to customize your size

Port is displaying valid PDI operation

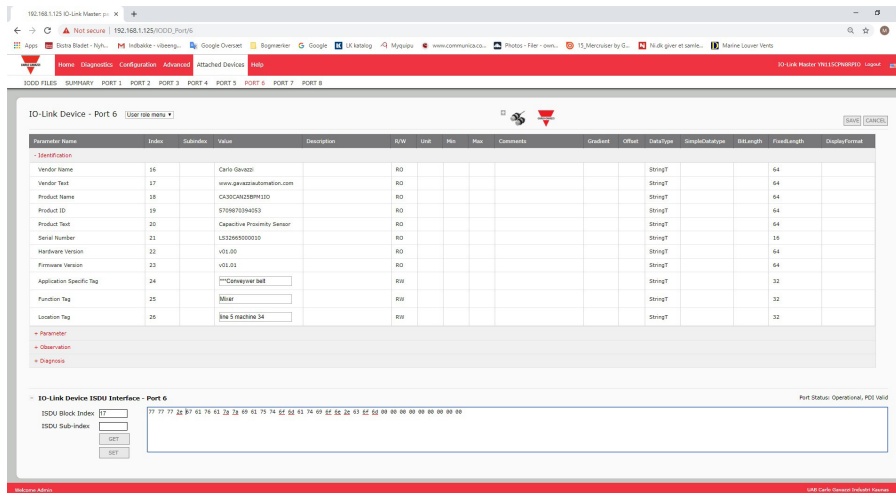
IO-Link Device ISDU Interface - Port 6

Port Status: Operational, PDI Valid

The Port page provides two IO-Link device configuration methods:

- IO-Link Device Port table (GUI), which depends on the appropriate IODD file loaded from the IO-Link device manufacturer onto the IOLM. To use the IO-Link Device Port table for configuring IO-Link devices, refer to the following subsections:
 - Editing Parameters - IO-Link Device - Port Table on Page 70
 - Resetting IO-Link Device Parameters to Factory Defaults on Page 71
- IO-Link Device ISDU Interface - Port, which can be used with or without IODD files loaded. Refer to the following information to use the IO-Link Device ISDU Interface - Port method:
 - The IO-Link Device Operator Manual from the device manufacturer is needed to use the IO-Link Device ISDU Interface since ISDU block index and ISDU sub-index numbers are required.
 - Editing Parameters - IO-Link Device ISDU Interface - Port on Page 72

The IO-Link Device Port table provides detailed information about the indexes and sub-indexes. Not all indexes have sub-indexes. In the following image, Index 21 has no sub-indexes



- If the IODD file follows IO-Link specifications, an asterisk next to RW means that parameter is not included in Data Storage.
- If a Sub-index has an asterisk next to it in the GUI, that means that sub-index is not sub-indexable. This may be useful information when using the IO-Link Device ISDU Interface or programming your PLC.

This example shows that Index 109 contains 10 sub-indexes.

When you perform a GET on Index 109 using the ISDU Interface, these are the results:

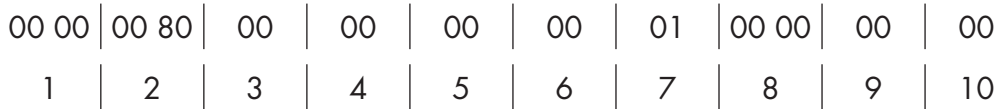


109	1*
109	2*
109	3*
109	4*
109	5*
109	6*
109	7*
109	8*
109	9*
109	10*

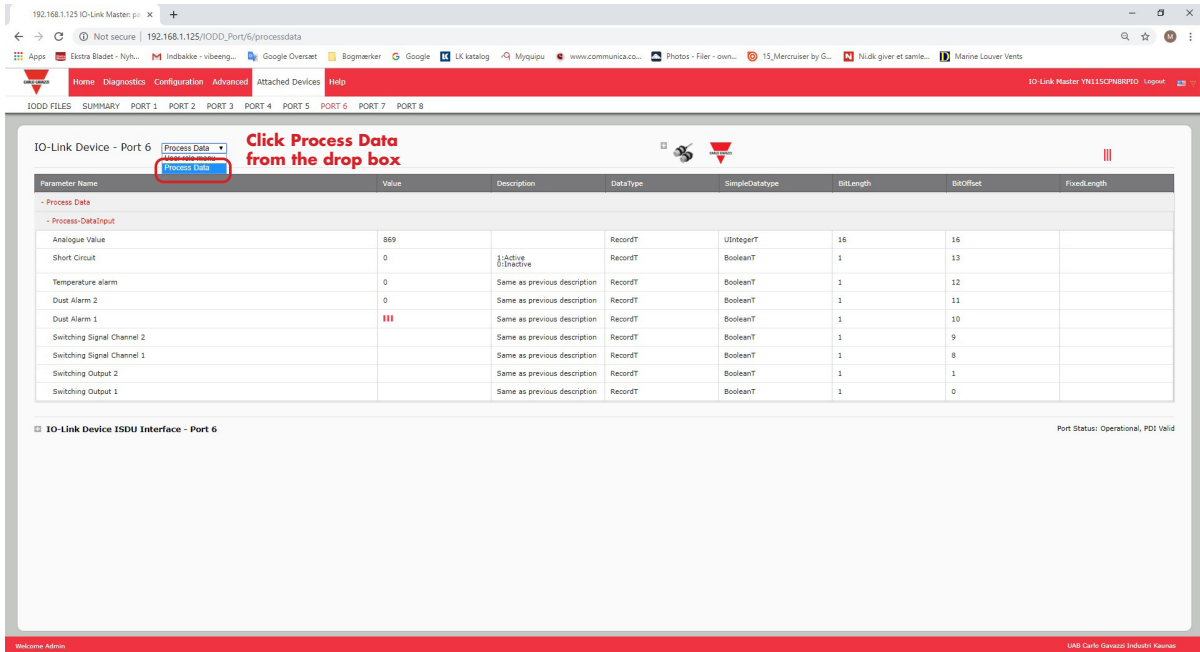
The GUI displays this information about Index 109.

Index	Subindex	Value	Description	R/W	Unit	Min	Max	Comments	Gradient	Offset	Data Type	SimpleDatatype	BitLength
109	1*	2246		RO				dynamic parameter			RecordT	UIntegerT	16
109	2*	2515		RO				dynamic parameter			RecordT	UIntegerT	16
109	3*	3		RO				dynamic parameter			RecordT	UIntegerT	8
109	4*	1		RO				dynamic parameter			RecordT	UIntegerT	8
109	5*	1		RO				dynamic parameter			RecordT	UIntegerT	8
109	6*	0		RO				dynamic parameter			RecordT	UIntegerT	8
109	7*	0		RO				dynamic parameter			RecordT	UIntegerT	8
109	8*	0		RO				dynamic parameter			RecordT	UIntegerT	16
109	9*	0		RO				dynamic parameter			RecordT	UIntegerT	8
109	10*	0		RO				dynamic parameter			RecordT	UIntegerT	8

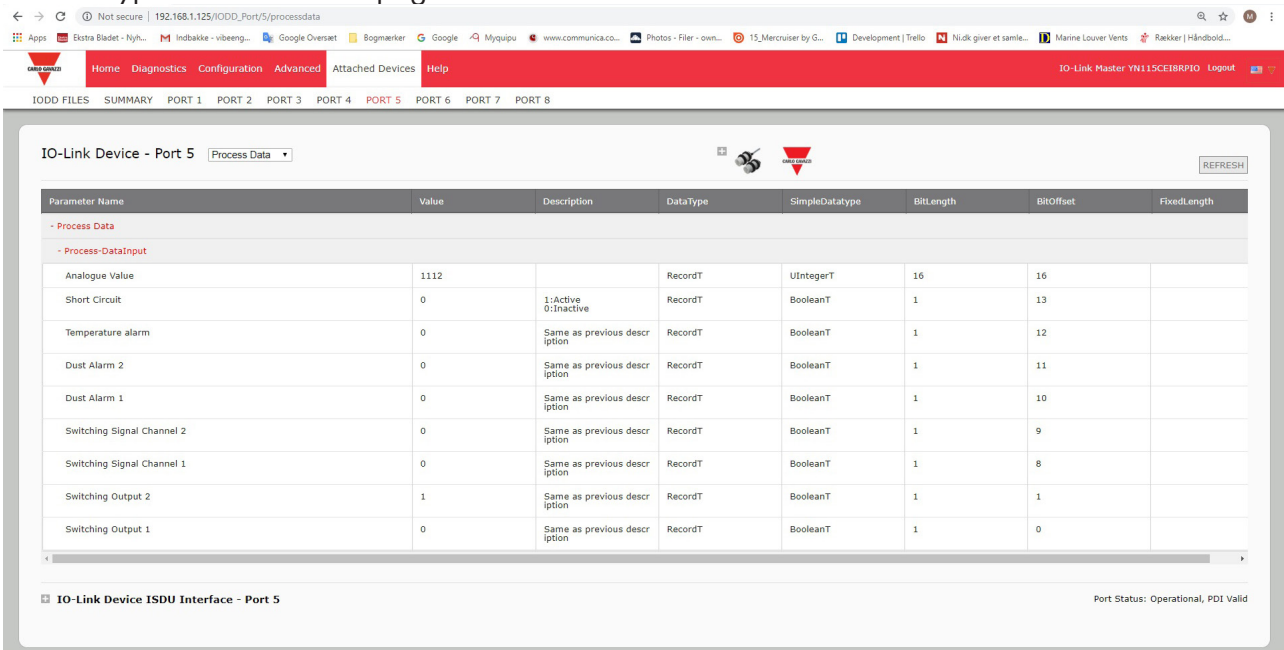
Which can be illustrated as:



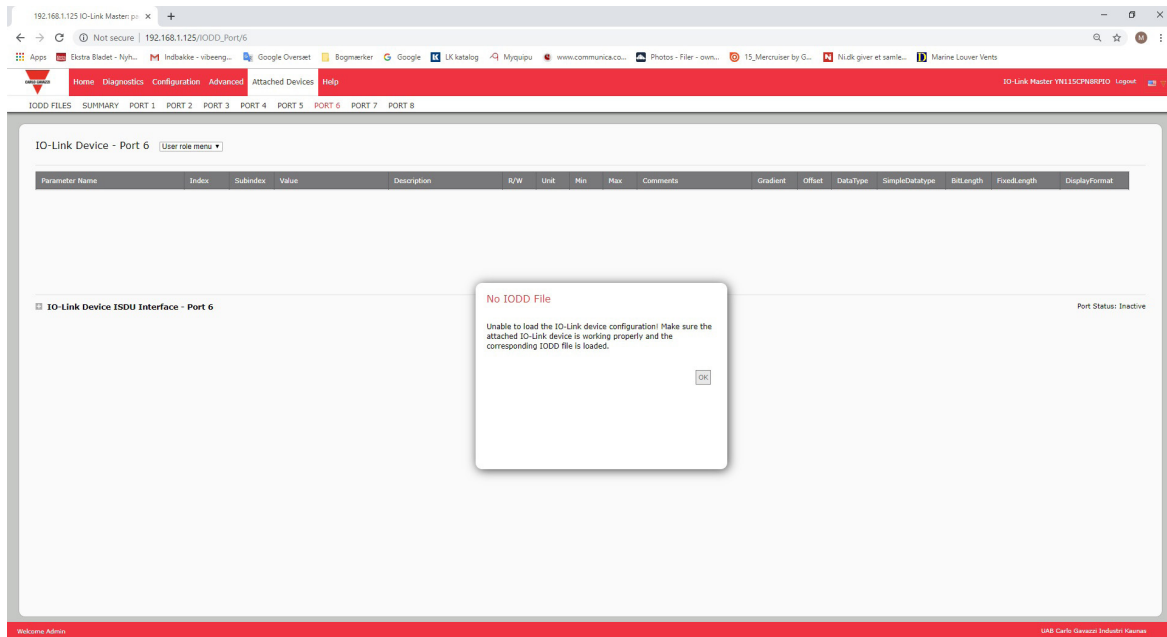
Access the Process Data page by selecting Process Data from the drop box next to the port number.



This shows a typical Process Data page.



If the correct IODD file has not been loaded or the IO-Link device does not support PDO, then you will receive this message.



8.2. Editing Parameters - IO-Link Device - Port Table

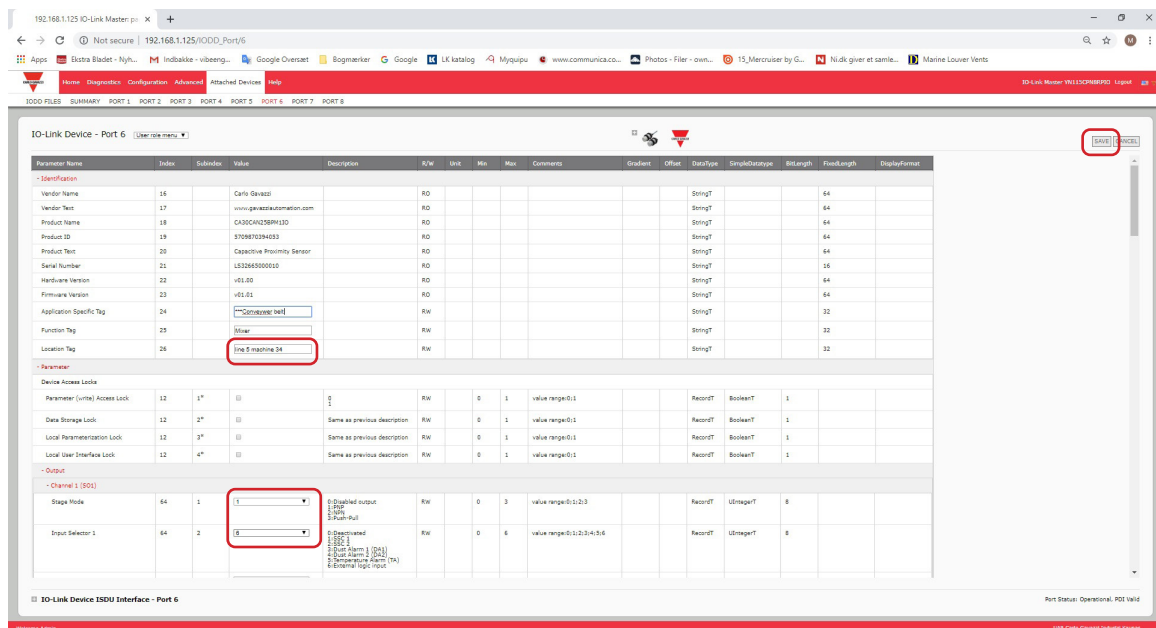
Use the following procedure to edit IO-Link device parameters using the IO-Link Device Port table.

Note: You may want to verify that the Automatic Download Enable for Data Storage option on the Configuration | IO-Link Settings page is NOT set to On as this can cause unreliable results on the corresponding port.

1. If you have not done so, load the IODD file from the IO-Link device manufacturer (Chapter 7. Loading and Managing IODD Files on Page 61).
2. Access the appropriate Port page by clicking Attached Devices and then the Port number that you want to configure.
3. Click the EDIT button after all of the device information is populated in the table.
4. Scroll down the table and make appropriate parameter changes for your environment.

Note: An IODD file may not contain all IO-Link device settings depending on the IO-Link device manufacturer. If you need to change a parameter that is not displayed in the IO-Link Device - Port table, you can refer to the IO-Link Device Operators Manual and use the IO-Link Device ISDU Interface to change the settings.

You may need to scroll to the right in the table to view applicable parameter values if the parameter is not selectable in a drop list.



5. Click the SAVE button after editing the parameters.

8.3. Resetting IO-Link Device Parameters to Factory Defaults

In the event you want to reset the IO-Link device to factory default, typically the IODD file provides the ability from the IO-Link device manufacturer. Use the following example to reset an IO-Link device.

1. Click the COMMAND button and locate the Restore Factory button.
2. Click the Restore Factory or Load Factory Settings button.

Note: The name of the button is determined by the IO-Link device manufacturer.

The screenshot shows the 'IO-Link Device - Port 6' configuration page. The 'Command' section is expanded, showing several buttons: 'Restore Factory', 'Restore SSC', 'Teach SP1 Start', 'Teach SP1 Stop', 'Teach SP2 Start', and 'Teach SP2 Stop'. The 'Restore Factory' button is highlighted with a red box. The table below shows the parameters for these commands.

Command	Address	Bit	Mode	Description	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link	IO-Link
TeachPoint 1 of Set point 2	59	4*	0	Same as previous description	RO		0	1	dynamic parameter value range:0;1			RecordT	BooleanT	1					
TeachPoint 2 of Set point 2	59	5*	0	Same as previous description	RO		0	1	dynamic parameter value range:0;1			RecordT	BooleanT	1					
Teach-in State	59	1*	0	0-IDLE 1-SUCCESS 4-WAIT FOR COMMAND 5-STOP 7-ERROR	RO		0	7	dynamic parameter value range:0;1;4;5;7			RecordT	UIntegerT	4					
- Teach-in Dynamic																			
Teach-in Select	58			0-Default channel 1-Switching signal Channel 1 2-Switching signal Channel 2 255-All SSC	RW		0	255	value range:0;1;2;255				UIntegerT	8					
Standard Command	2			71:Teach SP1 Start	WO		71	71	value range:71				UIntegerT	8					Button
Standard Command	2			72:Teach SP1 Stop	WO		72	72	value range:72				UIntegerT	8					Button
Standard Command	2			73:Teach SP2 Start	WO		73	73	value range:73				UIntegerT	8					Button
Standard Command	2			74:Teach SP2 Stop	WO		74	74	value range:74				UIntegerT	8					Button
Teach-in State	59	1*	0	0-IDLE 1-SUCCESS 4-WAIT FOR COMMAND 5-STOP 7-ERROR	RO		0	7	dynamic parameter value range:0;1;4;5;7			RecordT	UIntegerT	4					
- Command																			
Standard Command	2			130:Restore Factory Settings	WO		130	130	value range:130				UIntegerT	8					Button
Standard Command	2			160:Restore SSC	WO		160	160	value range:160				UIntegerT	8					Button

3. Click OK when the Refresh message appears.

The screenshot shows the 'IO-Link Device - Port 6' configuration page. A 'Refresh?' dialog box is displayed over the 'Restore Factory' button. The dialog box contains the text: 'Refresh? Your attached device's settings might have been affected by the recent commands you sent. Click OK to refresh.' The 'OK' button in the dialog box is highlighted with a red box.

8.4. Editing Parameters - IO-Link Device ISDU Interface - Port

The IO-Link Device ISDU Interface follows these guidelines:

- If necessary, convert hexadecimal ISDU index numbers to decimal, you must enter the decimal value for the ISDU Block Index and ISDU Sub-index numbers.
- You must enter the hexadecimal value for the IO-Link device parameters.

If the appropriate IODD files has been loaded, you can use the IO-Link Device - Port table to determine the index numbers and acceptable values for each parameter.

Note: An IODD file may not contain every IO-Link device setting depending on the IO-Link device manufacturer. If you need to change a parameter that is not displayed in the IO-Link Device - Port table, you can refer to the IO-Link Device Operators Manual.

If an IODD file has not been loaded for an IO-Link device, you can use the IO-Link Device Operator's Manual to determine the ISDU indexes.

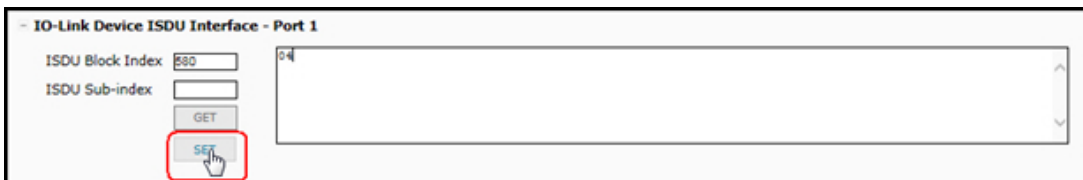
8.4.1. Overview

The following provides some basic information about the command usage and responses when using the ISDU Interface.

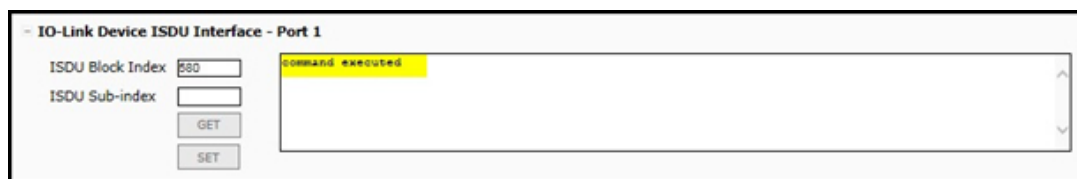
- You must enter the decimal value for the ISDU Block Index and ISDU Sub-index.
- The GET button retrieves the parameter value in hex from the IO-Link device. You may want to retrieve values to determine the data length.



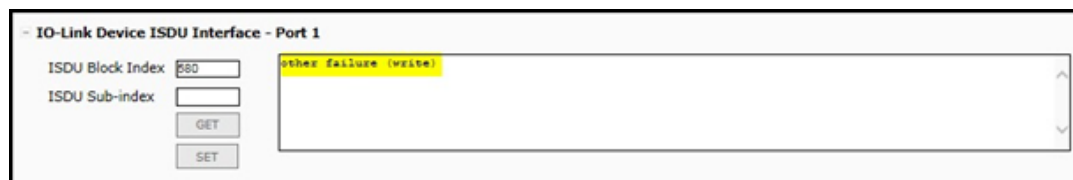
- The SET button sends the value to the IO-Link device.



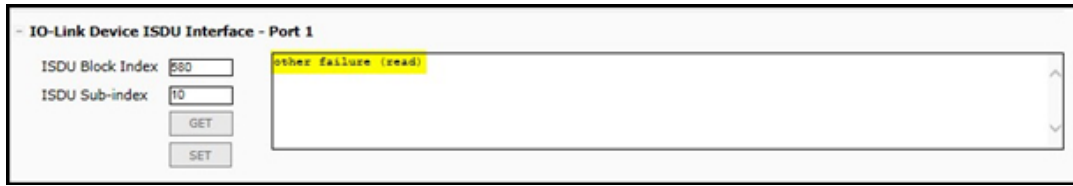
- After successfully changing a parameter, the IO-Link Master responds with a command executed notification.



- This message means that the IO-Link device defines the entry as an invalid setting.



- This message indicates that the IO-Link device cannot read the specified ISDU Block Index and Sub- index.

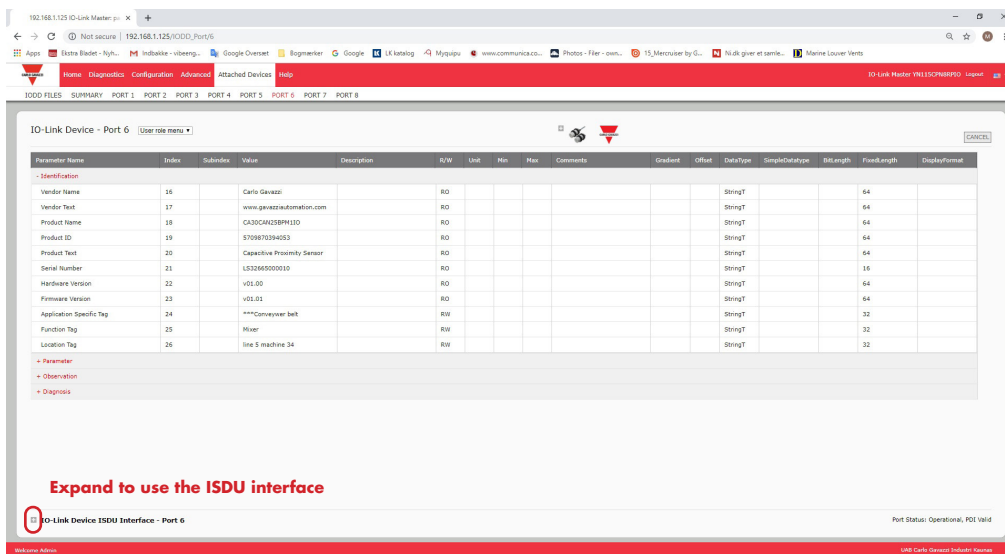


8.4.2. How to Use the Interface

Use the following procedure to edit parameters using the IO-Link Device ISDU Interface - Port.

Note: You may want to verify that the Automatic Download Enable for Data Storage option on the Configuration | IO-Link Settings page is NOT set to On as this can cause unreliable results on the corresponding port.

1. Click the + next to the IO-Link Device ISDU Interface to open the interface.



2. Enter the ISDU Block Index (decimal) that you want to edit.
3. If applicable, enter the ISDU Sub-index (decimal).
4. Edit the parameter (hex) and click the SET button.



5. Verify that a command executed message returns.
6. If the IODD file is loaded, optionally click REFRESH to verify your changes.

