

# SMART SENSORS TECHNOLOGIES



# Smart Sensing Technologies IO-Link Solutions & Ethernet Solutions

# THE CONNECTED ENTERPRISE

ROCKWELL AUTOMATION'S VISION FOR SMART MANUFACTURING



**SMART  
PLANTS**

**SMART  
MACHINES &  
EQUIPMENT**

**SMART  
DEVICES**



Sensors



Actuators



Intelligent Motor Control



Automation Control



Terminals



Audio



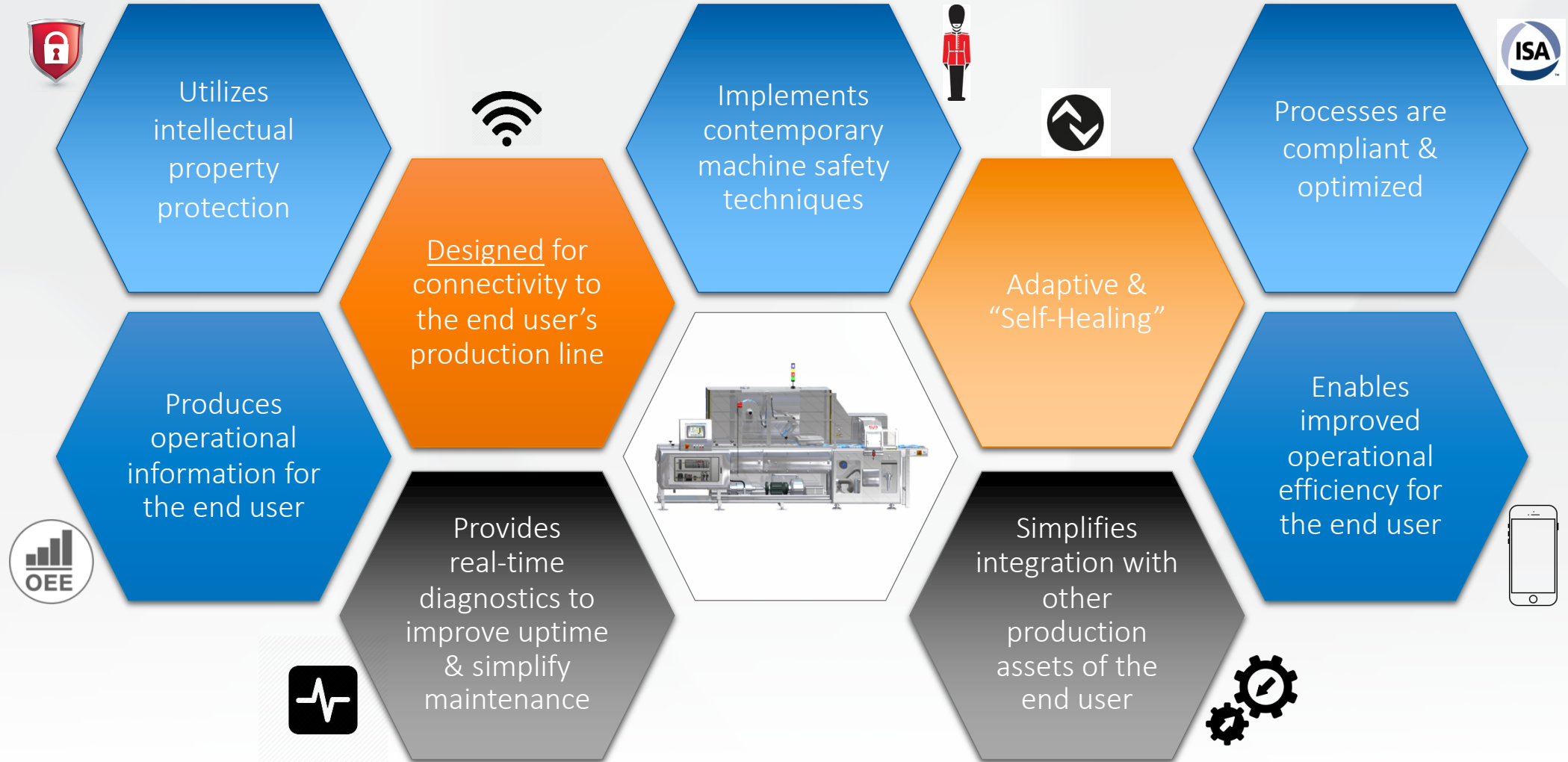
Video

# What is a Smart Machine?



# So...How Smart is your Equipment?

Assess Your Capabilities and Resources



# Agenda

Introduction to IO-Link

Why Rockwell Automation® IO-Link?

Benefits of IO-Link

IO-Link Portfolio, Features and Competitive Advantages

Scenarios

Q & A



## What is IO-Link?

- IO-Link is a worldwide open-standard protocol (IEC 61131-9)
  - **Already integrated** in most of the new sensing technologies
  - A **Low Cost** to be part of **The Industry 4.0**
- Allows sensing devices to be visible on EtherNet/IP
  - **Access** to I/O **data** and **diagnostic** information

# How are Field I/O Signals Handled Today?



EtherNet/IP

3 different types of I/O with:

- Different types of wiring (2/3/4 wires)
- Different types of configuration
- Different types of I/O modules required

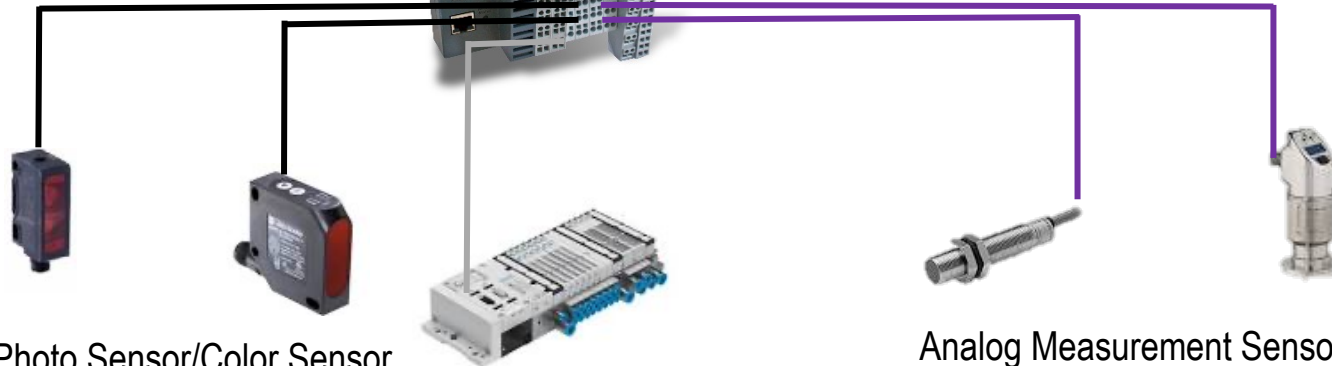


Photo Sensor/Color Sensor  
(Digital Input)

Actuator/Valve Manifold  
(Digital Output)

Analog Measurement Sensors  
(Analog Input)



# How Does It Change with IO-Link?



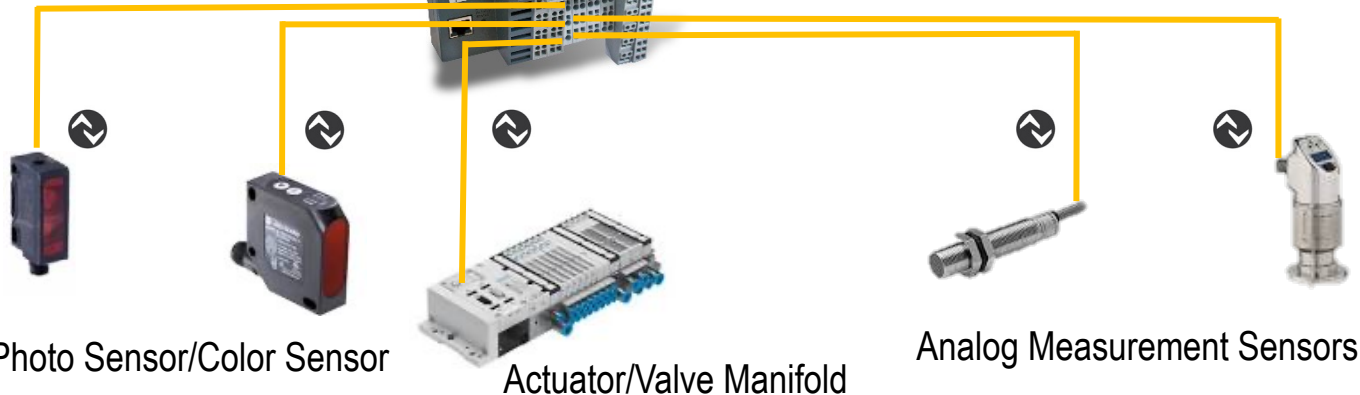
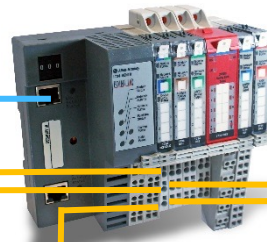
EtherNet/IP

