OMRON

Bringing IoT innovation to the plant floor

IO-Link series

Proximity Sensor
E2E-☐-IL☐

Spatter-resistant Proximity Sensor
E2EQ-☐-IL☐

Photoelectric Sensor
E3Z-☐-IL☐

Color Mark Photoelectric Sensor
E3S-DCP21-IL☐

IO-Link Master Unit
NX-ILM400

IO-Link Master Unit
GX-ILM08C

- Fault detection for fast and easy troubleshooting
- Condition monitoring for predictive maintenance
- Component identification for easy replacement and maintenance

IO-Link

Omron solutions:

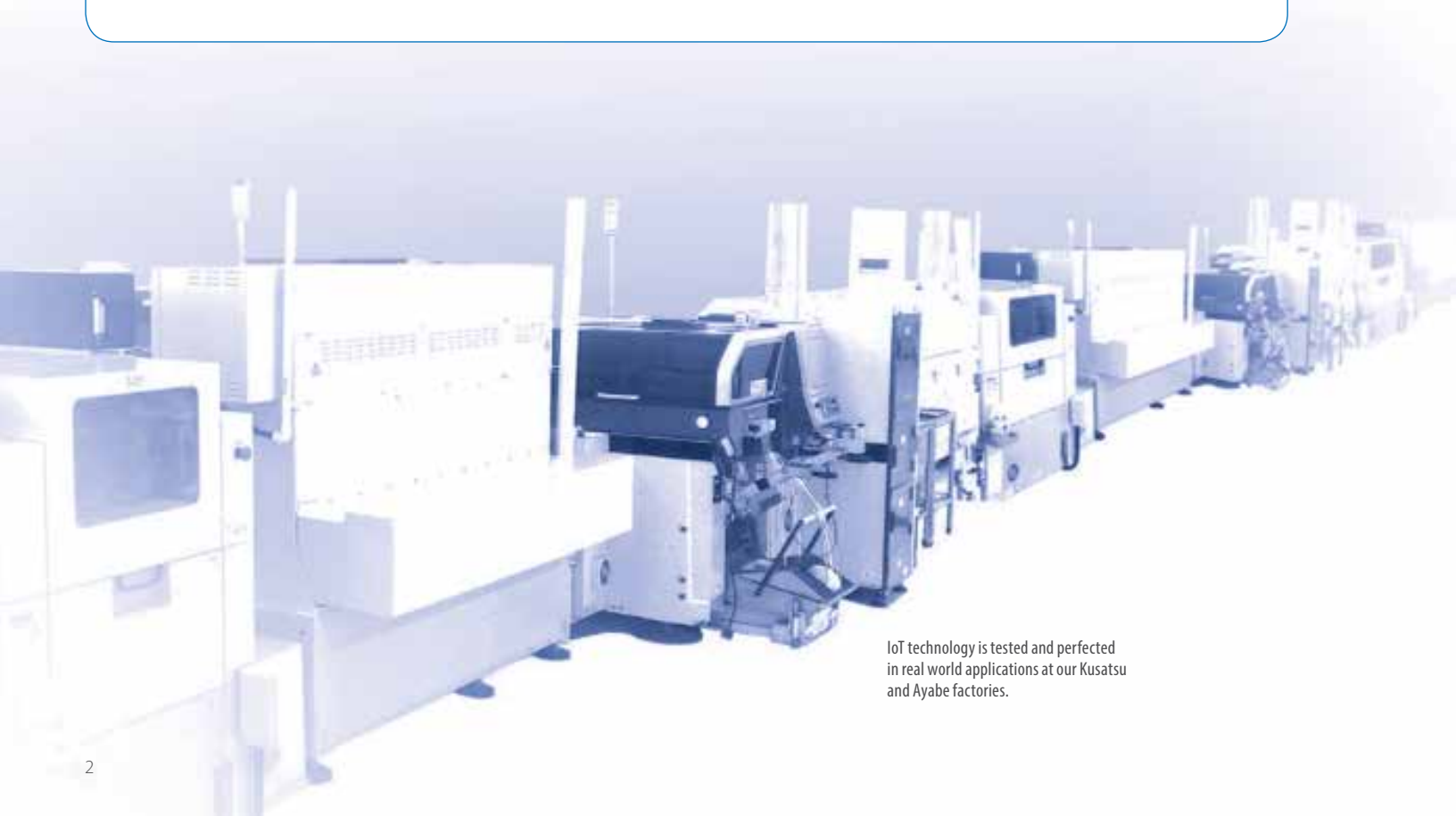
Bringing IoT innovation to the plant floor

IO-Link enabled devices bring factory floor data to the enterprise

Omron's unique position: practical IoT innovation

Omron's unmatched experience and expertise in complete automation solutions provide a unique insight into the integration of manufacturing systems from the sensor to the enterprise. Our long history of providing industry leading technology in everything from industrial components and sensors to safety and robotics allows us to help you implement the factory of the future today.