192.168.1.125 IO-Link Master p... x

192.168.1.125/IODD_Port/6

Home Diagnostics Configuration **Advanced** Attached Devices Help

IO-Link Master YN115CNRPFD Logout

IODD FILES SUMMARY PORT 1 PORT 2 PORT 3 PORT 4 PORT 5 PORT 6 PORT 7 PORT 8

IO-Link Device - Port 6 (User role menu)

Local Parameterization Lock	12	3*	0	Same as previous description	RW	0	1	value range:0;1	RecordT	BooleanT	1
Local User Interface Lock	12	4*	0	Same as previous description	RW	0	1	value range:0;1	RecordT	BooleanT	1

+ Output

- Switching Signal Channel 1

SSC1 Parameter

Set Point 1	60	1	1001		RW				RecordT	IntegerT	16
Set Point 2	60	2	10000		RW				RecordT	IntegerT	16
Mode	61	2	1	0: Deactivated 1: Single Point 2: Hysteresis 3: Two Point	RW	0	3	value range:0;1;2;3	RecordT	UIntegerT	8
Hysteresis	61	3	10		RW	%			RecordT	UIntegerT	16
Switching Logic	61	1	0	0: High active 1: Low active	RW	0	1	value range:0;1	RecordT	UIntegerT	8

- Switching Signal Channel 2

SSC2 Parameter

Set Point 1	62	1	1000		RW				RecordT	IntegerT	16
Set Point 2	62	2	10000		RW				RecordT	IntegerT	16

- IO-Link Device ISDU Interface - Port 6 Port Status: Operational, PDI Valid

ISDU Block Index:

ISDU Sub-Index:

command executed

Welcome Admin UAB Carlo Gavazzi Industri Kaunas

9. Utilizing IOLM Features

This chapter discusses using the following features:

- 9.1. Setting User Accounts and Passwords
- 9.2. Data Storage on Page 77, which provides automatic and manual data storage to upload or download IO-Link v1.1 device parameters
- 9.3. Device Validation on Page 81, which supports identical or compatible device validation to dedicate a port or ports to specific IO-Link devices
- 9.4. Data Validation on Page 82, which supports strict or loose data validation to verify data integrity
- 9.5. IOLM Configuration Files on Page 83 that supports a method to back up configuration files or load the same configuration to multiple IOLM units
- 9.6. Configuring Miscellaneous Settings on Page 85, which provides the following options:
 - 9.6.1. Using the Menu Bar Hover Shows Submenu Option on Page 85
 - 9.6.2. Enable PDO Write From Attached Devices Port Page on Page 86
 - 9.6.3. IO-Link Test Event Generator on Page 87
- 9.7. Clearing Settings on Page 89, which allows you to reset the IOLM to factory default values

Note: You must configure data storage, device validation, data validation in PROFINET IO using Step 7 or the TIA Portal. You can use data storage on the web page for temporary data storage related tasks.

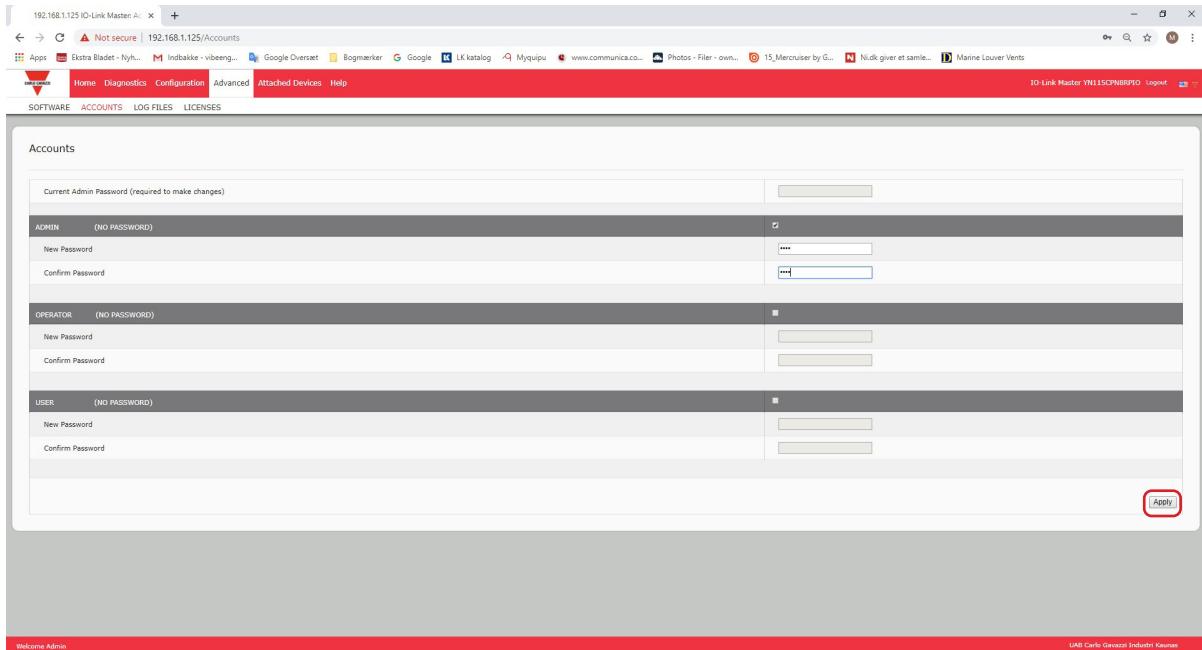
9.1. Setting User Accounts and Passwords

The IOLM is shipped from the factory without passwords. See the following table if you want to see how permissions are granted.

Page	Admin	Operator	User
Log-in	Yes	Yes	Yes
Home	Yes	Yes	Yes
Diagnostics - All	Yes	Yes	Yes
Configuration - IO-Link Settings	Yes	Yes	View-only
Configuration - Modbus/TCP	Yes	Yes	View-only
Configuration - PROFINET IO	Yes	Yes	View-only
Configuration - OPC UA	Yes	Yes	View-only
Configuration - Network	Yes	View-only	No
Configuration - Misc	Yes	Yes	Yes
Configuration - Load/Save	Yes	Yes	View-only
Configuration - Clear Settings	Yes	No	No
Advanced - Software	Yes	No	No
Advanced - Accounts	Yes	No	No
Advanced - Log Files	Yes	Yes	Yes
Advanced - Licenses	Yes	Yes	Yes
Attached Devices - IO-Link Device Description Files	Yes	Yes	View-only
Attached Devices - IO-Link Device Configuration Summary	Yes	Yes	View-only
Attached Devices - IO-Link Device - Port	Yes	Yes	View-only

You can use this procedure to set up passwords for the IOLM.

1. Open your browser and enter the IOLM IP address.
2. Click Advanced | ACCOUNTS.



3. Click the ADMIN check box.
4. If applicable, enter the old password in the Old Password text box.
5. Enter the new password in the New Password text box.
6. Re-enter the password in the Confirm Password text box.
7. Optionally, click the Operator check box, enter a new password, and re-enter the password in the Confirm Password text box.
8. Optionally, click the User check box, enter the new password, and re-enter the password in the Confirm Password text box.
9. Click Apply.
10. Close the new window that displays a Password saved banner.
11. Click the Log out button on the top navigation bar.
12. Re-open the web interface by selecting the appropriate user type in the drop list and entering the password.

9.2. Data Storage

Data storage is typically supported by IO-Link v1.1 devices. Data storage means that you can upload parameters from an IO-Link device to the IOLM and/or download parameters from the IOLM to the IO-Link device. This feature can be used to:

- Quickly and easily replace a defective IO-Link device
- Configure multiple IO-Link devices with the same parameters as fast as it takes to connect and disconnect the IO-Link device

To determine whether an IO-Link (v1.1) device supports data storage, you can check one of the following:

- IO-Link Diagnostics page - check the Data Storage Capable field to see if it displays Yes.
- IO-Link Configuration page - check to see if UPLOAD and DOWNLOAD buttons display under the Data Storage Manual Ops group. If only a Clear button displays, the device on the port does not support data storage.

Although you can make configuration changes using the web page, PROFINET IO configuration parameters overwrite the values on the IO-Link Settings page. See 3.7.1.1. IO-Link Port Settings (IO-Link Port Module Parameters) on Page 29 for PROFINET IO configuration procedures.

9.2.1. Uploading Data Storage to the IOLM

The IO-Link device manufacturer determines which parameters are saved for data storage. Remember, the IO-Link device should be configured before enabling data storage unless you are using data storage to back up the default device configuration.

There are two methods to upload Data Storage using the Configuration | IO-Link page:

- Automatic Upload Enable - If a port is set to On for this option, the IOLM saves the data storage parameters (if the data storage is empty) from the IO-Link device to the IOLM.

When this option is enabled and another IO-Link device (different Vendor ID and Device ID), is connected the IO-Link Diagnostics page displays a DS: Wrong Sensor in the IOLink State field and the IO-Link port LED flashes red, indicating a hardware fault.

Automatic upload occurs when the Automatic Upload Enable option is set to On and one of these conditions exists:

- There is no upload data stored on the gateway and the IO-Link device is connected to the port.
- The IO-Link device has the DS upload bit on; generally because you have changed the configuration through Teach buttons or the web interface.

Note: *Not all device parameters are sent to data storage. The IO-Link device manufacturer determines what parameters are sent to data storage.*

- Data Storage Manual Ops: UPLOAD - Selecting the UPLOAD button saves the data storage from the IO-Link device to the IOLM. The contents of the data storage does not change unless it is uploaded again or cleared. Another IO-Link device with a different Vendor ID and Device ID can be attached to the port without causing a hardware fault.

9.2.2. Downloading Data Storage to the IO-Link Device

There are two methods to download Data Storage using the Configuration | IO-Link Device page:

- Automatic Download Enable - An automatic download occurs when the Automatic Download Enable option is set to On and one of these conditions exists:
 - The original IO-Link device is disconnected and an IO-Link device which configuration data differs from the stored configuration data is connected.
 - The IO-Link device requests an upload and the Automatic Upload Enable option is set to Off.

Note: *Do not enable both Automatic Upload and Download at the same time, the results are not reliable among IO-Link device manufacturers.*

- Data Storage Manual Ops: DOWNLOAD - Selecting the DOWNLOAD button downloads the data storage from that port to the IO-Link device.

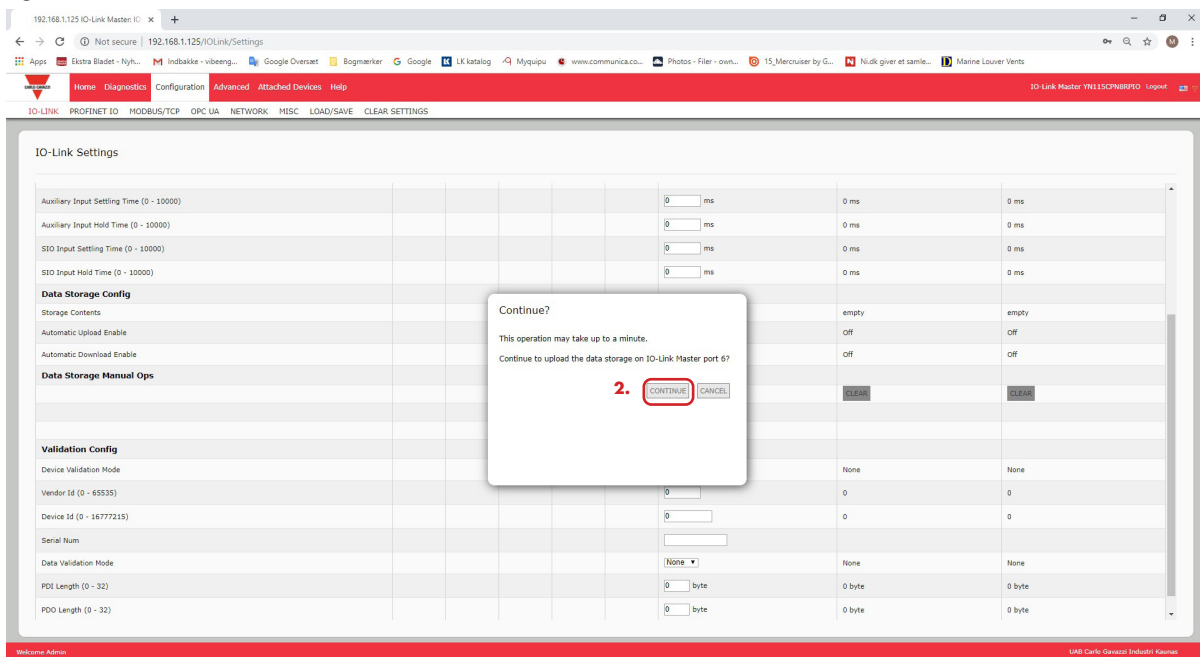
If an IO-Link device with a different Vendor ID and Device ID is attached to the port and a manual download is attempted, the IOLM issues a hardware fault.

9.2.3. Automatic Device Configuration

Use the following steps to use an IOLM port to configure multiple IO-Link devices with the same configuration parameters.

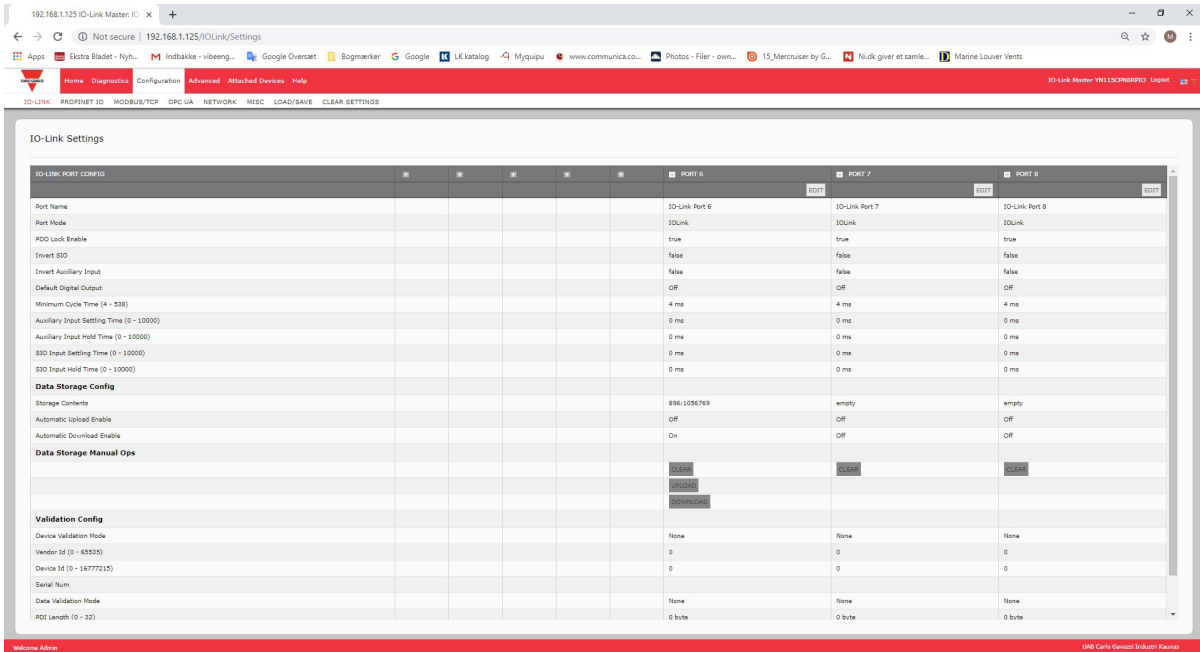
Note: You must configure data storage in PROFINET IO using Step 7 or TIA Portal. You can use data storage on the web page for temporary data storage related tasks.

1. If necessary, configure the IO-Link device as required for the environment.
2. Click Configuration | IO-Link.
3. Click the EDIT button for the port for which you want to store the data on the IOLM.
4. Click the UPLOAD button.
5. Click the CONTINUE button to the Continue to upload the data storage on IO-Link Master port [number] message.



6. Click the OK button to the Data storage upload successful on Port [number] message.

7. Set the Automatic Download Enable option to On.



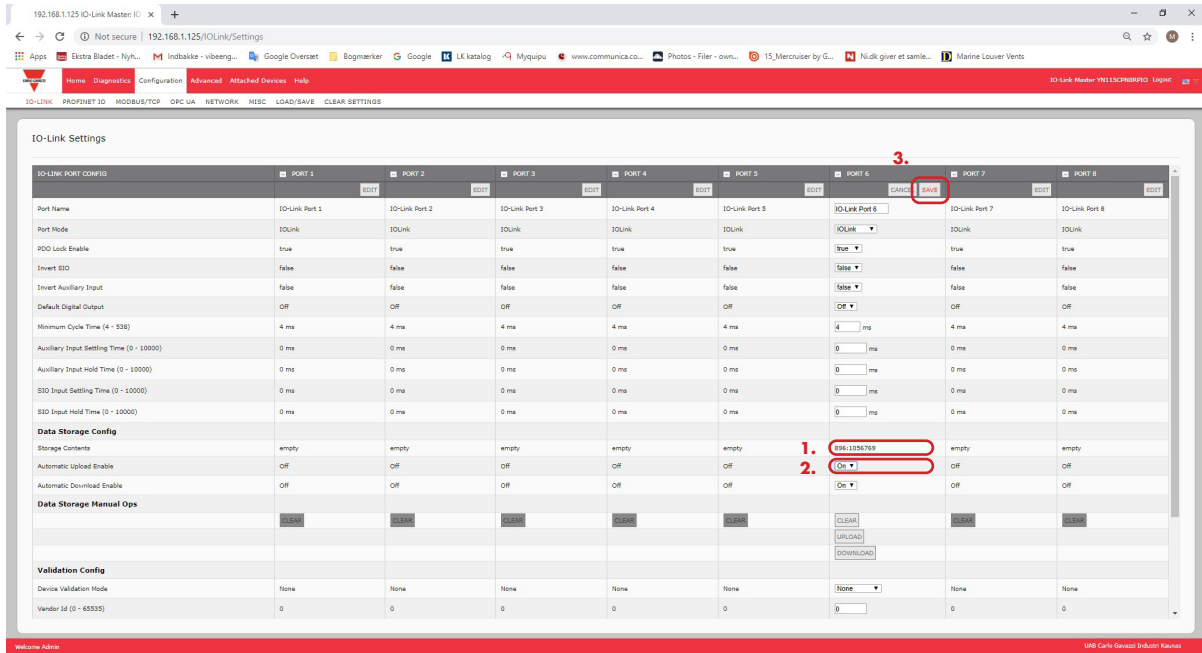
8. Click SAVE.
9. Click Diagnostics | IO-Link.
10. Replace the IO-Link device on that port with the IO-Link device for which you want configured automatically.
11. Verify that the IO-Link device displays operational Port Status and the appropriate IO-Link State.
12. Repeat Steps 10 and 11 for as many device as you want to configure.

9.2.4. Automatic Device Configuration Backup

The following procedure shows how to utilize data storage to automatically backup an IO-Link device configuration.
Note: You must configure data storage in PROFINET IO using Step 7 or TIA Portal. You can use data storage on the web page for temporary data storage related tasks.

Remember, if you adjust parameters using Teach buttons those values may or not may be updated in the data storage, which depends on the IO-Link device manufacturer. If you are unsure, you can always use the manual UPLOAD feature to capture the latest settings.

1. Click Configuration | IO-Link.
2. Click the EDIT button for the port for which you want to store the data on the IOLM.
3. Select On in the drop list for Automatic Data Storage Upload Enable.



4. Click SAVE.

When the Configuration | IO-Link page is refreshed, the Storage Contents field displays the Vendor ID and Device ID. In addition, the IO-Link Diagnostics page displays Upload-Only in the Automatic Data Storage Configuration field.

9.3. Device Validation

Device validation is supported by many IO-Link devices. Device Validation Mode provides these options:

- None - this disables Device Validation Mode.
- Compatible - permits a compatible IO-Link device (same Vendor ID and Device ID) to function on the corresponding port.
- Identical - only permits an IO-Link device (same Vendor ID, Device ID, and serial number) to function on the corresponding port.

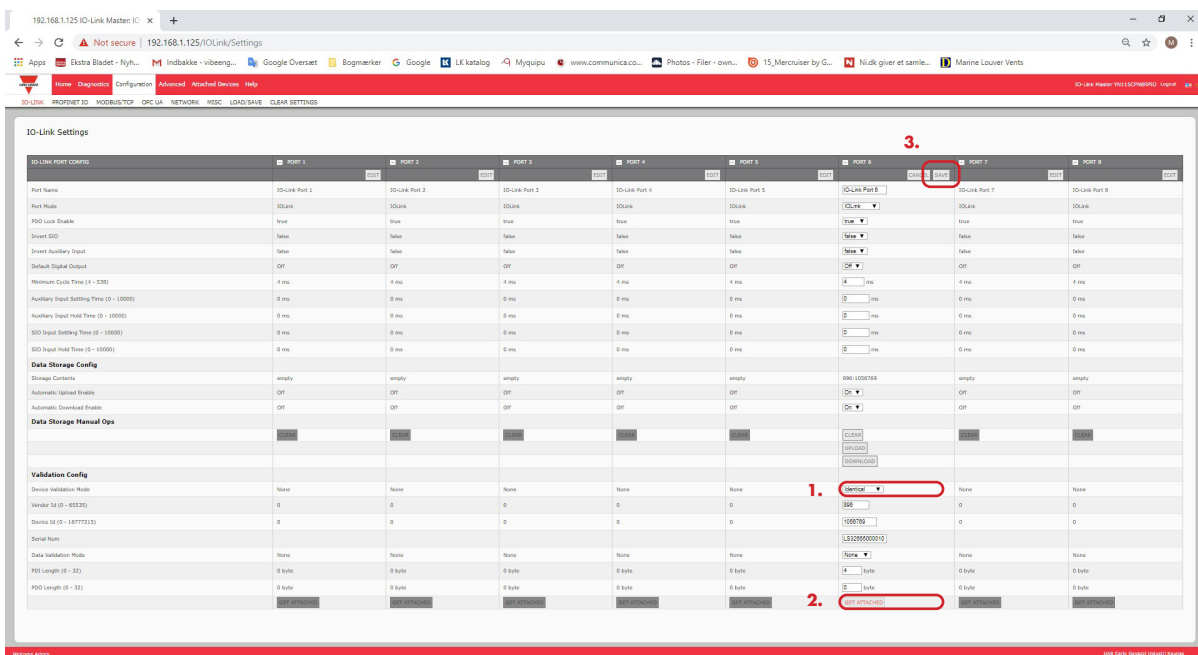
Although you can make configuration changes using the web page, PROFINET IO configuration parameters overwrite the values on the IO-Link Settings page. See 3.7.1.1. IO-Link Port Settings (IO-Link Port Module Parameters) on Page 29 for PROFINET IO configuration procedures.

Use this procedure to configure device validation.

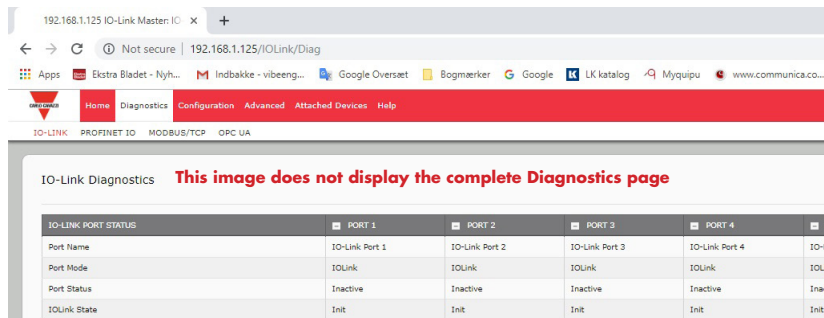
1. Click Configuration | IO-Link Settings.
2. Click the EDIT button.
3. Select Compatible or Identical for the Device Validation mode.

Note: Identical Device Validation requires a device serial number to operate.

4. Click the GET ATTACHED button or manually complete the Vendor ID, Device ID, and serial number. If the device does not have a serial number, you should not select Identical because the IOLM requires a serial number to identify a specific device.



5. Click the SAVE button. If the wrong or incompatible device is connected to the port, the IO-Link port LED flashes red and no IO-Link activity occurs on the port until the issue is resolved. In addition, the IO-Link Diagnostics page displays the following information.

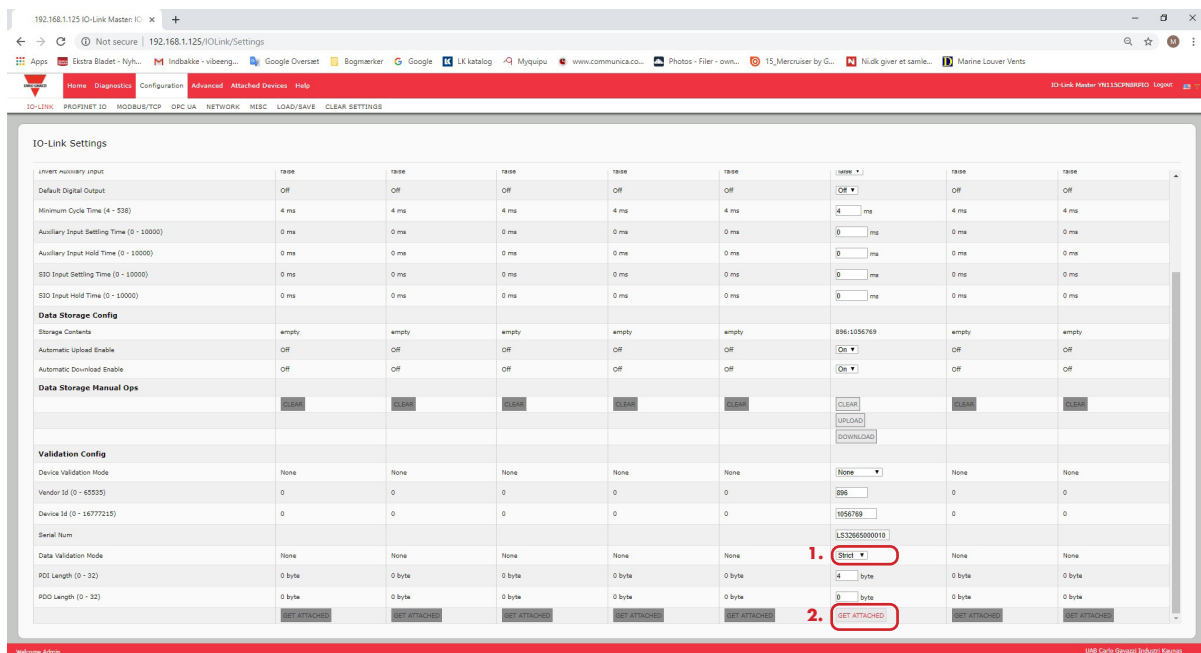


9.4. Data Validation

You can use this procedure to configure data validation.

Although you can make configuration changes using the web page, PROFINET IO configuration parameters overwrite the values on the IO-Link Settings page. See 3.7.1.1. IO-Link Port Settings (IO-Link Port Module Parameters) on Page 29 for PROFINET IO configuration procedures.

