



## IO-Link Systems

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## Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Added a Preface section	2
Reorganized content of IO-Link System Overview	3
Added new IO-Link master module features	4
Reorganized content of IO-Link Operation	9
Improved diagnostics section for ArmorBlock 5000 IO-Link master module	15
Combined ArmorBlock I/O and POINT I/O IO-Link information	17
Added IO-Link Device Object Libraries section	19

## Preface

### Download Firmware, AOP, EDS, and Other Files

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center at [rok.auto/pcdc](http://rok.auto/pcdc).

### Inclusive Terminology

Rockwell Automation recognizes that some of the terms that are currently used in our industry and in this publication are not in alignment with the movement toward inclusive language in technology. We are proactively collaborating with industry peers to find alternatives to such terms and making changes to our products and content. Please excuse the use of such terms in our content while we implement these changes.

### Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at [rok.auto/literature](http://rok.auto/literature).

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication <a href="#">1770-4.1</a>	Provides general guidelines for installing a Rockwell Automation industrial system.
Rockwell Automation IO-Link Technology website, <a href="https://www.rockwellautomation.com/en-us/products/hardware/allen-bradley/network-security-and-infrastructure/io-link-technology.html">https://www.rockwellautomation.com/en-us/products/hardware/allen-bradley/network-security-and-infrastructure/io-link-technology.html</a>	Provides tools and resources for Rockwell Automation IO-Link devices.
IO-Link website, <a href="http://io-link.com">io-link.com</a>	Provides IO-Link device information, system descriptions, and the IODDfinder tool for centralized access to documentation and information on the device functions described in an IODD.
Product Selection and Configuration tools, <a href="http://rok.auto/systemtools">rok.auto/systemtools</a>	Helps configure complete, valid catalog numbers, and build complete quotes that are based on detailed product information.
Product Certifications website, <a href="http://rok.auto/certifications">rok.auto/certifications</a>	Provides declarations of conformity, certificates, and other certification details.

## IO-Link System Overview

IO-Link technology is a worldwide open-standard protocol that integrates sensors and other field devices into our Connected Enterprise® by connecting the IO-Link enabled device into an IO-Link master module. You can use it to deliver data from smart devices directly into a control system efficiently. The flexibility of IO-Link capable devices allows machines to operate more effectively by providing diagnostics and data including detailed machine health status to improve uptime and increase productivity.

- IO-Link or Single-drop Digital Communication Interface (SDCI) is an IEC 61131-9 specification for point-to-point connection between sensor actuator and field level devices.
- IO-Link is NOT a fieldbus but an enhanced development of the current connection technology of sensors and actuators.
- An IO-Link system consists of IO-Link devices (often sensors, actuators, or combinations thereof) a standard 3-wire sensor actuator cable and an IO-Link master module.
- Point-to-point communication is based on a standard 3-wire sensor and actuator connection without additional requirements to the cable material.

## IO-Link Functionality

IO-Link communication is based on a master-slave structure in which the master controls the interface access to the connected device. The option of using the intelligence that is integrated into the device provides you with new methods to commission your device and monitor the health of your system. Benefits of IO-Link technology range from reduced installation time during startup to increased diagnostics over the lifetime of the machine. Other benefits of IO-Link technology include:

- Reduced inventory and operating costs
- Increased uptime/productivity
- Simplified design, installation, creation, and maintenance
- Enhanced flexibility and scalability
- Detailed diagnostic information for preventive maintenance

To that end, IO-Link offers a full range of advanced features and functions.

## Highly Integrated IO-Link

ArmorBlock 5000® IO-Link master modules are the latest On-Machine™ distributed I/O platform that offers greater flexibility to meet demanding machine requirements. ArmorBlock 5000 IO-Link master modules are configurable in Studio 5000 Logix Designer®. The benefits are:

- Studio 5000 Logix Designer treats all IO-Link devices as EtherNet/IP™ devices.
- All IO-Link devices have their own Studio 5000 Logix Designer Add-on Profile (AOP).
- All IO-Link device IODD can be downloaded, registered, imported, and exported.
- All IO-Link devices have their own controller tags.
- All IO-Link devices are part of a Studio 5000 Logix Designer project (.adc) file.
- Descriptive Tags
  - Faster programming during initial setup
  - More efficient troubleshooting process - Data tags are named based on the information that they provide.
  - Monitor device data through intuitive tag names
- Support of data storage mode with backup and restore function
- Support of ADC mode

## Automatic Device Configuration Mode

ArmorBlock 5000 IO-Link master module channels can function in either of two modes: Automatic Device Configuration (ADC) or Data Storage (DS) mode. In ADC mode, the ArmorBlock 5000 IO-Link master module enables you to:

- Automatically restore device configuration from controller
- Correlate device parameters
- Use configuration tag instead of message instructions

Device configurations are stored in the Logix controller and downloaded to new/replacement devices (of the same catalog number) without the need for reteaching/reprogramming. The benefits of ADC are:

- Building multiple machines (simple project download)
- Easy device replacement
- No special skill/knowledge required to replace devices
- No errors in electronic changeover compared to manual changeover

## Data Storage Mode

When an IO-Link device supports Data Storage, the Data Storage Backup/Restore function is used when ADC is disabled. Data Storage Backup/Restore enables you to automatically:

- Back up IO-Link device configuration to the IO-Link master
- Restore stored values to the device during device replacement

## Generic IO-Link Device

The generic IO-Link device profile allows you to add an IO-Link device without a unique identity and IODD file.

When you use the generic IO-Link device profile, there is no full IO-Link integration. You have to configure the device either with an external method or send messages to the IO-Link Service Parameter object. With the generic IO-Link device profile:

- The controller does not validate the IO-Link device.
- Process data is presented in raw IO-Link data format.
- You can configure device parameter through explicit messaging.

## Time Stamps

- Each IO-Link port supports an IO-Link channel and a discrete channel.
- Both IO-Link and discrete channels support time stamps.
- More accurate discrete input time stamps that are suitable for capturing time for critical applications are available.

## Diagnostic Data

- Real-time monitoring verifies that devices are operating correctly.
  - Optimized preventive maintenance – Identify and correct issues before failures can occur.
  - Detect device malfunctions/failure
- Detect damaged devices and pinpoint their exact location for quick troubleshooting through the Application Specific Name parameter.

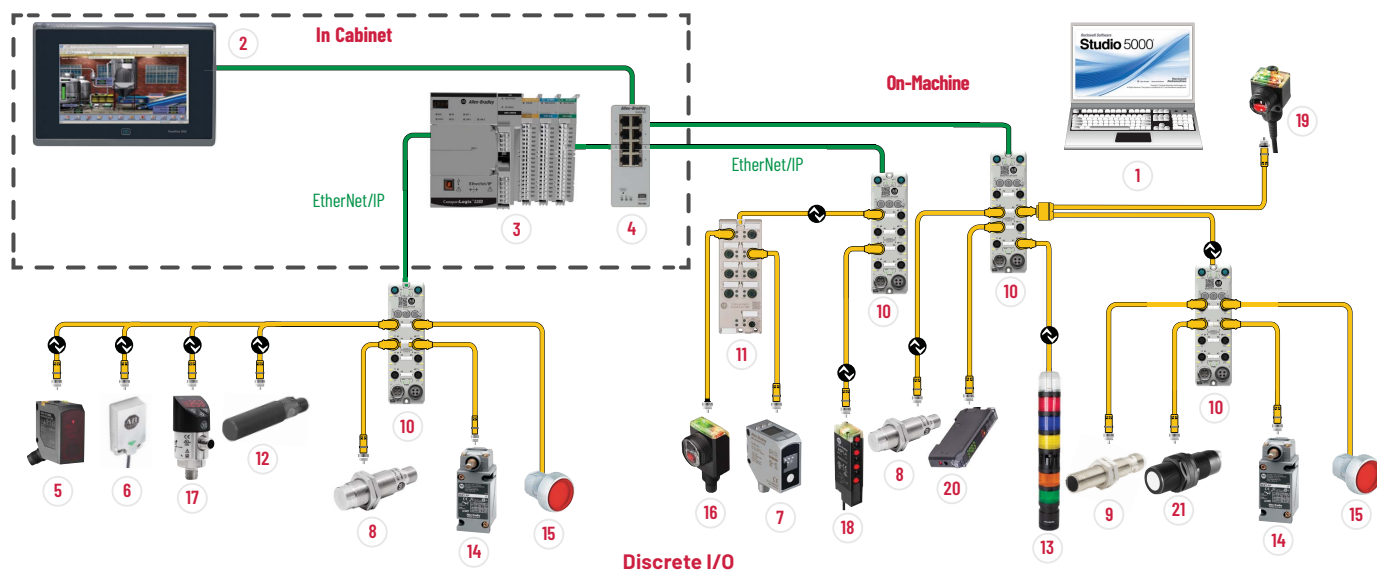
# IO-Link Systems

A typical IO-Link system consists of the following:

- Controller
- One or more IO-Link master modules
- One or more IO-Link devices/IO-Link hubs
- Cordsets or patchcords

There are two types of IO-Link systems: On-Machine and In Cabinet. [Figure 1](#) illustrates an overview of possible On-Machine architectures.

**Figure 1 - Possible On-Machine and In Cabinet IO-Link Architectures**



Item Number	Description	Item Number	Description	Item Number	Description	Item Number	Description
1	Studio 5000 Logix Designer	6	871FM mini flat pack proximity sensor	12	875L tubular capacitive sensor	17	836P Solid-state pressure sensor
2	PanelView™ 5510	7	46CLR ColorSight™ true color sensor	13	856T Control Tower™ stack lights	18	45PLA polarized light array photoelectric sensor
3	CompactLogix™ 5380	8	871TM tubular stainless steel sensor	14	802T Oiltight limit switch	19	42EF RightSight sensor
4	Stratrix® switch	9	872C WorldProx™ tubular general purpose inductive proximity sensor	15	800F 22 mm round operator	20	46DFA DIN rail fiber optic amplifier
5	45DMS distance measurement sensor	10	5032-810LM12 ArmorBlock 5000 IO-Link master	16	42AF RightSight™ M30 sensor	21	873P ultrasonic sensor
		11	T732IL ArmorBlock IO-Link hub				

IO-Link systems are available using three different product family IO-Link master modules. Let's begin with the latest IO-Link master module.

## ArmorBlock 5000 IO-Link Master Modules

ArmorBlock 5000 IO-Link master modules are the interface between field devices and higher-level controllers or information systems. They control data traffic between the connected devices and can be installed directly on the machine in the field.