- An IO-Link system consists of IO-Link devices (sensors and/or actuators), standard 3-wire cables and an IO-Link master
- Sensors featuring IO-Link act the same as the standard I/O sensors until connected to an IO-Link master

## With IO-Link:

- Single type of wiring (3-wire)
- Single configuration platform (Studio 5000)
- Single I/O module

 IO-Link



# Introduction to IO-Link

Source: IO-Link website ([www.io-link.com](http://www.io-link.com))

IO-Link combines powerful data and diagnostics with simple implementation and configuration, resulting in:

- Reduced inventory and operating costs
- Increased uptime/productivity
- Simplified design, installation, set up and maintenance
- Enhanced flexibility and scalability

# Agenda

Introduction to IO-Link

Why Rockwell Automation® IO-Link?

Benefits of IO-Link

IO-Link Portfolio, Features and Competitive Advantages

Launch Collateral

Frequently Asked Questions



# IO-Link: An Enabling Technology for The Connected Enterprise

- Enabled by integrated control and information, The Connected Enterprise allows us to create a smarter, more productive and more secure environment
- The Connected Enterprise facilitates the convergence of information technology and operations and the real-time information flow between them
- Based on IO-Link technology, our portfolio of smart sensors and I/O is the foundation of integrated control and information, providing seamless visibility of field data through your Integrated Architecture® control system

Connected Enterprise	
Integrated Architecture	
A-B Controller	
A-B IO-Link Master	
A-B IO-Link Sensors	 871FM 42JT 42EF 45CRM 871TM 871C

*Smart Sensors. Smart Machines. Smart Manufacturing.*

**KLINKMANN**

# Rockwell Automation IO-Link Strategy

## Standard, Consortium, & our Competitive Edge

Green = Strength  
Red = Weakness

Company	Controller (PLC)	Master Module	Sensors
Rockwell Automation	✓	✓	✓
Siemens	✓	✓	-
Balluff	-	✓	✓
Control	-	✓	-
FESTO	-	-	✓
IFM	-	✓	✓
SICK	-	✓	✓

Rockwell Automation has the Complete Solution

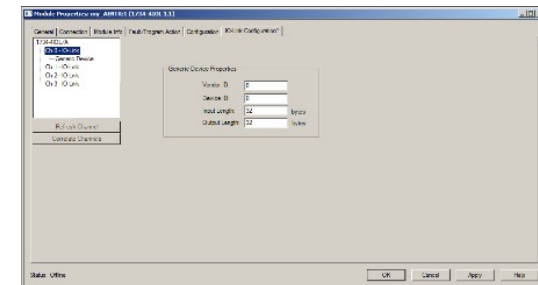
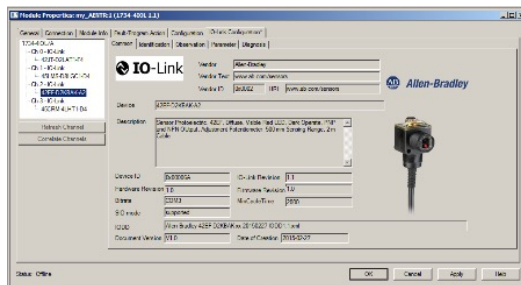


The Arena – Players of Consortium



# Levels of IO-Link Integration (1734-4IOL)

	Premier Integration = Higher Value	Basic Integration	Generic Integration
Inclusion	<ul style="list-style-type: none"> <li>Allen-Bradley and Encompass Partner sensors</li> </ul>	<ul style="list-style-type: none"> <li>ALL Sensors (most often Competitive)</li> </ul>	<ul style="list-style-type: none"> <li>ALL Sensors (most often Competitive)</li> </ul>
Description	<ul style="list-style-type: none"> <li>This method offers the best overall experience for managing, configuring and monitoring IO-Link devices. A well-formed IODD file is <u>required</u> and fully leveraged.</li> <li>Rockwell is the only company with Controller, IO-Link master, and IO-Link sensors.</li> </ul>	<ul style="list-style-type: none"> <li>This method provides a simple interface for connecting any IO-Link device to the Master Module by using information found in the device's IODD file.</li> </ul>	<ul style="list-style-type: none"> <li>This method provides an interface for connecting any IO-Link device to the Master. An IODD file is neither required nor used.</li> <li>Configuring devices as a "generic" profile</li> </ul>
Features	<ul style="list-style-type: none"> <li>Provide smooth, consistent integration of IO-Link enabled devices in our system.</li> <li>Configured in Studio 5000 Logix Designer application with 1734-4IOL Master AOP or through local teach.</li> <li>Devices are configured through a tabular method.</li> </ul>	<ul style="list-style-type: none"> <li>All sensors are supported.</li> <li>Typically used for Competitive Sensors</li> <li>AOP provides identification information only of the attached sensor.</li> <li>Customer continues to use the competitor's solution for configuring the sensor (USB master) OR</li> <li>Customers can use message instructions to configure the sensors.</li> </ul>	<ul style="list-style-type: none"> <li>All sensors are supported.</li> <li>Ideal for large OEM's that prefer sensor flexibility and significant programming.</li> <li>All I/O data from the Sensors are available in Controller, unformatted.</li> <li>No Automatic Device Configuration for the sensors.</li> </ul>



## The Rockwell Automation IO-Link Solution and Premier Integration

- **Premier Integration:** When using the full Rockwell Automation solution, customers are afforded an enhanced level of integration plus features and functionality not available with competitive offerings. This includes:
  - **Studio 5000 Logix Designer application**, one programming environment that provides access to IO data and configuration parameters across the entire Integrated Architecture system
  - **Add-on-Profile (AOP)** that simplifies the setup of Allen-Bradley IO-Link devices by organizing sensor information and configurable parameters for intuitive programming
  - **Automatic Device Configuration (ADC):** Sensor configurations can be stored in the Logix controller and downloaded to new/replacement sensors (of the same catalog number) without the need for re-teaching/re-programming
  - **Tag Names** and structure for IO-Link process data are automatically generated from the sensor IO Device Description (IODD) files
  - **Correlation** of the Read/Write (R/W) parameter values of connected IO-Link devices is compared to those stored in the controller so any differences can be mitigated (only while online in run-mode)

# Summary of Benefits when Using a Complete Rockwell Automation Solution

Sensor Manufacturer	<i>AB</i>	<i>Encompass</i>	<i>Competitor</i>
Single Software Tool (Studio 5000) Vs separate Tool	Green	Green	Red
Tabular Configuration Tool (AOP)	Green	Green	Red
Data Conversion/Mapping	Green	Green	Red
Correlation	Green	Green	Red
I/O Detailed Tag Names (Process Data)	Green	Green	Red
ADC for IO-Link Master (Controller to Master Config. ONLY)	Green	Green	Green
ADC for IO-Link Sensors v1.0 (Controller to Master to Sensor)	Green	Green	Red
ADC for IO-Link Sensors v1.1 (Controller to Master to Sensor)	Green	Green	Red
ADC for IO-Link Sensors v1.1 (Master to Sensor)	Green	Green	Red
Application Specific Name on main AOP screen	Green	Green	Red
Connector Agnostic (ie: replace a sensor that has a Micro Connector with a sensor that has another connector type and the master will treat it as the original part number)	Green	Green	Red
Consistent Parameter Names between sensors	Green	Red	Red
Offline only to Add/Remove Sensors	Green	Green	Green
Support multiple Sensor Personalities	Green	Green	Green
Process data invalid bit	Green	Green	Green
Fault and Run/Idle mode - defined behavior	Green	Green	Red
IODD files preinstalled with AOP	Green	Red	Red
EDS AOP key support	Green	Green	Red



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Why Rockwell Automation® IO-Link?