1. Click Configuration | IO-Link Settings.
2. Click the EDIT button on the port you want to configure for data validation.
3. Select Loose or Strict to enable data validation.
 - Loose - the slave device's PDI/PDO lengths must be less than or equal to the user-configured values.
 - Strict - the slave device's PDI/PDO lengths must be the same as the user-configured values.
4. Click the GET ATTACHED button or manually enter the PDI and PDO length.



5. Click the SAVE button.

If data validation fails, the IO-Link port LED flashes red and the IO-Link Diagnostics page displays an error.

9.5. IOLM Configuration Files

You can use the web interface to save or load IOLM configuration files.

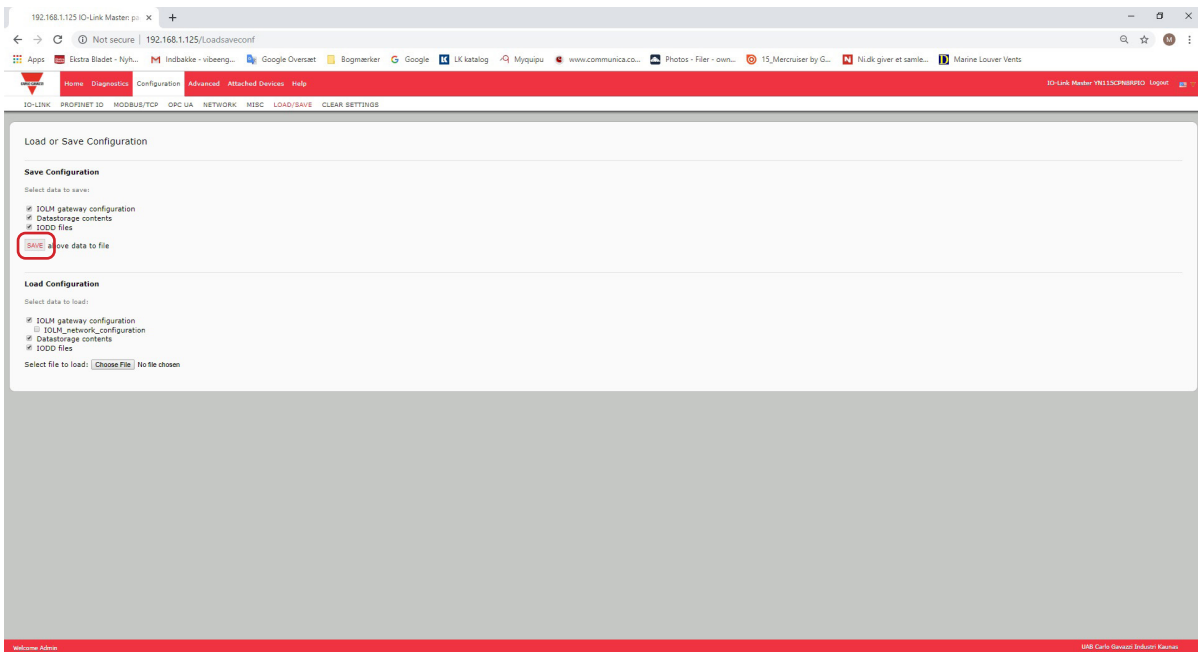
Use one of the following procedures to save or load configuration files.

- Saving Configuration Files (Web Interface) on Page 83
- Loading Configuration Files (Web Interface) on Page 84

9.5.1. Saving Configuration Files (Web Interface)

Use this procedure to save configuration files for the IOLM. The configuration files includes all port settings, network settings, and encrypted passwords.

1. Click Configuration | Load/Save.
2. Click the SAVE button.

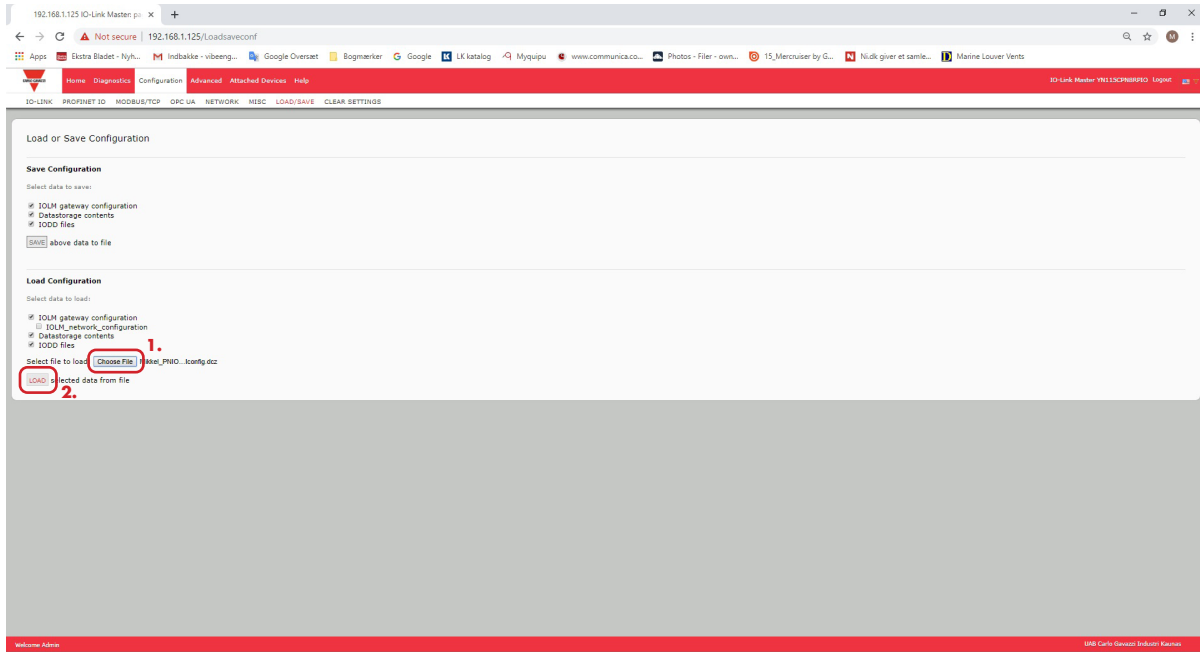


3. Click the Save as option and browse to the location that you want to store the configuration file.

9.5.2. Loading Configuration Files (Web Interface)

Use this procedure to load a configuration file onto the IOLM.

1. Click Configuration | Load/Save.
2. Click the Browse button and locate the configuration file (.dcz extension).
3. Click the LOAD button.



4. Click the OK button to close the Configuration Uploaded message that notifies you of what configuration parameters loaded.

9.6. Configuring Miscellaneous Settings

The Miscellaneous Settings page includes the following options:

- **Menu Bar Hover Shows Submenu**

This option displays sub-menus for a category when you hover over the category name.

For example, if you hover over Advanced, the SOFTWARE, ACCOUNTS, LOG FILES, and LICENSES sub-menus display. You can click any sub-menu and avoid opening the default menu for a category.

- **Enable PDO Write From Attached Devices Port Page**

When enabled, it allows you to write PDO data to IO-Link slaves from the Attached Devices | Port page in the web user interface. See 9.6.2. Enable PDO Write From Attached Devices Port Page on Page 86 for more information.

Note: The PDO write will not allow writes if the IOLM has a PLC connection. This should never be enabled in a production environment.

- **LED Flash**

You can force the IO-Link port LEDs on the IOLM into a flashing tracker pattern that allows you to easily identify a particular unit.

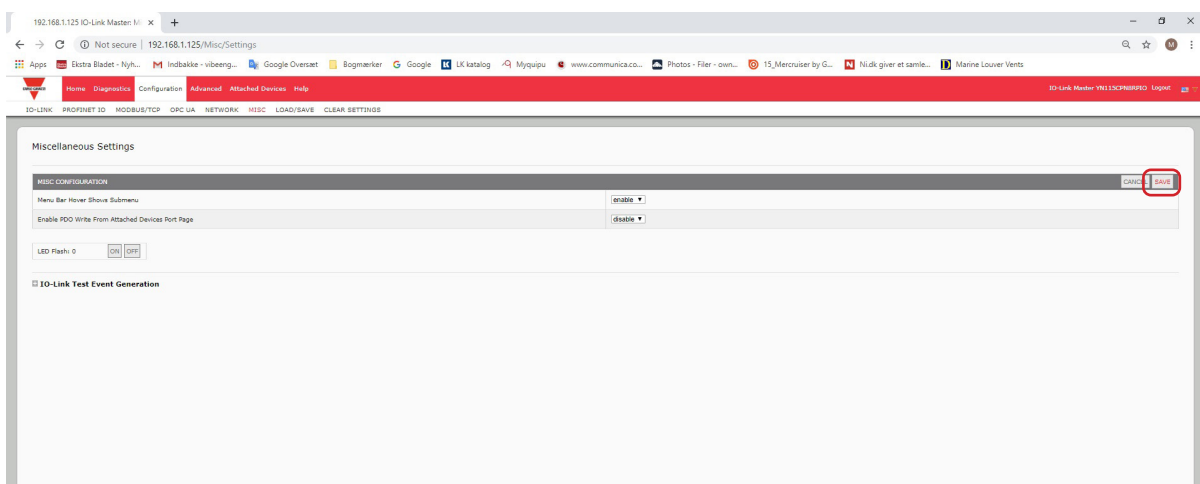
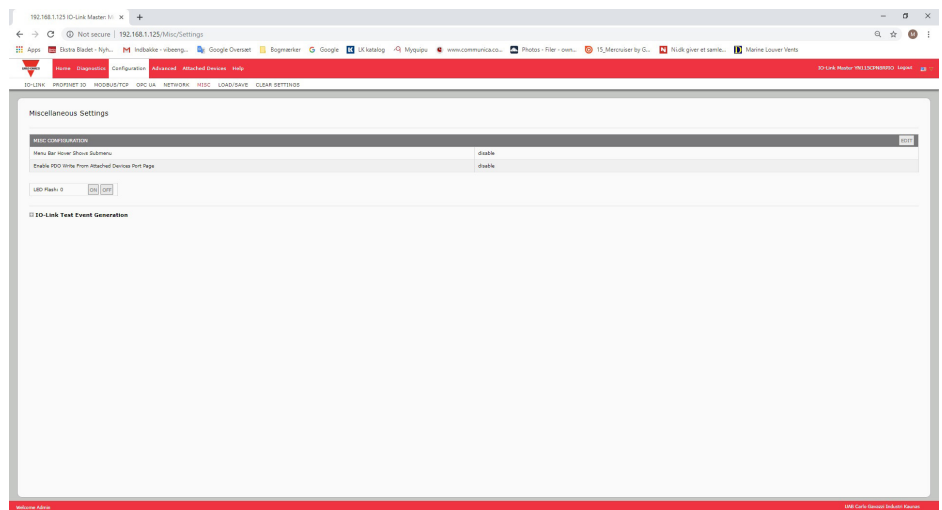
- Click the ON button to enable the LED tracker feature on the IOLM. The LEDs remain flashing until you disable the LED tracker feature
- Click the OFF button to disable the LED tracker.

9.6.1. Using the Menu Bar Hover Shows Submenu Option

Use this procedure to enable the Menu Bar Hover Shows Submenu option. If you enable this feature it displays the sub-menus for a category when you hover over the category name.

For example, if you hover over Advanced, the SOFTWARE, ACCOUNTS, LOG FILES, and LICENSES sub-menus display. You can click any sub-menu and avoid opening the default menu for a category.

1. Click Configuration | MISC.
2. Click the EDIT button.
3. Click Enable next to the Menu Bar Hover Shows Submenu option.
4. Click SAVE.



9.6.2. Enable PDO Write From Attached Devices Port Page

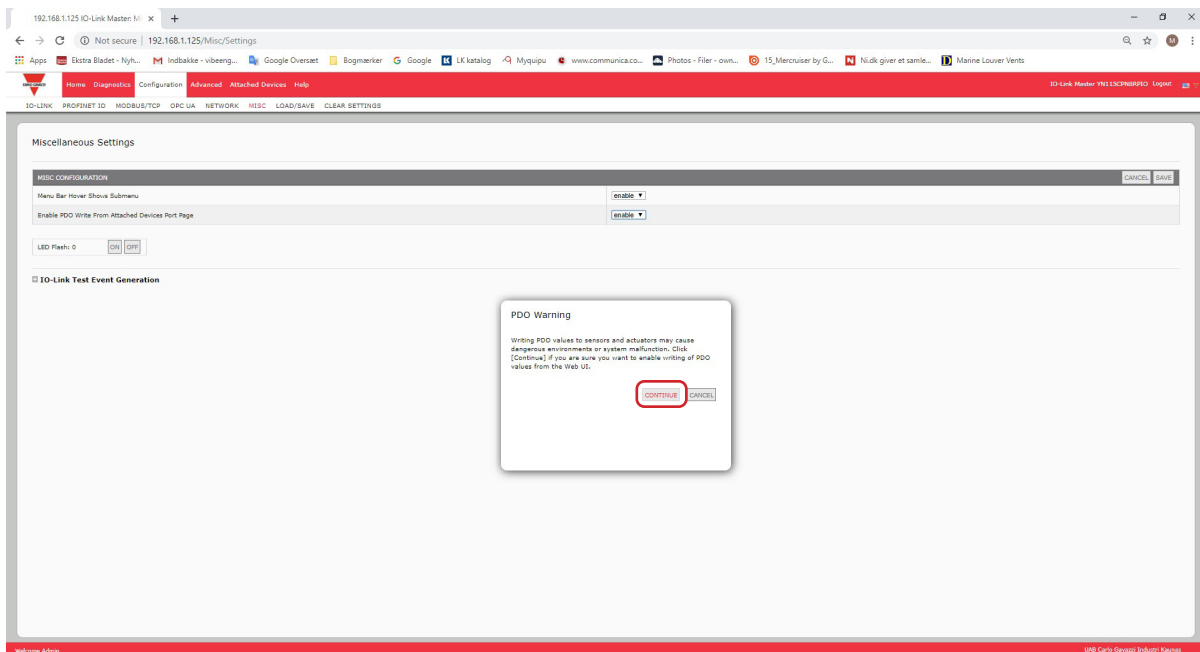
The purpose of this feature is for a non-production type of demonstration of the IOLM. You can enable this feature to get familiar with IO-Link or if you are commissioning a system and want to be able to test / get familiar with devices. It allows you to interact with a PDO device that does not have a PLC connection.

You must have set and signed into the IO-Link Master using an admin password.

Note: The PDO write will not allow writes if the IOLM has a PLC connection. This should never be enabled in a production environment.

Use this procedure to enable PDO write from the Attached Devices | Port page.

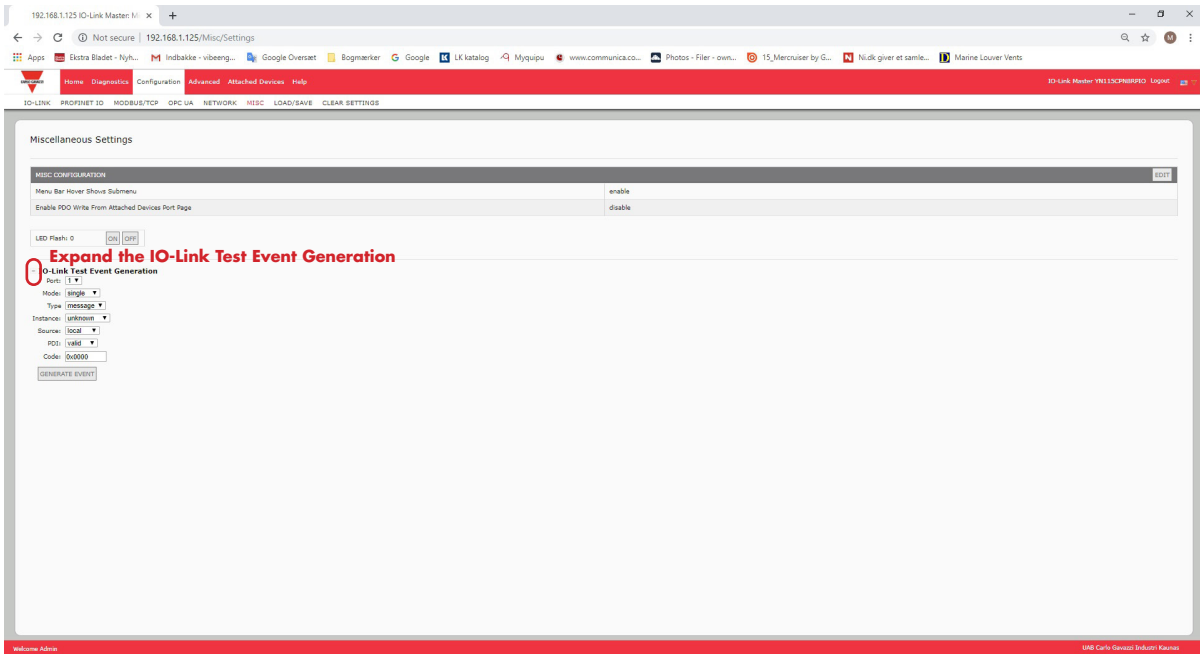
1. If necessary, log into the IOLM using the Administrator account.
2. Click Configuration | MISC.
3. Click the EDIT button.
4. Click Enable next to the Enable PDO Write From Attached Devices Port Page option.
5. Click the SAVE button.
6. If this will not cause an unstable environment, click the CONTINUE button.



9.6.3. IO-Link Test Event Generator

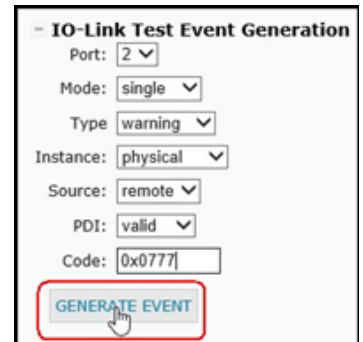
You can use the IO-Link Test Event Generator to send messages to an IOLM port. The generated events are displayed in the Diagnostics | IO-Link Settings page under the Last Events field and the syslog. This can test a port to verify that it is functioning correctly through

1. Click Configuration | Misc.
2. Expand the IO-Link Test Event Generator.



3. Select the port and type of event that you want to test. Use the following table to determine what type of event you want to generate.

IO-Link Test Event Generator Descriptions	
Port	The port number to which you want to send an event.
Mode	This is the first item in the event generated. <ul style="list-style-type: none"> • Single: generates Single in the event. • Coming: generates Active in the event • Going: generates Cleared in the event
Type	This is the second item in the event generated. <ul style="list-style-type: none"> • Message: generates Message in the event. • Warning: generates Warning in the event. • Error: generates Error in the event.
Instance	This is the level in which the event is generated. This is not displayed in the generated event. <ul style="list-style-type: none"> • unknown • physical • datalink • applayer • application



IO-Link Test Event Generator Descriptions (Continued)

Source	<p>This is the source in which the event is generated. This is the third item in the generated event.</p> <ul style="list-style-type: none"> local: simulation generated from the IOLM, which displays as Local in the event. remote: simulation of an IO-Link device event, which displays as Device in the generated event.
PDI	<p>This indicates whether to send valid or invalid PDI, which is not displayed in the generated event.</p> <ul style="list-style-type: none"> valid invalid
Code	<p>This is the fourth and fifth items in the generated event.</p> <ul style="list-style-type: none"> 0x0000: generates a s_pdu_check event 0x0001: generates a s_pdu_flow event 0x0002: generates a m_pdu_check event 0x0003: generates a s_pdu_illegal event 0x0004: generates a m_pdu_illegal event 0x0005: generates a s_pdu_buffer event 0x0006: generates a s_pdu_inkr event 0x0007: generates an s_pd_len event 0x0008: generates an s_no_pdin event 0x0009: generates an s_no_pdout event 0x000a: generates an s_channel event 0x000b: generates an m_event event 0x000c: generates an a_message event 0x000d: generates an a_warning event 0x000e: generates an a_device event 0x000f: generates an a_parameter event 0x0010: generates a devicelost event 0x0011, 13 - 17: generates an unknown event 0x0012: generates a s_desina event

4. Click Diagnostics and scroll down to Last Events.

The screenshot shows the 'IO-Link Diagnostics' web interface. The top navigation bar includes 'Home', 'Diagnostics', 'Configuration', 'Advanced', 'Attached Devices', and 'Help'. The main content area is titled 'IO-Link Diagnostics' and contains a table of device parameters and a list of events.

Parameter	Value
Device IO-Link Version	1.1
Actual Cycle Time	22.0ms
Device Minimum Cycle Time	5.0ms
Configured Minimum Cycle Time	4ms
Data Storage Capable	Yes
Automatic Data Storage Configuration	Disabled
Auxiliary Input (AI) Bit Status	OFF
Device PDI Data Length	4
PDI Data Valid	Yes
Last Rx PDI Data (MS Byte First)	04 44 00 00
PDI Lock Enable	Yes
PDI Locked	No
Device PDD Data Length	0
PDD Data Valid	0
Last Tx PDD Data (MS Byte First)	0
Time Since Initialization	0:11:23
Process Data Errors	0
Process Data Retries	0
Total Events	32
First Events	1 [Single Message Local (0245) m_generate 2 [Channel Error Local (0231) a_devinval 3 [Single Warning Local (0115) s_merr 4 [Channel Error Local (0234) a_devinval
Last Events	23 [Single Message Local (0220) already 24 [Channel Error Local (0230) m_generate 25 [Channel Error Local (0230) a_devinval 26 [Single Warning Local (0207) unknown

ISDU Statistics

ISDU Read Cmd Attempts	ISDU Read Cmd Errors	ISDU Write Cmd Attempts	ISDU Write Cmd Errors
0	0	0	0
0	0	0	0
0	0	35	0
0	0	0	0

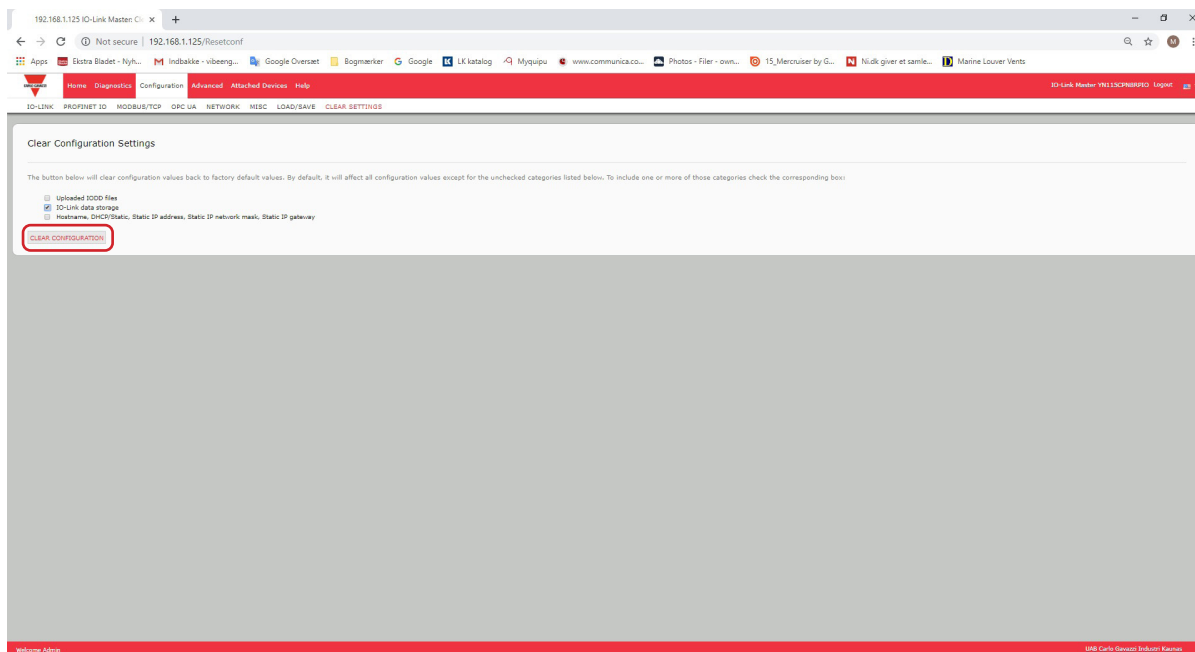
This is the event that was generated

9.7. Clearing Settings

You can return the IOLM to factory default values and can choose whether you want to restore these default values:

- Uploaded IODD files
- IO-Link data storage
- Hostname, network settings (DHCP/Static, static IP address, static network mask, and static IP gateway) Use the following procedure to restore factory default values on the IOLM.

1. Click Configuration | Clear Settings.



2. Click the OK button to the Done Configuration Cleared message.

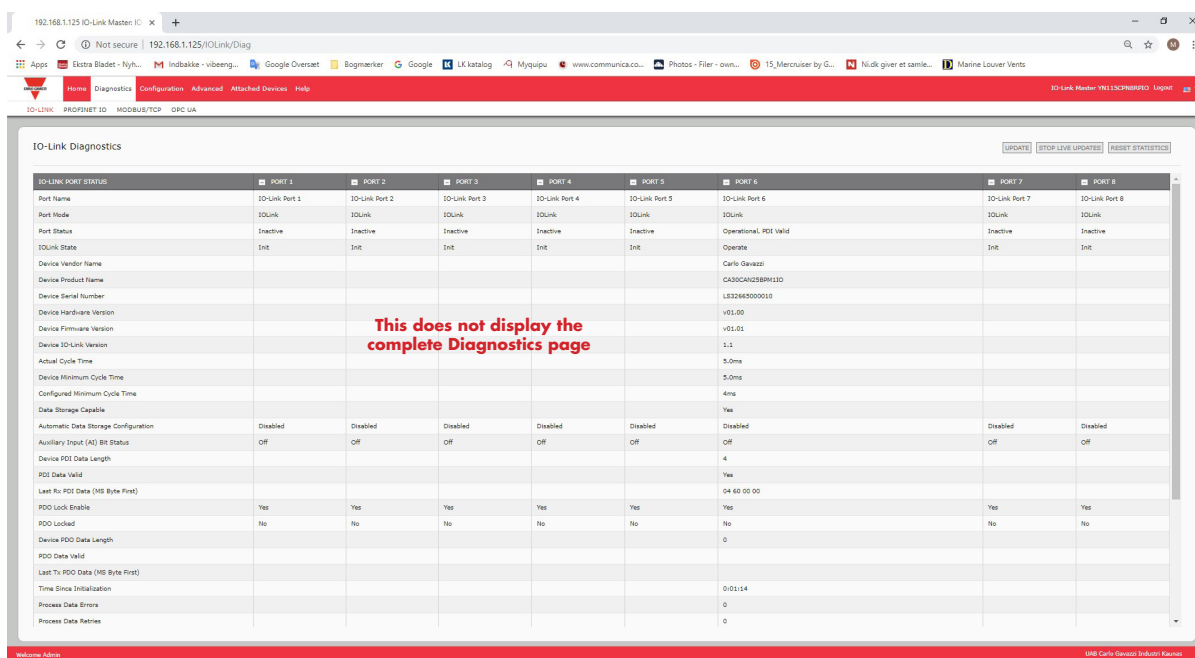
10. Using the Diagnostics Pages

This chapter provides information about the following Diagnostics pages.