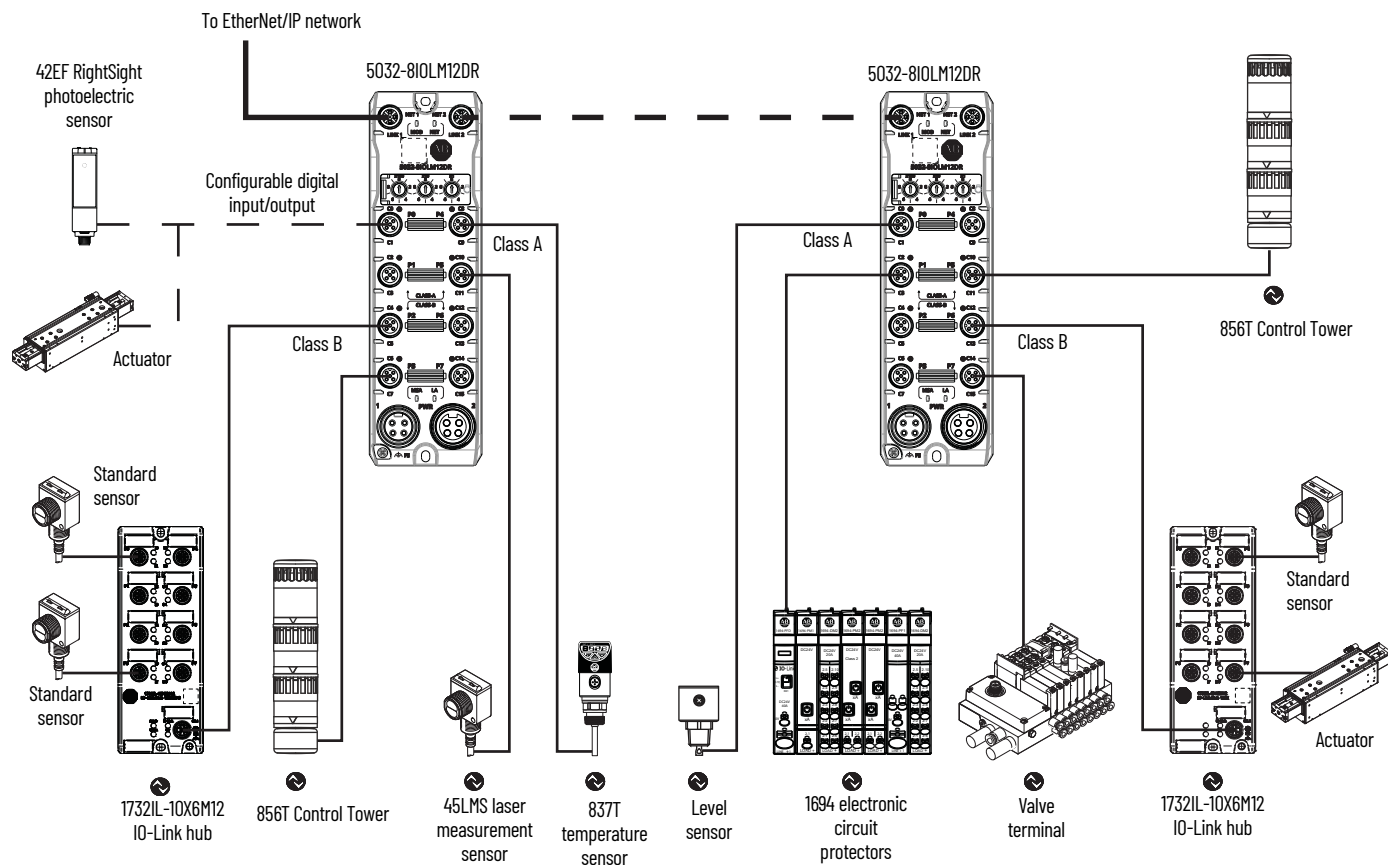
**Table 1 - Choose an ArmorBlock 5000 IO-Link Master Module**

	5032-810LM12DR, 5032-810LM12P5DR	5032-810LM12M12LDR
Dimensions, approx. HxWxD	200 x 60 x 32.7 mm (7.87 x 2.36 x 1.29 in.)	200 x 60 x 35.1 mm (7.87 x 2.36 x 1.38 in.)
IP rating	IP66, IP67, IP69	
Mounting options	<ul style="list-style-type: none"> <li>• Horizontal and vertical, inverted (zero stacked)</li> <li>• On-Machine or Panel</li> </ul>	
IO-Link Class A/Class B ports	4 Class A and 4 Class B	
High current ports	✓	
Power variants	Mini 4-pin, Mini 5-pin, L-coded	
Input time stamping	✓	

## ArmorBlock 5000 I/O On-Machine IO-Link System

The ArmorBlock 5000 IO-Link master module provides 16 channels that can be configured for IO-Link, digital input, and digital output. The module supports up to eight channels for IO-Link master communication with IO-Link compatible devices. [Figure 2](#) shows an example of the different IO-Link devices that you can connect to your ArmorBlock 5000 IO-Link master module.

**Figure 2 - IO-Link Connectivity Example**



The Studio 5000 Logix Designer application combines design and engineering elements in one interface, which allows you to access I/O and configuration data across the Integrated Architecture® system. Rockwell Automation® solutions provide a smooth, consistent integration of IO-Link enabled devices into the system.

- Multiple profiles facilitate flexible manufacturing by reducing changeover time for each device from minutes to seconds.
- Application-specific names make it easy to identify devices during commissioning and over the lifetime of the machine.
- Studio 5000 Logix Designer application descriptive tags are generated for I/O data, significantly reducing setup time, and simplifying troubleshooting and maintenance.
- Correlation of the read/write (R/W) parameter values of connected IO-Link devices are compared to the ones stored in the controller so any differences can be mitigated (only while online in run mode).

To simplify the integration of the IO-Link devices to the Rockwell Automation architecture, there is an IO-Link Add-on Profile (AOP) available for IO-Link master modules. The use of an AOP simplifies the setup of IO-Link enabled devices by providing the necessary fields in an organized manner. The AOP allows design and configuration of the system in a quick and efficient manner.

For more information on installation, see [ArmorBlock 5000 8-channel IO-Link Master Module Installation Instructions](#), publication [5032-IN001](#).

For more information on configuration, see [ArmorBlock 5000 8-channel IO-Link Master Module User Manual](#), publication [5032-UM001](#).

## IO-Link Devices

IO-Link enabled devices such as proximity sensors, photoelectric sensors, and other field devices offer advanced features and diagnostics that can only be accessed through an IO-Link master module.

Device Type	Devices	Additional Resources
Photoelectric sensor	42AF long-range general-purpose sensors	<ul style="list-style-type: none"> <li>RightSight Photoelectric Sensors with IO-Link Interface User Manual, publication <a href="#">42AF-UM001</a></li> </ul>
	42EF RightSight™ general-purpose sensors	<ul style="list-style-type: none"> <li>ClearSight™ RightSight PHOTOSWITCH® Photoelectric Sensors Installation Instructions, publication <a href="#">42EF-IN002</a></li> <li>LaserSight™ RightSight PHOTOSWITCH Photoelectric Sensors Installation Instructions, publication <a href="#">42EF-IN004</a></li> <li>RightSight Miniature Sensors Installation Instructions, publication <a href="#">42EF-IN008</a></li> <li>42EF RightSight Photoelectric Sensors with IO-Link Interface User Manual, publication <a href="#">42EF-UM001</a></li> </ul>
	42JS and 42JT VisiSight™ sensors	<ul style="list-style-type: none"> <li>VisiSight Photoelectric Sensors with IO-Link Interface User Manual, publication <a href="#">42JT-UM001</a></li> </ul>
	45DMS distance measurement sensors	<ul style="list-style-type: none"> <li>Distance Measurement Sensor Technical Data, publication <a href="#">45DMS-TD001</a></li> <li>PHOTOSWITCH Distance Measurement Sensor Installation Instructions, publication <a href="#">45DMS-IN001</a></li> </ul>
	46DFA DIN rail fiber-optic amplifier	<ul style="list-style-type: none"> <li>PHOTOSWITCH DIN Rail Fiber Optic Amplifier Installation Instructions, publication <a href="#">46DFA-IN001</a></li> </ul>
Color registration mark	45CRM color registration mark sensors	<ul style="list-style-type: none"> <li>45CRM Color Registration Mark Sensor Installation Instructions, publication <a href="#">45CRM-IN001</a></li> <li>Color Registration Mark Sensor with IO-Link Interface User Manual, publication <a href="#">45CRM-UM001</a></li> </ul>
Laser measurement sensor	45LMS laser measurement sensors	<ul style="list-style-type: none"> <li>45LMS Laser Measurement Sensor Installation Instructions, publication <a href="#">45LMS-IN001</a></li> <li>45LMS Laser Measurement Sensor with IO-Link Interface User Manual, publication <a href="#">45LMS-UM001</a></li> </ul>
Polarized light array	45PLA polarized light array sensors	<ul style="list-style-type: none"> <li>Polarized Sensor Array Installation Instructions, publication <a href="#">45PLA-IN001</a></li> </ul>
Solid-state pressure sensor	836P solid-state pressure sensors	<ul style="list-style-type: none"> <li>Solid-state Pressure Switches with IO-Link User Manual, publication <a href="#">836P-UM001</a></li> </ul>
Solid-state temperature sensor	837T solid-state temperature sensors	<ul style="list-style-type: none"> <li>Solid-state Temperature Sensors with IO-Link User Manual, publication <a href="#">837T-UM001</a></li> </ul>
True color sensor	46CLR ColorSight true color sensors	<ul style="list-style-type: none"> <li>ColorSight Sensor Installation Instructions, publication <a href="#">46CLR-IN001</a></li> </ul>
Inductive sensor	871C mini tubular sensors	<ul style="list-style-type: none"> <li>Inductive Proximity Sensor Specifications, publication <a href="#">PROX-TD001</a></li> <li>871C Miniature Inductive Sensors with IO-Link Interface User Manual, publication <a href="#">871C-UM001</a></li> </ul>
	871FM mini rectangular sensors M5 Square and M8 square	<ul style="list-style-type: none"> <li>871FM Inductive Sensors with IO-Link Interface User Manual, publication <a href="#">871FM-UM001</a></li> </ul>
	871FM mini flat pack sensors, 20 x 32 x 8 mm (0.78 x 1.25 x 0.31 in.) and 30 x 52 x 14 mm (1.18 x 2.04 x 0.55 in.)	<ul style="list-style-type: none"> <li>Miniature Metal Flat Pack Inductive Sensors with IO-Link User Manual, publication <a href="#">871FM-UM002</a></li> </ul>
	871TM tubular stainless-steel sensors	<ul style="list-style-type: none"> <li>Inductive Sensors with IO-Link Interface User Manual, publication <a href="#">871TM-UM002</a></li> </ul>
Ultrasonic sensor	873P analog or discrete output ultrasonic sensors	<ul style="list-style-type: none"> <li>Bulletin 873P Ultrasonic Proximity Sensor Installation Instructions, publication <a href="#">873P-IN001</a></li> <li>Ultrasonic Sensors Installation Instructions, publication <a href="#">873P-IN006</a></li> <li>Bulletin 873P Programmable Ultrasonic Proximity Sensor Installation Instructions, publication <a href="#">873P-IN002</a></li> <li>Ultrasonic Sensors with IO-Link Interface User Manual, publication <a href="#">873P-UM001</a></li> </ul>
Capacitive sensor	875L tubular capacitive sensors	<ul style="list-style-type: none"> <li>875F/875L Capacitive Sensors User Manual, publication <a href="#">875-UM001</a></li> </ul>
High-frequency Radio Frequency Identification (RFID)	56RF high-frequency radio frequency identification	<ul style="list-style-type: none"> <li>RFID Specifications Technical Data, publication <a href="#">56RF-TD001</a></li> <li>RFID Systems User Manual, publication <a href="#">56RF-UM001</a></li> <li>58UHF RFID Systems User Manual, publication <a href="#">58UHF-UM001</a></li> </ul>
Output	856T Control Tower stack lights	<ul style="list-style-type: none"> <li>Signaling Specifications Technical Data, publication <a href="#">855-TD001</a></li> <li>Control Tower IO-Link Class B Light and Sound Module Controller User Manual, publication <a href="#">856T-UM001</a></li> </ul>
Output/Input	1694 modular electronic circuit protectors	<ul style="list-style-type: none"> <li>1694 Electronic Circuit Protection 24V DC IO-Link Installation Instructions, publication <a href="#">1694-IN001</a></li> </ul>

## IO-Link Hubs

ArmorBlock® I/O 16-channel IO-Link hubs operate with IO-Link master modules via the IO-Link connector. The IO-Link hubs feature 8 x M12 connectors that can support up to 16 digital channels.