**Benefits of IO-Link**

IO-Link Portfolio, Features and Competitive Comparison

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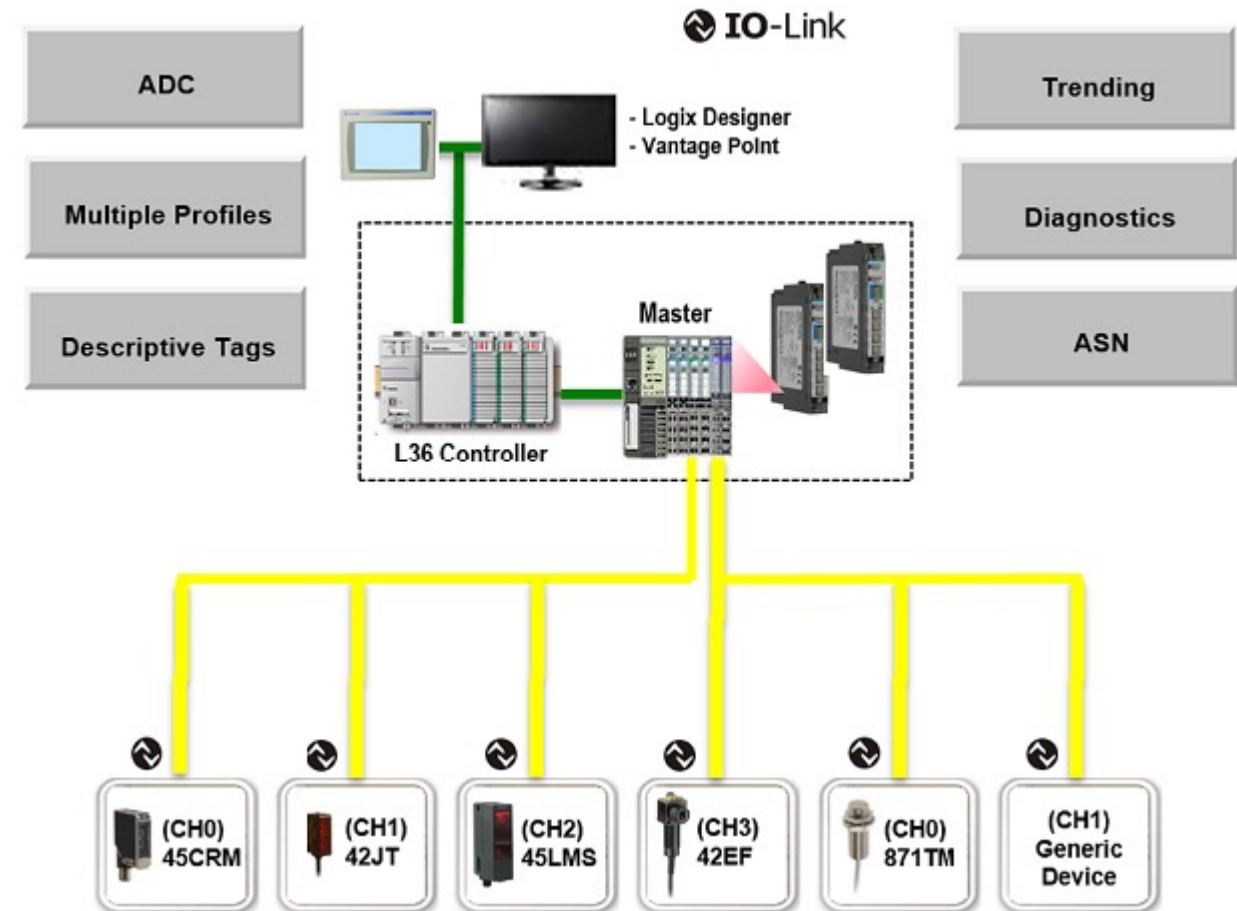
Q & A



 **IO-Link**

# Key IO-Link Sensor Features

- **Automatic Device Configuration (ADC)** reduces errors upon sensor replacement - configurations stored in the controller are automatically sent to the new device
- **Multiple profiles** facilitate flexible manufacturing by reducing changeover time for each sensor from minutes to seconds
- **Real-time diagnostics and trending** optimize preventative maintenance and troubleshooting, reducing issue resolution time by up to 90%
- **Application-Specific Names** make it easy to identify sensors during commissioning and over the lifetime of the machine
- **Descriptive Tags** are automatically generated for I/O data, significantly reducing setup time and simplifying troubleshooting and maintenance.



## Summary of Key IO-Link Benefits for OEMs



*Faster Time to Market*

- One programming environment for Sensors and Architecture
- Seamless integration into Rockwell Automation EtherNet/IP Architecture
- Intuitive programming simplifies initial setup and helps eliminate logic errors



*Lower Total Cost of Ownership*

- No incremental cost for sensors
- No wiring changes
- Scalable solution – enable IO-Link functionality as needed
- Reduce device inventory 50% by streamlining SKU's



*Improved Asset Utilization*

- Easy access to actionable contextualized information
- Real-time diagnostics optimize preventative maintenance and troubleshooting
- Multiple Profiles facilitate flexible manufacturing



*Enterprise Risk Management*

- ADC capabilities reduce mistakes in device replacement
- Restrict configuration changes to authorized personnel only
- Achieve BOM compliance

*Smart Sensors enabling Smart Machines enabling Smart Manufacturing*

## Summary of Key IO-Link Benefits for End Users



*Faster Time to Market*

- One programming environment for Sensors and Architecture
- Seamless integration into Rockwell Automation EtherNet/IP Architecture
- Intuitive programming simplifies initial setup and helps eliminate logic errors



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**IO-Link Portfolio, Features and Competitive Advantages**