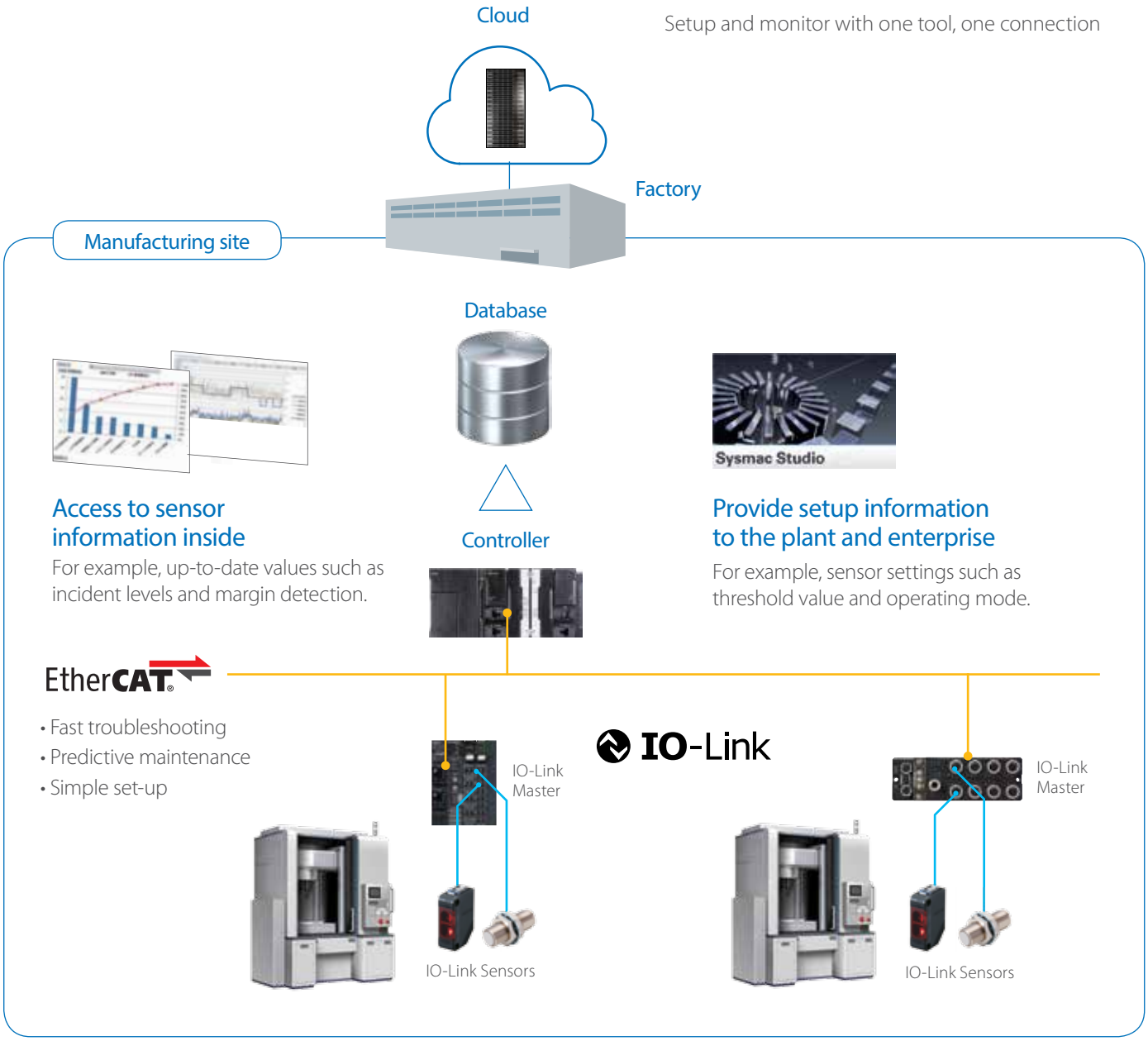
Machine and product level expertise ▷ Plant and line integration ▷ Global enterprise level data



IoT technology is tested and perfected in real world applications at our Kusatsu and Ayabe factories.

Totally integrated software environment

Setup and monitor with one tool, one connection



IoT down to the component level

It is common for discussions about the adoption of IoT to be centered around the Controller, HMI and IT systems. In reality, however, some of the most important information about a plant or enterprise is found within the machine level sensors.

IO-Link for communication down to the sensor level

Omron's initial offering of IO-Link products includes photoelectric sensors, color mark sensors, proximity sensors and IO-Link masters. By connecting sensors and controllers via IO-Link, all necessary information for stable sensor operations, such as incident light levels, are visible. Now, monitoring and error detection at the sensor level is possible; reducing downtime, aiding in predictive maintenance and decreasing commissioning time.