Module Type	IO-Link Hub	Class Type	Additional Resources
Input module	1732IL-IB16M12	Class A	<ul style="list-style-type: none"> <li>ArmorBlock I/O Module Selection Guide, publication <a href="#">1732-SG001</a></li> <li>ArmorBlock 16-Channel IO-Link Hubs Installation Instructions, publication <a href="#">1732IL-IN001</a></li> <li>ArmorBlock 16-channel IO-Link Hub User Manual, publication <a href="#">1732IL-UM001</a></li> </ul>
Input/output module	1732IL-IOX6M12	Class B	
Configurable	1732IL-16CFGM12M12L	Class A with external power	

- They are suitable for use in machines and installations with moderate I/O concentration.
- IO-Link hubs use M12 A-coded connectors for I/O signals and an IO-Link interface.
- IO-Link hubs are fully sealed in die-cast zinc housing to protect electronic components from environmental factors.
- IO-Link hubs comply with IO-Link interface and system specification v1.1.2.
- Each IO-Link hub takes one IO-Link channel from the IO-Link master module.



## IO-Link Operation

IO-Link delivers data over standard field cabling. By connecting an IO-Link device to an IO-Link master module, the field device data and diagnostics are accessible. IO-Link allows you to go beyond product detection on the machine. You can monitor the health of connected devices as the system runs.

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**IMPORTANT** The response time of an IO-Link system may not be fast enough for high-speed applications. In this case, it is possible to monitor or configure the device through an IO-Link channel while connecting a second pin (if the device offers a second output) of the device to a standard input channel.

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### Transmission Rates

Three transmission rates are specified for the IO-Link device:

- COM 1 = 4.8 kBd
- COM 2 = 38.4 kBd
- COM 3 = 230.4 kBd

An IO-Link device typically supports only one of the specified transmission rates, while the IO-Link v1.1.2 specifications, or later, requires an IO-Link master module to support all three transmission rates.

### Transmission Quality

The IO-Link communication system operates at a 24V level. If a transmission fails, the frame is repeated two more times. If the transmission fails on the third try, the IO-Link master module recognizes a communication failure and signals it to the controller.

### Response Time

The IODD of the device contains a value for the minimum cycle time of the device. This value indicates the time intervals at which the master module addresses the device. The value has a large influence on the response time. In addition, the master has an internal processing time that is included in the calculation of the system response time.

Devices with different minimum cycle times can be configured on one master. The response time differs for these devices. When configuring the master, you can specify a fixed cycle time (a minimum of 3 ms) and the device-specific minimum cycle time that is stored in the IODD. The master then addresses the device that is based on this specification. The typical response time for a device therefore results from the effective cycle time of the device and the typical internal processing time of the master.

### Data Types

There are four data types available through IO-Link:

Data Type	-->	IO-Link Data Type
Process data	-->	Cyclic data
Value status	-->	Cyclic data
Device data	-->	Acyclic data
Events	-->	Acyclic data

Table 2 - Types of Data

Data Type	Description
Process data	The process data of the devices is transmitted cyclically in a data frame in which the device specifies the size of the process data. Depending on the device, 0...32 bytes of process data are possible (for each input and output). The consistency width of the transmission is not fixed and is thus dependent on the master. Some devices can support multiple process data modes, which allows for selection of different cyclic process data themes.
Value status	The value status indicates whether the process data is valid or invalid. The value status can be transmitted cyclically with the process data.
Device data	Device data supports device-specific configurable parameters, identification data, and diagnostic information. They are exchanged acyclically and at the request of the IO-Link master module. Device data can be written to the device (Write) and also read from the device (Read).
Events and time stamps	When an event occurs, the device signals the presence of the event to the master. The master then reads out the event. Events can be error messages and warnings/maintenance data. Error messages are transmitted from the device to the controller via the IO-Link master module. The transmission of device parameters or events occurs independently from the cyclic transmission of process data.

## Data Access

Table 3 - Types of Data Access

Data Type	Description
Cyclic data	To exchange the cyclic process data between an IO-Link device and a controller, the IO-Link data from the IO-Link master module is placed on the address ranges assigned beforehand. The user program on the controller accesses the process values using these addresses and processes them. The cyclic data exchange from the controller to the IO-Link device (for example, an IO-Link sensor) is performed in reverse.
Acyclic data	Acyclic data, such as device parameters or events, are exchanged using a specified index and subindex range. The controller accesses these values through Explicit Messaging. The use of the index and subindex ranges allows targeted access to the device data (for example, for reassigning the device or master parameters during operation).

## Fallback

The Fallback feature allows an IO-Link master module to configure an IO-Link device, and then to instruct the device to fall back to discrete input mode. When you set the channel to Fallback mode, a single input bit is provided in the controller tag.

When a module has channels in Fallback mode, you can configure them in the same way as channels in IO-Link mode. During operation, the channel functions as a Digital Input.

Once you configure the channel for Fallback, a wake-up command is issued to the target device if:

1. The project is online with the controller and the module properties of the IO-Link master module is open, including when you:
  - Correlate connected devices
  - Change the device parameters
  - Select Refresh on the module properties
2. You change the device parameters in the module properties, and then download the changes to the IO-Link master module through the controller.

In either case, the devices return to Fallback mode once the operations are completed.

## Configure ArmorBlock 5000 IO-Link Master Module and IO-Link Devices

The following example describes how to configure an ArmorBlock 5000 IO-Link master module and device in the Studio 5000 Logix Designer environment.

For this description, we are using the following hardware and software:

- CompactLogix 5380 controller – 5069-L3100ERM
- ArmorBlock 5000 IO-Link master module – 5032-8IOLM12DR
- Allen-Bradley® solid-state 836P pressure sensor
- Studio 5000 Logix Designer application version 35.00.00
- ArmorBlock 5000 IO-Link AOP

Before configuring the IO-Link device, the following steps are required.

1. Install and connect a controller and IO-Link master module to the IO-Link device.
2. Download and install the IO-Link master module AOP.
3. Set the Network Address on the IO-Link master module.
4. Create a Studio 5000 Logix Designer application project.
5. Add the controller to the project.
6. Add the IO-Link module to the project and set at least one channel to IO-Link mode.

### Register IO-Link Device IODD File

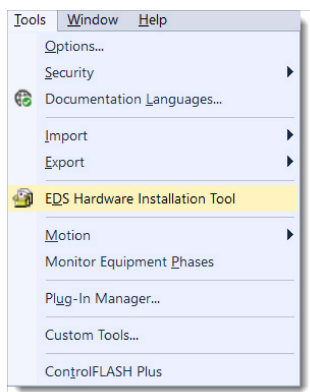
If the IO-Link device that you want to configure is not available in the Studio 5000 Logix Designer application, then you must register the IODD for the device.

IODD files contain information that is related to the device, integrated into the system environment. You can download IODD files for Rockwell Automation IO-Link devices from the Product Compatibility and Download Center (PCDC) at [rok.auto/pcdc](http://rok.auto/pcdc).

For third-party IO-Link devices, you can download the IODD files from the manufacturer's website or use the "IODDfinder" tool that is available on the IO-Link website at [io-link.com](http://io-link.com) to search for the IODD files.

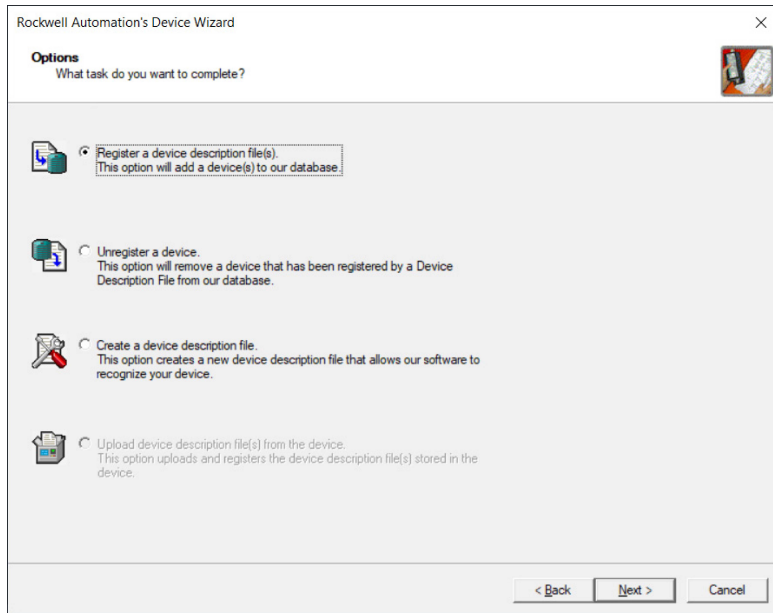
To register a device IODD, complete these steps.

1. In the Studio 5000 Logix Designer application, select Tools > EDS Hardware Installation Tool.



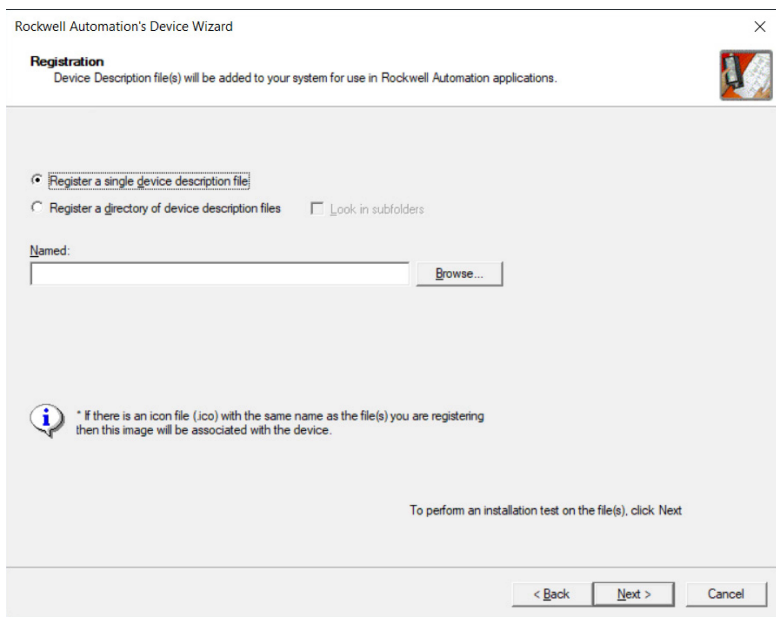
The Rockwell Automation Device Wizard appears.

2. Select Next to begin.
3. Select Register a device description file(s) and select Next.



4. Choose to register one file or a directory of files, and select Browse.

If you choose Register a directory of device description files, you can also select Look in subfolders.



If you selected one file:

- a. Browse to the location of your IODD file.
- b. Select the file and select Open.

If you selected a directory:

- a. In the Browse for Folder dialog, browse to the folder with your IODD files.
- b. Select the folder and select OK.