- IO-Link Port Diagnostics on Page 90
- Modbus/TCP Diagnostics on Page 93
- PROFINET IO Diagnostics Page on Page 96
- OPC UA Diagnostics Page on Page 99

10.1. IO-Link Port Diagnostics

Use the IO-Link Diagnostics page to determine the status of the IO-Link configuration.



The following table provides information about the IO-Link Diagnostics page.

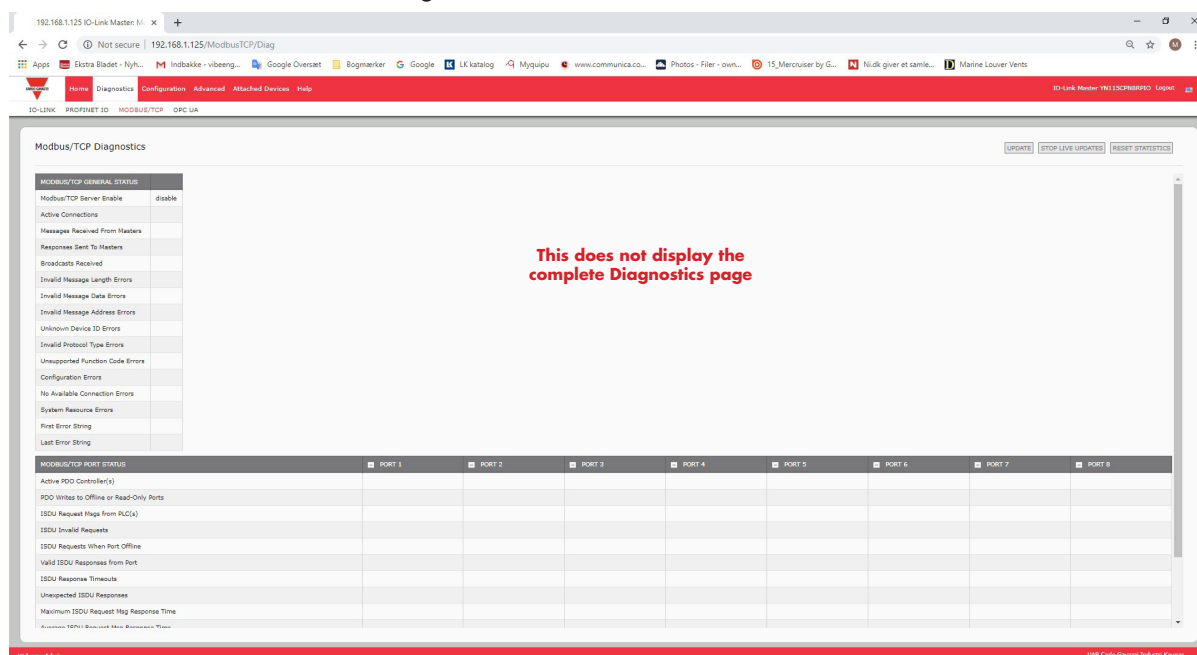
IO-Link Diagnostics	
Port Name	This is an optional friendly port name, which can be configured in the Configuration IO-Link page.
Port Mode	Displays the active device mode: <ul style="list-style-type: none"> • Reset = The port is configured to disable all functionality. • IO-Link = The port is configured to IO-Link mode. • Digital In = The port is configured to operate as a digital input. • Digital Out = The port is configured to operate as a digital output.

IO-Link Diagnostics (Continued)	
Port Status	<p>Displays the port status:</p> <ul style="list-style-type: none"> • Inactive = The port is in active state. Typically, this indicates that the device is either not attached or not detected. • Initializing = The port is in the process of initializing. • Operational = The port is operational and, if in IO-Link mode, communications to the IO-Link device has been established. • PDI Valid = The PDI data is now valid. • Fault = The port has detected a fault and is unable to re-establish communications.
IO-Link State	<ul style="list-style-type: none"> • Operate - Port is functioning correctly in IO-Link mode but has not received valid PDI data. This may also display during a data storage upload or download. • Init - The port is attempting initialization. • Reset - One of the following conditions exists: <ul style="list-style-type: none"> - The Port Mode configuration is set to Reset. - The Port Mode configuration is set to DigitalIn or DigitalOut. • DS - Wrong Sensor - Hardware failure (IO-Link LED also flashes red) because there is Data Storage on this port, which does not reflect the attached device. • DV - Wrong Sensor - Hardware failure (IO-Link LED also flashes red) because Device Validation is configured for this port and the wrong device is attached. • DS - Wrong Size - Hardware failure (IO-Link LED also flashes red) because the size of the configuration on the device does not match the size of the configuration stored on the port. • Comm Lost - Temporary state after a device is disconnected and before the port is re-initialized. • Pre-operate - Temporary status displayed when the device: <ul style="list-style-type: none"> - Is starting up after connection or power-up. - Uploading or downloading automatic data storage.
Device Vendor Name	Displays the Device Vendor Name as stored in ISDU Index 16.
Device Product Name	Displays the device product name as stored in ISDU Index 18.
Device Serial Number	Displays the device serial number as stored in ISDU Index 21.
Device Hardware Version	Displays the device hardware version as stored in ISDU Index 22.
Device Firmware Version	Displays the device firmware version as stored in ISDU Index 23.
Device IO-Link Version	The supported device IO-Link version as stored in ISDU Index 0.
Actual Cycle Time	This is the actual, or current, cycle time of the IO-Link connection to the device.
Device Minimum Cycle Time	This is the minimum, or fastest, cycle time supported by the connected IO-Link device.
Configured Minimum Cycle Time	Configured in the Configuration IO-Link page, this is the minimum cycle time the IO-Link Master will allow the port to operate at. The Actual Cycle Time, which is negotiated between the IO-Link Master and the device, will be at least as long as the greater of the Configured Minimum Cycle Time and the Device Minimum Cycle Time.
Data Storage Capable	Displays whether the IO-Link device on a port supports the data storage feature. Not all IO-Link devices support the data storage feature.
Automatic Data Storage Configuration	Displays whether a port is configured to automatically upload data from the IO-Link device or download data from the IOLM to the IO-Link device. Disabled displays if automatic upload or download are not enabled.

IO-Link Diagnostics (Continued)	
Auxiliary Input (AI) Bit Status	The current status of the auxiliary bit as received on DI (Pin 2 on the IOLM YN115, and YL212) of the IO-Link port.
Device PDI Data Length	The supported Device PDI Data Length, in bytes, as stored in ISDU Index 0.
PDI Data Valid	Current status of PDI data as received from the IO-Link device.
Last Rx PDI Data (MS Byte First)	The last Rx PDI data as received from the IO-Link device.
PDO Lock Enable	If enabled on the Configuration IO-Link Settings page, an industrial protocol application (PROFINET IO, EtherNet/IP, or Modbus TCP) can lock the write access to the PDO value so that the PDO value cannot be changed by other protocols (including OPC UA or the Web interface). Such a lock is released when the PLC to IO-Link Master network link disconnects.
PDO Locked	Indicates whether or not one of the industrial protocol applications has locked the write access to the PDO value.
Device PDO Data Length	The supported Device PDO Data Length, in bytes, as stored in ISDU Index 0.
PDO Data Valid	Status of PDO data being received from controller(s).
Last Tx PDO Data (MS Byte First)	The last Tx PDO data.
Time Since Initialization	The time since the last port initialization.
Process Data Errors	The number of process data errors the port received.
Process Data Retries	The number of process data retries the port performed.
Total Events	The total number of events that were received on this port.
First Events	Up to the first, or oldest, three events that were received on this port.
Last Events	Up to the last, or most recent, three events that were received on this port.
ISDU Statistics	
ISDU Read Cmd Attempts	The number of read ISDU command attempts.
ISDU Read Cmd Errors	The number of read ISDU command errors.
ISDU Write Cmd Attempts	The number of write ISDU command attempts.
ISDU Write Cmd Errors	The number of write ISDU command errors.

10.2. Modbus/TCP Diagnostics

The Modbus/TCP Diagnostics page may be useful when trying to troubleshoot Modbus/TCP communications or port issues related to Modbus/TCP configuration.



Note: The complete Modbus/TCP Diagnostics page is not illustrated.

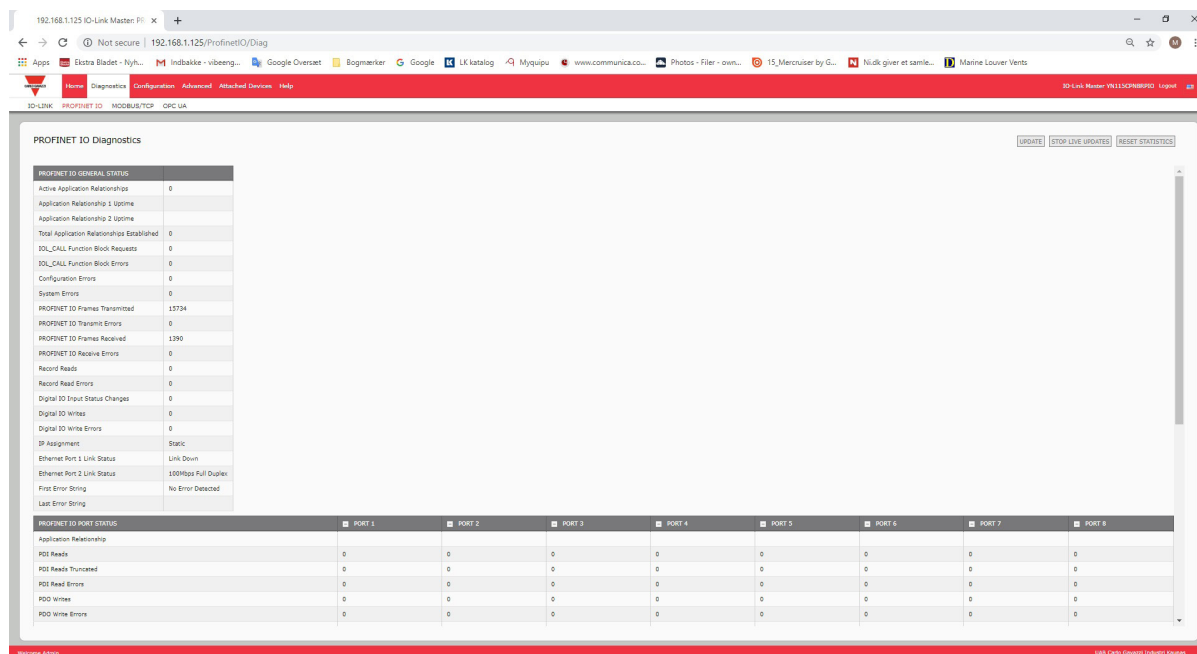
Modbus/TCP Diagnostics	
Active Connections	Displays the current number of active Modbus/TCP connections.
Messages Received from Masters	Displays the number of Modbus messages received from Modbus/TCP Masters.
Responses Sent to Masters	Displays the number of Modbus responses sent to Modbus/TCP Masters.
Broadcasts Received	Displays the number of broadcast Modbus/TCP messages received.
Invalid Message Length Errors	Displays the number of Modbus messages received with incorrect length fields.
Invalid Message Data Errors	Displays the number of invalid message data errors. These errors occur when the IO-Link Master receives a message that cannot be performed due to invalid data.
Invalid Message Address Errors	Displays the number of invalid message address errors. These errors occur when the IO-Link Master receives a message that cannot be performed due to an invalid address.

Modbus/TCP Diagnostics (Continued)	
Unknown Device ID Errors	Displays the number of unknown device ID errors. These errors occur when the IO-Link Master receives a message that is addressed to a device ID other than the configured Slave Mode Device ID.
Invalid Protocol Type Errors	Displays the number of invalid message protocol type errors. These errors occur when the IO-Link Master receives a Modbus/TCP message that specifies a non-Modbus protocol.
Unsupported Function Code Errors	Displays the number of invalid Modbus function code errors. These errors occur when the IO-Link Master receives a message that cannot be performed due to an unsupported Modbus function code.
Configuration Errors	Displays the number of improper configuration errors. These errors occur when the IO-Link Master receives a message that cannot be performed due to an invalid configuration.
No Available Connection Errors	Displays the number of Modbus/TCP connection attempts that were rejected due to no available connections. This occurs when the number of Modbus/TCP connections has reached the limit.
System Resource Errors	Displays the number of system resource errors. These errors indicate a system error on the IO-Link such as operating system errors or full message queues. These errors typically occur when the PLC(s) are sending messages to the IO-Link Master faster than the IO-Link Master can process them.
First Error String	Text description of the first error that occurred.
Last Error String	Text description of the last error that occurred.
Modbus/TCP Port Specific Diagnostics	
Active PDO Controller(s)	Lists IP addresses that are controlling the PDO data.
PDO Writes to Offline or Read-Only Ports	Displays the number of PDO write messages that were dropped due to any of the following: <ul style="list-style-type: none"> • The port is configured in IO-Link mode: <ul style="list-style-type: none"> - There is no device connected to the port. - The IO-Link device is off-line. - The IO-Link device does not support PDO data. • The PDO Transmit Mode (To PLC) is disabled. • The port is configured in Digital Input mode.
ISDU Request Msgs From PLC(s)	Displays the number of ISDU request messages received from the PLC(s) or other controllers. These request messages may contain one or multiple ISDU commands.
ISDU Invalid Requests	Displays the number of ISDU requests received over Modbus/TCP with one or more invalid commands.
ISDU Requests When Port Offline	Displays the number of ISDU requests received over Modbus/TCP when the IO-Link port was offline. This can occur when: <ul style="list-style-type: none"> • The IO-Link port is initializing, such as after start-up. • There is no IO-Link device attached to the port. • The IO-Link device is not responding. • Communication to the IO-Link device has been lost.
Valid ISDU Responses From Port	Displays the number of valid ISDU response messages returned from the IO-Link port interface and available to the PLC(s). The response messages contain results to the ISDU command(s) received in the request message.
ISDU Response Timeouts	Displays the number of ISDU requests that did not receive a response within the configured ISDU Response Timeout.

Modbus/TCP Diagnostics (Continued)	
Unexpected ISDU Responses	Displays the number of unexpected ISDU responses. Unexpected responses may occur when an ISDU response is received after the ISDU request has timed out. This typically requires setting the ISDU Response Timeout to a longer value.
Maximum ISDU Request Msg Response Time	Displays the maximum time period required to process all commands within an ISDU request message. The response is not available until all ISDU command(s) contained in the request have been processed.
Average ISDU Request Msg Response Time	Displays the average time period required to process the ISDU request message(s). The response is not available until all ISDU command(s) contained in the request have been processed.
Minimum ISDU Request Msg Response Time	Displays the minimum time period required to process all commands within an ISDU request message. The response is not available until all ISDU command(s) contained in the request have been processed.
ISDU Read Commands	Displays the number of ISDU read commands received over Modbus/TCP.
ISDU Write Commands	Displays the number of ISDU write commands received over Modbus/TCP.
ISDU NOP Commands	Displays the number of ISDU NOP (no operation) commands received over Modbus/TCP.

10.3. PROFINET IO Diagnostics Page

The PROFINET IO Diagnostics page may be useful when trying to troubleshoot communications or port issues related to PROFINET IO configuration.



The following table provides information about the PROFINET IO Diagnostics page.

PROFINET IO Diagnostics	
Active Application Relationships	Displays the current number of active PROFINET IO connections.
Application Relationship 1 Uptime	The uptime of the first application relationship.
Application Relationship 2 Uptime	The uptime of the second application relationship.
Total Application Relationships Established	The total number of application relationships that have been established since power up.
IOL_CALL Function Block Requests	The total number of IOL_CALL function block requests received.

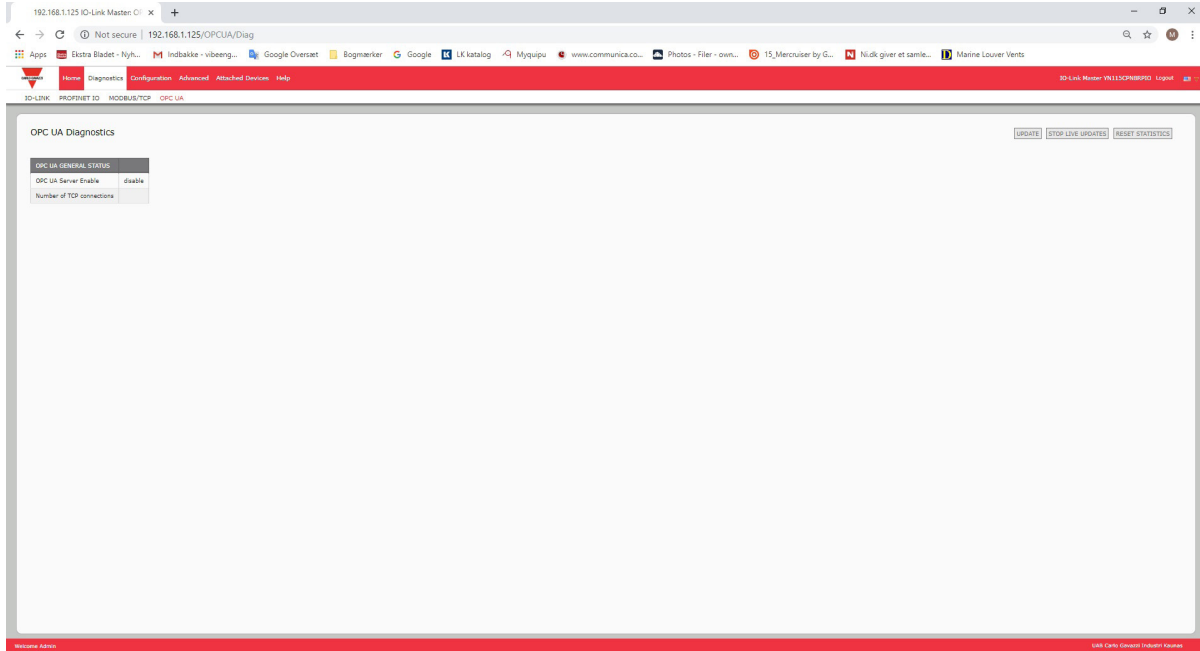
PROFINET IO Diagnostics (Continued)	
IOL_CALL Function Block Errors	The number of errors when handling IOC_CALL function block requests.
Configuration Errors	The number of system configuration related errors.
System Errors	Displays the number of system resource errors. These errors indicate a system error on the IO-Link such as operating system errors or full message queues. These errors typically occur when the PLC(s) are sending messages to the IO-Link Master faster than the IO-Link Master can process them.
PROFINET IO Frames Transmitted	The total number of transmitted PROFINET IO frames.
PROFINET IO Transmit Errors	The number of errors when transmitting PROFINET IO frames.
PROFINET IO Frames Received	The total number of received PROFINET IO frames.
PROFINET IO Receive Errors	The number of errors when receiving PROFINET IO frames.
Record Reads	The total number of record read requests received.
Record Read Errors	The number of errors when handling record read requests.
Digital IO Input Status Changes	The number of times that the status of the all digital I/O pins have changed.
Digital IO Writes	The number of times that the status of the digital output pins have changed.
Digital IO Write Errors	The number of errors when writing to digital output pins.
IP Assignment	The current IP assignment method.
Ethernet Port 1 Link Status	Current link status of Ethernet Port 1.
Ethernet Port 2 Link Status	Current link status of Ethernet Port 2.
First Error String	Text description of the first error that occurred.
Last Error String	Text description of the last error that occurred.
PROFINET IO Port Status	
Application Relationship	The application relationship (1 or 2) that the IO-Link port belongs to.
PDI Reads	The number of PDI reads.
PDI Reads Truncated	The number of PDI reads where data has been truncated due to size
PDI Read Errors	The number of errors when reading PDI.
PDO Writes	The number of PDO writes.
PDO Write Errors	The number of errors when writing PDO.
SIO Input Status Changes	The number of times the status of C/Q pin has changed when a port is in SIO input mode.
SIO Output Writes	The number of times the status of C/Q pin has changed when a port is in SIO output mode.
SIO Output Write Errors	The number of errors when writing to C/Q pin when a port is in SIO output mode.
Auxiliary Input Status Changes	The number of time the status of auxiliary pin has changed.

PROFINET IO Diagnostics (Continued)	
Event Reads	The number of IO-Link events.
Event Read Errors	The number of errors when reading IO-Link events.
Get Port Mode Errors	The number of errors when getting IO-Link port mode.
Set Port Mode Errors	The number of errors when setting IO-Link port mode.
ISDU Request Msgs From PLC(s)	Displays the number of ISDU request messages received from the PLC(s) or other controllers. These request messages may contain one or multiple ISDU commands.
ISDU Invalid Requests	Displays the number of ISDU requests received over PROFINET IO with one or more invalid commands.
Valid ISDU Responses From Port	Displays the number of valid ISDU response messages returned from the IO-Link port interface and available to the PLC(s). The response messages contain results to the ISDU command(s) received in the request message.
ISDU Response Timeouts	Displays the number of ISDU requests that did not receive a response within the configured ISDU Response Timeout.
Maximum ISDU Request Msg Response Time	Displays the maximum time period required to process all commands within an ISDU request message. The response is not available until all ISDU command(s) contained in the request have been processed.
Average ISDU Request Msg Response Time	Displays the average time period required to process the ISDU request message(s). The response is not available until all ISDU command(s) contained in the request have been processed.
Minimum ISDU Request Msg Response Time	Displays the minimum time period required to process all commands within an ISDU request message. The response is not available until all ISDU command(s) contained in the request have been processed.
ISDU Read Commands	Displays the number of ISDU read commands received over PROFINET IO.
ISDU Read Failures	The number of errors when processing ISDU read commands.
ISDU Write Commands	Displays the number of ISDU write commands received over PROFINET IO.
ISDU Write Failures	The number of errors when processing ISDU write commands.
Process Alarms	The number of process alarms sent to PLC.
Return of Submodule Alarms	The number of Return of Submodule alarms sent to PLC.
Channel Diagnostics Alarms Added	The number of channel diagnostics alarms sent to PLC.
Channel Diagnostics Alarms Removed	The number of channel diagnostics alarms removed from PLC.
Alarm Errors	The number errors when handling PROFINET IO alarms.

10.4. OPC UA Diagnostics Page

The OPC UA Diagnostics page displays status for OPC UA:

- Whether the OPC UA feature is enabled or disabled
- Number of TCP connections



11. PROFINET IO Reference Information

11.1. Sample IO-Link Master Gateway Configuration

This section demonstrates how to configure and use an IO-Link gateway.

Slot	Module	Order number	I Address	Q address	Diagnostic Address	Comment	Access
0	YL212CPN8M1IO	YL212CPN8M1IO			2036*		Full
X1	Interface				2037*		Full
X1 P1	Port 1				2036*		Full
X1 P2	Port 2				2035*		Full
1	IO-Link In 2 bytes		6...7				Full
2	IO-Link In/Out 2 bytes		8...9	2...3			Full
3	SIO Digital In		10				Full
4	SIO Digital Out			4			Full
5							
6							
7							
8							
9	IO-Link Status		1...4				Full
10							


STEP 7 V5.5 - Carlo Gavazzi IOLM gateway Configuration Example

Device overview						
Module	Rack	Slot	I address	Q address	Type	
YL212CPN8M1IO	0	0			YL212CPN8M1IO	
Interface	0	0 X1			YL212CPN8M1IO	
IO-Link In 2 bytes_1	0	1	6...7		IO-Link In 2 bytes	
IO-Link In/Out 2 bytes_1	0	2	8...9	2...3	IO-Link In/Out 2 bytes	
SIO Digital In_1	0	3	10		SIO Digital In	
SIO Digital Out_1	0	4		4	SIO Digital Out	
	0	5				
	0	6				
	0	7				
	0	8				
IO-Link Status_1	0	9	1...4		IO-Link Status	
	0	10				

TIA Portal V13 - Carlo Gavazzi IOLM gateway Configuration Example

- The first IO-Link device, which supports 2 bytes of PDI data, was connected to IO-Link Port 1. The PDI data were mapped into the process image at address IW 6 of the IO controller, as shown in the figure below. The IO controller can read the current PDI data from the IO-Link device at IW 6.
- The second IO-Link device, which supports 2 bytes of PDI data and 2 bytes of PDO data, was connected to IO-Link Port 2. The PDI data are mapped into the process image at address IW 8. The PDO data are mapped into process image at address QB 4. The IO controller can access PDI and PDO via the two memory locations.
- IO-Link Port 3 and Port 4 are configured as SIO Digital In and SIO Digital Out. The IO controller can read the input status of the C/Q pin of Port 3 at IB 10, and set the output C/Q pin value of Port 4 by writing to QB 4. IO-Link port status is reported through the module in Slot 10. The 4-byte port status was available at IB 1 to IB 4.