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 **IO-Link**

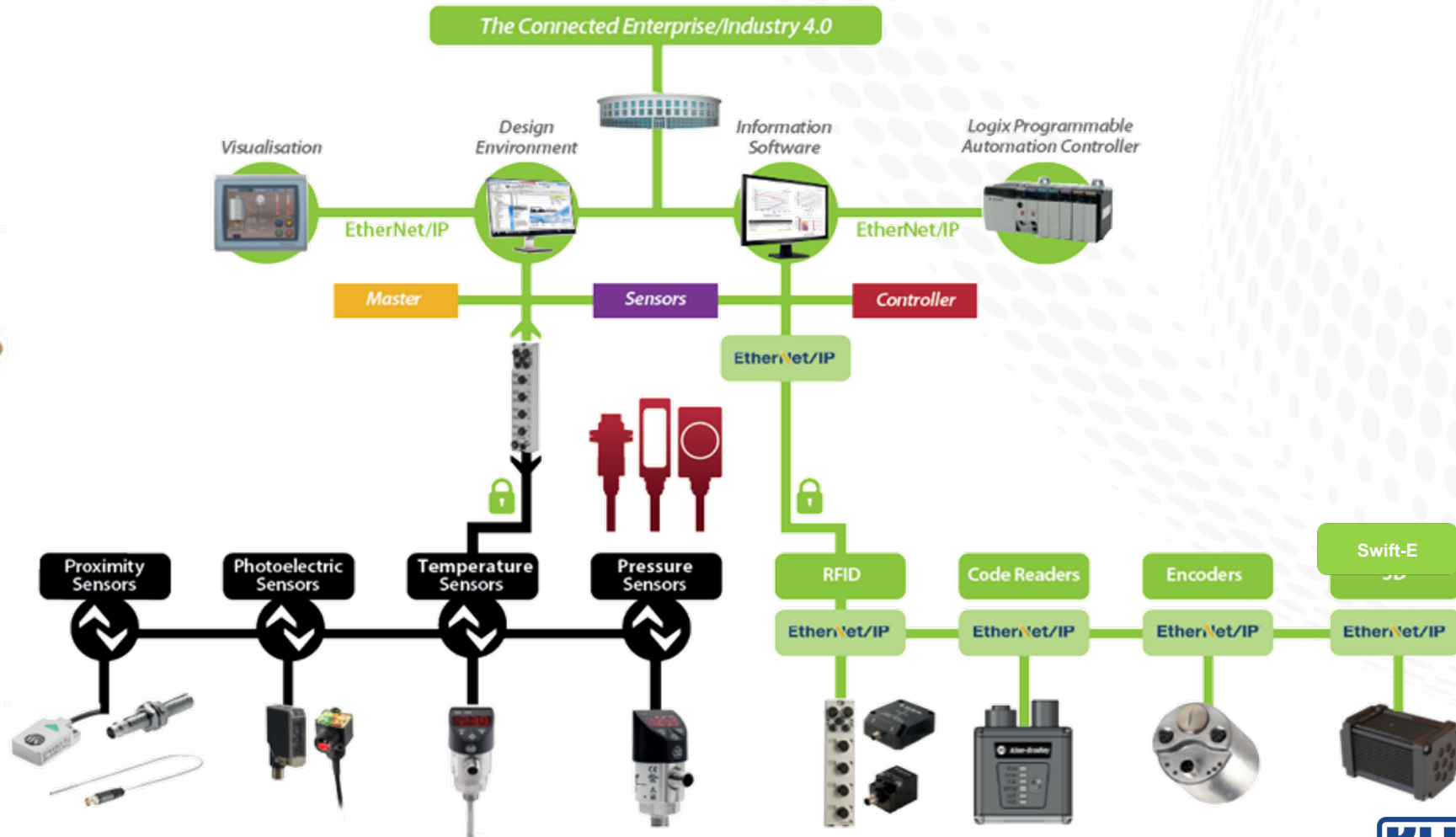
**KLINKMANN**

# Smart Sensors

Enabling The Connected Enterprise



Mobility



# 42EF RightSight IO-Link Features

- **Triggered (Output status):** provides indication when the target is detected
- **Margin Low Alarm:** provides indication when the target signal is marginal and the sensor is about to fail
- **Proximity Alarm:** Indicates to the operator if there is a target in the background that may be near the threshold
- **Signal Strength:** provides the raw signal strength value reflected by the target (diffuse) or the reflector (-Retro)
- **Location Indication:** helps customers distinguish sensors in applications where you must identify in a large machine
- **Alignment Mode:** aids operator achieve optimal alignment of the sensor in diffuse and polarized retroreflective applications
- **Internal Temperature:** provides the sensor's internal temperature which helps customers determine if the sensor is operating close to its minimum and maximum temperature
- **Counter:** when enabled this parameter counts the number of times the target has been detected
- **Timer:** Indicates the amount of time the output was present or absent, which can be used to, determine how fast your system is operating

Type	# of Catalog Numbers	Catalog #
Polarized Retro-reflective	12	42EF-P2-xxB-xx
Diffuse	12	42EF-D2xxAK-xx



## 871TM IO-Link Features

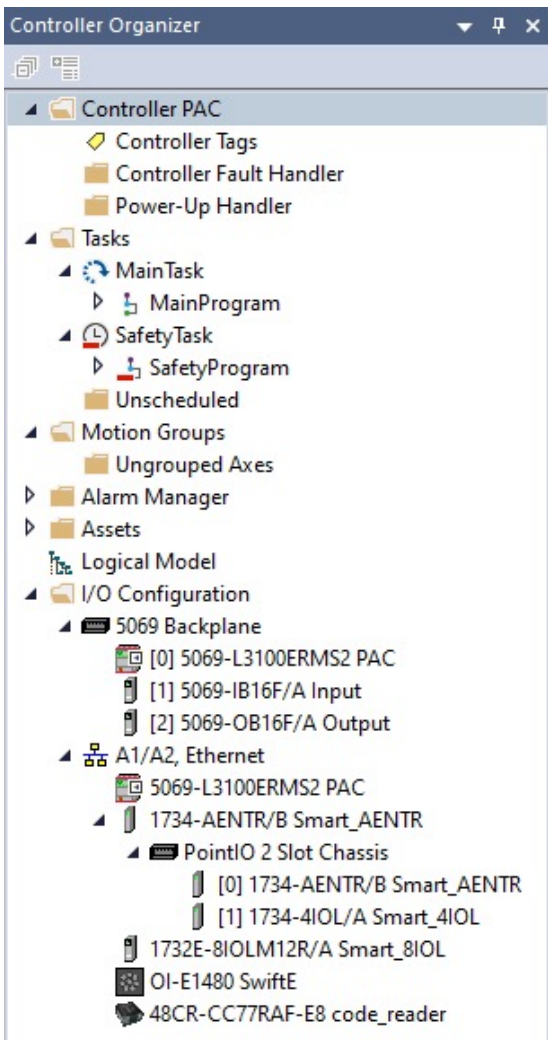
- **Triggered (Output status):** provides indication when the target is detected
- **Margin status:** provides indication when the target is detected beyond 80% of the specified operating range (i.e. the application may become unreliable/unstable)
- **Timer functions:** enables the manipulation of the sensor's output signal (i.e., Delay On, Stretch On...etc.)
- **Switching mode polarity:** allows the device output type (i.e., N.O. or N.C.) to be changed for use in standard IO mode

Types	# of Catalog Numbers	Catalog #
M12,Shielded	3	871TM-M6NP12-*
M12,Unshielded	2	871TM-N10NP12-*
M18,Shielded	2	871TM-M10NP18-*
M18,Unshielded	2	871TM-N20NP18-*

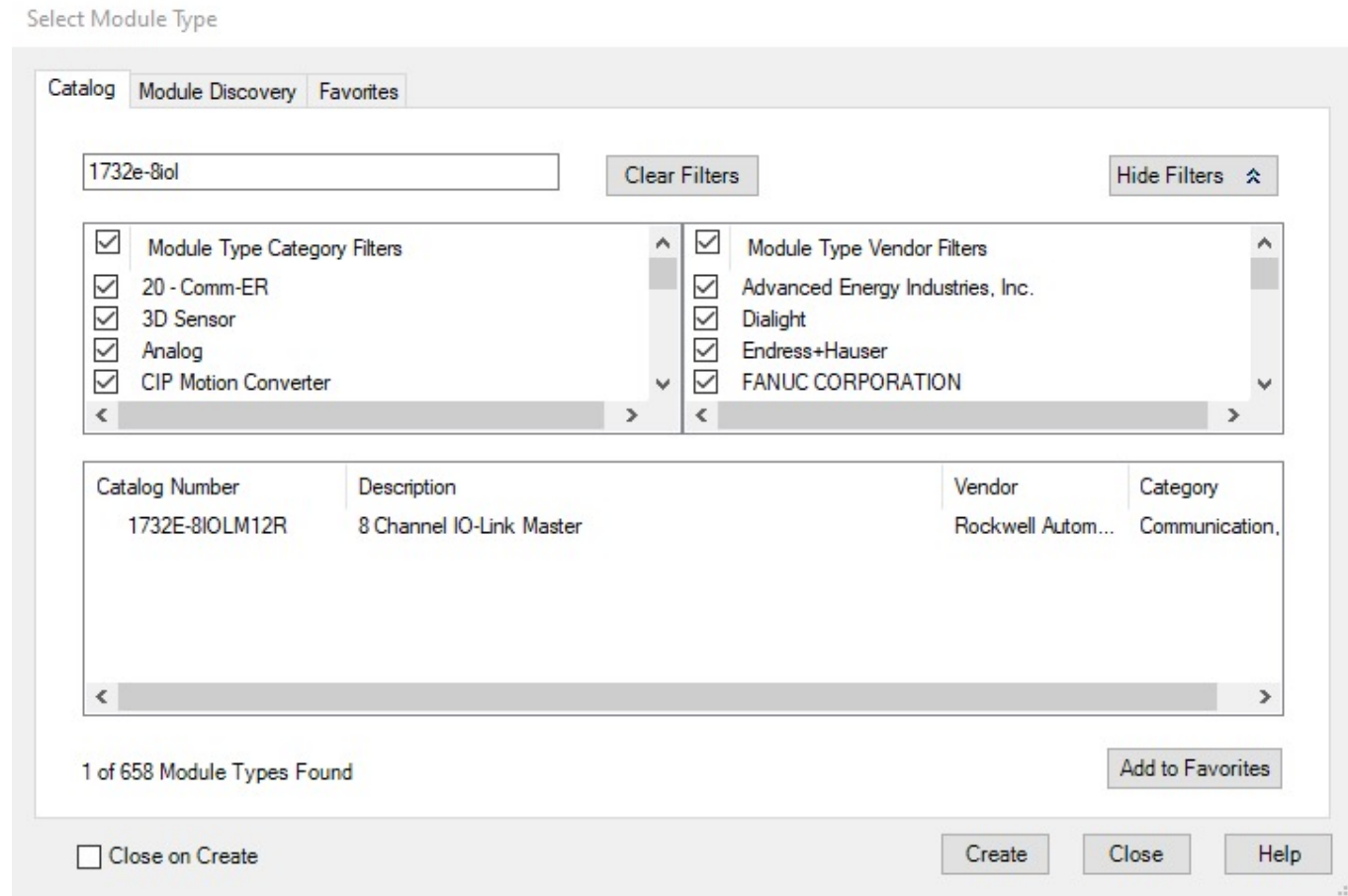




# Master IO-Link Configuration – 5 Easy Steps (Step 1)



[Create an IO-Link Master in the I/O Configuration Tree](#)