5. To complete the installation, select Next and follow the on-screen prompts.

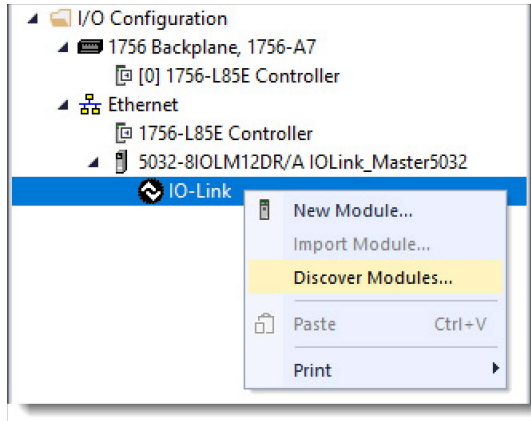
**IMPORTANT** If the IO-Link is already registered and you have selected to register the same version or an older version, you must confirm whether you want to overwrite the current version.

## Add IO-Link Devices to the Project

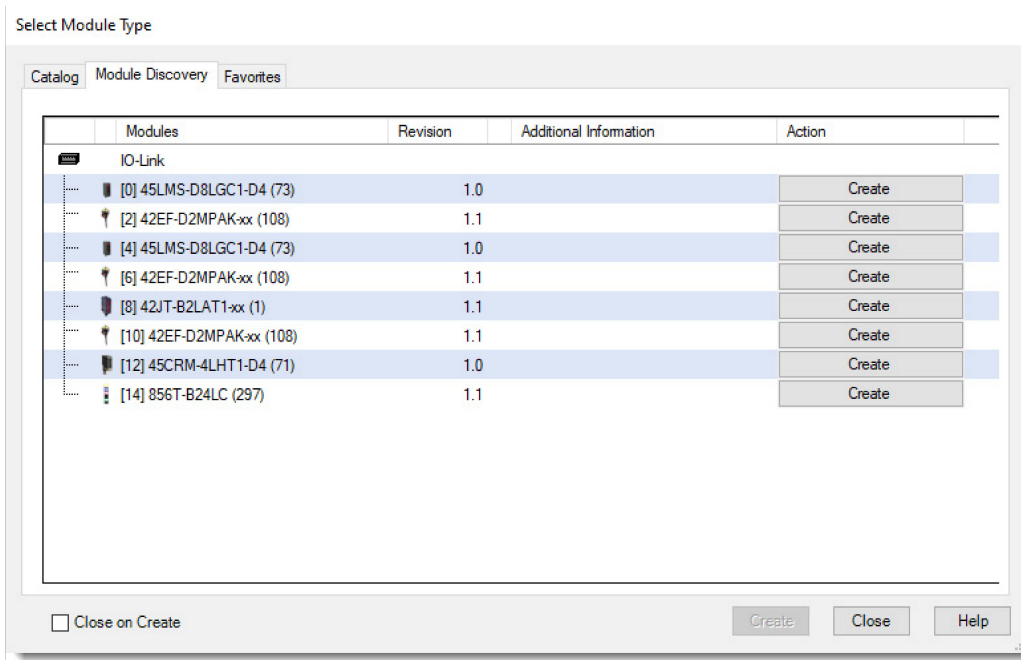
The steps to add IO-Link devices to the IO-Link master modules vary between the ArmorBlock 5000 I/O, ArmorBlock I/O, and POINT I/O™ IO-Link master modules. This example depicts the workflow to add devices to an ArmorBlock 5000 IO-Link master module.

Once the IO-Link file is registered, add the sensor to the IO-Link master module in the project.

1. In the I/O Configuration tree, right-click the IO-Link bus and choose Discover Modules.



The Select Module Type dialog box appears. The Module Discovery tab shows the available modules that are connected to the IO-Link bus.



2. Select the IO-Link device and choose Create to add the discovered module to the project.

## Edit the IO-Link Device Properties

Click the views in the New Module dialog box to view and change the configuration parameters.

### Configuration View

The Configuration view displays only the configurable device parameters and their project values. The list of parameters is identical to the ones shown in the device Configuration tags.

If ADC is disabled, this view can only be used after a successful Device Correlation Check has been performed.

Use the Configuration view to complete the following tasks:

- Change the project values of the device parameters.
- Insert factory default values.

**Configuration**

Name	R/W	Value	Units	Style	Descriptio
<b>Identification</b>					
<b>User Specific Information</b>					
Application-specific...	rw	***	***		Possibility to mark a device with us
User Tag 1	rw	***			
User Tag 2	rw	***			
<b>Parameter</b>					
<b>Operation Configuration</b>					
<b>Triggered</b>					
Set Point - Thres...	rw	1000		Decimal	
Polarity	rw	Not Inverted			
Pin 2 Mode	rw	Disabled			
Phy Mode	rw	Auto Detect			
<b>Sensor Configuration</b>					
MarginLevel - Low ...	rw	0.8			
MarginLevel - High ...	rw	1.5			

Insert Factory Defaults      Correlate

*The values displayed here are stored in the controller. The values are sent to the device when a connection is established and when online and Apply is selected, including when inhibited.*

Status: Running      OK      Cancel      Apply      Help

# ArmorBlock 5000 IO-Link Master Module Diagnostics

The ArmorBlock 5000 IO-Link master module displays diagnostics for connected IO-Link devices within the Studio 5000 Logix Designer application.

Figure 3 - IO-Link Port Event Log

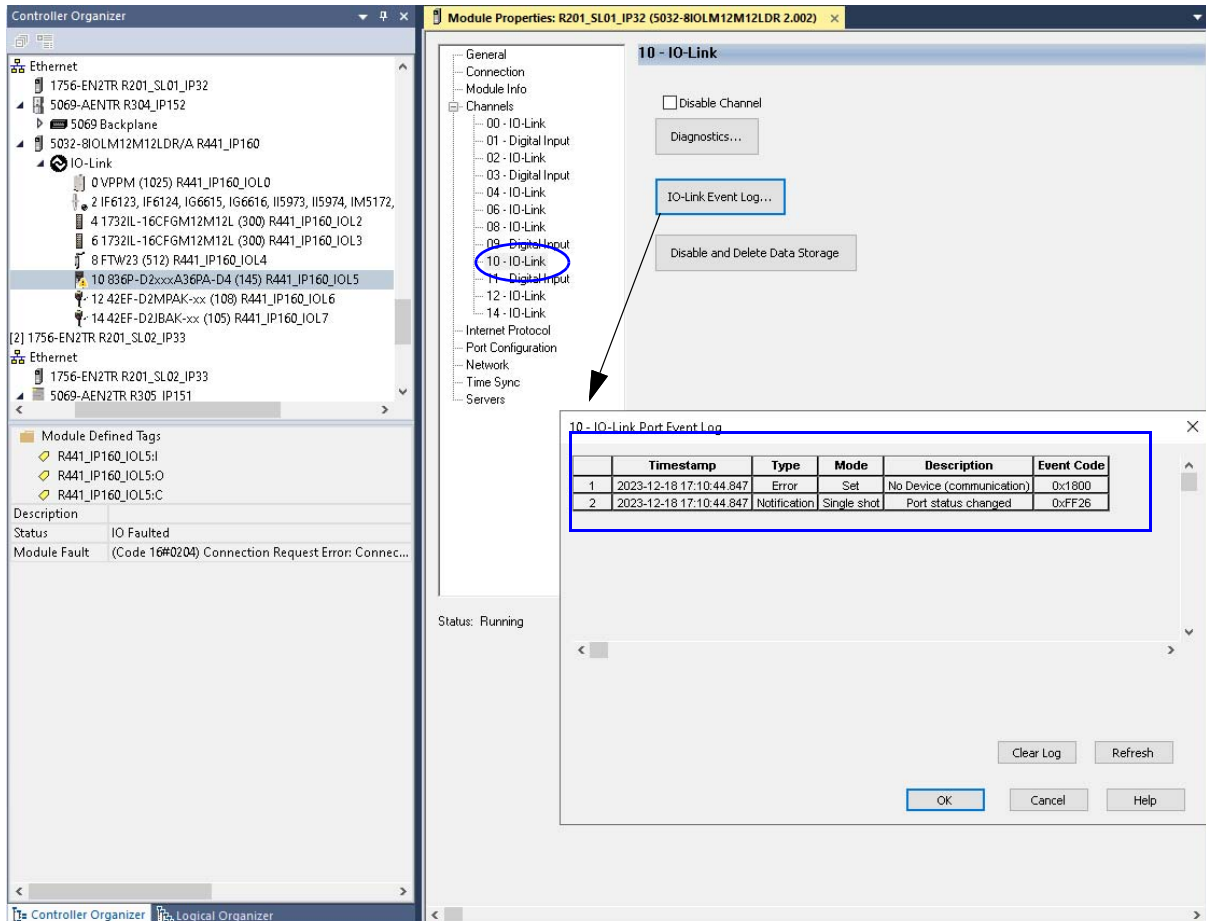


Figure 4 - IO-Link Channel or Port Diagnostics

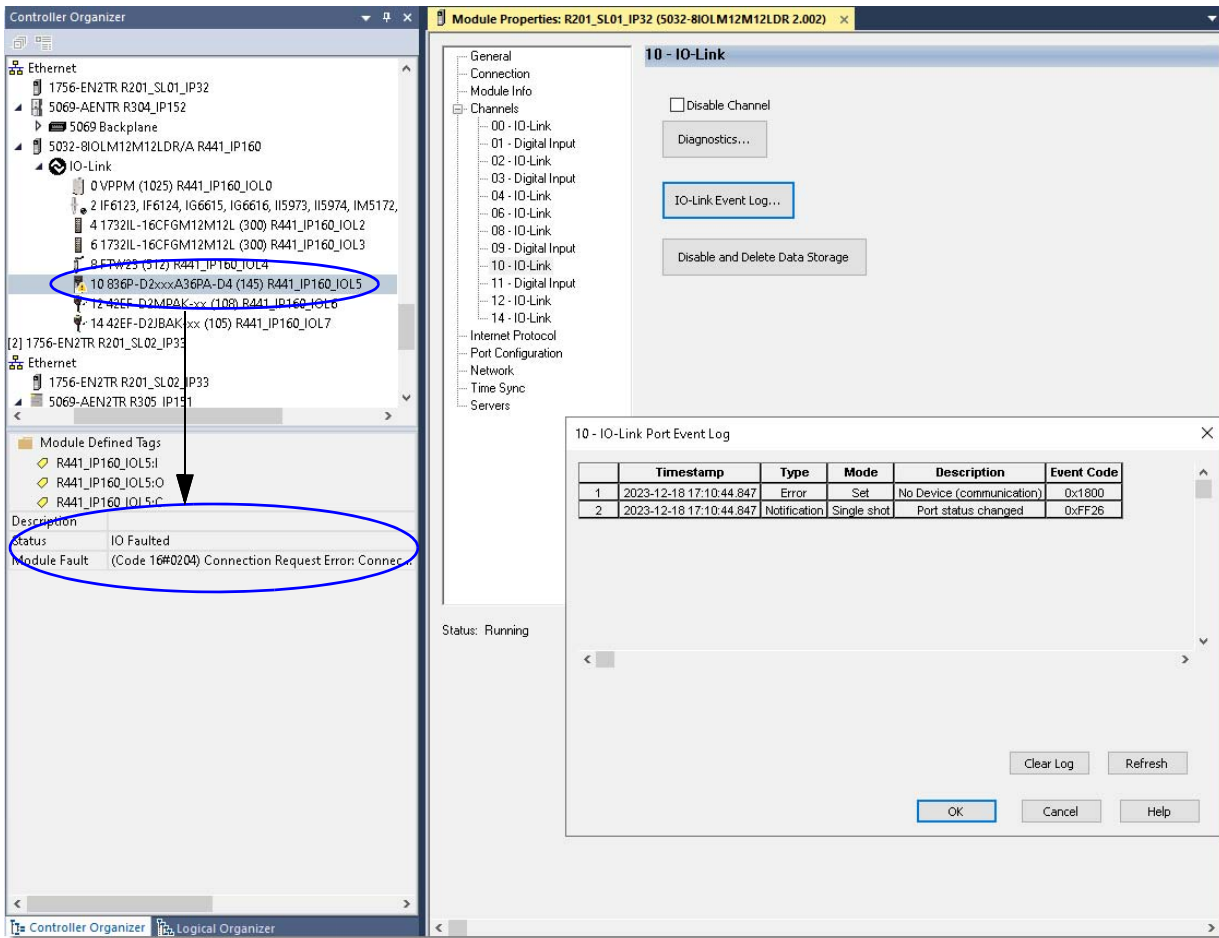


Figure 5 shows how fault conditions are indicated in the controller tags for the module.