Using a variable table, as shown in the following, we monitored and modified the IO data directly.

		Address	Symbol	Display format	Status value	Modify value
1		IB 1	"Status_Active"	BIN	2#0000_1111	
2		IB 2	"Status_PDInvalid"	BIN	2#0000_1111	
3		IB 3	"Status_AuxInput"	BIN	2#0000_1101	
4		IB 4	"Status_Error"	BIN	2#0000_0000	
5		IW 6	"P1_IOLink2bytes"	HEX	W#16#0953	
6		IW 8	"P2_IOLink2bytes"	HEX	W#16#0000	
7		IB 10	"P3_SIOInput"	HEX	B#16#01	
8		QB 4	"P4_SIOOutput"	HEX	B#16#01	B#16#01

STEP 7 V5.5 - Monitoring and Modifying IO Data

	i	Name	Address	Display format	Monitor value	Modify value
1		"Status_Active"	%IB1	Bin	2#0000_1111	
2		"Status_PDInvalid"	%IB2	Bin	2#0000_0000	
3		"Status_AuxiliaryInput"	%IB3	Bin	2#0000_1101	
4		"Status_Error"	%IB4	Bin	2#0000_0000	
5		"P1_IOLink2bytes"	%IW6	Hex	16#0927	
6		"P2_IOLink2bytes"	%IW8	Hex	16#0000	
7		"P3_SIOInput"	%IB10	Hex	16#01	
8		"P4_SIOOutput"	%QB4	Hex	16#01	16#01

TIA Portal V13 - Monitoring and Modifying IO Data

IB 1-4 are input data from IO-Link Status module (Slot 10). IB 1 is IO-Link Active, IB 2 is PDI Valid, IB 3 is Auxiliary Input, and IB 4 is IO-Link Error. According to the current value of IB 1, Ports 1-4 are active. IB 2 shows the PDI data of Ports 1-4 are valid. IB 3 shows that the auxiliary input pins of Ports 1, 3, and 4 are high. No errors are detected so IB 4 is zero.

The PDI data of Port 1 is shown in IW 6. The PDI data of Port 2 is shown in IW 8.

In this example, we connected the C/Q pin, auxiliary input pin of Port 3 and Port 4 together, creating a testing loopback. Then we modified QB 4 to 0x01, which turned the C/Q Pin of Port 4 to high. IB 10 shows the status of the C/Q pin of Port 3 is high (0x01) as a result. The high status of auxiliary input pins of Ports 3 and 4 is reflected in IB 3.

11.2. Read PDI Data as Record Data

For IO modules that have input data, the Port Qualifier and PDI data can also be read by using the SFB52 RDREC (read record). The following table shows the available record read indexes for the IO-Link Master.

Available Record Read Index for IOLM YN115 and IOLM YL212

Index	Description
100..131	1-32 byte of PDI data from an IO-Link Port module in Slot 1
200..231	1-32 byte of PDI data from an IO-Link Port module in Slot 2
300..331	1-32 byte of PDI data from an IO-Link Port module in Slot 3
400..431	1-32 byte of PDI data from an IO-Link Port module in Slot 4
500..531	1-32 byte of PDI data from an IO-Link Port module in Slot 5
600..631	1-32 byte of PDI data from an IO-Link Port module in Slot 6
700..731	1-32 byte of PDI data from an IO-Link Port module in Slot 7
800..831	1-32 byte of PDI data from an IO-Link Port module in Slot 8
900	1-4 byte of PDI data from a Port Status module in Slot 9
1000	1-4 byte of PDI data from a Port Status module in Slot 10
1100	1-4 byte of PDI data from a Port Status module in Slot 11
1200	1-4 byte of PDI data from a Port Status module in Slot 12

Using the same example in 11.1. Sample IO-Link Master Gateway Configuration on Page 100; a record read request of 2-bytes at index 100 would return the current PDI data of the IO-Link device attached to Port 1. A record read request of 1-byte at Index 900 would return the current IO-Link port active status.

Reading partial PDI data via record read request is supported. For an instance, an IO-Link device that supports 32-bytes PDI data is connected to IO-Link Port 5. A record read request of 32-bytes at Index 500 returns the whole 32-bytes of PDI data. Another record read request of 4-bytes at Index 529 returns the last 4-bytes of the PDI data. This provides flexibility in being able to get only the interested data from a large PDI data block.

If a record read requests more data than the IO module or IO-Link device supports, IO-Link Master returns the available PDI data and fills the remaining data with zeros. Again using the same example in 11.1. Sample IO-Link Master Gateway Configuration on Page 100; a record read request of 4-bytes at Index 100 returned 0x09 0x0E 0x00 0x00, where 0x09 and 0x0E were the actual PDI data.

IO-Link Master returns an error if a record read request contains an invalid index.

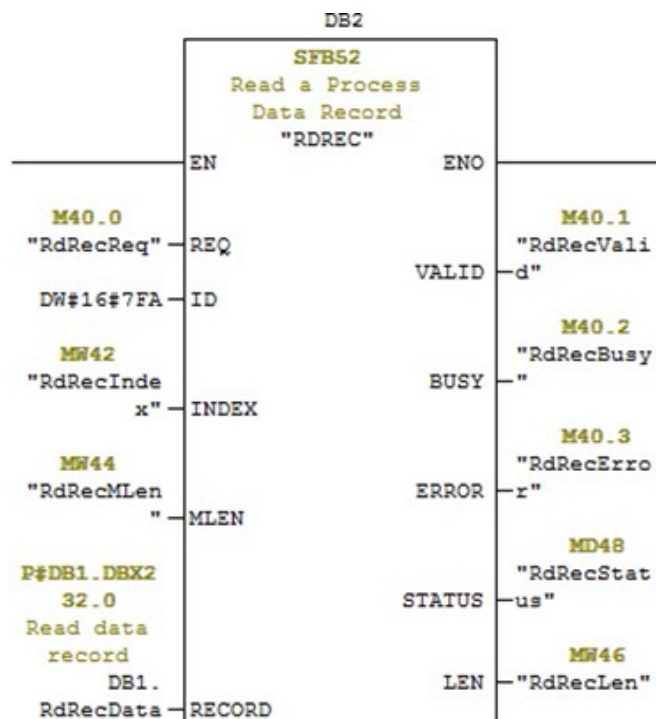
Writing PDO Data to an IO-Link device via data record write service is not supported. This is because that the new PDO data written by a record write will only last for one update cycle. The next cycle the IO controller overwrites the new PDO data with the old cyclic data from the process image.

11.3. Using the SFB52 RDREC

To use the SFB52 RDREC, specify the index of the requested module in INDEX. Specify the maximum number of bytes you want to read in MLEN. The selected length of the target area RECORD should have at least the length of MLEN bytes.

TRUE on output parameter VALID verifies that the data record has been successfully transferred into the target area RECORD. In this case, the output parameter LEN contains the length of the fetched data in bytes.

The output parameter ERROR indicates if a data record transmission error has occurred. In this case, the output parameter STATUS contains the error information.



SFB52 Read a Process Data Record

11.4. Read and Write ISDU with the FB IOL_CALL

The function block IOL_CALL represents the conversion for the IO-Link technology to and from IO-Link devices. The IO-Link Master supports the IOL_CALL function block. It can be used to access an ISDU of an IO-Link device. The IOL_CALL function block and the library description are available at: [http:// support.automation.siemens.com/WW/view/de/82981502](http://support.automation.siemens.com/WW/view/de/82981502)

To use IOL_CALL function block, do the following:

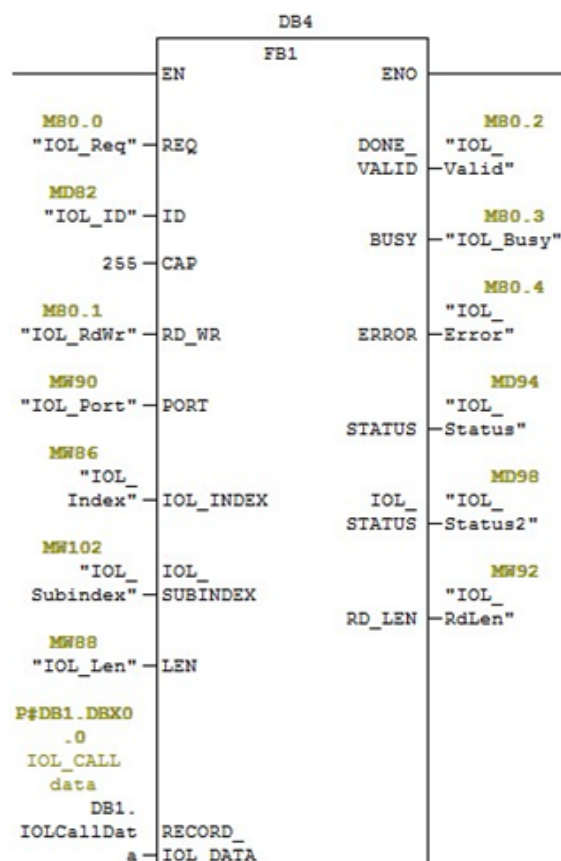
1. Set CAP to 255.
2. Specify PORT to be the IO-Link port number (1 to 8) at which the IO-Link device is connected.
3. Set IOL_INDEX and IOL_SUBINDEX to be the index and subindex of the requested ISDU. RECORD_IOL_DATA requires the full specification of the DB parameters, i.e. P#DB1.DBX0.0 byte 232.

The target area RECORD_IOL_DATA must have enough available bytes to hold the requested ISDU block up to 232 bytes.

4. Set RD_WR to 0 for read and 1 for write. For write, also specify the length of the data to be written in LEN. A positive edge on REQ starts the IOL_CALL request.

BUSY is set to 1 when the IOL_CALL request is in progress. Once completed, DONE_VALID is set to 1 if there was no error. Otherwise, ERROR is set and STATUS and IOL_STATUS contain the error information. For the remainder of the IOL_CALL function block parameters and complete error information, refer to the IOL_CALL library description.

The IOL_CALL function block has a 20 seconds timeout value. If



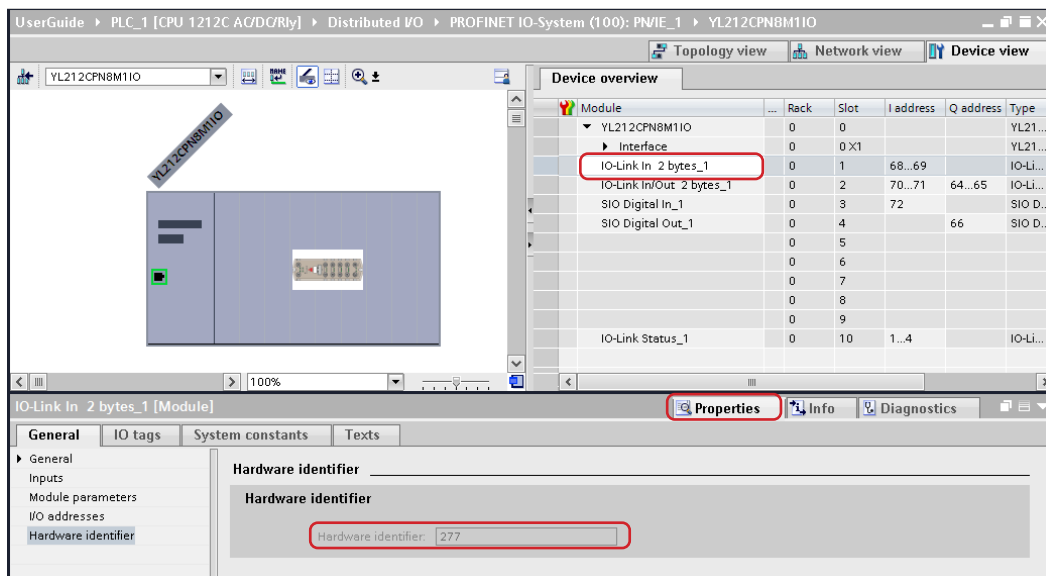
Parameter	Description
CAP	Access point of the IOL_CALL function. Use 255.
PORT	IO-Link port number at which the IO-Link device is operated, port number 1 through 8. All other values: not supported.
IOL_INDEX	Address parameter INDEX (IO-Link device). 0 - 32767: index of ISDU
IOL_SUBINDEX	Address parameter SUBINDEX (IO-Link device). <ul style="list-style-type: none"> • 0: not support • 1 - 255: subindex of ISDU

the request takes longer than 20 seconds, the process is aborted and a timeout error is returned. The IOLM also has a timeout value for IOL_CALL request. The default timeout value is 20 seconds. It can be changed through the web page (Configuration | PROFINET IO).

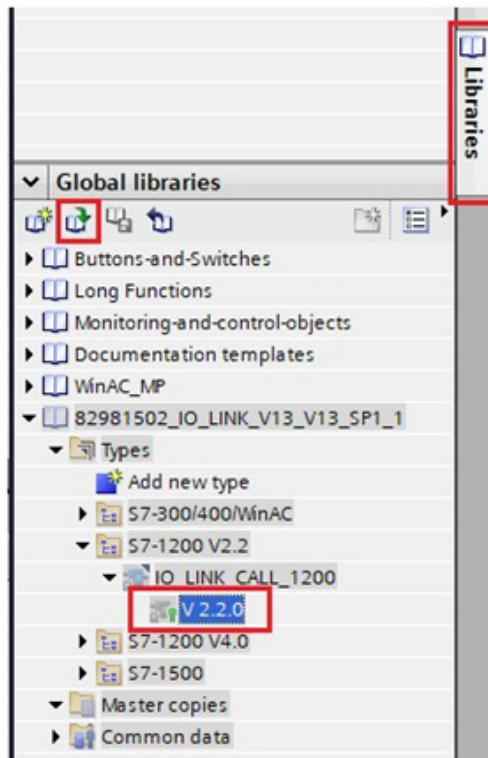
11.4.1. Using the IO-Link Library In the TIA Portal

Use the following procedure to use the IO-Link library in the TIA Portal.

1. Download the IO-Link library from Siemens: <http://support.automation.siemens.com/WW/view/de/82981502>.
For TIA Portal V13, download the Archive.zip archive. For STEP 7 V5.5 and V14, download 82981502_IO_LINK_Library_Vx.x.
2. Unzip the library to a working directory.
3. Configure the TIA Portal project.
 - a. Create a new or open an existing TIA Portal project.
 - b. Configure the PLC, Carlo Gavazzi IOLM gateway and all the IO-Link ports.
 - c. Compile and download the project.
 - d. Make sure that everything is working as expected.
4. Take a note of the hardware identifier of the IO-Link module, which will be used to access IO-Link device ISDU.



5. Open the IO-Link library.
 - a. In TIA Portal, click the Open global library button on the Libraries tab.
 - b. Navigate to the above working directory, where the IO-Link library was unzipped.
 - c. Select the IO_LINK_V13.al13 and click Open. Depending on the version of TIA Portal, the library may need to be upgraded.
 - d. After opened, there should be an 82981502_IO_LINK_xxx library. IO_LINK_CALL_1200 V 2.2.0 is the one that will be used.



6. Create tags and data block by going to PLC tags, create some tags that will be used as the parameters of IO_LINK_CALL.

IO_Link_Library_Demo > PLC_1 [CPU 1212C AC/DC/Rly] > PLC tags > Default tag table [38]

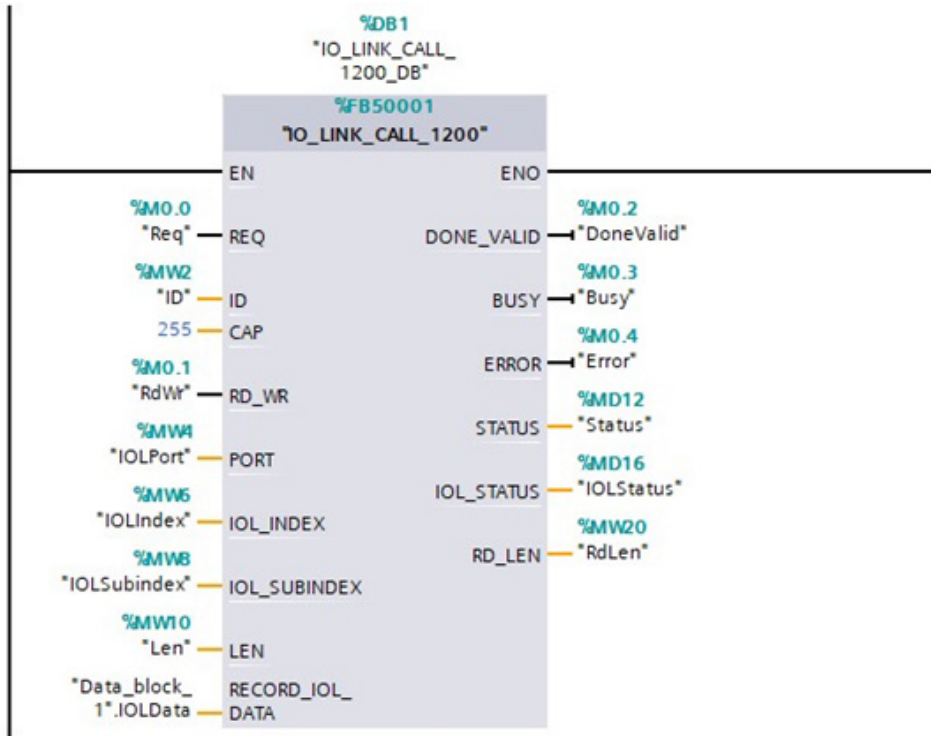
	Name	Data type	Address	Retain	Visibl...	Acces...	Comment
1	Req	Bool	%MO.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	ID	Hw_Io	%MW2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	RdWr	Bool	%MO.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	IOLPort	UInt	%MW4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
5	IOLIndex	UInt	%MW6	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
6	IOLSubindex	UInt	%MW8	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
7	Len	UInt	%MW10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
8	DoneValid	Bool	%MO.2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
9	Busy	Bool	%MO.3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
10	Error	Bool	%MO.4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
11	Status	DWord	%MD12	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
12	IOLStatus	DWord	%MD16	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
13	RdLen	UInt	%MW20	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

7. Add a new data block and create a 232-byte array, which will be used to store the ISDU data.

IO_Link_Library_Demo > PLC_1 [CPU 1212C AC/DC/Rly] > Program blocks > Data_block_1 [DB2]

	Name	Data type	Start value	Retain	Accessible f...	Visible in .
1	Static			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	IOLData	Array[0..231] of Byte		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

8. Insert IO_LINK_CALL.
 - a. Open the Main block.
 - b. From the Global libraries, select 82981502_IO_LINK_xxx | Types | S7-1200V2.2 | IO_LINK_CALL_1200 | V2.2.0 and insert it into a new network.
 - c. Enter the parameters using the above tags. Enter 255 for the parameter CAP.
 - d. Compile and download the project.



9. Test IO_LINK_CALL.
 - a. Create a new watch table and enter the parameters of IO_LINK_CALL.
 - b. Click the Monitor all button to start monitoring all tags.
 - c. Enter the hardware identifier of the IO-Link module as the modify value of tag ID.
 - d. Enter the IO-Link port number (1 based), index, subindex, and length of the requested ISDU as the modify value of the corresponding tags.
 - e. Finally set the Req tag to be true and click the Modify once button.

IO_Link_Library_Demo ▶ PLC_1 [CPU 1212C AC/DC/Rly] ▶ Watch and force tables ▶ Watch table_1						
	Name	Address	Display format	Monitor value	Modify value	
1	"Req"	%M0.0	Bool	<input checked="" type="checkbox"/> TRUE	TRUE	<input checked="" type="checkbox"/>
2	"ID"	%MW2	DEC	278	278	<input checked="" type="checkbox"/>
3	"RdWr"	%M0.1	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
4	"IOLPort"	%MW4	DEC	1	1	<input checked="" type="checkbox"/>
5	"IOLIndex"	%MW6	DEC	16	16	<input checked="" type="checkbox"/>
6	"IOLSubindex"	%MW8	DEC	0		<input type="checkbox"/>
7	"Len"	%MW10	DEC	32	32	<input checked="" type="checkbox"/>
8	"DoneValid"	%M0.2	Bool	<input checked="" type="checkbox"/> TRUE		<input type="checkbox"/>
9	"Busy"	%M0.3	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
10	"Error"	%M0.4	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
11	"Status"	%MD12	Hex	16#0000_0000		<input type="checkbox"/>
12	"IOLStatus"	%MD16	Hex	16#0000_0000		<input type="checkbox"/>
13	"RdLen"	%MW20	DEC	8		<input type="checkbox"/>
14		<Add new>				<input type="checkbox"/>

10. The IO_LINK_CALL is triggered on the positive edge of parameter REQ. Once completed, check the value of tag DoneValid, Busy, Error, Status, IOLStatus, and RdLen. If the ISDU request was completed successfully, the DoneValid should be true. The RdLen contains the number of bytes returned. The actual data is stored in Data_block_1.IOLData.

	Name	Data type	Start value	Monitor value	Retain	Accessible f...
1	Static				<input type="checkbox"/>	<input type="checkbox"/>
2	IOLData	Array[0..231] of Byte			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3	IOLData[0]	Byte	16#0	16#53	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	IOLData[1]	Byte	16#0	16#49	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	IOLData[2]	Byte	16#0	16#43	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	IOLData[3]	Byte	16#0	16#48	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	IOLData[4]	Byte	16#0	16#20	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	IOLData[5]	Byte	16#0	16#41	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	IOLData[6]	Byte	16#0	16#47	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10	IOLData[7]	Byte	16#0	16#00	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11	IOLData[8]	Byte	16#0	16#00	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12	IOLData[9]	Byte	16#0	16#00	<input type="checkbox"/>	<input checked="" type="checkbox"/>

11.5. Diagnostic Alarm

Events from IO-Link Master and IO-Link devices are mapped to PROFINET alarms and channel diagnostics according to the IO-Link on PROFINET Working Document Version 13.4.2015 with some modifications.

11.5.1. IO-Link Event Mapping Overview

IO-Link events are mapped into PROFINET Alarms and Channel Diagnostics using the following table. Each appearing IO-Link event (mode Coming) results in adding channel diagnostics. Each disappearing IO-Link event (mode Going) results in removing channel diagnostics. IO-Link events that have mode Single will be mapped to PROFINET process alarm.

IO-Link Event Mapping	
IO-Link Event Mode	PROFINET
Single	Process alarm
Coming	Add channel diagnostics
Going	Remove channel diagnostics

In addition, only IO-Link events that have the type of Error or Warning are mapped to PROFINET channel diagnostics. Type Message IO-Link events are not mapped.

11.5.2. IO-Link EventCode Mapping

IO-Link events that are generated by IO-Link devices (remote events) are mapped to PROFINET diagnostics using ChannelErrorType 0x500 and 0x501.

- For an EventCode that is between 0x0000 and 0x7FFF, ChannelErrorType 0x500 is used. The EventCode is directly mapped to ExtChannelErrorType.
- For an EventCode that is between 0x8000-0xFFFF, ChannelErrorType 0x501 is used. The EventCode is mapped to ExtChannelErrorType with the MSB set to 0.
- For IO-Link events that are generated by IO-Link Master (local events), ChannelErrorType 0x502 is used. EventCode is directly mapped to ExtChannelErrorType.

The following table summaries how IO-Link EventCode is mapped to PROFINET diagnostics.

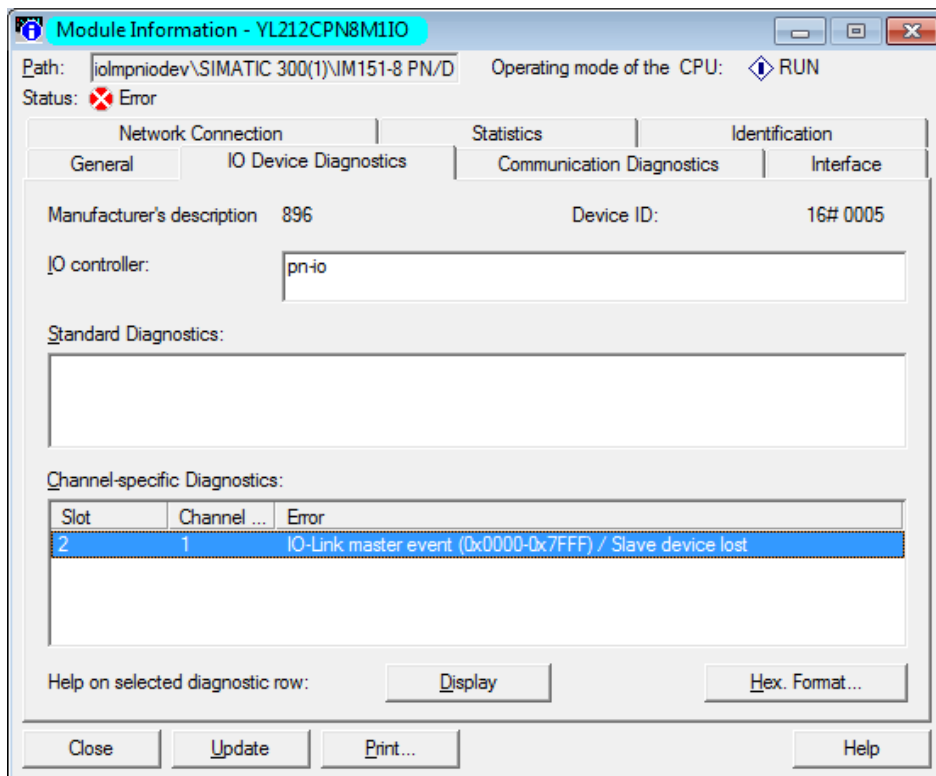
IO-Link EventCode Mapping				
Source	EventCode	Channel Error Type	Ext Channel Error Type	Comment
IO-Link Device (remote)	0x0000-0x7FFFF	0x500	0x0000-0x7FFFF	Direct mapping of EventCode to ExtChannelErrorType (e.g. EventCode 0x6321 will be mapped to ExtChannelErrorType 0x6321)
IO-Link Device (remote)	0x8000-0xFFFF	0x501	0x0000-0x7FFFF	Mapping of EventCode to ExtChannelErrorType. Set MSB (EventCode) to "0" (e.g. EventCode 0x8005 ExtChannelErrorType 0x0005)
IO-Link Master (local)	0x0000-0x7FFFF	0x502	0x0000-0x7FFFF	Direct mapping of local EventCode to ExtChannelErrorType

The following table lists some of the EventCode that the Carlo Gavazzi IO-Link Master generates.