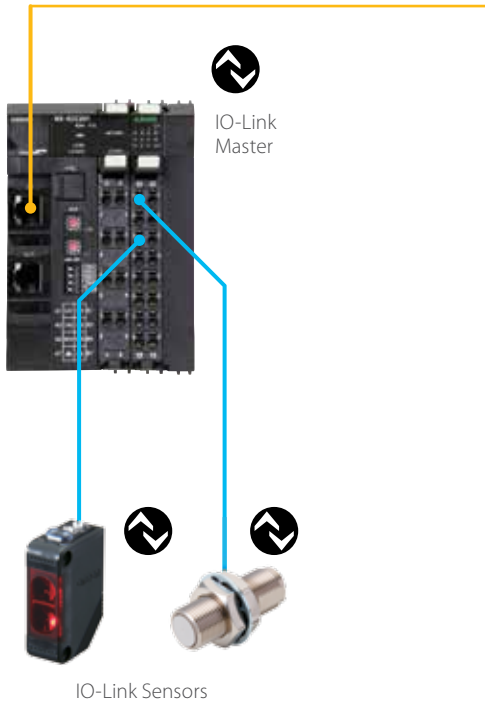
IO-Link is

Communication down to the sensor level

IO-Link

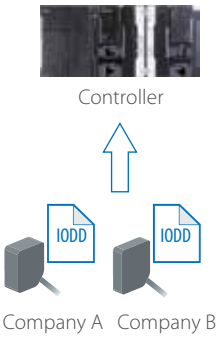
An open international standard

As of December 2015, over 100 companies, including major sensor manufacturers, have joined the IO-Link Consortium. IO-Link, specified as international standard IEC 61131-9, is an open information technology (interface technology) between the Sensor/Actuator and the I/O Terminal. It collects information from the sensor/actuator through the IO-Link Master via a fieldbus network into the host controller. IO-Link enables communication within the whole system and reduces time required for commissioning and maintenance.



Third party compatibility

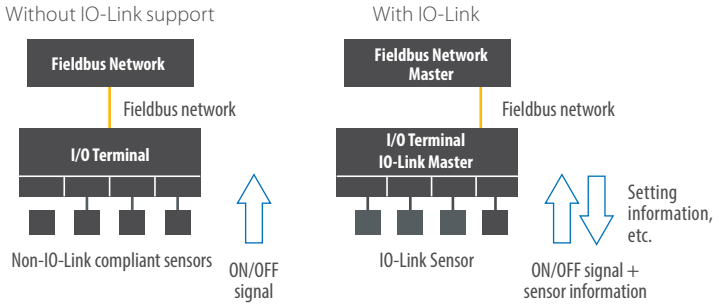
All IO-Link Sensors have an IODD (Input Output Data Description) file that lists the component type and what parameters need to be set. IODD files are a global standard, so IO-Link components can be used interchangeably with any IO-Link manufacturer.

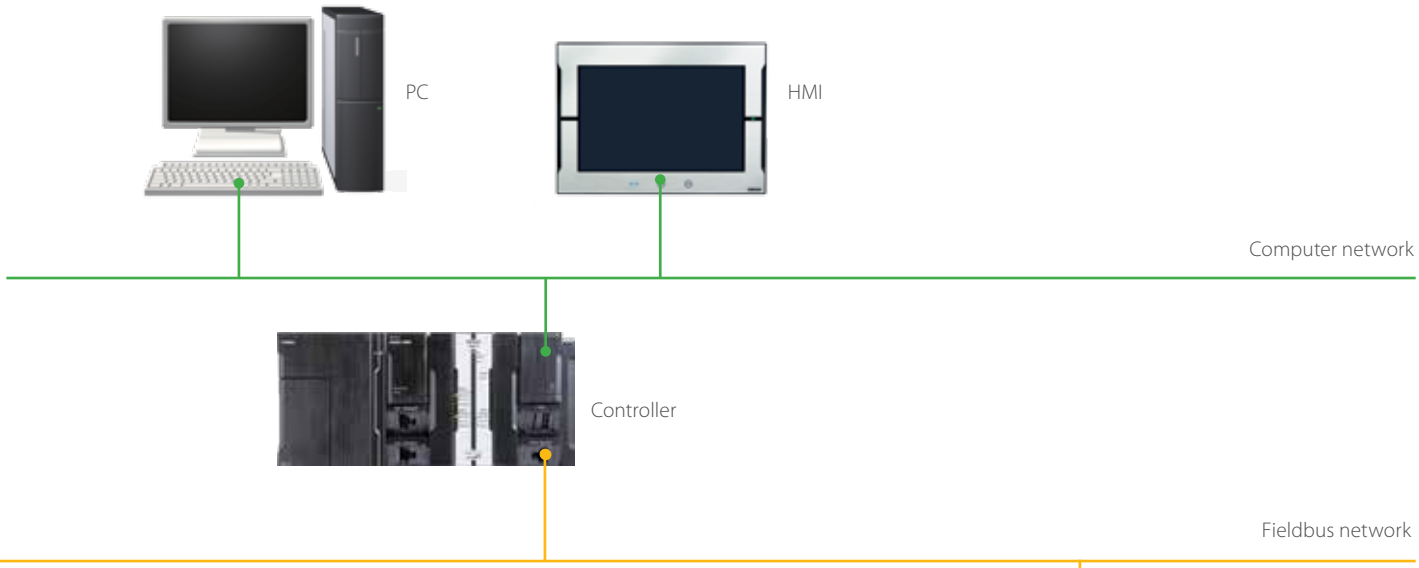


Information beyond on and off

IO-Link sends and receives not only ON/OFF signals, but also sensor information. Omron's IO-Link components are compatible with COM 2 and COM 3, and are capable of high speed communications.