Figure 5 - Fault Indication in Controller Tags for IO-Link Master Module

Name	Value	Force Mask	Style	Data Type	Class
▶ R341_IP120_IOL6:C		{...}	{...}	AB:5000_IOLIN...	Standard
▶ R341_IP120_IOL6:I		{...}	{...}	AB:5000_IOLIN...	Standard
R341_IP120_IOL6:I.RunMode		1	Decimal	BOOL	Standard
R341_IP120_IOL6:I.ConnectionFaulted		0	Decimal	BOOL	Standard
R341_IP120_IOL6:I.DiagnosticActive		1	Decimal	BOOL	Standard
R341_IP120_IOL6:I.CIPSyncValid		1	Decimal	BOOL	Standard
R341_IP120_IOL6:I.CIPSyncTimeout		0	Decimal	BOOL	Standard
▶ R341_IP120_IOL6:I.DiagnosticSequenceC...		7	Decimal	SINT	Standard
R341_IP120_IOL6:I.ConfigChanged		0	Decimal	BOOL	Standard
R341_IP120_IOL6:I.Fault		0	Decimal	BOOL	Standard
R341_IP120_IOL6:I.Uncertain		1	Decimal	BOOL	Standard
R341_IP120_IOL6:I.DeviceError		0	Decimal	BOOL	Standard
R341_IP120_IOL6:I.EventPresent		0	Decimal	BOOL	Standard
R341_IP120_IOL6:I.DSMatch		1	Decimal	BOOL	Standard
▶ R341_IP120_IOL6:I.LatestEvent		{...}	{...}	AB:5000_IOLIN...	Standard
▶ R341_IP120_IOL6:I.DataTimestamp	1681207876640997719		Decimal	LINT	Standard
▶ R341_IP120_IOL6:I.ProcessDataIn		{...}	{...}	AB:42EF_P2MP...	Standard
▶ R341_IP120_IOL6:O		{...}	{...}	AB:5000_IOLIN...	Standard



## ArmorBlock I/O and POINT I/O IO-Link Capabilities

Both ArmorBlock I/O and POINT I/O product families include IO-Link master modules.

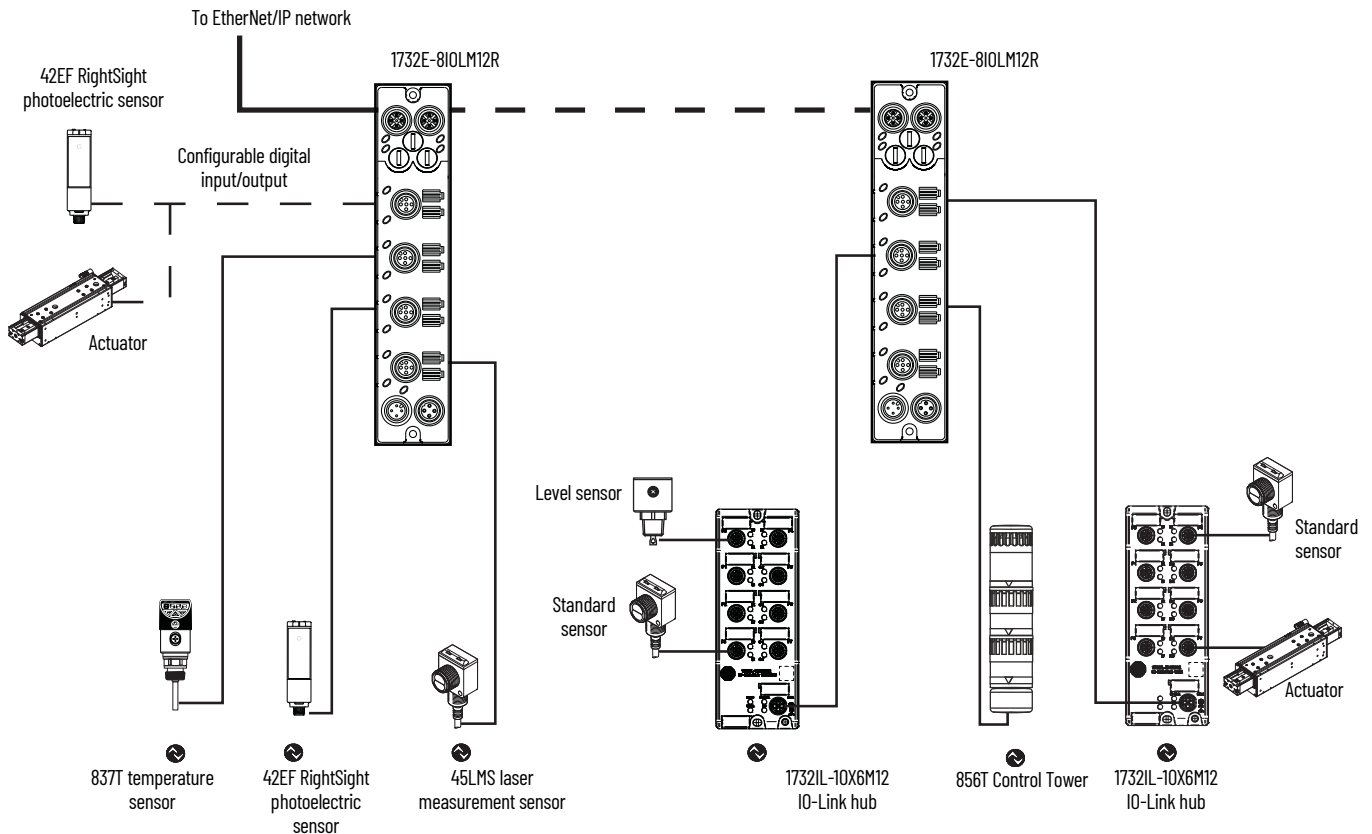
**Table 4 - ArmorBlock I/O and POINT I/O IO-Link Master Module Comparison**

If you need...	Choose	
	On-Machine	In Cabinet
	1732E-8IOLM12R	1734-4IOL
Dimensions, approx. HxWxD	179 x 37 x 27 mm (7.05 x 1.46 x 1.06 in.)	56 x 12 x 75.5 mm (2.21 x 0.47 x 2.97 in.)
IP rating	IP65, IP66, IP67, IP69K	None (open-style)
Mounting options	<ul style="list-style-type: none"> <li>Horizontal and vertical, inverted (without derating)</li> <li>On-Machine or Panel</li> </ul>	Horizontal and vertical (without derating)
IO-Link Class A/Class B ports	8 Class A	4 Class A
Power variants	M12 A-coded 4 pin	—

### ArmorBlock I/O On-Machine IO-Link System

The ArmorBlock I/O IO-Link master module provides eight channels that can be individually configured as an IO-Link master or as a standard digital I/O module on four M12 connectors. The IO-Link master module operates in v1.1 mode and is compatible with both v1.0 and v1.1 IO-Link devices to fit any IO-Link and/or discrete application. [Figure 6](#) shows an example of the different IO-Link devices that you can connect to your ArmorBlock I/O IO-Link master module.

**Figure 6 - IO-Link Connectivity Example**



The ArmorBlock I/O IO-Link master module includes these features.

Feature	Description
Slim footprint with 8 IO-Link channels	The slim form factor makes it suitable for smaller On-Machine spaces.
All channels configurable as input or output	The module can be configured as an IO-Link master module or as a standard digital I/O module.
Time stamping of input data	Offers submillisecond time stamping on a per point basis and provides the basic ON/OFF and OFF/OFF detection of all COS input data (also commonly known as the process data).
Time stamping of event data	If multiple events occur at the IO-Link enabled device or IO-Link master module level, the actual time stamp of the event could be delayed from the actual time that the event occurred.

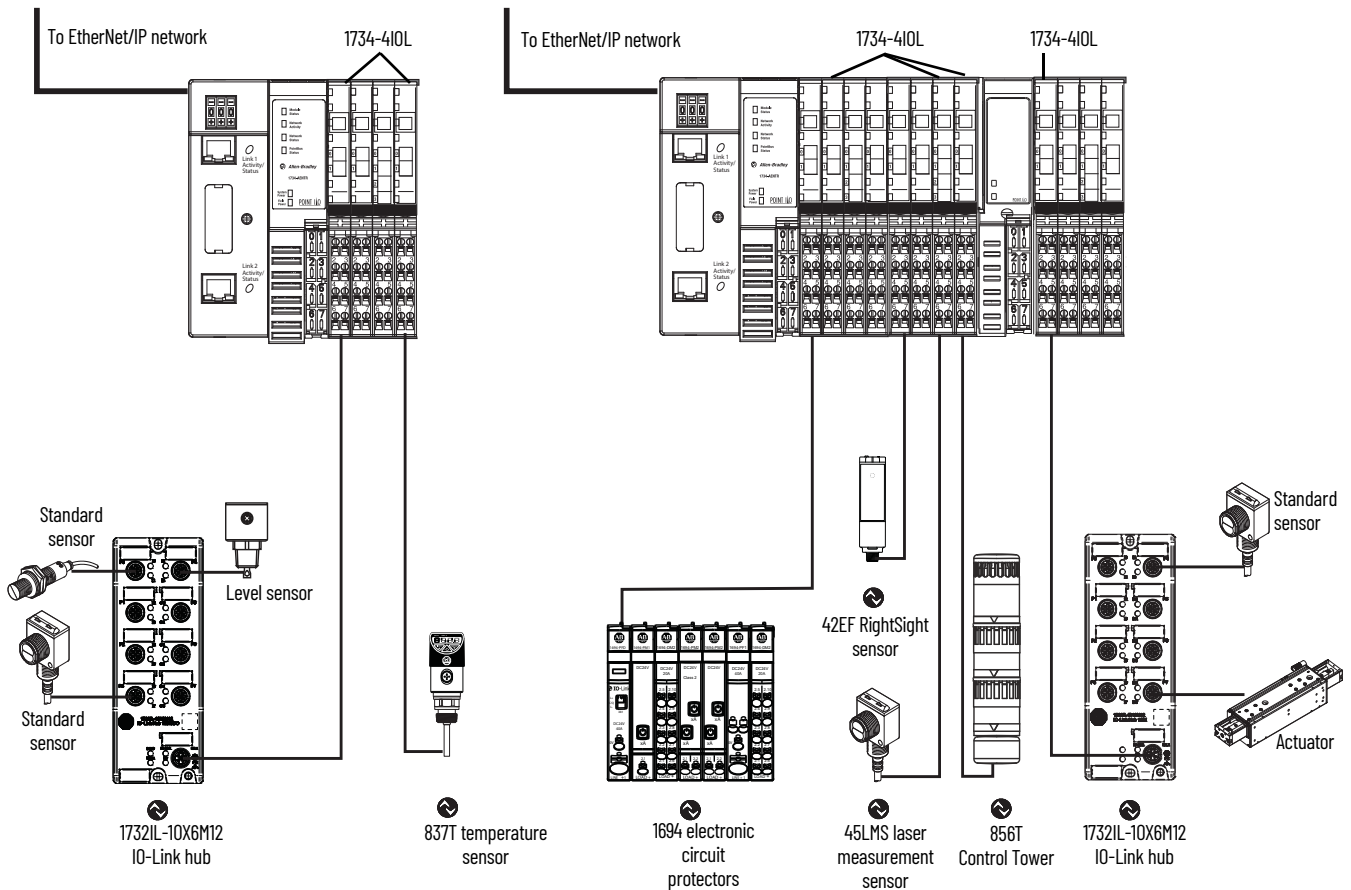
For more information on installation, see ArmorBlock I/O 8 Channel IO-Link Master Module Installation Instructions, publication [1732E-IN001](#).