## Master IO-Link Configuration – 5 Easy Steps (Step 2)

Configure this new module with a Name and Ethernet Address

Change Module Definition and Channel Modes if required

**General**

Type: 1732E-8IOLM12R 8 Channel IO-Link Master  
Vendor: Rockwell Automation/Allen-Bradley  
Parent: Local  
Name: Smart\_8IOL  
Description:

Ethernet Address  
 Private Network: 192.168.1. 33  
 IP Address: . . .  
 Host Name:

Module Definition  
Series: B  
Revision: 3.001  
Electronic Keying: Compatible Module  
Connection: Timestamp Data

Channel Modes

Channel 0	IO-Link	Channel 4	IO-Link
Channel 1	IO-Link	Channel 5	IO-Link
Channel 2	IO-Link	Channel 6	IO-Link
Channel 3	IO-Link	Channel 7	IO-Link

Change ...

# Master IO-Link Configuration – 5 Easy Steps (Step 3)

[Configure the Channels on the IO-Link Master by clicking Change](#)

**IO-Link**

- 1732E-8IOL12MR/A
  - Ch 0 - IO-Link
    - 45DMS-B8LGT
  - Ch 1 - IO-Link
    - IG6615
  - Ch 2 - IO-Link
    - 46DFA-L2LBT1
  - Ch 3 - IO-Link
  - Ch 4 - IO-Link
    - 871FM-MV7BA
  - Ch 5 - IO-Link
  - Ch 6 - IO-Link
    - 1732IL-IB16M1
  - Ch 7 - IO-Link

Channel	Mode	Vendor	Device	Application Specific Name	Electronic Keying	Process Data Input	Data Storage
0	IO-Link	Allen-Bradley	45DMS-B8LGT1-...	45DMS	Exact Match	Triggered1,Triggered...	Enable ADC
1	IO-Link		IG6615	***	Exact Match		Disabled
2	IO-Link	Allen-Bradley	46DFA-L2LBT1-A2		Exact Match	Triggered,Margin,Pro...	Enable ADC
3	IO-Link						
4	IO-Link	Allen-Bradley	871FM-MV7BA20...	871FM Small Flat...	Exact Match	Triggered,Margin,Pro...	Enable ADC
5	IO-Link						
6	IO-Link	Allen-Bradley	1732IL-IB16M12		Exact Match		Enable ADC
7	IO-Link						

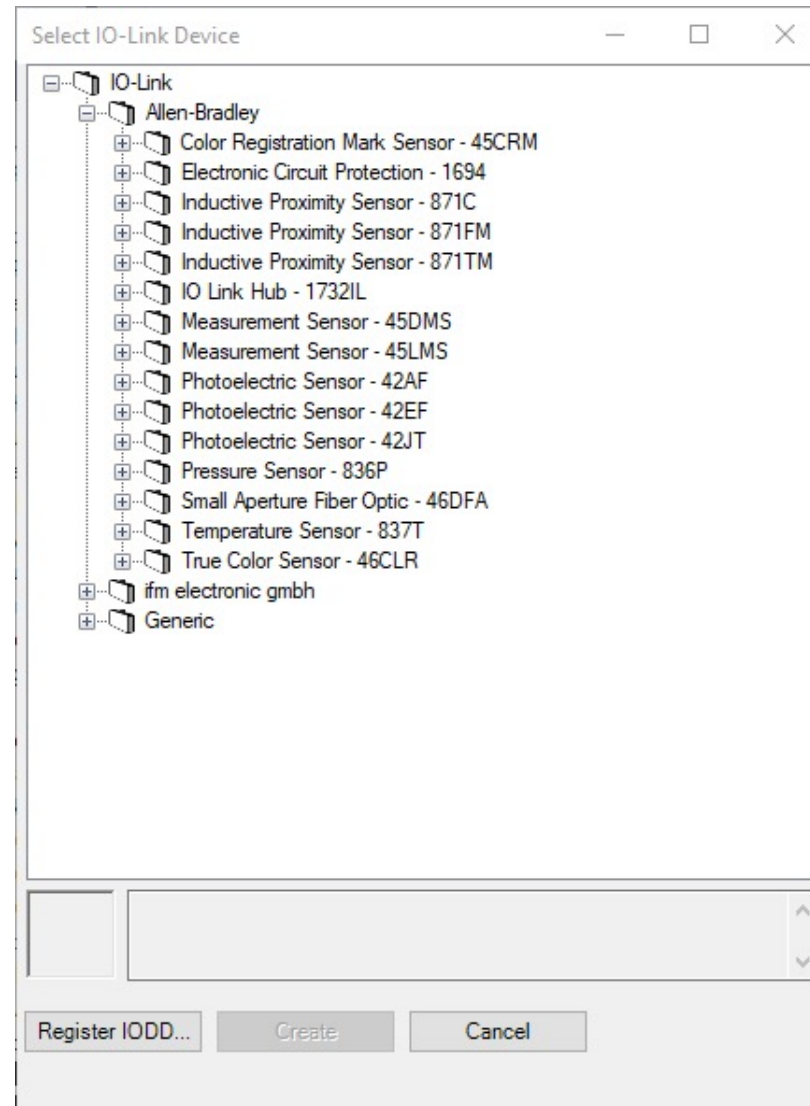
[Change...](#)

**DANGER.** Parameter changes by external source are shown only after Refresh. External changes could be overwritten without notice.

[Refresh](#) ←

## Master IO-Link Configuration – 5 Easy Steps (Step 4)

Select the IO-Link devices from the IODD folder



## Master IO-Link Configuration – 5 Easy Steps (Step 5)

Modify the Application-Specific Name, Process Data Input & Data Storage as desired

Change Channel Configuration

Channel	Mode	Vendor	Device	Application Specific Name	Electronic Keying	Process Data Input	Data Storage	Change Device
0	IO-Link	Allen-Bradley	45DMS-B8LGT1-D5	45DMS	Exact M... ▾	Triggered1,Triggered2,... ▾	Enable ADC ▾	...
1	IO-Link		IG6615	***	Exact M... ▾		Disabled Enable ADC	...
2	IO-Link	Allen-Bradley	46DFA-L2LBT1-A2		Exact M... ▾	Triggered,Margin,Proxi... ▾	Restore Backup/Restore	...
3	IO-Link							...
4	IO-Link	Allen-Bradley	871FM-MV7BA20-FD...	871FM Small Flat...	Exact M... ▾	Triggered,Margin,Proxi... ▾	Enable ADC ▾	...
5	IO-Link							...
6	IO-Link	Allen-Bradley	1732IL-IB16M12		Exact M... ▾		Enable ADC ▾	...
7	IO-Link							...

Discover Devices... Path: F5CQZY2!AB\_ETHIP-1\192.168.1.33

OK Cancel

→ You are ready to take advantage of the Rockwell Automation IO-Link solution!