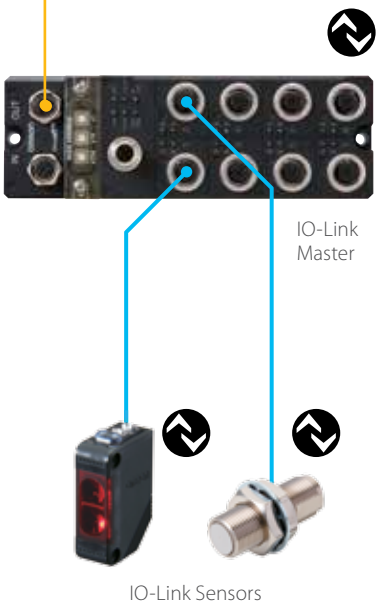
*1. Baud rates are as follows. COM 1: 4.8 kbps, COM 2: 38.4 kbps, COM 3: 230.4 kbps





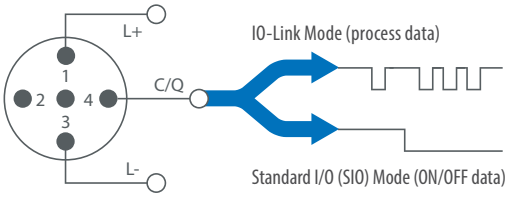
Standard 3-wire unshielded cable

No dedicated communication cables required



No special cabling required

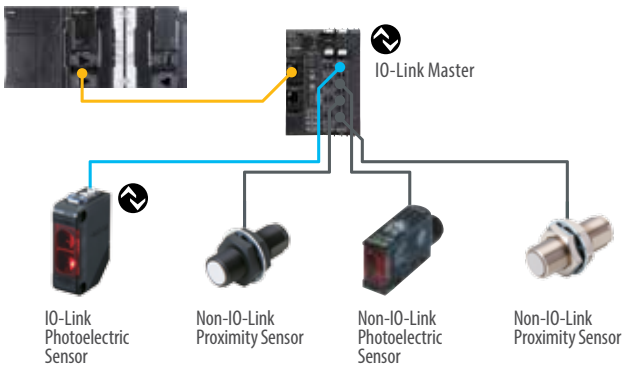
IO-Link works with a conventional 3-wire unshielded cable - no dedicated communication cable is required. IO-Link has both an IO-Link Mode which communicates digitally and Standard I/O (SIO) Mode which uses conventional contact input/output.



3-wire unshielded cable
Maximum length 20m

Mix IO-Link and conventional sensors

Add IO-Link devices to existing trouble spots where additional data or troubleshooting is required - you can even have standard and IO-Link devices on the same master.



Masters and sensors to match your application

Omron provides two types of IO-Link Masters, push-in clamp terminal blocks and M12 Smartclick connectors

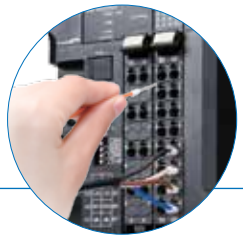
IO-Link Masters

NX-series IO-Link Master Unit
NX-ILM400
4-port/push-in clamp
terminal block

EtherCAT Coupler

IO-Link

Reduce wiring time with optional push in clamp terminal blocks



Value Design for Panel

Part of our Panel Design concept for optimized panels.

IO-Link Sensors

Sensors for push-in clamp terminals

Photoelectric
Sensor
E3Z-☐-IL☐
Pre-wired Models

Proximity Sensor
E2E-☐-IL☐
Pre-wired Models

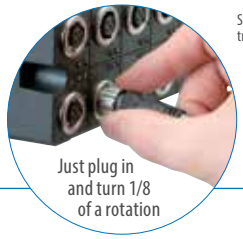
Photoelectric
Sensor
E3Z-☐-IL☐
M8 Connector

Spatter-resistant
Proximity Sensor
E2EQ-☐-IL☐
Pre-wired Models

IO-Link

The IO-Link Master with M12 Smartclick connectors for wet and dusty environments

Environment-resistant Unit
GX-ILM08C
IP67 Type 8-port/M12
Smartclick connector

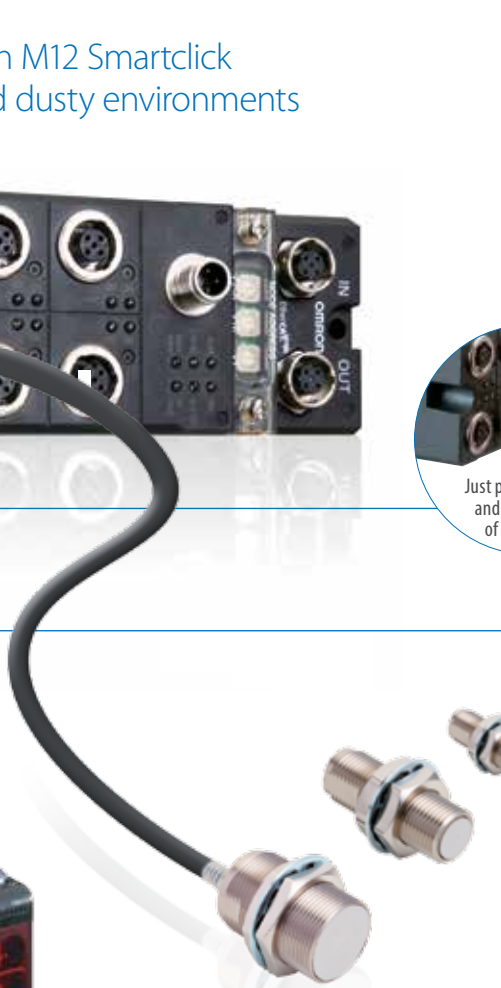


Smartclick
Smartclick is a registered trademark of Omron.