IO-Link EventCode	ExtChannelErrorType	Description
0x0001	0x0001	Slave PDU Flow
0x0002	0x0002	Master PDU checksum error
0x0003	0x0003	Slave illegal PDU
0x0004	0x0004	Master illegal PDU
0x0005	0x0005	Slave PDU buffer
0x0006	0x0006	Slave PD INKR
0x0007	0x0007	Slave PD length
0x0008	0x0008	Slave no PDI
0x0009	0x0009	Slave no PDO
0x000A	0x000A	Slave channel
0x000B	0x000B	Master event
0x000C	0x000C	Application message
0x000D	0x000D	Application warning
0x000E	0x000E	Application device
0x000F	0x000F	Application parameter
0x0010	0x0010	Slave device lost
0x0012	0x0012	Slave DESINA

IO-Link EventCode	ExtChannelErrorType	Description
0x001A	0x001A	Slave wrong sensor
0x001B	0x001B	Slave retry
0x001E	0x001E	Power short circuit
0x001F	0x001F	Power sensor
0x0020	0x0020	Power actuator
0x0021	0x0021	Power fault
0x0022	0x0022	Power reset
0x0023	0x0023	Slave fallback
0x0024	0x0024	Master preoperate
0x0028	0x0028	Data storage ready
0x0029	0x0029	Data storage identity fault
0x002A	0x002A	Data storage size fault
0x002B	0x002B	Data storage upload fault
0x002C	0x002C	Data storage download fault
0x002F	0x002F	Data storage device locked fault

The following images show a Slave device lost event that was available in the diagnostics when an IO-Link device was disconnected from an IO-Link port. In the figure, Slot 2 means that the device was connected to IO-Link Port 2. The event will be removed from the diagnostics when the device is reconnected to the same IO-Link port.



STEP 7 V5.5: IO-Link Events Through PROFINET Channel Diagnostics

IOLM_UserGuide ▶ PLC_1 [CPU 1212C AC/DC/Rly]

Online access

- ▼ Diagnostics
 - General
 - Diagnostic status
 - Diagnostics buffer**
 - Cycle time
 - Memory
 - ▶ PROFINET interface [X1]
 - ▶ Functions

Diagnostics buffer

Events

Display CPU Time Stamps in PG/PC local time

No.	Date and time	Event	
1	30/08/2019 10:31:31.01...	IO-Link master event (0x0000-0x7FFF) - Slave device lost	
2	30/08/2019 10:31:31.00...	New I/O access error during process image update	
3	30/08/2019 10:20:59.31...	Follow-on operating mode change - CPU changes from STARTUP to RUN mode	
4	30/08/2019 10:20:59.31...	Follow-on operating mode change - CPU changes from STOP to STARTUP mode	
5	30/08/2019 10:20:55.02...	Follow-on operating mode change - CPU changes from STOP (initialization) to ...	
6	30/08/2019 10:20:54.58...	Power on - CPU changes from NO POWER to STOP (initialization) mode	
7	30/08/2019 10:20:54.58...	Power off - CPU changes from RUN to NO POWER mode	
8	30/08/2019 10:20:51.21...	New I/O access error during process image update	

Freeze display

Details on event:

Details on event: 1 of 50 Event ID: 16# 7D1F:CE0

Description: Error: IO-Link master event (0x0000-0x7FFF) - Slave device lost |> HW_ID= 281, Input/output channel number 1

TIA Portal V13: IO-Link Events Through PROFINET Channel Diagnostics

12. Modbus/TCP Interface

The IOLM provides a slave-mode Modbus/TCP interface that provides:

- Read access to the Process Data Input (PDI) and Process Data Output (PDO) data blocks for each IO-Link port
- Write access to the PDO data block for each IO-Link port
- Write access to send ISDU requests to each IO-Link port
- Read access to ISDU responses from each IO-Link port
- Read access to the Port Information Block for each IO-Link port

The Modbus interface is disabled by default.

- To enable Modbus/TCP:
1. Click Configuration | Modbus/TCP.
 2. Click the EDIT button in the Modbus/TCP Configuration table.
 3. Select enable in the Modbus Enable drop box.
 4. Click the SAVE button.



Modbus/TCP to IO-Link

Refer to Chapter 13. Functionality Descriptions on Page 118 for detailed information about process data block descriptions, event handling, and ISDU handling.

- 13.1.1.1. Input Process Data Block-8 Bit Data Format on Page 119
- 13.1.1.2. Input Process Data Block-16 Bit Data Format on Page 120
- 13.1.1.3. Input Process Data Block-32 Bit Data Format on Page 120
- 13.1.2.1. Output Process Data Block-8 Bit (SINT) Data Format on Page 121
- 13.1.2.2. Output Process Data Block-16 Bit (IINT) Data Format on Page 122
- 13.1.2.3. Output Process Data Block-32 Bit (DINT) Data Format on Page 123
- 13.2. Event Handling on Page 124

12.1. Modbus Function Codes

This table shows the supported Modbus function codes.

Message Type	Function Code	Maximum Message Size
Read Holding Registers	3	250 Bytes (125 Words)
Write Single Register	6	2 bytes (1 Word)
Write Multiple Registers	16 (10 hex)	246 Bytes (123 Words)
Read/Write Holding Registers	23 (17 hex)	Write: 242 bytes (121 Words) Read: 246 bytes (123 Words)

12.2. Modbus Address Definitions

This table shows the supported Modbus function codes.

	IO-Link Port 1	IO-Link Port 2	IO-Link Port 3	IO-Link Port 4	Access	Length
Multiple Port PDI Data Block(s)	999 (Base 0) 1000 (Base 1)	1999 (Base 0) 2000 (Base 1)	2999 (Base 0) 3000 (Base 1)	3999 (Base 0) 4000 (Base 1)	Read- Only	Configurable per port (s)
Port Specific PDI Data Block	1000 (Base 0) 1001 (Base 1)	2000 (Base 0) 2001 (Base 1)	3000 (Base 0) 3001 (Base 1)	4000 (Base 0) 4001 (Base 1)	Read- Only	Configurable per port
Multiple Port PDO Data Block(s)	1049 (Base 0) 1050 (Base 1)	2049 (Base 0) 2050 (Base 1)	3049 (Base 0) 3050 (Base 1)	4049 (Base 0) 4050 (Base 1)	Read- Only	Configurable per port (s)
Port Specific PDO Data Block	1050 (Base 0) 1051 (Base 1)	2050 (Base 0) 2051 (Base 1)	3050 (Base 0) 3051 (Base 1)	4050 (Base 0) 4051 (Base 1)	Read- Only	Configurable per port
Receive ISDU Response	1100 (Base 0) 1101 (Base 1)	2100 (Base 0) 2101 (Base 1)	3100 (Base 0) 3101 (Base 1)	4100 (Base 0) 4101 (Base 1)	Read- Only	4 to 125 Words
Transmit ISDU Request	1300 (Base 0) 1301 (Base 1)	2300 (Base 0) 2301 (Base 1)	3300 (Base 0) 3301 (Base 1)	4300 (Base 0) 4301 (Base 1)	Write- Only	4 to 123 Words
Port Information Block (Continuous Block)						232 Words
Vendor Name	1500 (Base 0) 1501 (Base 1)	2500 (Base 0) 2501 (Base 1)	3500 (Base 0) 3501 (Base 1)	4500 (Base 0) 4501 (Base 1)	Read- Only	64 Chars 32 Words
Vendor Text	1532 (Base 0) 1533 (Base 1)	2532 (Base 0) 2533 (Base 1)	3532 (Base 0) 3533 (Base 1)	4532 (Base 0) 4533 (Base 1)	Read- Only	64 Chars 32 Words
Product Name	1564 (Base 0) 1565 (Base 1)	2564 (Base 0) 2565 (Base 1)	3564 (Base 0) 3565 (Base 1)	4564 (Base 0) 4565 (Base 1)	Read- Only	64 Chars 32 Words
Product Id	1596 (Base 0) 1597 (Base 1)	2596 (Base 0) 2597 (Base 1)	3596 (Base 0) 3597 (Base 1)	4596 (Base 0) 4597 (Base 1)	Read- Only	64 Chars 32 Words
Product Text	1628 (Base 0) 1629 (Base 1)	2628 (Base 0) 2629 (Base 1)	3628 (Base 0) 3629 (Base 1)	4628 (Base 0) 4629 (Base 1)	Read- Only	64 Chars 32 Words
Serial Number	1660 (Base 0) 1661 (Base 1)	2660 (Base 0) 2661 (Base 1)	3660 (Base 0) 3661 (Base 1)	4660 (Base 0) 4661 (Base 1)	Read- Only	16 Chars 8 Words
Hardware Revision	1668 (Base 0) 1669 (Base 1)	2668 (Base 0) 2669 (Base 1)	3668 (Base 0) 3669 (Base 1)	4668 (Base 0) 4669 (Base 1)	Read- Only	64 Chars 32 Words
Firmware Revision	1700 (Base 0) 1701 (Base 1)	2700 (Base 0) 2701 (Base 1)	3700 (Base 0) 3701 (Base 1)	4700 (Base 0) 4701 (Base 1)	Read- Only	64 Chars 32 Words
Device PDI Length	1732 (Base 0) 1733 (Base 1)	2732 (Base 0) 2733 (Base 1)	3732 (Base 0) 3733 (Base 1)	4732 (Base 0) 4733 (Base 1)	Read- Only	1 Word
Device PDO Length	1733 (Base 0) 1734 (Base 1)	2733 (Base 0) 2734 (Base 1)	3733 (Base 0) 3734 (Base 1)	4733 (Base 0) 4734 (Base 1)	Read- Only	1 Word

12.2.1. 8-Port Models

	IO-Link Port 5	IO-Link Port 6	IO-Link Port 7	IO-Link Port 8	Access	Length
Multiple Port PDI Data Block(s)	4999 (Base 0) 5000 (Base 1)	5999 (Base 0) 6000 (Base 1)	6999 (Base 0) 7000 (Base 1)	7999 (Base 0) 8000 (Base 1)	Read- Only	Configurable per port (s)
Port Specific PDI Data Block	5000 (Base 0) 5001 (Base 1)	6000 (Base 0) 6001 (Base 1)	7000 (Base 0) 7001 (Base 1)	8000 (Base 0) 8001 (Base 1)	Read- Only	Configurable per port
Multiple Port PDO Data Block(s)	5049 (Base 0) 5050 (Base 1)	6049 (Base 0) 6050 (Base 1)	7049 (Base 0) 7050 (Base 1)	8049 (Base 0) 8050 (Base 1)	Read- Only	Configurable per port (s)
Port Specific PDO Data Block	5050 (Base 0) 5051 (Base 1)	6050 (Base 0) 6051 (Base 1)	7050 (Base 0) 7051 (Base 1)	8050 (Base 0) 8051 (Base 1)	Read- Only	Configurable per port
Receive ISDU Response	5100 (Base 0) 5101 (Base 1)	6100 (Base 0) 6101 (Base 1)	7100 (Base 0) 7101 (Base 1)	8100 (Base 0) 8101 (Base 1)	Read- Only	4 to 125 Words
Transmit ISDU Request	5300 (Base 0) 5301 (Base 1)	6300 (Base 0) 6301 (Base 1)	7300 (Base 0) 7301 (Base 1)	8300 (Base 0) 8301 (Base 1)	Write- Only	4 to 123 Words
Port Information Block (Continuous Block)						232 Words
Vendor Name	5500 (Base 0) 5501 (Base 1)	6500 (Base 0) 6501 (Base 1)	7500 (Base 0) 7501 (Base 1)	8500 (Base 0) 8501 (Base 1)	Read- Only	64 Chars 32 Words
Vendor Text	5532 (Base 0) 5533 (Base 1)	6532 (Base 0) 6533 (Base 1)	7532 (Base 0) 7533 (Base 1)	8532 (Base 0) 8533 (Base 1)	Read- Only	64 Chars 32 Words
Product Name	5564 (Base 0) 5565 (Base 1)	6564 (Base 0) 6565 (Base 1)	7564 (Base 0) 7565 (Base 1)	8564 (Base 0) 8565 (Base 1)	Read- Only	64 Chars 32 Words
Product Id	5596 (Base 0) 5597 (Base 1)	6596 (Base 0) 6597 (Base 1)	7596 (Base 0) 7597 (Base 1)	8596 (Base 0) 8597 (Base 1)	Read- Only	64 Chars 32 Words
Product Text	5628 (Base 0) 5629 (Base 1)	6628 (Base 0) 6629 (Base 1)	7628 (Base 0) 7629 (Base 1)	8628 (Base 0) 8629 (Base 1)	Read- Only	64 Chars 32 Words
Serial Number	5660 (Base 0) 5661 (Base 1)	6660 (Base 0) 6661 (Base 1)	7660 (Base 0) 7661 (Base 1)	8660 (Base 0) 8661 (Base 1)	Read- Only	16 Chars 8 Words
Hardware Revision	5668 (Base 0) 5669 (Base 1)	6668 (Base 0) 6669 (Base 1)	7668 (Base 0) 7669 (Base 1)	8668 (Base 0) 8669 (Base 1)	Read- Only	64 Chars 32 Words
Firmware Revision	5700 (Base 0) 5701 (Base 1)	6700 (Base 0) 6701 (Base 1)	7700 (Base 0) 7701 (Base 1)	8700 (Base 0) 8701 (Base 1)	Read- Only	64 Chars 32 Words
Device PDI Length	5732 (Base 0) 5733 (Base 1)	6732 (Base 0) 6733 (Base 1)	7732 (Base 0) 7733 (Base 1)	8732 (Base 0) 8733 (Base 1)	Read- Only	1 Word
Device PDO Length	5733 (Base 0) 5734 (Base 1)	6733 (Base 0) 6734 (Base 1)	7733 (Base 0) 7734 (Base 1)	8733 (Base 0) 8734 (Base 1)	Read- Only	1 Word

12.3. Multiple Port Process Data (PDI/PDO) Access via Modbus/TCP

The process data has been grouped together in order to minimize the number of Modbus messages required to interface to the IO-Link master. The PDI and PDO data for multiple ports can be received or transmitted by one message.

	Modbus Holding Register Address (Base 1)	Controller Port 1 Access		Controller Port 2 Access		Controller Port 3 Access		Controller Port 4 Access	
		Read (Input)	Write (Output)	Read (Input)	Write (Output)	Read (Input)	Write (Output)	Read (Input)	Write (Output)
Read (Input) Process Data Input	1000 (Port 1)								
	2000 (Port 2)								
	3000 (Port 3)								
	4000 (Port 4)								
Read (Input) Process Data Input	1050 (Port 1)								
	2050 (Port 2)								
	3050 (Port 3)								
	4050 (Port 4)								
Write (Output) Process Data Input	1050 (Port 1)								
	2050 (Port 2)								
	3050 (Port 3)								
	4050 (Port 4)								

	Modbus Holding Register Address (Base 1)	Controller Port 5 Access		Controller Port 6 Access		Controller Port 7 Access		Controller Port 8 Access	
		Read (Input)	Write (Output)	Read (Input)	Write (Output)	Read (Input)	Write (Output)	Read (Input)	Write (Output)
Read (Input) Process Data Input	5000 (Port 5)								
	6000 (Port 6)								
	7000 (Port 7)								
	8000 (Port 8)								
Read (Input) Process Data Input	5050 (Port 5)								
	6050 (Port 6)								
	7050 (Port 7)								
	8050 (Port 8)								
Write (Output) Process Data Input	5050 (Port 5)								
	6050 (Port 6)								
	7050 (Port 7)								
	8050 (Port 8)								

To receive and transmit process data for eight ports, it may be necessary to adjust the size of the PDI/PDO data blocks.

Modbus Read/Write Access where:

- All PDI data can be read with one Modbus Read Holding Registers message.
- All PDO data can be read with one Modbus Read Holding Registers read message.
- All PDO data can be written with one Modbus Write Holding Registers message.
- Controller Read access:
 - The PDI data from one or more ports may be read with one message. (i.e.: If addressing port 1, at address 1000, ports one to four may be read in one message.)
 - The PDO data from one or more ports may be read with one message. (i.e.: If addressing port 1, at address 1050, ports one to four may be read in one message.)
 - Partial PDI and PDO data reads are allowed.
 - The length of the Read message can range from 1 to the total, configured PDI or PDO length for all ports starting at the addressed port.
- Controller Write (Output) access:
 - Only PDO data may be written.
 - The PDO data for one or more ports may be written with one Write Holding Registers message.
 - Partial PDO data writes are not allowed.

- The length of the Write message must be equal to the total of the configured PDO lengths for all ports to be written. The one exception is that the data length of the last port to be written must be equal to or greater than the device PDO length for that port.

13. Functionality Descriptions

This chapter discusses the following for Modbus/TCP:

- Process Data Block Descriptions on Page 118
- Event Handling on Page 124
- ISDU Handling on Page 127

13.1. Process Data Block Descriptions

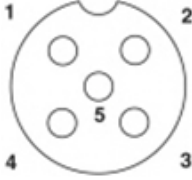
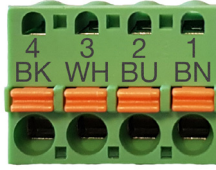
This subsection discusses the following:

- Input Process Data Block Description
- Output Process Data Block Description on Page 120

13.1.1. Input Process Data Block Description

The Input Process Data Block format is dependent on the configured PDI Data Format. The following tables describe the Input Process Data Block in the possible formats.

Parameter Name	Data Type	Description
Port status	BYTE	<p>The status of the IO-Link device.</p> <p>Bit 0 (0x01): 0 = IO-Link port communication initialization process is inactive 1 = IO-Link port communication initialization process is active</p> <p>Bit 1 (0x02): 0 = IO-Link port communication is not operational 1 = IO-Link port communication is operational</p> <p>Bit 2 (0x04): 0 = IO-Link input process data is not valid. 1 = IO-Link input process data is valid.</p> <p>Bit 3 (0x08): 0= No fault detected 1= Fault detected</p> <ul style="list-style-type: none"> • A minor communication fault is indicated by the Operational status bit being set to 1. A minor communication fault results from: <ul style="list-style-type: none"> - A temporary loss of communication to the IO-Link device. - A recoverable IOLM software or hardware fault. • A major communication fault is indicated by the Operational bit being set to 0. <ul style="list-style-type: none"> - An unrecoverable loss of communication to the IO-Link device. - An unrecoverable IOLM software or hardware fault. <p>Bits 4-7: Reserved (0)</p>

Parameter Name	Data Type	Description
Auxiliary I/O	BYTE	<p>The auxiliary bit on the IO-Link port is:</p> <ul style="list-style-type: none"> Pin 2 on the IOLM YN115, and YL212  <ul style="list-style-type: none"> DI (labeled as 3 on the device) on the IOLM YN115  <p>Bit 0 (0x01): The status of the auxiliary bit. 0 = off 1 = on</p> <p>Bits 1-3: Reserved (0) If Include Digital I/O in PDI Data Block is disabled:</p> <p>Bits 4-7: Reserved (0)</p> <p>IOLM YN115 - Dedicated DIO Ports Only If Include Digital I/O in PDI Data Block is enabled:</p> <p>Bits 4-7:</p> <ul style="list-style-type: none"> Bit 4 (0x10) – D1 = DI status Bit 5 (0x20) – D2 = DIO status Bit 6 (0x40) – D3 = D2 status Bit 7 (0x80) – D4 = DIO status
Event Code	INT	16-bit event code received from the IO-Link device.
PDI Data Default Length = 32 bytes	Array of up to 32 BYTEs	The PDI data as received from the IO-Link device. May contain from 0 to 32 bytes of PDI data. The definition of the PDI data is device dependent. Note: Length is configurable using the web page interface.

13.1.1.1. Input Process Data Block-8 Bit Data Format

The following table provides detailed information about the Input Process Data Block-8 Bit data format.

Byte	Bit 7	Bit 0
0	Port Status	
1	Auxiliary I/O	
2	Event Code LSB	
3	Event Code MSB	
4	PDI Data Byte 0	
5	PDI Data Byte 1	
..	..	
..	..	
N+3	PDI Data Byte (N-1)	

13.1.1.2. Input Process Data Block-16 Bit Data Format

The following table provides detailed information about the Input Process Data Block-16 data format.

Word	Bit 15	Bit 8	Bit 7	Bit 0
0	Port Status		Auxiliary I/O	
1	Event Code			
2	PDI Data Word 0			
3	PDI Data Word 1			
..	..			
..	..			
N+1	PDI Data Word (N-1)			

13.1.1.3. Input Process Data Block-32 Bit Data Format

The following table provides detailed information about the Input Process Data Block-32 Bit data format.

Long word	Bit 315	Bit 24	Bit 23	Bit 16	Bit 15	Bit 0
0	Port Status		Auxiliary I/O		Event Code	
2	PDI Data Long Word 0					
3	PDI Data Long Word 1					
..	..					
N	PDI Data Long Word (N-1)					

13.1.2. Output Process Data Block Description

The contents of the Output Process Data Block are configurable.

Parameter Name	Data	Description
Clear Event Code in PDO Block (Configurable option) <i>Default: Not included</i>	INT	If included, allows clearing of 16-bit event code received in the PDI data block via the PDU data block.
Include Digital Output(s) in PDO Data Block <i>Default: Not included</i>	INT	If included, allows setting the Digital Output Pins D2 and D4.
PDO Data <i>Default Length = 32 bytes</i>	Array of up to 32 BYTES	The PDO data written to the IO-Link device. May contain from 0 to 32 bytes of PDO data. The definition and length of the PDO data is device dependent. Note: Length is configurable via web page interface.

13.1.2.1. Output Process Data Block-8 Bit (SINT) Data Format

Without either the Clear Event Code in PDO Block or Include Digital Output(s) in PDO Data Block options selected:

Byte	Bit 7	Bit 0
0	PDO Data Byte 0	
1	PDO Data Byte 1	
..	..	
..	..	
N-1	PDO Data Byte (N-1)	

With the Clear Event Code in PDO Block option selected and without the Include Digital Output(s) in PDO Data Block option selected:

Byte	Bit 7	Bit 0
0	Event Code LSB	
1	Event Code MSB	
2	PDO Data Byte 0	
3	PDO Data Byte 1	
..	..	
..	..	
N+1	PDO Data Byte (N-1)	

With both the Clear Event Code in PDO Block and Include Digital Output(s) in PDO Data Block options selected:

Byte	Bit 7	Bit 0
0	Event code LSB	
1	Event code MSB	
2	Digital Output Settings: Bit 1 (0x02) - DI setting Bit 3 (0x08) - C/Q setting	
3	0 (Unused)	
4	PDO Data Byte 0	
5	PDO Data Byte 1	
..	..	
..	..	
N + 3	PDO Data Byte (N-1)	

13.1.2.2. Output Process Data Block-16 Bit (INT) Data Format

Without either the Clear Event Code in PDO Block or Include Digital Output(s) in PDO Data Block options selected:

Word	Bit 15	Bit 0
0	PDO Data Word 0	
1	PDO Data Word 1	
..	..	
..	..	
N-1	PDO Data Word (N-1)	

With the Clear Event Code in PDO Block option selected and without the Include Digital Output(s) in PDO Data Block option selected:

Word	Bit 15	Bit 0
0	Event Code	
1	PDO Data Word 0	
2	PDO Data Word 1	
..	..	
..	..	
N	PDO Data Word (N-1)	

With both the Clear Event Code in PDO Block and Include Digital Output(s) in PCO Data Block options selected:

Word	Bit 15	Bit 0
0	Event code	
1	Digital Output Settings: Bit 1 (0x02) - DI setting Bit 3 (0x08) - C/Q setting	
2	PDO Data Word 0	
3	PDO Data Word 1	
..	..	
..	..	
N + 1	PDO Data Word (N-1)	

13.1.2.3. Output Process Data Block-32 Bit (DINT) Data Format

Without either the Clear Event Code in PDO Block or Include Digital Output(s) in PDO Data Block options selected:

Long word	Bit 31	Bit 0
0	PDO Data Long Word 0	
1	PDO Data Long Word 1	
..	..	
..	..	
N-1	PDO Data Long Word (N-1)	

With the Clear Event Code in PDO Block option selected and without the Include Digital Output(s) in PDO Data Block option selected:

Long word	Bit 31	Bit 16	Bit 15	Bit 0
0	0		Event code	
1	PDO Data Long Word 0			
2	PDO Data Long Word 1			
..	..			
..	..			
N-1	PDO Data Long Word (N-1)			

With both the Clear Event Code in PDO Block and Include Digital Output(s) in PDO Data Block options selected:

Long word	Bit 31	Bit 16	Bit 15	Bit 0
0	Digital Output Settings: Bit 17 (0x2000) – DI setting Bit 19 (0x8000) – C/Q setting		Event code	
1	PDO Data Long Word 0			
2	PDO Data Long Word 1			
..	..			
..	..			
N-1	PDO Data Long Word (N-1)			

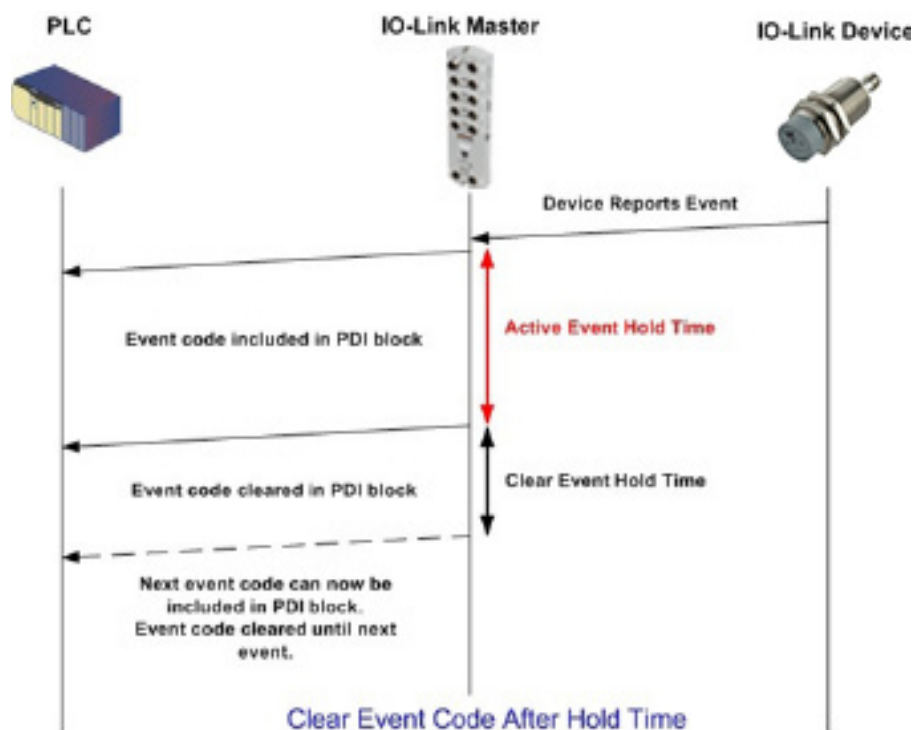
13.2. Event Handling

The IOLM event handling is designed to provide real-time updates of event codes received directly from the IO-Link device. The IO-Link event code:

- Is included in the second 16-bit word of the Input Process Data (PDI) block.
 - An active event is indicated by a non-zero value.
 - Inactive or no event is indicated by a zero value.
 - Two methods are provided to clear an event:
 - Enable the Clear Event After Hold Time option.
 - The IOLM keeps, or holds, the active event code in the PDI block until the configured Active Event Hold Time has passed.
 - The IOLM then clears the event code in the PDI block and waits until the Clear Event Hold Time has passed before including another event code in the PDI block.
 - Enable the Clear Event In PDO Block option.
 - The IOLM monitors the PDO block received from the PLC.
 - The IOLM expects the first entry of the PDO block to indicate an event code to be cleared.
 - If there is an active event code in the PDI block and the PDO block both contain the same event code, the event code is cleared in the PDI block.
 - The IOLM then clears event code in the PDI block and waits until the Clear Event Hold Time has passed before including another event code in the PDI block.
 - The two methods can be used separately or together to control clearing of events.
- The next subsections illustrate the event clearing process for the various event configurations.