# Rockwell Automation IO-Link Sensors – Offline Overview

The screenshot displays the Rockwell Automation IO-Link software interface. On the left, a hierarchical tree shows the configuration of IO-Link sensors. The selected device is a 1732E-8IOL12MR/A, which has eight channels (Ch 0 - IO-Link to Ch 7 - IO-Link). Each channel is connected to a specific sensor: Ch 0 (45DMS-B8LGT), Ch 1 (IG6615), Ch 2 (46DFA-L2LBT1), Ch 3 (IG6615), Ch 4 (871FM-MV7BA), Ch 5 (45DMS-B8LGT), Ch 6 (1732IL-IB16M1), and Ch 7 (IO-Link). The right pane shows the 'Advanced' tab for the selected device, displaying a table of parameters.

Name	R/W	Value	Unit
[-] Device Information			
Vendor Name	ro		
Product Name	ro		
Product ID	ro		
Product Text	ro		
Serial Number	ro		
[-] User Specific Information			
Application Specific Tag	rw	871FM Small Flat Pack Proximity	
User Tag 1	rw		
User Tag 2	rw		
[-] Revision Information			
Hardware Version	ro		
Firmware Version	ro		
[-] Device Monitoring			
.SignalStrength On	ro		
.SignalStrength Off	ro		

Warning messages are visible on the left side of the interface, indicating that parameter changes by external sources are shown only after a refresh and could be overwritten without notice.

- Ease of integration with AOP
- Offline programming
- AOI & Faceplates

Preferred data storage option:  
**Enable ADC** – For Rockwell Automation and supported Encompass™ partner devices, **Automatic Device Configuration (ADC)** option is available. ADC only stores the configuration data in the controller and in the offline project file. The data is downloaded to the IO-Link device, when the device is replaced, with no user action needed.

Other options  
**Disable**  
**Backup/Restore**  
**Restore**

# Rockwell Automation IO-Link Sensors – Online Overview

The screenshot displays the Rockwell Automation IO-Link software interface. On the left, a hierarchical tree shows the configuration of IO-Link sensors, including a 1732E-8IOL12MR/A controller and seven channels (Ch 0-7) of various sensors like 45DMS-B8LGT, IG6615, 46DFA-L2LBT1, 871FM-MV7BA, and 1732L-IB16M1. The right pane shows the 'Advanced' tab for a selected sensor, displaying a table of device information.

Name	R/W	Value	Unit
[-] Device Information			
Vendor Name	ro	Allen-Bradley	...
Product Name	ro	871FM-MV7BA20-FD02X	...
Product ID	ro	871FM-MV7BA20-FD02X Ser. A	...
Product Text	ro	Prox Sensor, WFI, 7mm SD, NPN or PNP, 0.1...	...
Serial Number	ro	59561597	...
[-] User Specific Information			
Application Specific Tag	rw	871FM Small Flat Pack Proximity	...
User Tag 1	rw		...
User Tag 2	rw		...
[-] Revision Information			
Hardware Version	ro	1.0	...
Firmware Version	ro	1.0	...
[-] Device Monitoring			
.SignalStrength On	ro	1647	...
.SignalStrength Off	ro	68	...

Warning messages on the left indicate: 'DANGER change are sho Externa overwri' and 'DANGER. Parameter changes by external sourc are shown only after Refre External changes could be overwritten without notice.'

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Other options  
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# Competitors IO-Link Sensors – Offline Overview

The screenshot displays the IO-Link software interface. On the left, a tree view shows a hierarchy of channels (Ch 0 to Ch 7) under the main device 1732E-8IOL12MR/A. The selected channel is Ch 2 - IO-Link, which is associated with device IG6615. The main panel shows the configuration for this device. The 'Common' tab is active, displaying the IO-Link logo and various fields: Vendor (redacted), Vendor Text (redacted), Vendor ID (0x0136), and URL (redacted). The device is identified as 'IG6615' and described as an 'Inductive sensor'. Below this, several parameters are listed in a grid: Device ID (0x000317), IO-Link Revision (1.1), Hardware Revision (AB), Firmware Revision (120), Bitrate (COM2), and MinCycleTime (3000). The SIO mode is set to 'supported'. At the bottom, the IODD field is redacted, and the Document Version is V1.3.14.18, with a Date of Creation of 2017-07-07. A 'Refresh' button is located at the bottom right. A warning message at the bottom left states: 'DANGER. Parameter changes by external source are shown only after Refresh. External changes could be overwritten without notice.'

- No offline programming
  - Must write complicated code and Explicit Messaging to set up
  - Must use other software
  - Limited Information's and diagnostics
- Online configuration only
- No faceplates

The data storage options are:

**Disable** – Data storage is not used.

**Backup/Restore** – Changes to parameters within the device are copied and saved to the IO-Link master. Any replacement device with factory default settings are overwritten by the copy in the master.

**Restore** – The master restores parameters to the device. Changes to the parameters within the device are not saved to the IO-Link master. Any replacement device with factory default settings is overwritten by the copy in the master.



# Competitors IO-Link Sensors – Online Overview

The screenshot displays a software interface for managing IO-Link sensors. On the left, a tree view shows a hierarchy of sensors, with the selected device being a 1732E-8IOL12MR/A. The main area shows the 'Parameter' tab for this device, which contains a table of parameters. The table has columns for Name, R/W (Read/Write), Value, and Unit. The parameters include 'Device Status' (Out of specification) and 16 'Detailed Device Status' entries (1-16), all with Read-Only (ro) access and hex values. A 'Refresh' button is located at the bottom right of the table. On the left side of the interface, there are several warning messages: 'DANGER changes are show External overwrit', 'DANGER change are sho Externz overwri', and 'DANGER. Parameter changes by external source are shown only after Refre External changes could be overwritten without notice.'

Name	R/W	Value	Unit
Device Status	ro	Out of specification	
Detailed Device Status [1]	ro	0xe4,0x8c,0x10	
Detailed Device Status [2]	ro	0x00,0x00,0x00	
Detailed Device Status [3]	ro	0x00,0x00,0x00	
Detailed Device Status [4]	ro	0x00,0x00,0x00	
Detailed Device Status [5]	ro	0x00,0x00,0x00	
Detailed Device Status [6]	ro	0x00,0x00,0x00	
Detailed Device Status [7]	ro	0x00,0x00,0x00	
Detailed Device Status [8]	ro	0x00,0x00,0x00	
Detailed Device Status [9]	ro	0x00,0x00,0x00	
Detailed Device Status [10]	ro	0x00,0x00,0x00	
Detailed Device Status [11]	ro	0x00,0x00,0x00	
Detailed Device Status [12]	ro	0x00,0x00,0x00	
Detailed Device Status [13]	ro	0x00,0x00,0x00	
Detailed Device Status [14]	ro	0x00,0x00,0x00	
Detailed Device Status [15]	ro	0x00,0x00,0x00	
Detailed Device Status [16]	ro	0x00,0x00,0x00	

- Parameters can be setup online only and devices must be connected
- Parameters are owned by the IO-Link Master
- Restore or Restore/Backup features available (no ADC)
- If IO-Link Master & Sensors must be replaced, then all data is lost
- Limited diagnostic

The data storage options are:

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# 42EF AOP/AOI TAGS Example

▶ Sensor_42EF	Local	{...}	{...}	raC_Dvc_42EF_4IOL
▶ Sensor_42EF_CtrlCmd	Local	{...}	{...}	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
▶ Sensor_42EF_CtrlSet	Local	{...}	{...}	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
▶ Sensor_42EF_CtrlSts	Local	{...}	{...}	raC_UDT_ItfAD_IOLinkSensorDiscrete_Sts
▶ Sensor_42EF_Inp_I	Local	{...}	{...}	raC_UDT_ItfAD_42EF_Inp_4IOL

## 42EF Information-Setting

▲ Sensor_42EF	Local	{...}
Sensor_42EF.EnableIn		1
Sensor_42EF.EnableOut		1
Sensor_42EF.ChXTriggered		0
▶ Sensor_42EF.ChXSignalStrength		35
▶ Sensor_42EF.ChxGain		35
Sensor_42EF.ChXMarginLowAlarm		0
Sensor_42EF.ChXProximityAlarm		0
▶ Sensor_42EF.Channel_Number		0
Sensor_42EF.Sts_Connected		1
Sensor_42EF.Sts_Available		1
Sensor_42EF.Sts_Warning		0
Sensor_42EF.Sts_Faulted		0
Sensor_42EF.Sts_Ready		1
Sensor_42EF.Sts_Active		1
▶ Sensor_42EF.Sts_bNotReady		0
Sensor_42EF.raC_Dvc_ADframework_DV_LD		1