Sensors with M12 connectors

Color Mark
Photoelectric
Sensor
E3S-DCP21-IL☐
M12 Pre-wired
Smartclick Connector

Photoelectric Sensor
E3Z-☐-IL☐
M12 Pre-wired
Smartclick Connector



Proximity Sensor
E2E-☐-IL☐
M12 pre-wired
Smartclick connector

Spatter-resistant
Proximity Sensor
E3Z-☐-IL☐
M12 pre-wired
Smartclick connector

Enhanced manufacturing solutions

through fault detection, condition monitoring and part identification

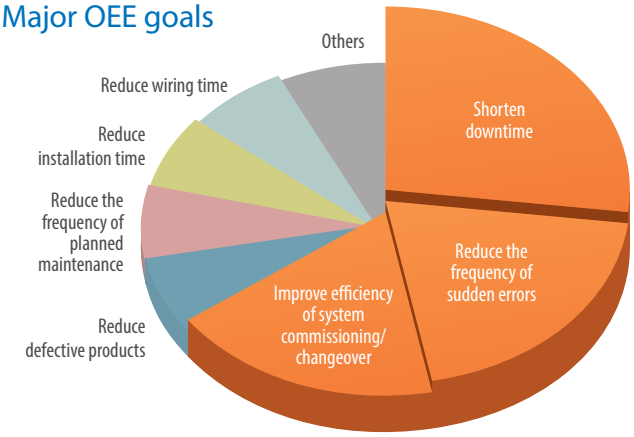
Improving equipment operation is a universal goal for manufacturers. OEE (overall equipment effectiveness) is a common metric that identifies the percentage of manufacturing time that is truly productive. It is one of the best metrics for identifying losses, benchmarking progress, and improving the productivity of manufacturing equipment.

Overall equipment effectiveness = **Availability** (planned and unplanned stops) × **Performance** (slow cycles and small stops) × **Quality** (defects)

These three losses are further divided into the Six Big Losses - the most common causes of equipment-based productivity loss in manufacturing.

Overall Equipment Effectiveness	Recommended Six Big Losses	Traditional Six Big Losses
Availability Loss	Unplanned Stops	Equipment Failure
	Planned Stops	Setup and Adjustments
Performance Loss	Small Stops	Idling and Minor Stops
	Slow Cycles	Reduced Speed
Quality Loss	Production Rejects	Process Defects
	Startup Rejects	Reduced Yield
OEE	Fully Productive Time	Valuable Operating Time

Major OEE goals



Note: Based on Omron's survey, January 2016.

Omron's IO-Link compliant components solve stop loss issues while improving equipment operation rates

Fault detection for quick recovery
makes reduced downtime possible
P. 9

Condition monitoring for predictive maintenance
makes the reduction of equipment failure possible
P. 10

Component identification for reduced man-hours
makes improved set-up and adjustments possible
P. 12

Fault detection for quick recovery

Detect and troubleshoot connection issues

Traditional challenges:

· A fault is displayed on an HMI or panel, but it is difficult to identify the actual problem on the machine

· Maintenance personnel are required to investigate the cause of the downtime; lost production can last several hours to several days

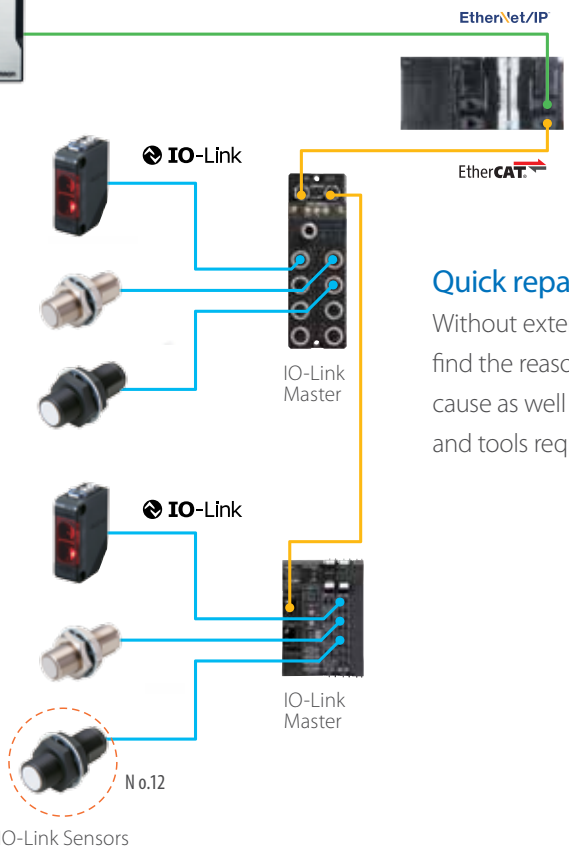
With IO-Link enabled devices, sensor status and fault conditions reported in real time

When a sensor fault occurs, IO-Link allows you to see which sensor faulted and the cause of the error. With this information, you can determine the required action and quickly bring the equipment back online. IO-Link also detects disconnected or broken wires on both the output and the input/power.

Note: The screen is a conceptual illustration.

Sensor fault occurred

Provides identification information and fault details. The sensor part number is displayed.



Quick repair

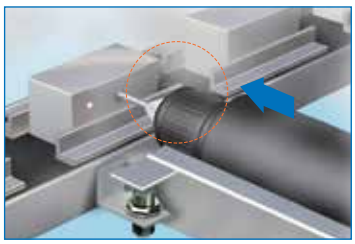
Without extensive troubleshooting to find the reason for the error, the root cause as well as the replacement parts and tools required are known instantly.