For more information on configuration, see ArmorBlock I/O 8 Channel IO-Link Master Module User Manual, publication [1732E-UM007](#).

## POINT I/O In Cabinet IO-Link System

The POINT I/O IO-Link master module provides four channels that can be individually configured as an IO-Link master or as a standard digital I/O module. The IO-Link master operates in v1.1 mode and is compatible with both v1.0 and v1.1 IO-Link devices to fit any IO-Link and/or discrete application. [Figure 7](#) shows an example of the different IO-Link devices that you can connect to your POINT I/O IO-Link master module.

Figure 7 - IO-Link Connectivity Example



The POINT I/O IO-Link master module includes these features.

Feature	Description
IO-Link master module events	Access IO-Link events through Explicit Messaging by querying the Events attribute of an IO-Link module object. This attribute contains a list of events that are logged from the IO-Link channel. You can view the 25 most recent events by querying that attribute.
Fallback	The Fallback feature allows an IO-Link master module to configure an IO-Link device, and then to instruct the device to fall back to discrete input mode. When you set the channel to Fallback mode, a single input bit is provided in the controller tag and the devices return to Fallback mode once the operations are completed.

For more information on installation, see POINT I/O 4 Channel IO-Link Master Module Installation Instructions, publication [1734-IN043](#).

For more information on configuration, see POINT I/O 4 Channel IO-Link Master Module User Manual, publication [1734-UM020](#).

## Programming Considerations

For ArmorBlock I/O and POINT I/O IO-Link master modules, you can enhance the interface with IO-Link devices and IO-Link hubs by adding IO-Link Device Object Libraries that include Add-On Instruction rungs and HMI faceplates. IO-Link Device Object Libraries allow you to collect, process, and deliver data between smart devices and application logic.

The library provides pre-configured status, diagnostic, and configuration HMI faceplates for FactoryTalk® View ME/SE or Studio 5000 View Designer® and Add-On Instructions. Use with Studio 5000® Application Code Manager. (1734-4IOL, 1732E-8IOLM12R, 1694, 42AF, 42EF, 42JT, 45CRM, 45DMS, 45PLA, 46CLR, 46DFA, 836P, 837T, 856T, 871C, 871FM, 871TM, 873P, 875L).

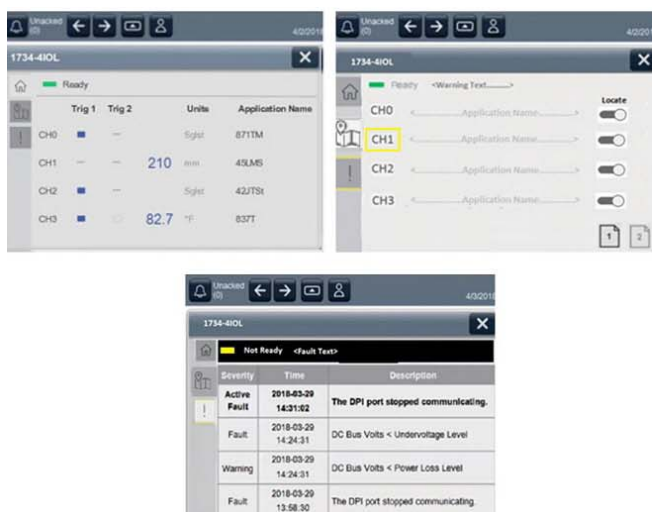
For more information on how to download, install, and use the IO-Link Device Object Library, see the IO-Link Device Library Reference Manual, publication [DEVICE-RM300](#).

## IO-Link Device Object Libraries

IO-Link Device Object Libraries enable you to easily interface with Rockwell Automation intelligent devices such as drives, motion, network switches, sensors, IO, and more. The libraries contain tested, documented, and lifecycle-managed objects that can be used with Machine Builder, process, and packaged libraries or as standalone components. Device objects include HMI faceplates for FactoryTalk View ME/SE and Studio 5000 View Designer® application and provide a user interface that seamlessly integrates with the products.

### Faceplate Examples

POINT I/O IO-Link Master Faceplate



836P IO-Link Sensor Faceplate



HMI faceplates are standard display files that provide a common user interface. They are HMI pop-up screens that are used to display detailed information that is related to a specific instruction or device. In systems that follow ISA 101.1 design guidelines, faceplates are often referred to as Level 4 displays.

Pre-configured device objects include an Add-On Instruction rung and an HMI faceplate providing the following benefits:

- Collect, process, and deliver data between smart devices and application logic
- Detailed device data collection and delivery
- Enhanced device status and diagnostics
- Common control interfaces maximizing flexible automation device selection and application code reuse

Device object use cases:

- Basic device maintenance and diagnostics
- Virtual device operations for startup and commissioning
- Operator and program control for velocity machine and process applications

An IO-Link Device Object Library provides pre-configured status and diagnostic faceplates and Add-On Instruction sets for Allen-Bradley IO-Link sensors, ArmorBlock I/O IO-Link master modules, ArmorBlock I/O IO-Link hubs, and POINT I/O IO-Link master modules. You can use IO-Link device objects with Machine Builder, process, and packaged libraries, or as standalone components. IO-Link Device Object Add-On Instruction objects collect, process, and deliver data between hardware devices and application logic.

An IO-Link Device Object Library includes the following:

- IO-Link device instructions for IO-Link master modules and IO-Link devices
- Library folders and files
- Visualization files
- Basic faceplate attributes
- Faceplate revision notes
- Launch buttons
- Library versions
- State model
- Interfaces
- Data types
- Application Code Manager

## Studio 5000 Application Code Manager

Studio 5000 Application Code Manager is a tool that you can use with the Device Object Libraries to streamline project and machine development. The bulk coding tool allows you to design and standardize functionality with reusable application code. With the Application Code Manager tool you can:

- Enable more efficient project development with reusable libraries of code
- Quickly create and deploy projects through our Application Content Libraries
- Import Rockwell Automation provided application content libraries to expedite system development
- Build your own reusable code that can be managed and deployed across your entire enterprise

You can use an IO-Link Device Object Library in harmony with other application code libraries including other Device Object Libraries (such as network, IO, power, safety device libraries) or application libraries (such as PlantPax<sup>®</sup> process objects or Machine Builder libraries). All libraries are intended to follow similar design philosophies to provide a consistent experience for operators and maintenance staff.

## Download the IO-Link Device Libraries

For the latest compatible software information and to download the Rockwell Automation library, see the [Product Compatibility and Download Center](#).

Search “Device Library” or filter on Application Content to find the library.

## FIND DOWNLOADS ?

Device Library	All Categories	All Families	Q	COMPARE	DOWNLOADS
IO Device Library	Tested, documented and life-cycle managed library objects for Rockwell Automation 1756, 1769, 1734, 1794, 1738, 1732E, 1719, 509 (Application Content/Engineering Libraries)				
IO-Link Device Library	Tested, documented and life-cycle managed IO-Link Master and Sensor Library Objects. (Application Content/Engineering Libraries) (Application Content/Engineering Libraries)				
Network Device Library	Tested, documented and life-cycle managed library objects for Stratix Switch and Device Level Ring DLR network objects. (Application Content/Engineering Libraries)				
<b>Power Device Library</b>	<b>Tested, documented and life-cycle managed Power Device Library Objects for E300, ArmorStart, SMC50, PowerFlex, and Kinetix. (Application Content/Engineering Libraries)</b>				
Safety Device Library	Tested, documented and life-cycle managed library objects for Rockwell Automation Safety Instructions. (Application Content/Engineering Libraries)				

Device Library	Version	Download
Power Device Library	3.01.00	Download
IO Device Library	5.00	Download
IO-Link Device Library	2.2.00	Download
Network Device Library	1.04.00	Download
Safety Device Library	1.01.00	Download

## Download and Install Studio 5000 Application Code Manager

To download the Studio 5000 Application Code Manager, do as follows:

1. From the PCDC, search “Application Code Manager” and select the item to download.
2. Extract the downloaded .zip file by running the 4.xx.00–Studio5000\_ACMDVD.exe executable file. This extracts a new folder that contains a Setup.exe file that you can run to begin product installation.
3. Follow the prompts from the splash screen until installation is complete.



You must use an SQL server for Application Code Manager. The SQL Server Express application is offered for free and is included in the Application Code Manager installer.

### Register Libraries in Studio 5000 Application Code Manager

Use the Studio 5000 Application Code Manager or the Studio 5000 “Import Library Objects” plug-in wizard to import IO-Link Device Object Library objects into a Logix 5000® controller project. To use the library in Application Code Manager, you must first register the libraries.

To register the entire library, do as follows:

1. Locate and run the setup.cmd file in the root folder of the library files. A Windows® console appears as the script runs.
2. When the library registration is complete, the console displays “Deployment Complete” as shown.

```

C:\WINDOWS\system32\cmd.exe
-- Be patient, the duration of this process varies based on library size
-- Script Complete

::-----
:: Registering Libraries
::-----

-- Be patient, the duration of this process varies based on library size
-- Registration Complete

Deployment Complete
Exit deployment? [Y]?

```

3. To exit the registration console, enter “Y”.

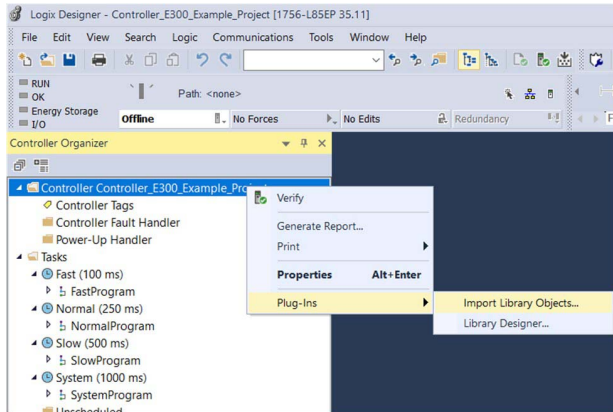
You can manually register one or multiple library objects in the Studio 5000 Application Code Manager. For information on how to register library objects manually, see the IO-Link Device Library Reference Manual, publication [DEVICE-RM300](#).