▶ Sensor_42EF.Current_Setpoint		600
▶ Sensor_42EF.Current_Temp		61
▶ Sensor_42EF.MaxSessionTemp		67
▶ Sensor_42EF.MinSessionTemp		55
▶ Sensor_42EF.MaxTempLife		72
▶ Sensor_42EF.MinTempLife		32
▶ Sensor_42EF.HoursSession		742
▶ Sensor_42EF.HoursLife		3399
▶ Sensor_42EF.OnDuration		2316
▶ Sensor_42EF.OffDuration		532
▶ Sensor_42EF.SignalStrengthOn		26625
▶ Sensor_42EF.SignalStrengthOff		7
▶ Sensor_42EF.ExcessGain		35
▶ Sensor_42EF.CurrentCount		542
Sensor_42EF.LocatiIndicatorON		0
Sensor_42EF.LEDStatusON		1

▶ Sensor_42EF.IO_DO_Mode		0
▶ Sensor_42EF.Lock_Status		0
▶ Sensor_42EF.Alignment_Mode		0
▶ Sensor_42EF.ContrastLevel		255
▶ Sensor_42EF.AlignmentMode		256
Sensor_42EF.Sts_InhibitSet		0
Sensor_42EF.Sts_InhibitCmd		0

## 42EF Control-Command

▲ Sensor_42EF_CtrlCmd	Local	{...}
▶ Sensor_42EF_CtrlCmd.bCmd		0
Sensor_42EF_CtrlCmd.ResetWarn		0
Sensor_42EF_CtrlCmd.ResetFault		0
Sensor_42EF_CtrlCmd.Physical		0
Sensor_42EF_CtrlCmd.Virtual		0
Sensor_42EF_CtrlCmd.ResetCounter		0
Sensor_42EF_CtrlCmd.Locate		0
Sensor_42EF_CtrlCmd.Activate		0
Sensor_42EF_CtrlCmd.Deactivate		0

# TAGS & AOI/Faceplate Overview – Rockwell Automation versus Competitors



Smart_8IOL:I.Ch4Triggered	1	Decimal	BOOL
Smart_8IOL:I.Ch4MarginLowAlarm	1	Decimal	BOOL
Smart_8IOL:I.Ch4ProximityAlarm	0	Decimal	BOOL
▶ Smart_8IOL:I.Ch4Gain	1	Decimal	INT
▶ Smart_8IOL:I.Ch4SignalStrength	1149	Decimal	DINT

871FM

Ready

871FM Small F... **LOCATE**

Trigger  On

Triggered Duration	Not Triggered Duration	Trigger Count
4095 ms	4095 ms	3

Signal Strength (% SP)

SP	Signal Strength	Contrast	Gain
---	67	215	1

871FM

Ready

Internal Temperature

44.0 degC

Operating Hours Since Inception: 2955

Operating Hours Since Power Up: 291

Min/Max since power up (purple line)

Min/Max since inception (green line)

871FM

Ready

Setpoint 1000

Signal Strength 66

Graph showing Signal Strength vs Time

1:43:36 1:44:36 1:45:36

871FM

Ready

Parameter Settings

Output Polarity: Light On

Trigger Settings

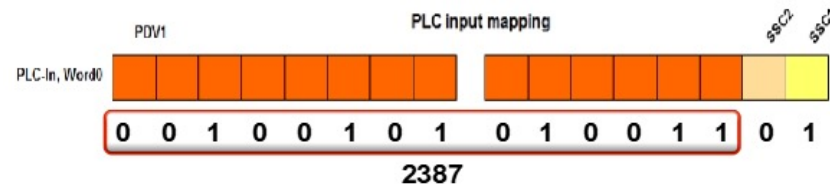
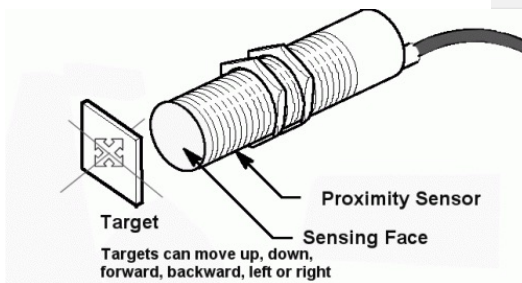
Reset Count

Reset Durations

Local Setting

Disable LEDs

▲ Smart_8IOL:I.Ch1Data	{...}	{...}	Binary	SINT[2]
▶ Smart_8IOL:I.Ch1Data[0]	2#0111_1111		Binary	SINT
▶ Smart_8IOL:I.Ch1Data[1]	2#1110_0000		Binary	SINT



PDV1 is field/distance & SSC1/SSC2 are 2 configurable outputs

No Faceplates Available

**KLINKMANN**

# Example of 16-Bit data manipulation required for Competitors

IFM Data manipulation + Value in a String Rungs 1 to 4

**MOV**

Source Smart\_8IOL:I.Ch1Data [1]

Dest Prox\_IFM\_IG6615

2#1110\_0000

2#0111\_1111\_1110\_0000

**BTD**

Source Smart\_8IOL:I.Ch1Data [0]

Source Bit 2#0111\_1111

Dest Prox\_IFM\_IG6615

Dest Bit 2#0111\_1111\_1110\_0000

Dest Bit 8

Length 8

**BTD**

Source Prox\_IFM\_IG6615

Source Bit 2#0111\_1111\_1110\_0...

Dest ProxIFM\_PDV1

Dest Bit 2#0001\_1111\_1111\_1...

Dest Bit 0

Length 14

**DTOS**

Source ProxIFM\_PDV1

Dest Prox\_IFM\_String

2#0001\_1111\_1111...

'8184'

Smart_8IOL:I.Ch1Data	{...}	{...}	Binary	SINT[2]
Smart_8IOL:I.Ch1Data[0]	2#0111_1111		Binary	SINT
Smart_8IOL:I.Ch1Data[1]	2#1110_0000		Binary	SINT

Data for competitors consist of two SINT binary register. They must be combined as an INT (16 Bits) register to be usable for process value.

\* SINT An atomic data type that stores an 8-bit signed integer value (-128 to +127)

# Analogy: Microsoft Windows versus RA Studio 5000 solutions

Industry 4.0

	<u>Operating System</u>	<u>Software</u>	<u>User Experience</u>
Microsoft Windows	<ul style="list-style-type: none"> <li>Windows 10</li> <li>Computer</li> </ul>	<ul style="list-style-type: none"> <li>Excel</li> <li>PowerPoint</li> <li>Word</li> </ul>	<ul style="list-style-type: none"> <li>Easy Entry of Data</li> <li>Drag and Drop</li> <li>Macros if required</li> </ul>
RA Studio 5000 Solutions	<ul style="list-style-type: none"> <li>Studio Designer or RSLogix 5000</li> <li>Logix Controller</li> </ul>	<ul style="list-style-type: none"> <li>Add-on Profiles</li> <li>Add-On Instructions</li> <li>EDS Files</li> <li>HMI Faceplates</li> <li>Automatic Device Configuration</li> <li>One Software/PCDC</li> <li>Sample Code</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive Tags</li> <li>Easy Access to Tags Data</li> <li>Easy programming</li> <li>No Explicit Messages</li> <li>Drag and Drop/ Import-Export</li> <li>Libraries</li> <li>Encompass Partner</li> </ul>
Competitor Solutions	<ul style="list-style-type: none"> <li>Studio Designer or RSLogix 5000</li> <li>Logix Controller</li> </ul>	<ul style="list-style-type: none"> <li>EDS Files</li> <li>Add-On Instructions (Some Competitors)</li> <li>Must develop program/codes to Read/Write values before programming</li> <li>Multiple Software's Required</li> </ul>	<ul style="list-style-type: none"> <li>Uncomprehensive Tags</li> <li>Explicit Messages required</li> <li>Communication between controller and devices</li> <li>Multi-Languages</li> <li>Environment Conviviality</li> </ul>

Green = Strength  
Red = Weakness

Conclusion: It is obvious that working with competitor solutions mean that software's must be developed before going into a not so friendly user experience (higher cost), where Studio 5000 solution (Premiere Integration) is less work, no software proprietary code and a friendly user experience (lower cost).