Reduce downtime

with enhanced data

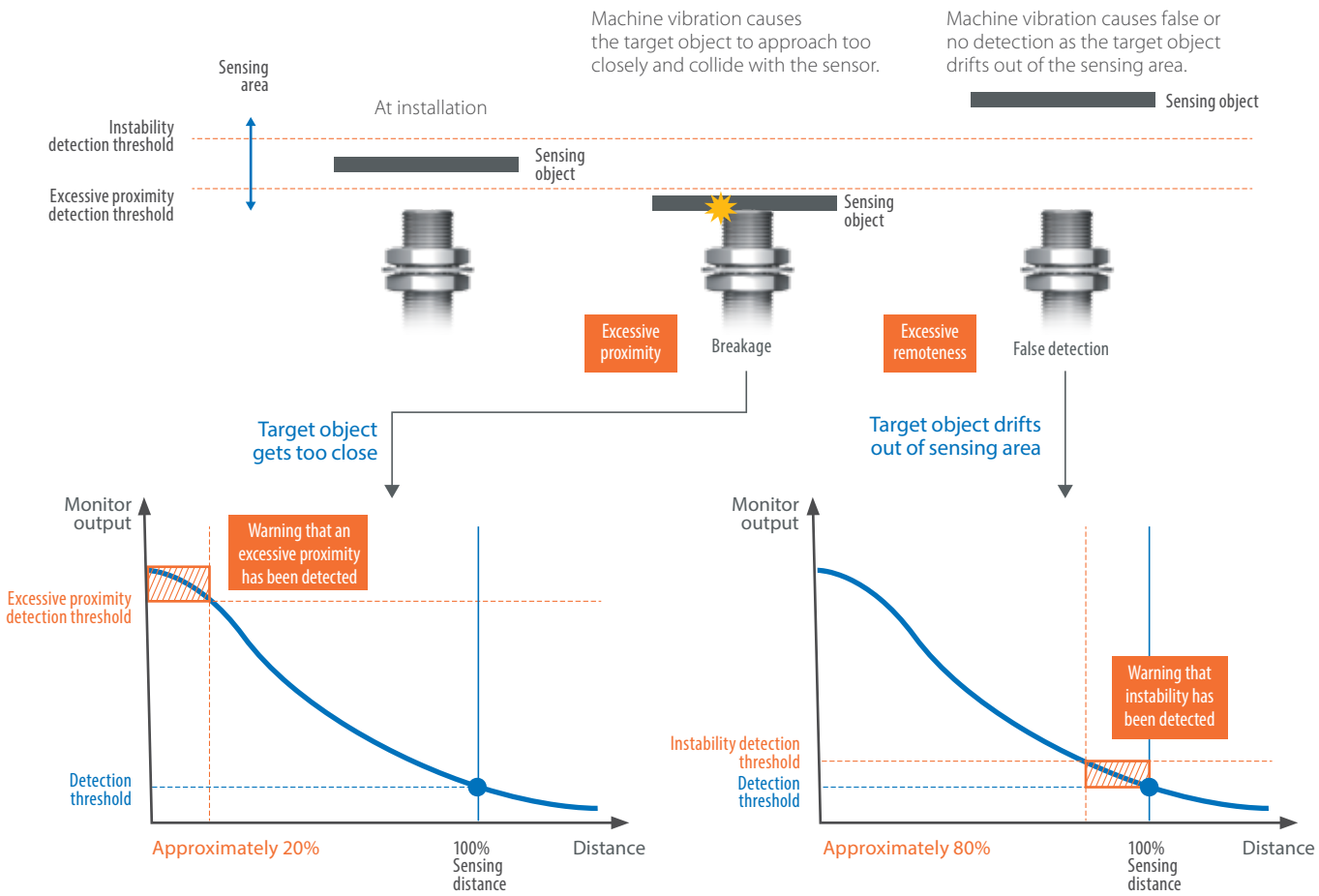
Traditional challenges:

· The location of the target object changes over time due to wear and vibration and can result in false detection and collision



With an IO-Link proximity sensor, you are notified if the target distance is changing, providing early warning before a fault occurs.

Constantly monitoring the position of the target object and notifying of excessive remoteness or proximity is useful for predictive maintenance.



Monitor sensor performance

to reduce downtime

Traditional challenges:

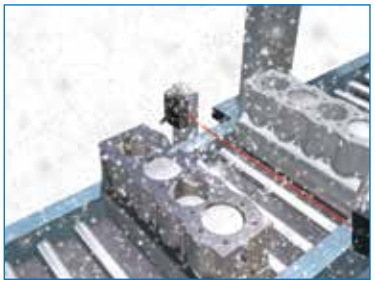
· Debris or dust accumulated on the lens of the through-beam photoelectric sensor leads to a decline in the incident light level, causing the sensor to fault and the process to stop

· Water drops stick to the sensing surface of a reflective sensor causing reflected light to enter

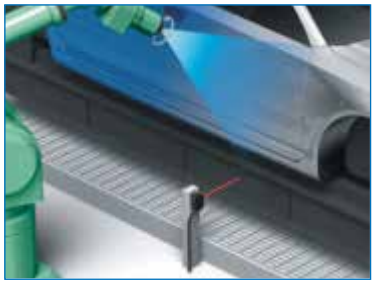
With an IO-Link photoelectric sensor, monitoring incident light level prevents false detection

The photoelectric sensor offers several instability settings, allowing you to monitor the incident light level and easily determine when maintenance must be performed.