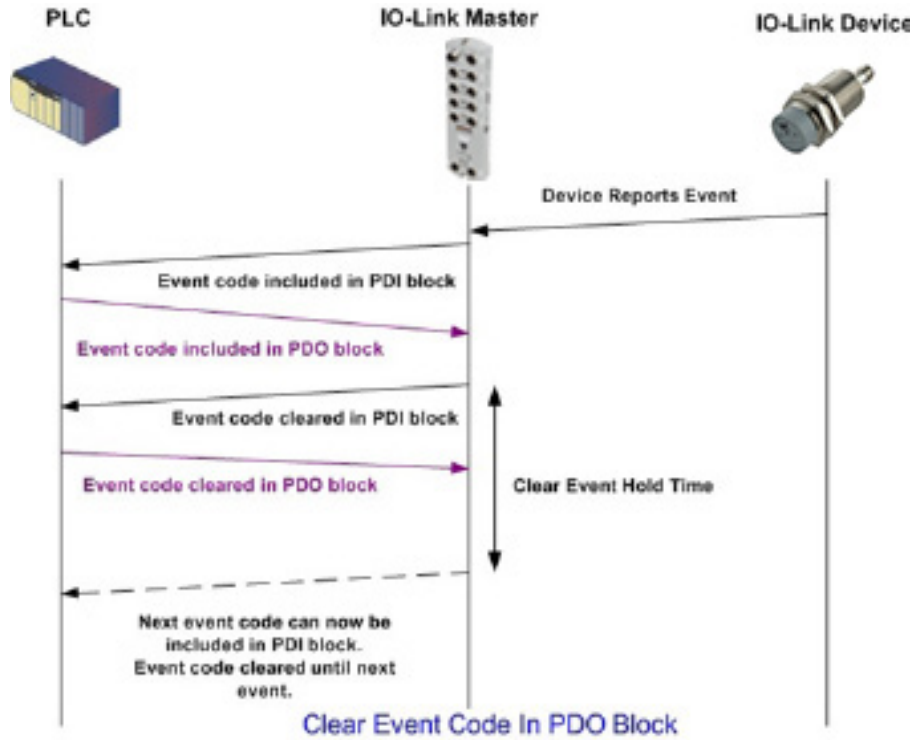
13.2.1. Clear Event After Hold Time Process

This illustrates clearing the event after the hold time process.



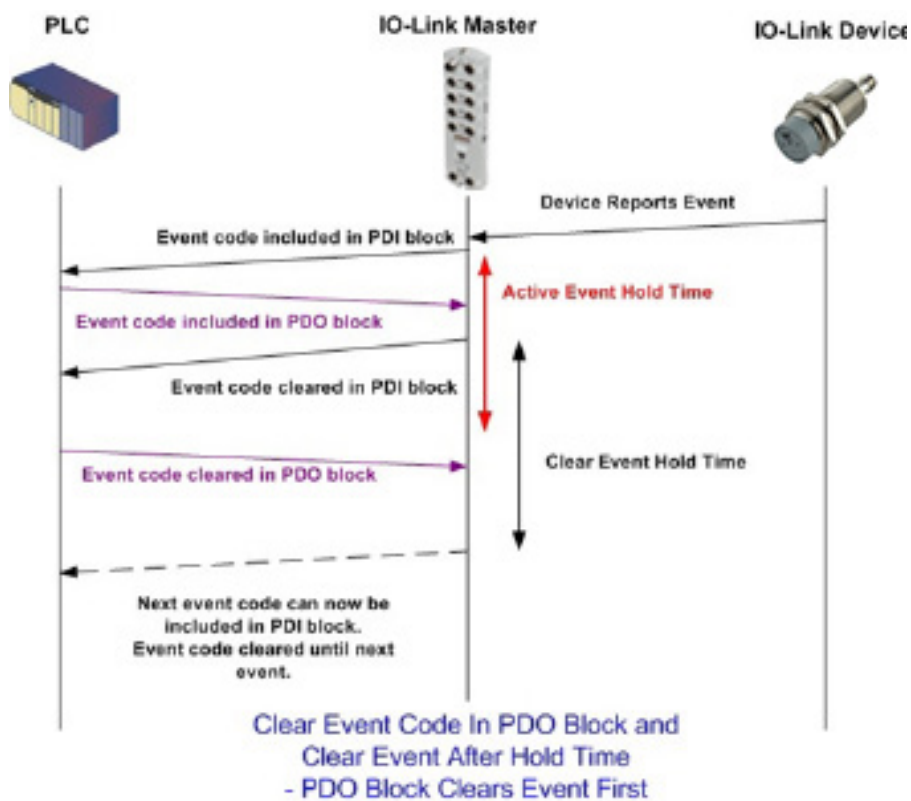
13.2.2. Clear Event in PDO Block Process

This illustrates clearing the event in the PDO block process.



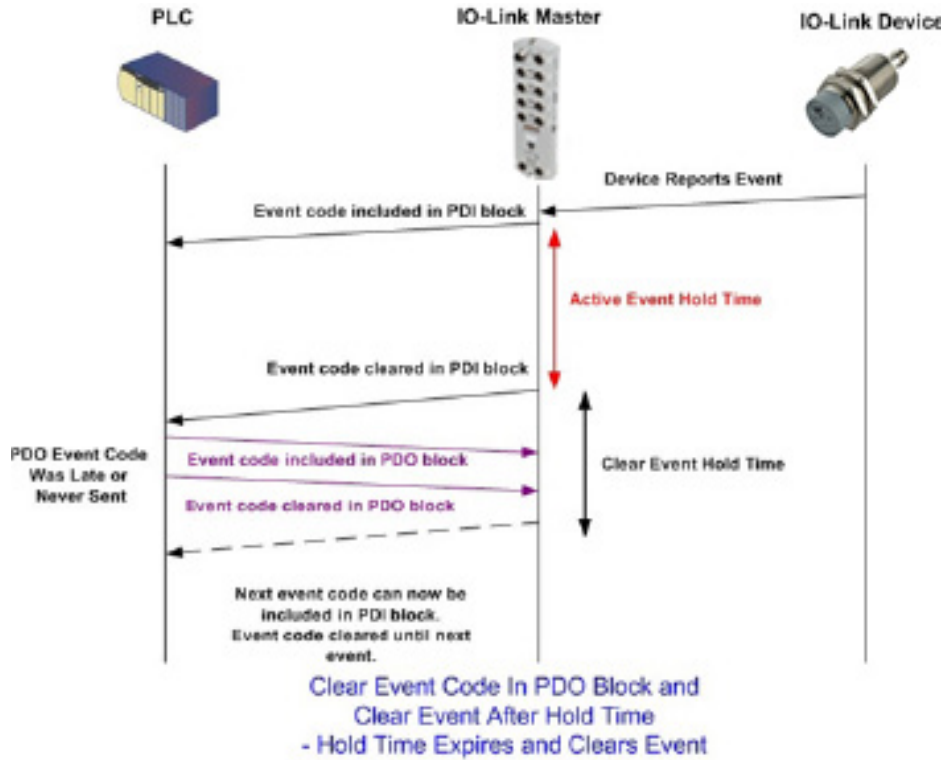
13.2.3. Clear Event Code in PDO Block and Clear Event After Hold Time Process- PDO Block First

This illustrates clearing the event code in the PDO block and clearing the event after the hold time process with the PDO block first.



13.2.4. Clear Event Code in PDO Block and Clear Event After Hold Time Process- Hold Time Expires

This illustrates clearing the event code in the PDO block and clearing the event after the hold time process with the hold time expired.



13.3. ISDU Handling

The IOLM provides a very flexible ISDU interface that is used by all supported industrial protocols. The ISDU interface contains the following:

- An ISDU request may contain one or multiple individual ISDU read and/or write commands.
- Individual ISDU command based byte swapping capabilities.
- Variable sized command structures to allow access to wide range of ISDU block sizes.
- A single ISDU request may contain as many ISDU read and/or write commands as allowed by the industrial protocol payload. For example, if an industrial protocol provides up to 500 byte read/write payloads, then an ISDU request may contain multiple commands of various lengths that can total up to 500 bytes in length.
- For the ControlLogix family of EtherNet/IP PLCs, both blocking and non-blocking ISDU request methods are provided.
 - The IOLM implements blocking ISDU requests by not responding to an ISDU request message until all commands have been processed.
 - The IOLM implements non-blocking ISDU requests by:
 - Responding to an ISDU request message immediately after receiving and verifying the ISDU request.
 - Requiring the PLC to monitor the ISDU request status with read messages. The IOLM will not return a completed status until all of the ISDU commands have been processed.

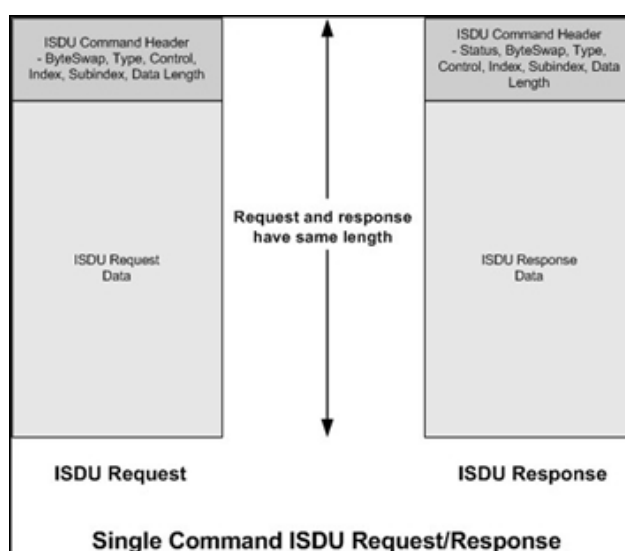
13.3.1. ISDU Request/Response Structure

ISDU requests may contain a single command or multiple, nested commands. This subsection discusses the following:

- Single ISDU Command Request on Page 127
- Multiple ISDU Command Structure on Page 128

13.3.1.1. Single ISDU Command Request

This illustrates a single ISDU command request.

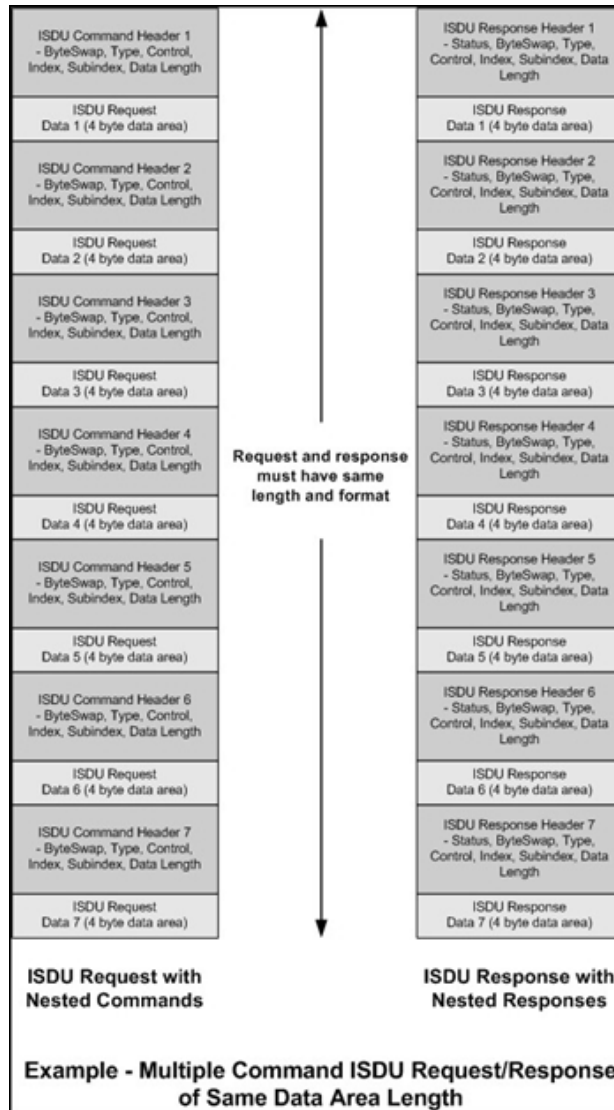


13.3.1.2. Multiple ISDU Command Structure

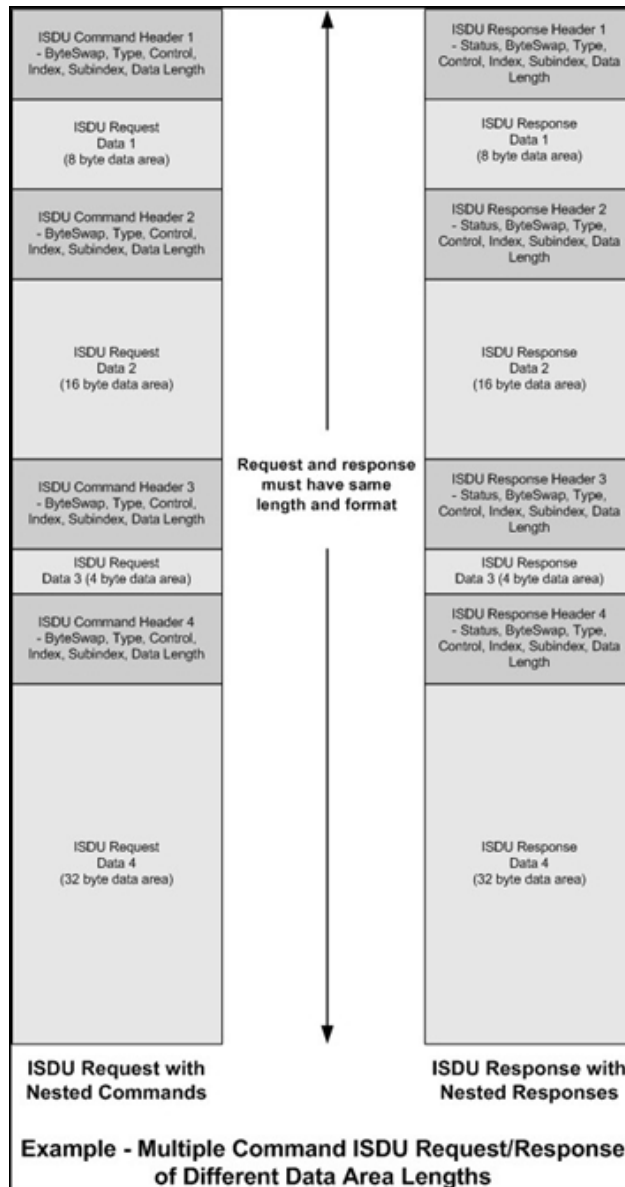
ISDU requests with multiple commands may consist of commands of the same data size or commands with different data sizes. The following are two examples of multiple ISDU commands.

- ISDU commands of same data size (Page 128)
- ISDU commands of different data sizes (Page 129)

Multiple Command ISDU Request/Response of Same Data Area Length



Multiple Command ISDU Request/Response of Different Data Lengths



13.3.2. ISDU Request Message Format-From PLC to IOLM

Write and read ISDU commands have the same message data format. Each ISDU request message is comprised of one or more commands. The command(s) can consist of either a series of nested commands or a single read command.

Note: A list of nested ISDU commands is terminated with either a control field of 0, (single/last operation), or the end of the message data.

13.3.2.1. Standard ISDU Request Command Format

This table displays a standard ISDU request command format with ControlLogix PLCs.

Name	Data type	Parameter Descriptions
Byte Swapping	USINT	Bits 0-3: 0= No byte swapping. 1= 16-bit (INT) byte swapping of ISDU data. 2= 32-bit (DINT) byte swapping of ISDU data. Bits 4-7: Set to zero. Unused.
RdWrControlType	USINT	Provides the control and type of ISDU command. Bits 0-3, Type Field: 0 = NOP (No operation) 1 = Read operation 2 = Write operation 3 = Read/Write "OR" 4 = Read/Write "AND" Bits 4-7, Control Field: 0 = Single/Last Operation (length can vary from to 1 to 232) 1 = Nested batch command – fixed 4 byte data area 2 = Nested batch command – fixed 8 byte data area 3 = Nested batch command – fixed 16 byte data area 4 = Nested batch command – fixed 32 byte data area 5 = Nested batch command – fixed 64 byte data area 6 = Nested batch command – fixed 128 byte data area 7 = Nested batch command – fixed 232 byte data area
Index	UINT	The parameter address of the data object in the IO-Link device.
Subindex	UINT	The data element address of a structured parameter of the data object in the IO-Link device.
Datalength	UINT	Length of data to read or write. For nested batch commands, the data length can vary from 1 to the fixed data area size.
Data	Array of USINTs, UINTs, or UDINTs.	Size of array is determined by the Control field in RdWrControlType. Note: Data is valid only for write commands.

13.3.2.2. Integer (16-Bit Word) ISDU Request Command Format

This table shows an integer (16 bit word) ISDU request command format with a SLC, MicroLogix, PLC-5, or Modbus/TCP.

Name	Data type	Parameter Descriptions
Byte Swapping/ RdWrControlType	USINT	<p>Provides the control and type of ISDU command.</p> <p>Bits 0-3, Type Field: 0 = NOP (No operation) 1 = Read operation 2 = Write operation 3 = Read/Write "OR" 4 = Read/Write "AND"</p> <p>Bits 4-7, Control Field: 0 = Single/Last Operation (length can vary from 1 to 232) 1 = Nested batch command – fixed 4 byte data area 2 = Nested batch command – fixed 8 byte data area 3 = Nested batch command – fixed 16 byte data area 4 = Nested batch command – fixed 32 byte data area 5 = Nested batch command – fixed 64 byte data area 6 = Nested batch command – fixed 128 byte data area 7 = Nested batch command – fixed 232 byte data area</p> <p>Bits 8-11: 0 = No byte swapping. 1 = 16-bit (INT) byte swapping of ISDU data. 2 = 32-bit (DINT) byte swapping of ISDU data.</p> <p>Bits 12-15: Set to zero. Unused.</p>
Index	UINT	The parameter address of the data object in the IO-Link device.
Subindex	UINT	The data element address of a structured parameter of the data object in the IO-Link device.
Datalength	UINT	Length of data to read or write. For nested batch commands, the data length can vary from 1 to the fixed data area size.
Data	Array of USINTs, UINTs, or UDINTs.	Size of array is determined by the Control field in RdWrControlType. Note: Data is valid only for write commands.

13.3.3. ISDU Response Message Format

The ISDU responses have the same data format as requests with the only exception being the returned command status. Each ISDU response message is comprised of one or more responses to the single and/or nested command(s) received in the request.

13.3.3.1. Standard ISDU Response Command Format

The following table show the standard ISDU response command format with ControlLogix PLCs.

Name	Data type	Parameter Descriptions
Byte Swapping	USINT	Indicates the byte alignment and status of the command response. Byte swapping, bits 0-3: 0= No byte swapping. 1= 16-bit (INT) byte swapping of TX/RX ISDU data. 2= 32-bit (DINT) byte swapping of TX/RX ISDU data. Status, bits 4-7: 0 = NOP (No operation) 1 = In process (Only valid for non-blocking requests) 2 = Success 3 = Failure: IO-Link device rejected the request. 4 = Timed out: IO-Link device did not respond
RdWrControlType	USINT	Provides the control and type of ISDU request Bits 0-3, Type Field: 0 = NOP (No operation) 1 = Read operation 2 = Write operation 3 = Read/Write "OR" 4 = Read/Write "AND" Bits 4-7, Control Field: 0 = Single/Last Operation (length can vary from to 1 to 232) 1 = Nested batch command – fixed 4 byte data area 2 = Nested batch command – fixed 8 byte data area 3 = Nested batch command – fixed 16 byte data area 4 = Nested batch command – fixed 32 byte data area 5 = Nested batch command – fixed 64 byte data area 6 = Nested batch command – fixed 128 byte data area 7 = Nested batch command – fixed 232 byte data area
Index	UINT	The parameter address of the data object in the IO-Link device.
Subindex	UINT	The data element address of a structured parameter of the data object in the IO-Link device.
Datalength	UINT	Length of data that was read or written. For nested batch commands, the data length can vary from 1 to fixed data area size.
Data	Array of USINTs, UINTs, or UDINTs.	Data required for read commands. Optionally can return the data of a write command. The size of the array is determined by the Control field in the RdWrControlType. Note: Data field not required for single NOP commands.

13.3.3.2. Integer (16-Bit Word) ISDU Response Command Format

The following table shows an integer (16-bit word) ISDU response command format with SLC, MicroLogix, PLC-5, or Modbus/TCP.

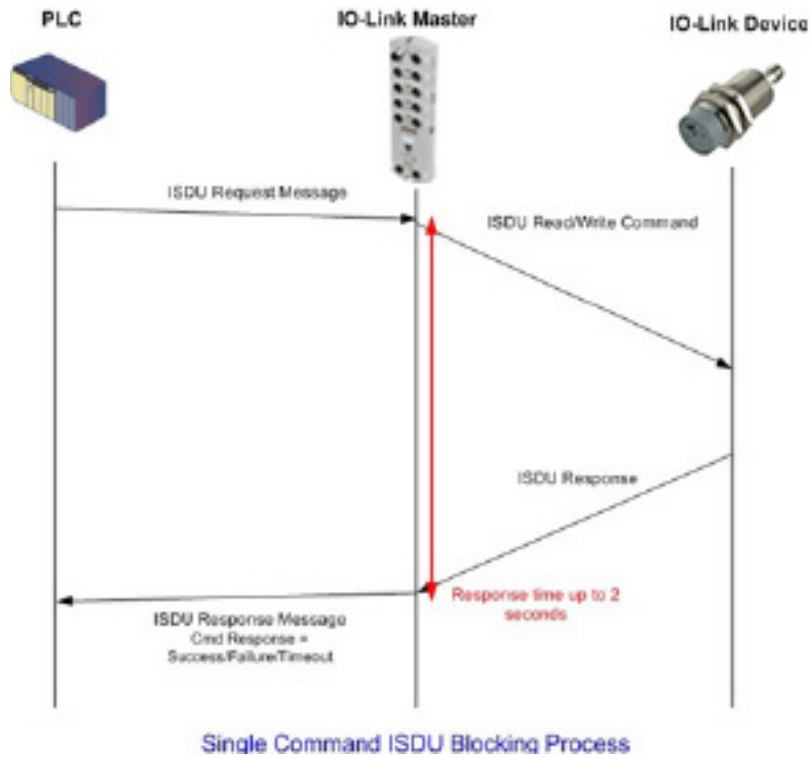
Name	Data type	Parameter Descriptions
Status, Byte Swapping, RdWrControlType	USINT	<p>Indicates the control, type, byte swapping and status of the ISDU command.</p> <p>Bits 0-3, Type Field: 0 = NOP (No operation) 1 = Read operation 2 = Write operation 3 = Read/Write "OR" 4 = Read/Write "AND"</p> <p>Bits 4-7, Control Field: 0 = Single/Last Operation (length can vary from 1 to 232) 1 = Nested batch command – fixed 4 byte data area 2 = Nested batch command – fixed 8 byte data area 3 = Nested batch command – fixed 16 byte data area 4 = Nested batch command – fixed 32 byte data area 5 = Nested batch command – fixed 64 byte data area 6 = Nested batch command – fixed 128 byte data area 7 = Nested batch command – fixed 232 byte data area</p> <p>Byte swapping, bits 8-11: 0= No byte swapping. 1= 16-bit (INT) byte swapping of TX/RX ISDU data. 2= 32-bit (DINT) byte swapping of TX/RX ISDU data.</p> <p>Status, bits 12-15: 0 = NOP (No operation) 1 = In process (Only valid for non-blocking requests) 2 = Success 3 = Failure: IO-Link device rejected the request. 4 = Timed out: IO-Link device did not respond</p>
Index	UINT	The parameter address of the data object in the IO-Link device.
Subindex	UINT	The data element address of a structured parameter of the data object in the IO-Link device.
Datalength	UINT	Length of data that was read or written. For nested batch commands, the data length can vary from 1 to fixed data area size.
Data	Array of USINTs, UINTs, or UDINTs.	<p>Data required for read commands. Optionally can return the data of a write command.</p> <p>The size of the array is determined by the Control field in the RdWrControlType.</p> <p>Note: Data field not required for single NOP commands.</p>

13.3.4. ISDU Blocking and Non-Blocking Methods

The IOLM supports both blocking and non-blocking ISDU requests. The following diagrams demonstrate how each mode works.