# Rockwell Automation IO-Link solution advantages

## Ease of integration with IO-Link Masters, Sensors, AOP & AOI/Faceplates

- 4 Ports/Point-IO & eight Ports/On-Machine IO-Link Masters
- 5 Easy steps to configure the IO-Link Master
- Offline & Online programming using RSLogix 5000 or Studio 5000 (version 24+)
- Automatic Device Configuration (ADC)
- Comprehensive TAGS for programming & diagnostic
- No need to develop custom code to setup or access information's from devices
- Pre-configured AOI/Faceplates for Factory View ME & View Designer
- Intellectual property does not belong to the programmer only
- **(Rockwell Automation is the only one to provide end-to-end IO-Link solutions)**

\* Competitor sensors can be used with limited data and configuration (no ADC)

# IO-Link Products and IO-Link Masters

Bulletin Number	Description
1694	Modular Electronic Circuit Protector
1732E-8IOL	IO-Link Master
1732IL	IO-Link Hubs
1734-4IOL	IO-Link Master
42AF	General Purpose Photoelectric Sensor
42EF	General Purpose Photoelectric Sensor



Bulletin Number	Description
42JT	Miniature Photoelectric Sensor
45CRM	Color Mark Photoelectric Sensor
45DMS	Distance Measurement Photoelectric Sensor
45LMS	Laser Measurement Photoelectric Sensor
45PLA	Light Array Photoelectric Sensor
46CLR	True Color Photoelectric Sensor



Bulletin Number	Description
46DFA	Fiber Optic Photoelectric Sensor
836P	Solid State Pressure Sensor
837T	Solid State Temperature Sensor
871C	Specialty Inductive Proximity Sensor
871FM	Mini Flat Pack Inductive Proximity Sensor
871TM	Stainless Steel Inductive Proximity Sensor
873P	Ultrasonic Sensor

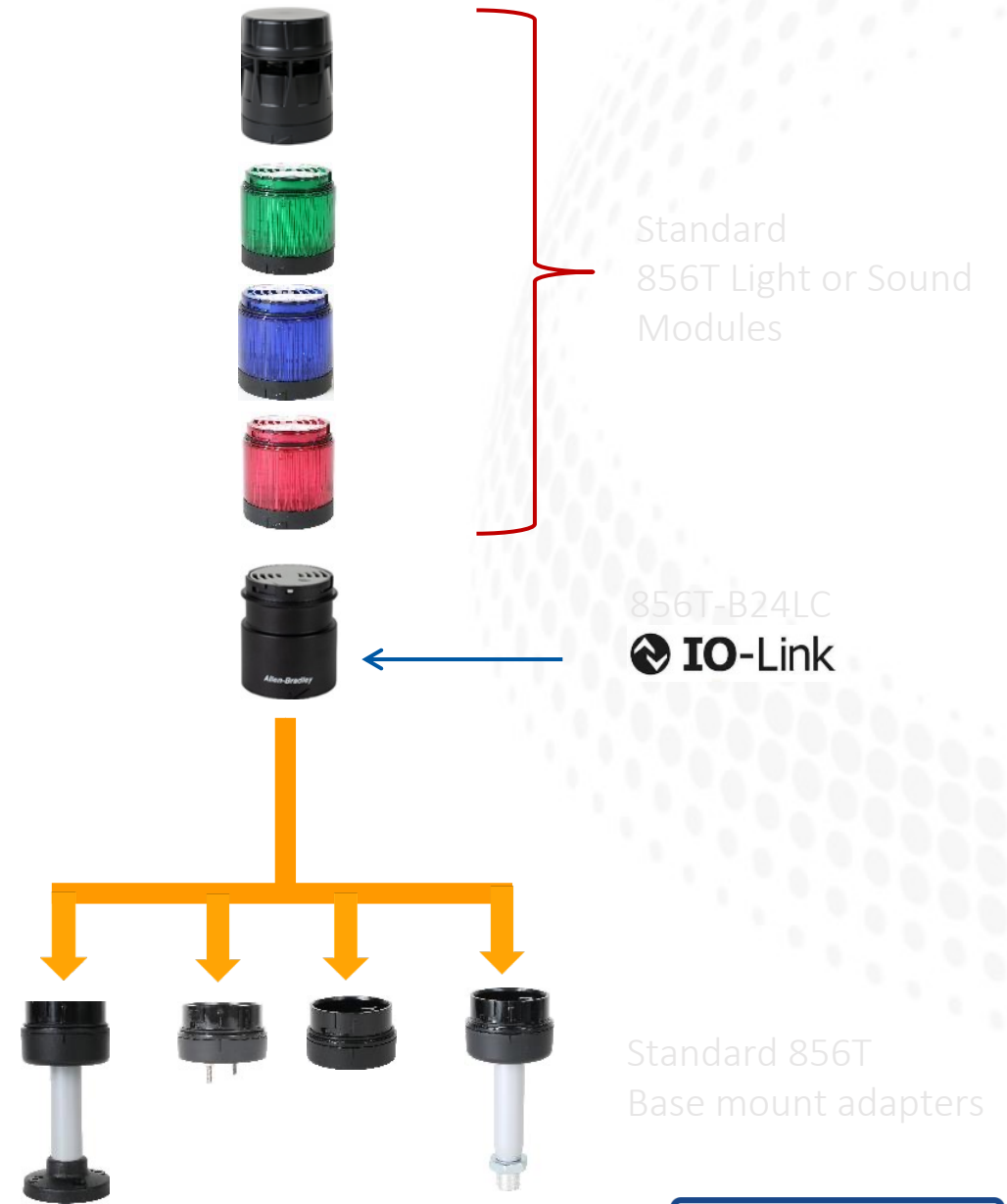


# 856T-B24LC Installation

## Compatible 856T base mount adapters:

- Surface 1/2" NPT base mount
- Surface with screws
- Pole mount base (10,25,40,60 cm)
- Tube mount base adaptor (10,25 cm)

Installation is done without tools in the same way as any standard 856T power module





# 856T-B24LC: Tower Light IO-Link Module

Enable the control of an 856T tower light over IO-Link



## Other Intelligent Devices on Ethernet

48CR Bar Code Reader



Swift-E Reconfigurable 3D Sensor



56RF Radio Frequency Identification RFID



842E EtherNet/IP Multi-Turn Encoders



*And more to come...*

# Sensing & Connectivity Portfolio

## Photoelectric Sensors

### Devices include:

- Rectangular & Cylindrical packages
- Fiber Optics
- Fork sensors
- Color and Contrast sensors
- Laser sensing solutions
- Bkg. Suppression
- Measurement
- Clear Object detection
- Optical Label sensor



## Proximity Sensors & Limit Switches

### Devices include:

- Long range inductive proximity - cylindrical and rectangular
- Ultrasonic sensors
- Capacitive sensors
- Weld Field Immune
- Mechanical Limit switches
- Safety Limit switches
- Analog measurement
- Gripper, clamp and cylinder sensors



## Process Sensors

### Devices include:

- Pressure sensors for liquid, vapors, and gas measurements
  - Display & non-display versions
- Temperature sensors for liquids, gas and vapors
  - Display and non-display versions
- Flow rate of liquid media
- Level of liquid in tanks, containers, pipelines



## Advanced Sensors

### Devices include:

- HF RFID System
  - Interface Block, Tags and Transceivers
- 48CR Code Reader
- Swift-E Reconfigurable 3D Sensor
- Ethernet/IP Absolute Encoders
- Incremental Optical Encoders
- CIP Safety Encoder



## Connectivity, Networking & Linking

### Devices include:

- IO-Link enabled Masters
- Corsets and Patchcords
- Distribution boxes, Splitters and tees
- V & Y cables
- Ethernet media and components



# Agenda

Introduction to IO-Link

Why Rockwell Automation® IO-Link?

Benefits of IO-Link

IO-Link Portfolio, Features and Competitive Advantages

Scenarios

Q & A



 **IO-Link**

# *IO-Link & Ethernet Scenarios*

Operations Information with Mobility

Smart Commissioning with Mobility

Effective Commissioning

Product Changeover

Logging Historical Events

Smart Tracking and Tracing

Smart Devices Overview

Thank you!

**KLINKMANN**