Debris and dust accumulate on the sensing surface (Through-beam)

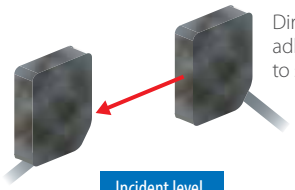


Paint adheres to the sensing surface (Through-beam)

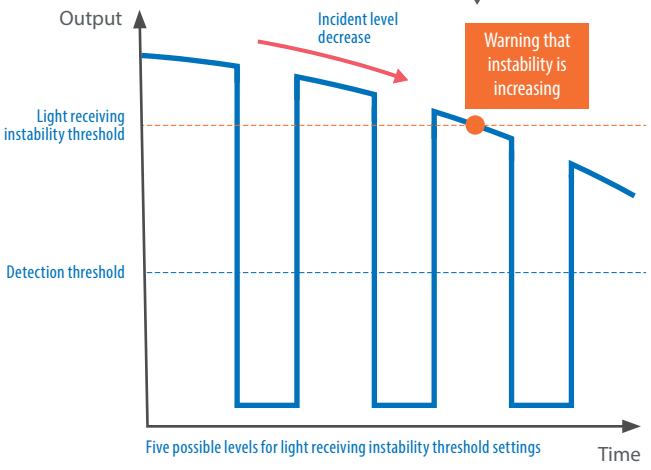


Water drops collect on the sensing surface (Through-beam)

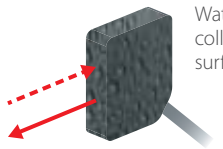
The incident level decreases when the level is higher than the detection threshold.



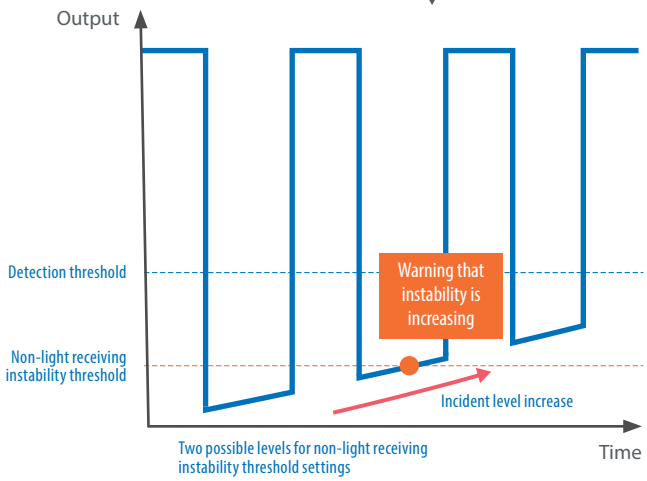
Incident level decreases ▶ False detection



The incident level increases when the level is lower than the detection threshold.



Incident level increases ▶ False detection



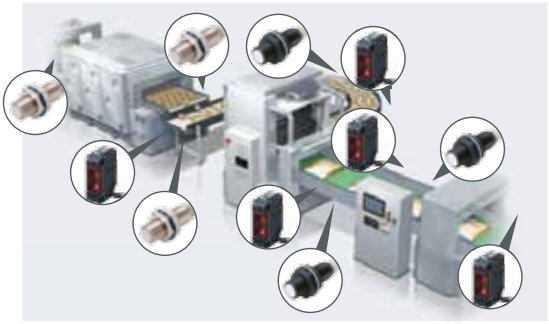
Enhanced troubleshooting

for reduced downtime

Traditional challenges:

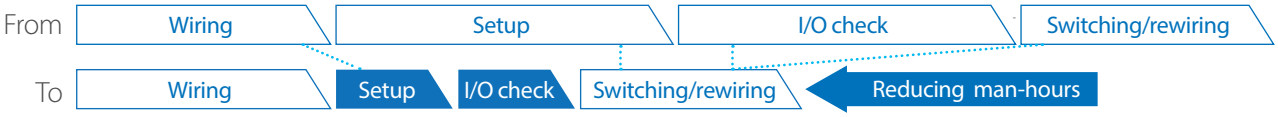
· During system commissioning or changeover, operators had to perform an I/O check for each of the thousands of sensors installed on the line, taking an enormous amount of time

· Lost production and downtime caused by installation errors



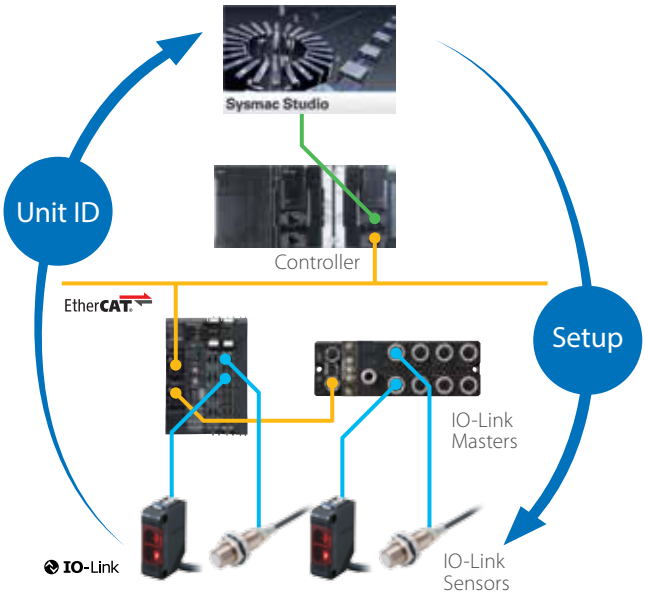
IO-Link pinpoints problems and speeds commissioning

By checking the sensor identification (manufacturer, sensor type, model number), you can easily detect mistakes such as misconnected or unconnected sensors and installation errors. Also, because it is possible to program multiple sensors at once, it is also possible to significantly reduce commissioning time.