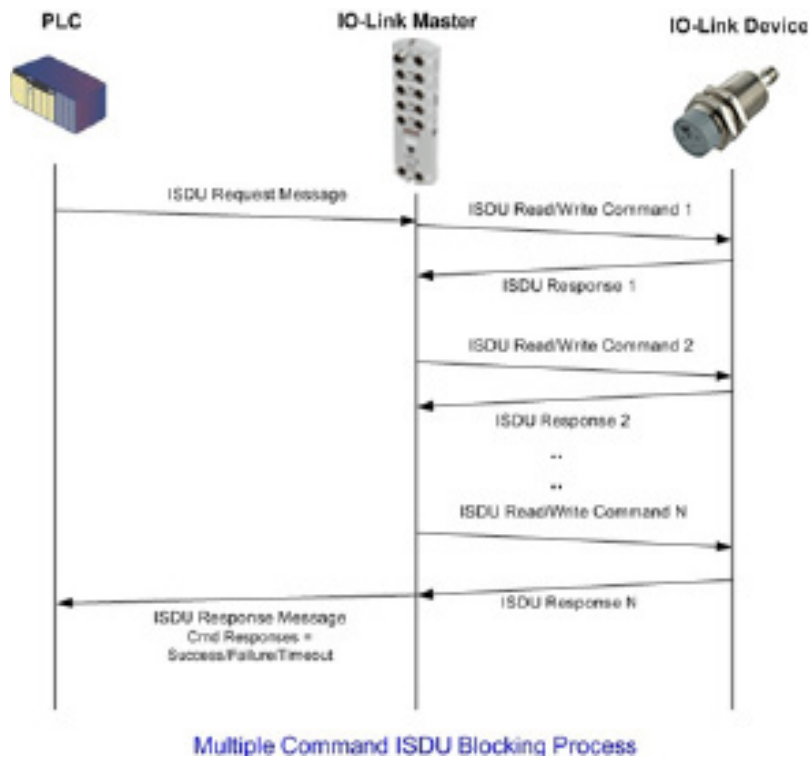
13.3.4.1. Single Command Blocking

The following illustrates the single command blocking method.



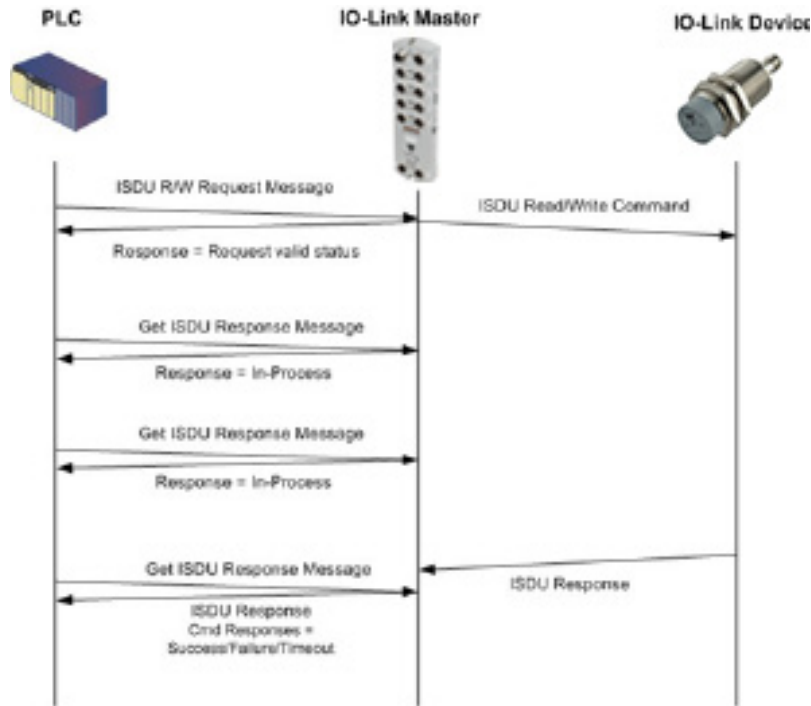
13.3.4.2. Multiple Command Blocking

This illustrates the multiple command blocking method.



13.3.4.3. Single Command Non-Blocking

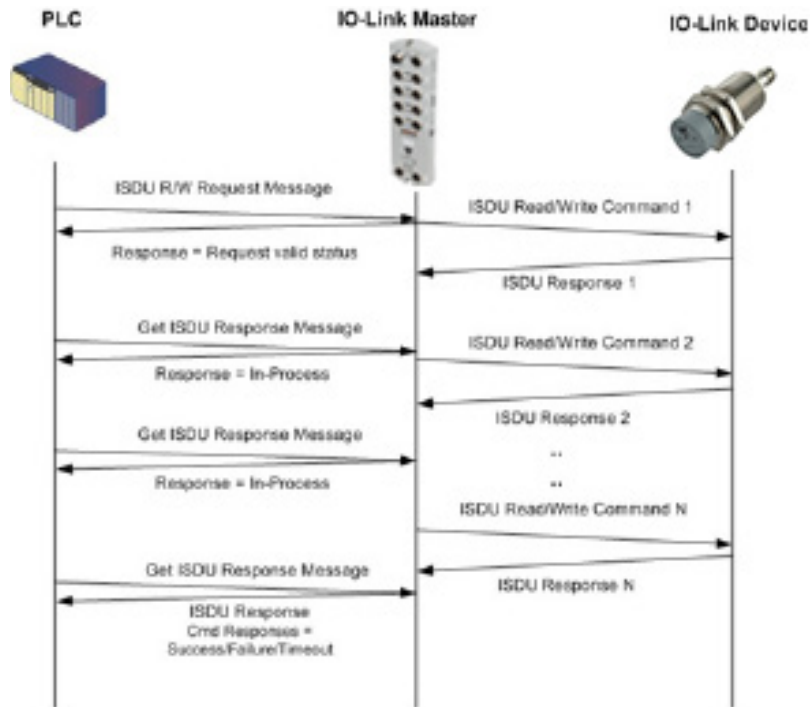
This illustrates the single command non-blocking method



Single Command ISDU Non-Blocking Process

13.3.4.4. Multiple Command Non-Blocking

This illustrates the multiple command non-blocking method.



Multiple Command ISDU Non-Blocking Process

14. Troubleshooting and Technical Support

This chapter provides the following information:

- Troubleshooting on Page 136
- IOLM LEDs on Page 136
- Contacting Technical Support on Page 139
- Using Log Files on Page 140

14.1. Troubleshooting

Before contacting Technical Support, you may want to try the following:

- Check to make sure LEDs are not reporting an issue using IOLM LEDs on Page 136.
- Verify that the network IP address, subnet mask, and gateway are correct and appropriate for the network. Make sure that the IP address programmed into the IO-Link Master matches the unique reserved IP configured address assigned by the system administrator.
 - If using DHCP, the host system needs to provide the subnet mask. The gateway is optional and is not required for a purely local network.
 - Remember that if the rotary switches on the IOLM YN115 and YL212 are set to a non- default position, the rotary switches override the lower 3 digits (8 bits) of the static IP address configured in the Network page.
 - Verify that the Ethernet hub and any other network devices between the system and the IO-Link Master are powered up and operating.
- Verify that you are using the correct types of cables on the correct connectors and that all cables are connected securely.
- Disconnect and re-connect the IO-Link device, or optionally, use the Configuration | IO-Link page to Reset the port, and then set the Port Mode back to IO-Link.
- Reboot or power cycle the IOLM. Use the Advanced | Software page to reboot the IOLM.
- Verify that the Port Mode matches the device, for example: IO-Link, Digital In, Digital Out, or Reset (port is disabled).
- If you are receiving an error that indicates a hardware fault, check the Configuration | IO-Link page for the port experiencing the fault.
 - Check the settings for the Automatic Upload Enable and Automatic Download Enable options. If the Vendor ID or Device ID of the attached device does not match, a hardware fault is generated.
 - Make sure if the port contains data storage that the Vendor ID and Device ID match the device attached to the port. If it does not, CLEAR the data storage or move the device to another port.
 - Check the Device Validation and Data Validation settings. If the attached device does not meet these settings, a hardware fault is issued.
- Open the IO-Link Master web interface and review the following pages to see if you can locate a problem:
 - IO-Link Diagnostics
 - Digital I/O Diagnostics (IOLM YN115)
 - Modbus/TCP Diagnostics
 - OPC UA Diagnostics
 - PROFINET IO
- If you have a spare IO-Link Master, try replacing the IO-Link Master.

14.2. IOLM LEDs


The following tables provide LED descriptions.

- IOLM YL212 LEDs on Page 215
- IOLM YN115 LEDs on Page 219

14.2.1. IOLM YL212 LEDs

The IOLM YL212 (8-port IP67 model with an L-coded power connector) provides these LEDs.

LED Activity During Power On Sequence - IOLM YL212	
1. The US LED lights. 2. The ETH1/ETH2 LED lights on the connected port. 3. The MOD and NET LEDs are lit. 4. The IO-Link LEDs flash (if no IO-Link device attached) or are lit if an IO-Link device is attached. If a PLC is connected, the NET LED is lit and green.	

IOLM YL212 LEDs	
US	The US LED provides the following information: <ul style="list-style-type: none"> • Green solid = The IO-Link Master is powered. • Red solid = Power input voltage below 18VDC.
UA	The UA LED provides the following information: <ul style="list-style-type: none"> • Green solid = The IO-Link Master is powered. • Red solid = Power input voltage below 18VDC.
MOD (Module Status)	The MOD LED provides the following information: <ul style="list-style-type: none"> • Off = No errors or there is no PLC connection • Green and red flashing = Self-test • Green flashing = Standby – not configured • Green solid = Operational • Red flashing: <ul style="list-style-type: none"> - One or more errors detected when NET is off - Fatal error when NET is also flashing • Red solid = Maintenance required or demanded
NET (Network)	The NET LED provides the following information: <ul style="list-style-type: none"> • Off = No PLC connection • Green and red flashing = Self-test • Green flashing = An IP address is configured, but no connections are established • Green solid = PLC connection established • Red flashing = Fatal error when MOD is also flashing • Red solid = Duplicate IP address on network
Port 1 - 8 	This LED provides the following information about the IO-Link port. <ul style="list-style-type: none"> • Off = SIO mode - signal is low or disabled • Yellow = SIO mode - signal is high • Red flashing = Hardware fault - make sure that configured IO-Link settings on the port do not conflict with the device that is attached: <ul style="list-style-type: none"> - Automatic Upload and/or Download is enabled and it is not the same device. - Device Validation Mode is enabled and it is not the correct device. - Data Validation Mode is enabled but there is an error. • Solid red = PDI of the attached IO-Link device is invalid. • Green solid = An IO-Link device is connected and communicating • Green flashing = Searching for IO-Link devices
Port 1-8 DI	The DI LED indicates digital input on DI (Pin 2). <ul style="list-style-type: none"> • Of = DI signal is low or disconnected • Yellow = DI signal is high
ETH1/ETH2	The ETH1/ETH2 LEDs provide the following information: <ul style="list-style-type: none"> • Green solid = Link • Green flashing = Activity

14.2.2. IOLM YN115 LEDs

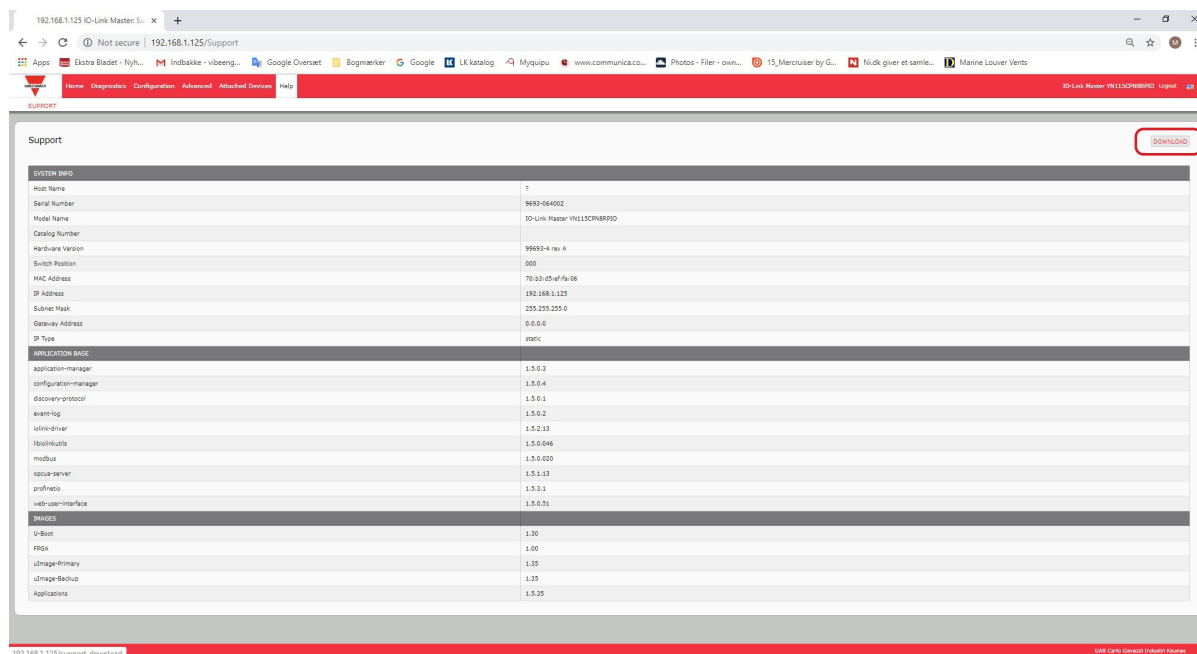
The IOLM YN115 (8-port IP20 DIN rail model with pluggable, removable connectors) provides these LEDs.

LED Activity During Power On Sequence - IOLM YN115
1. The X1/X2 LED lights on the connected port. 2. The MOD and NET LEDs are lit. 3. The IO-Link LEDs flash (if no IO-Link device attached) or are lit if an IO-Link device is attached. If a PLC is connected, the NET LED is lit and green.

IOLM YN115 LEDs	
MOD (Module Status)	The MOD LED provides the following information: <ul style="list-style-type: none"> • Off = No errors or there is no PLC connection • Green and red flashing = Self-test • Green flashing = Standby – not configured • Green solid = Operational • Red flashing: <ul style="list-style-type: none"> - One or more errors detected when NET is off - Fatal error when NET is also flashing red • Red solid = Maintenance required or demanded
NET (Network Status)	The NET LED provides the following information: <ul style="list-style-type: none"> • Off = No PLC connection • Green and red flashing = Self-test • Green flashing = An IP address is configured, but no connections are established • Green solid = PLC connection established • Red flashing = Fatal error when MOD is also flashing • Red solid = Duplicate IP address on network
Port 1-8	This LED provides the following information about the IO-Link port. <ul style="list-style-type: none"> • Of = SIO mode - signal is low or disabled • Yellow = SIO mode - signal is high • Red flashing = Hardware fault - make sure that configured IO-Link settings on the port do not conflict with the device that is attached: <ul style="list-style-type: none"> - Automatic Upload and/or Download is enabled and it is not the same device. - Device Validation Mode is enabled and it is not the correct device. - Data Validation Mode is enabled but there is an error. • Red solid = PDI of the attached IO-Link device is invalid. • Green solid = An IO-Link device is connected and communicating • Green flashing = Searching for IO-Link devices
Dual Ethernet Ports	The Ethernet LEDs provide the following information: <ul style="list-style-type: none"> • Green solid = Link • Yellow solid = Activity

14.3. Contacting Technical Support

You may want to access the Help/SUPPORT page when you call Technical Support, as they may request the information displayed on the SUPPORT page.



The screenshot shows a web browser window displaying the 'Support' page of an IO-Link Master device. The page contains a table with system and application base information. A 'DOWNLOAD' button is visible in the top right corner of the table area.

SYSTEM INFO	
Host Name	?
Serial Number	9693-064002
Model Name	IO-Link Master V1115C10R8P10
Catalog Number	
Hardware Version	999934 rev A
Switch Position	000
MAC Address	70-03-05-ef-fa-16
IP Address	192.168.1.125
Subnet Mask	255.255.255.0
Gateway Address	0.0.0.0
IP Type	static
APPLICATION BASE	
application-manager	1.5.0.3
configuration-manager	1.5.0.4
discover-protocol	1.5.0.1
event-log	1.5.0.2
io-link-driver	1.5.2.13
liblinkutils	1.5.0.046
modbus	1.5.0.020
opcu-server	1.5.1.13
profnetio	1.5.0.3
sub-device-interface	1.5.0.021
FIRMWARE	
U-boot	1.30
PPSA	1.00
UImage-Primary	1.35
UImage-Backup	1.35
Applications	1.5.35

In case of questions regarding IO-Link Master, please contact your local Carlo Gavazzi office.

14.4. Using Log Files

The IO-Link Master provides five different log files that you can view, export, or clear:

- Syslog (system log) displays line-by-line activity records.
- dmesg displays Linux kernel messages.
- top displays which programs are using most of the memory and CPU.
- ps displays the running programs
- pniio displays PROFINET IO activity
- All log files start up automatically during the startup cycle. Each log file has a size limit of 100KB.

Note: Typically, log files are intended to be used by Technical Support in the event there is a problem.

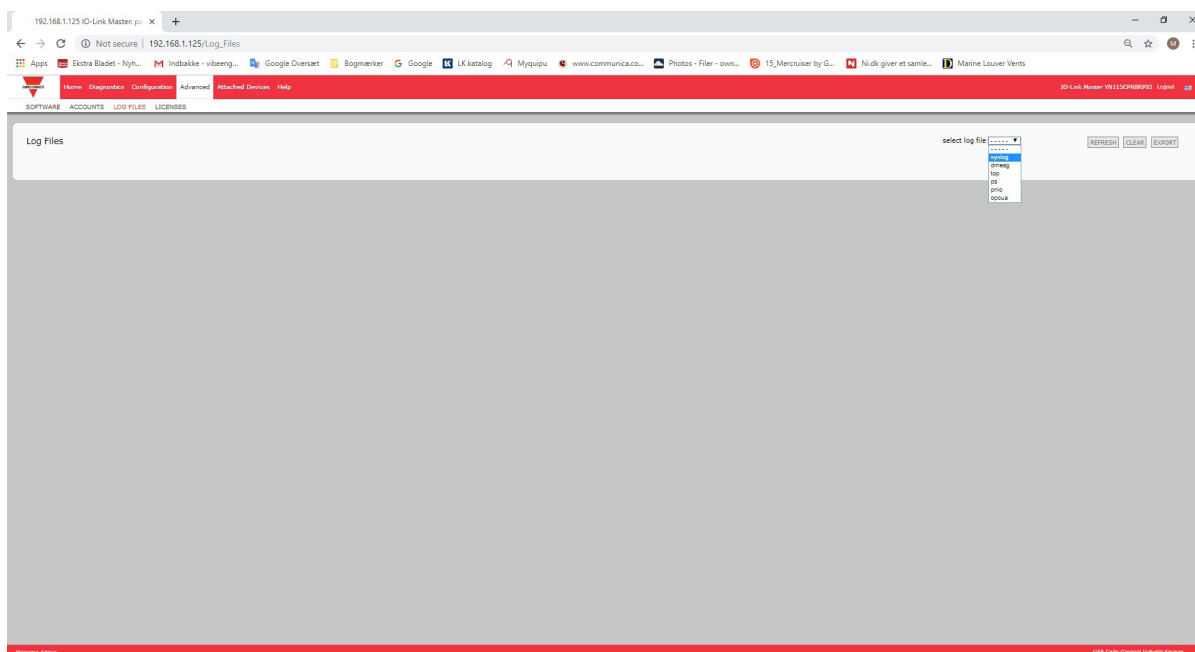
You can use the following procedures to:

- View a Log File on Page 140
- Export a Log File on Page 141
- Clear a Log File on Page 141

14.4.1. View a Log File

Use this procedure to view a log file.

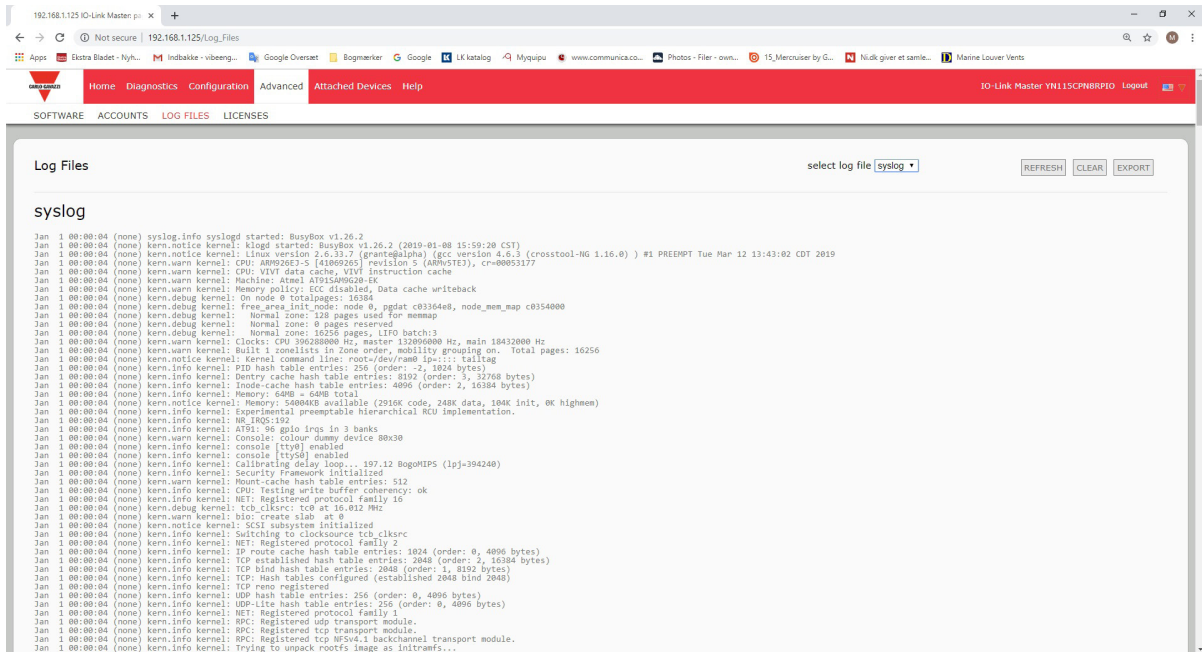
1. Open your browser and enter the IP address of the IO-Link Master.
2. Click Advanced and then LOG FILES.
3. Select the log file type from the drop-list.
4. Optionally, click the REFRESH button to get the latest information.
5. Optionally, export the log file.



14.4.2. Export a Log File

Use the following procedure to export a log file.

1. Open your browser and enter the IP address of the IO-Link Master.
2. Click Advanced and then LOG FILES.
3. Select the log file type from the drop-list.
4. Click the EXPORT button.
5. Click the Save button drop-list and click Save to save it to your user folder or Save as to browse to or create a new folder in which to place the log file.

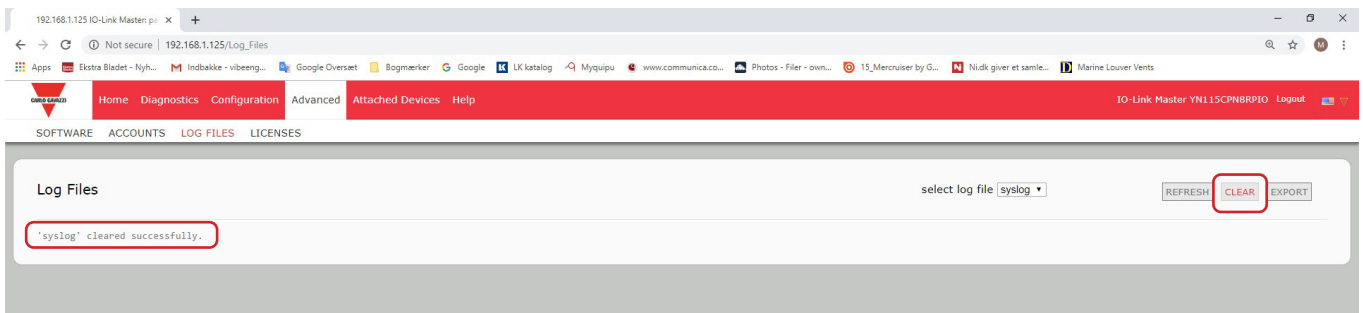


6. Depending on your browser, you may need to close the pop-up window.

14.4.3. Clear a Log File

Use this procedure to clear a log file.

1. Open your browser and enter the IP address of the IO-Link Master.
2. Click Advanced and then LOG FILES.
3. Optionally, export the log file.
4. Select the log file type from the drop-list.
5. Click the CLEAR button.



The log file automatically starts logging the latest information.

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