## Import Logic into Studio 5000 Logix Designer Projects

You must have the Application Code Manager installed to use the Studio 5000 Import Library Object Wizard plug-in but you do not need it to be open or create projects.

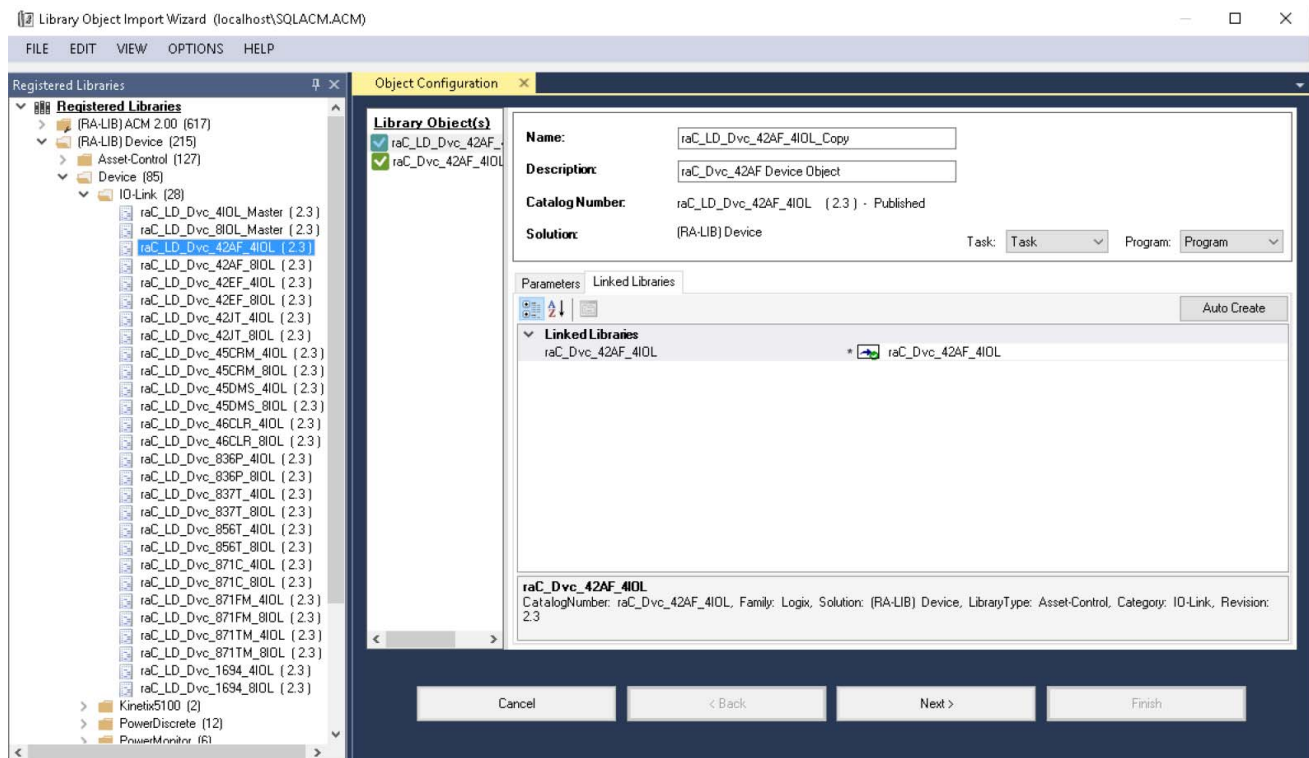
Import a device object into an existing application as follows:

1. Right-click on an item (for example, Controller, Task, Program) in the Controller Organizer and select Plug-Ins > Import Library Objects...



The Application Code Manager Wizard launches and shows the Object Configuration view.

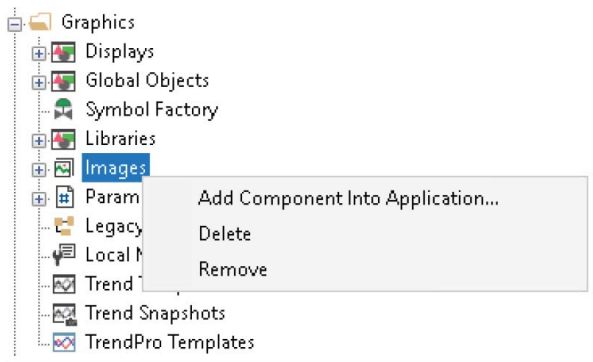
2. From the Registered Libraries list, select your device and drag it to the Library Object(s) list.



3. Configure the following:
  - Enter a name and description for the device.
  - Assign the Task and Program.
  - Select an IO-Link master module ChannelNumber to connect the IO-Link sensor or device to.
  - Assign the MasterName to the instance of the IO-Link master module in the controller project (for example, 1734-4IOL or 1732E-8IOLM12R).
4. Select Auto Create to create all the required linked libraries, or select Next to create linked libraries manually or point to existing linked libraries.
5. Select the appropriate merge options.
6. Select Next, and then select Finish to complete the import.

## Import FactoryTalk View Visualization Files

Device objects include HMI faceplates, which displays device information. There is no controller programming required other than to create the I/O module in the project. If you use FactoryTalk View ME/SE, you must also import the tag import file FTViewStudio\_IOLinkLibrary\_Tags\_3\_00.CSV to support navigation on faceplates.



Import the visualization files as follows:

1. Import HMI Images files.  
Select all images in the \HMI FactoryTalk View Images - png folder and select Open.
2. Import Global Object files.  
Select the global object (.ggfx) files from the \HMI - FactoryTalk View ME\Global Objects - ggfx folder.
3. Import HMI faceplates.  
Select the faceplate (.gfx) files from the \HMI - FactoryTalk View ME\Displays -gfx folder.

Once you have imported the files into the FactoryTalk® View Studio project, you can use them in your application as follows:

1. Open the Global Display (raC-3-ME) Graphic Symbols - IO-Link Device folder.
2. Copy the desired launch button style and paste it into a display in your application where you wish to open the faceplate.

For more information on how to configure objects for specific IO-Link devices, IO-Link hubs, or IO-Link master modules, see the IO-Link Device Library Reference Manual, publication [DEVICE-RM300](#).

## IO-Link Diagnostics

IO-Link devices that are connected to an IO-Link master module provide diagnostics and data including detailed machine health status to improve uptime and increase productivity.

### Real-time Diagnostics

- Real-time monitoring of the entire machine down to the sensor level
- Optimized preventive maintenance – Identify and correct issues before failures can occur.
- Detect sensor malfunctions or sensor failure.
- Get IO-Link sensor diagnostics to identify and correct the issue before failure occurs.

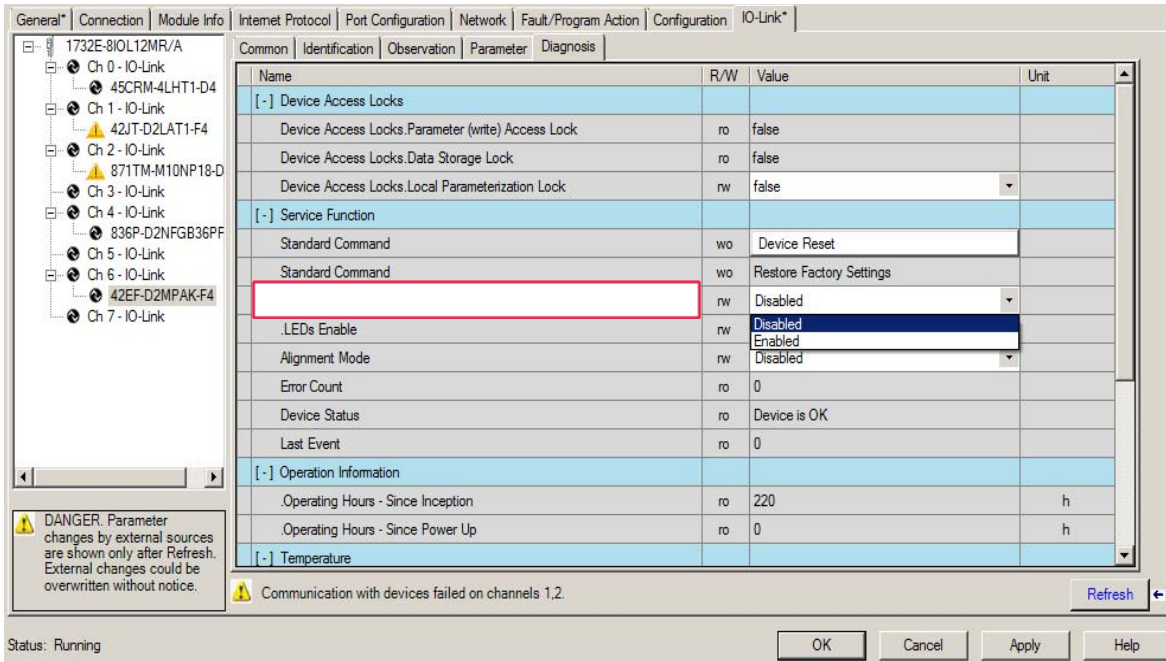
## ArmorBlock I/O IO-Link Master Module

The ArmorBlock I/O IO-Link master module displays diagnostic information for the IO-Link devices within the Studio 5000 Logix Designer application.

To enhance the IO-Link master module interface with IO-Link devices and IO-Link hubs, use IO-Link Device Object Libraries that include Add-On Instruction rungs and HMI faceplates. IO-Link Device Object Libraries allow you to collect, process, and deliver data between smart devices and application logic.

For more information on how to use IO-Link Device Object Libraries for an ArmorBlock I/O IO-Link master module, see the IO-Link Device Library Reference Manual, publication [DEVICE-RM300](#).

**Figure 8 - Device Diagnostic Information Displayed in the IO-Link View**



You can access and view the diagnostic tags in the ArmorBlock I/O IO-Link master module properties. The Studio 5000 Logix Designer application automatically generates diagnostic descriptive tags for IO-Link enabled devices from the device IODD files and displays them in the controller tag view of the IO-Link master module.

**Figure 9 - Controller Tag View with Diagnostic Descriptive Tags**

Name	Value	Force Mask	Style	Data Type
my_8iol192168:C	{...}	{...}		AB:1732_8IOL1:C:0
my_8iol192168:I	{...}	{...}		AB:1732_8IOL33...
my_8iol192168:I.Ch0DiagEvent	{...}	{...}		AB:1732_8IOL_St...
my_8iol192168:I.Ch0Triggered	0		Decimal	BOOL
my_8iol192168:I.Ch1DiagEvent	{...}	{...}		AB:1732_8IOL_St...
my_8iol192168:I.Ch1MarginLowAlarm	0		Decimal	BOOL
my_8iol192168:I.Ch1Triggered	0		Decimal	BOOL
my_8iol192168:I.Ch2DiagEvent	{...}	{...}		AB:1732_8IOL_St...
my_8iol192168:I.Ch2MarginStatus	0		Decimal	BOOL
my_8iol192168:I.Ch2Triggered	0		Decimal	BOOL
my_8iol192168:I.Ch3DiagEvent	{...}	{...}		AB:1732_8IOL_St...
my_8iol192168:I.Ch4DiagEvent	{...}	{...}		AB:1732_8IOL_St...
my_8iol192168:I.Ch4Pressure	5		Decimal	INT
my_8iol192168:I.Ch4Triggered1	0		Decimal	BOOL
my_8iol192168:I.Ch4Triggered2	0		Decimal	BOOL
my_8iol192168:I.Ch5DiagEvent	{...}	{...}		AB:1732_8IOL_St...
my_8iol192168:I.Ch6DiagEvent	{...}	{...}		AB:1732_8IOL_St...
my_8iol192168:I.Ch6Gain	2		Decimal	INT
my_8iol192168:I.Ch6MarginLowAlarm	0		Decimal	BOOL
my_8iol192168:I.Ch6ProximityAlarm	0		Decimal	BOOL
my_8iol192168:I.Ch6SignalStrength	0		Decimal	DINT
my_8iol192168:I.Ch6Triggered	0		Decimal	BOOL
my_8iol192168:I.Ch7DiagEvent	{...}	{...}		AB:1732_8IOL_St...
my_8iol192168:I.Fault	2#0000_0000...		Binary	DINT
my_8iol192168:I.Status	{...}	{...}		AB:1732_8IOL_St...