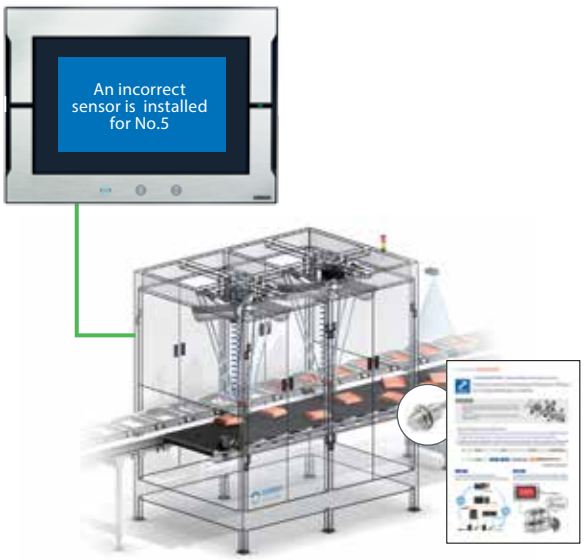
Automatic setup

Program all devices at once to reduce commissioning time and inconsistent settings.



I/O check

Use identification checks to automatically detect installation errors before commissioning.



Overview of IO-Link compliant devices

IO-Link Masters

Product name	Number of IO-Link ports	External connection terminal	Environment tolerance	Model
NX Series IO-Link Master Unit *1 	4	Push-in clamp terminals	IP20	NX-ILM400
GX Series IO-Link Master Unit 	8	M12 Smartclick Connector	IP67	GX-ILM08C

*1. EtherCAT Communication Coupler Unit NX-ECC2☐☐ is necessary for the system configuration.

IO-Link Sensors

Photoelectric Sensor

Product name	System		Model
E3Z-☐-IL☐ 	Through-beam	Pre-wired Models (2m)	E3Z-T81-IL☐ 2M
		M12 Pre-wired Smartclick Connector Models (0.3m)	E3Z-T81-M1TJ-IL☐ 0.3M
		Standard M8 Connector Models	E3Z-T86-IL☐
	Retro-reflective	Pre-wired Models (2m)	E3Z-R81-IL☐ 2M
		M12 Pre-wired Smartclick Connector Models (0.3m)	E3Z-R81-M1TJ-IL☐ 0.3M
		Standard M8 Connector Models	E3Z-R86-IL☐
	Diffuse-reflective	Pre-wired Models (2m)	E3Z-D82-IL☐ 2M
		M12 Pre-wired Smartclick Connector Models (0.3m)	E3Z-D82-M1TJ-IL☐ 0.3M
		Standard M8 Connector Models	E3Z-D87-IL☐
	Diffuse-reflective Narrow-beam	Pre-wired Models (2m)	E3Z-L81-IL☐ 2M
		M12 Pre-wired Smartclick Connector Models (0.3m)	E3Z-L81-M1TJ-IL☐ 0.3M
		Standard M8 Connector Models	E3Z-L86-IL☐

Color Mark Photoelectric Sensor

Product name	System		Model
E3S-DCP21-IL☐ 	Diffuse-reflective	M12 Connector Models	E3S-DCP21-IL☐

Standard Proximity Sensor (DC 3-wire Shielded Model)

Product name	System		Model
E2E-☐-IL☐ 	M12	Pre-wired Models (2m)	E2E-X3B4-IL☐ 2M
		M12 Pre-wired Smartclick Connector Models (0.3m)	E2E-X3B4-M1TJ-IL☐ 0.3M
	M18	Pre-wired Models (2m)	E2E-X7B4-IL☐ 2M
		M12 Pre-wired Smartclick Connector Models (0.3m)	E2E-X7B4-M1TJ-IL☐ 0.3M
	M30	Pre-wired Models (2m)	E2E-X10B4-IL☐ 2M
		M12 Pre-wired Smartclick Connector Models (0.3m)	E2E-X10B4-M1TJ-IL☐ 0.3M

Spatter-resistant Proximity Sensor (DC 3-wire Shielded Model)

Product name	System		Model
E2EQ-☐-IL☐ 	M12	Pre-wired Models (2m)	E2EQ-X3B4-IL☐ 2M
		M12 Pre-wired Smartclick Connector Models (0.3m)	E2EQ-X3B4-M1TJ-IL☐ 0.3M
	M18	Pre-wired Models (2m)	E2EQ-X7B4-IL☐ 2M
		M12 Pre-wired Smartclick Connector Models (0.3m)	E2EQ-X7B4-M1TJ-IL☐ 0.3M
	M30	Pre-wired Models (2m)	E2EQ-X10B4-IL☐ 2M
		M12 Pre-wired Smartclick Connector Models (0.3m)	E2EQ-X10B4-M1TJ-IL☐ 0.3M

Software

Product name	Model
Sysmac Studio*2	SYSMAC-SE2☐☐☐

*2. CX-Configurator FDT for IO-Link sensor setup is included in Sysmac Studio.

Notes

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