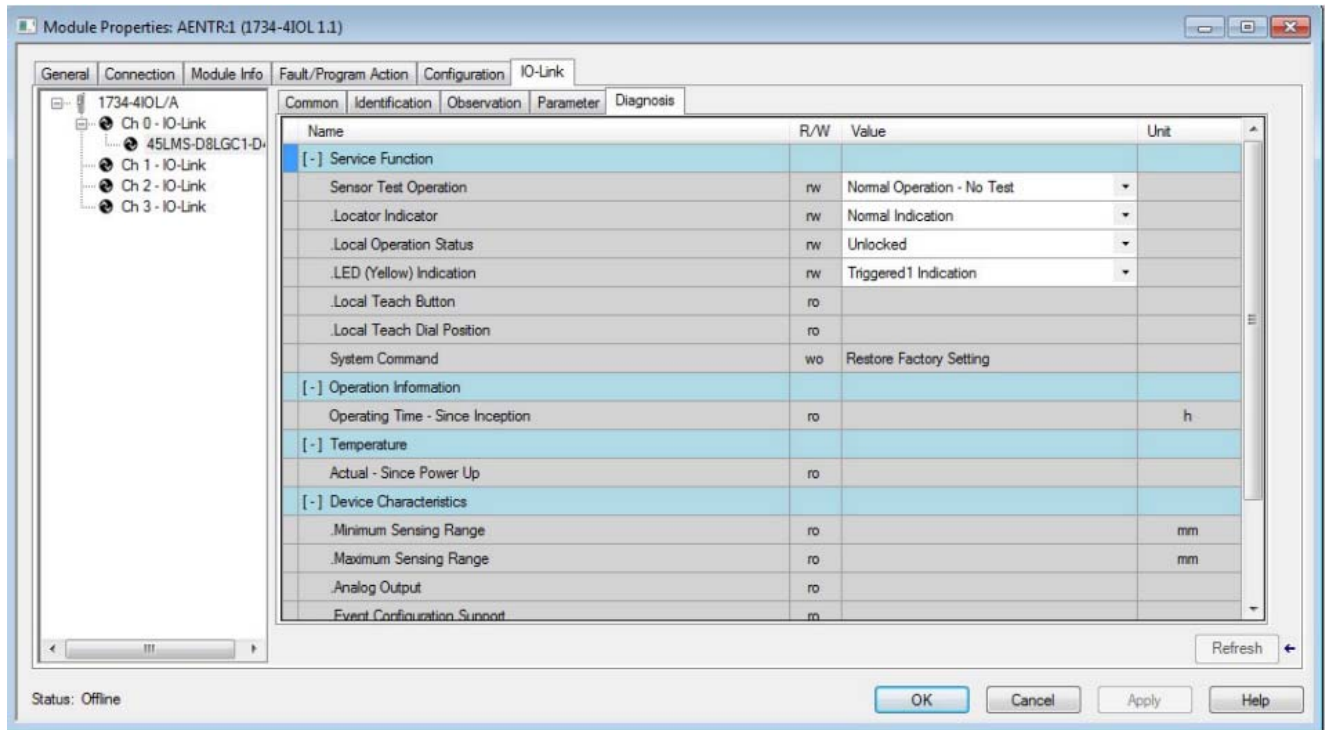
## POINT I/O IO-Link Master Module

The POINT I/O IO-Link master module displays parameters for troubleshooting the IO-Link device within the Studio 5000 Logix Designer application.

To enhance the POINT I/O IO-Link master module interface with IO-Link devices and IO-Link hubs, use IO-Link Device Object Libraries that include Add-On Instruction rungs and HMI faceplates. IO-Link Device Object Libraries allow you to collect, process, and deliver data between smart devices and application logic.

For more information on how to use IO-Link Device Object Libraries for a POINT I/O IO-Link master module, see the IO-Link Device Library Reference Manual, publication [DEVICE-RM300](#).

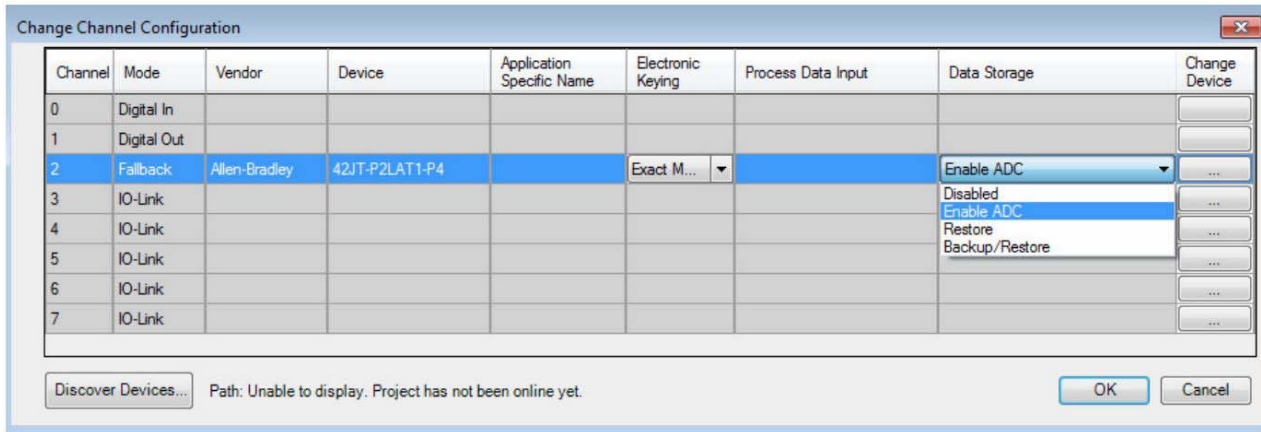
**Figure 10 - IO-Link Device Troubleshooting Parameters Displayed on the Diagnosis Tab**



## Configure the ArmorBlock I/O IO-Link Master Module

The ArmorBlock I/O IO-Link master module can discover registered devices and these devices can be configured in the Studio 5000 Logix Designer application module properties.

Figure 11 - IO-Link Device Configuration in ArmorBlock I/O IO-Link Master Module

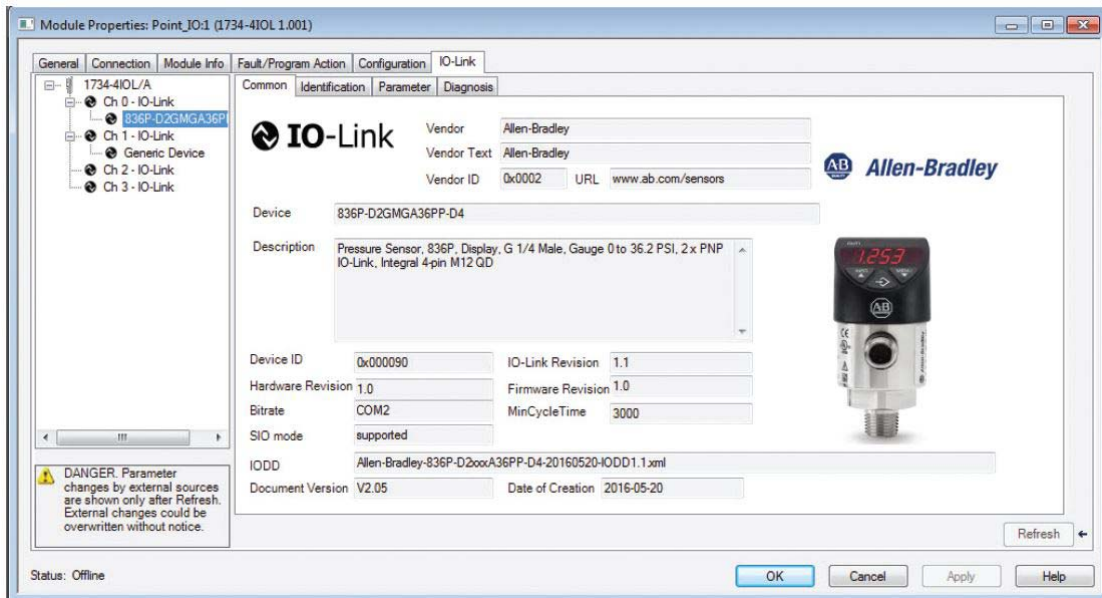


For full instructions on how to add and configure IO-Link devices to an ArmorBlock I/O IO-Link master module, see ArmorBlock I/O 8 Channel IO-Link Master Module User Manual, publication [1732E-UM007](#).

## Configure the POINT I/O IO-Link Master Module

With the POINT I/O IO-Link master module, you can configure device parameters for IO-Link devices with the IO-Link Advanced integration level from the Studio 5000 Logix Designer application module properties.

Figure 12 - IO-Link Device Configuration in POINT I/O IO-Link Master Module



For full instructions on how to add and configure IO-Link devices to a POINT I/O IO-Link master module, see POINT I/O 4 Channel IO-Link Master Module User Manual, publication [1734-UM020](#).



# Rockwell Automation Support

Use these resources to access support information.

<b>Technical Support Center</b>	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	<a href="http://rok.auto/support">rok.auto/support</a>
<b>Local Technical Support Phone Numbers</b>	Locate the telephone number for your country.	<a href="http://rok.auto/phonesupport">rok.auto/phonesupport</a>
<b>Technical Documentation Center</b>	Quickly access and download technical specifications, installation instructions, and user manuals.	<a href="http://rok.auto/techdocs">rok.auto/techdocs</a>
<b>Literature Library</b>	Find installation instructions, manuals, brochures, and technical data publications.	<a href="http://rok.auto/literature">rok.auto/literature</a>
<b>Product Compatibility and Download Center (PCDC)</b>	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	<a href="http://rok.auto/pcdc">rok.auto/pcdc</a>

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Rockwell Otomasyon Ticaret A.Ş. Kar Plaza İş Merkezi E Blok Kat:6 34752, İçerenköy, İstanbul, Tel: +90 (216) 5698400 EEE Yönetmeliğine Uygundur

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AMERICAS: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000

EUROPE/MIDDLE EAST/AFRICA: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2663 0600

ASIA PACIFIC: Rockwell Automation SEA Pte Ltd, 2 Corporation Road, #04-05, Main Lobby, Corporation Place, Singapore 618494, Tel: (65) 6510 6608

UNITED KINGDOM: Rockwell Automation Ltd., Pitfield, Kiln Farm, Milton Keynes, MK11 3DR, United Kingdom, Tel: (44)(1908) 838-800

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