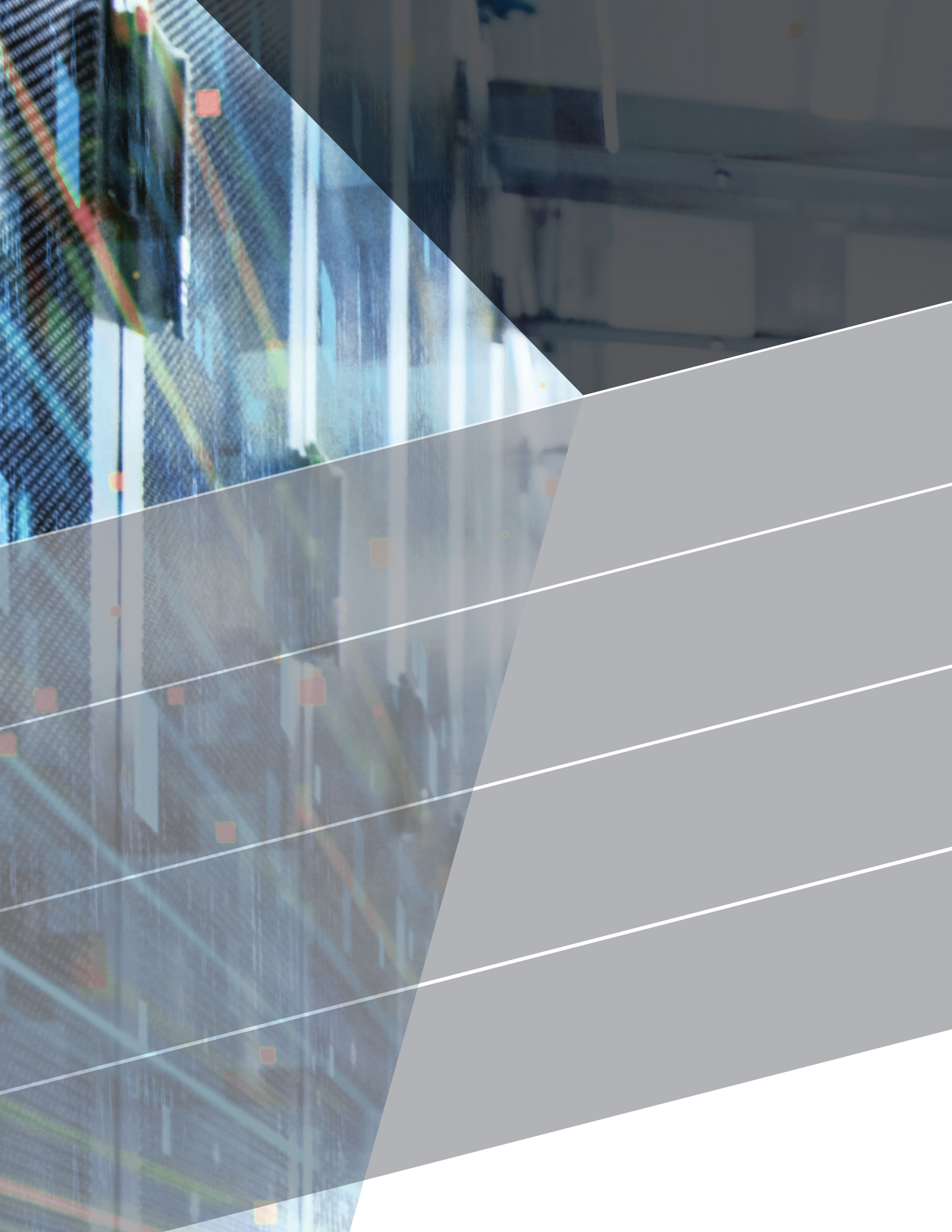
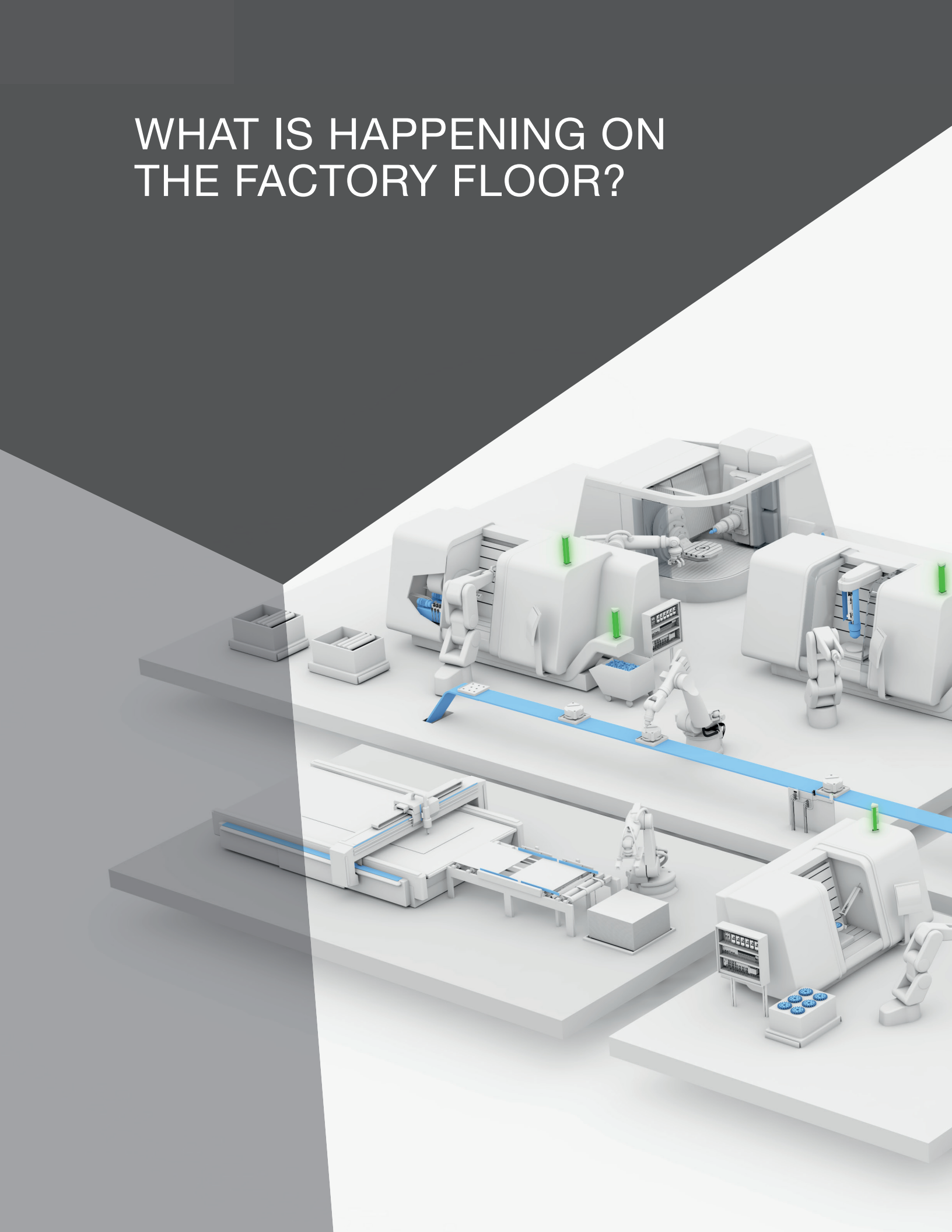

BALLUFF
IO-Link for Manufacturers
IMPROVING PLANT FLOOR VISIBILITY AND EFFICIENCY
innovating automation
IO-Link



CONTENTS

EtherCAT® EtherNet/IP™ CC-Link IE PROFINET®

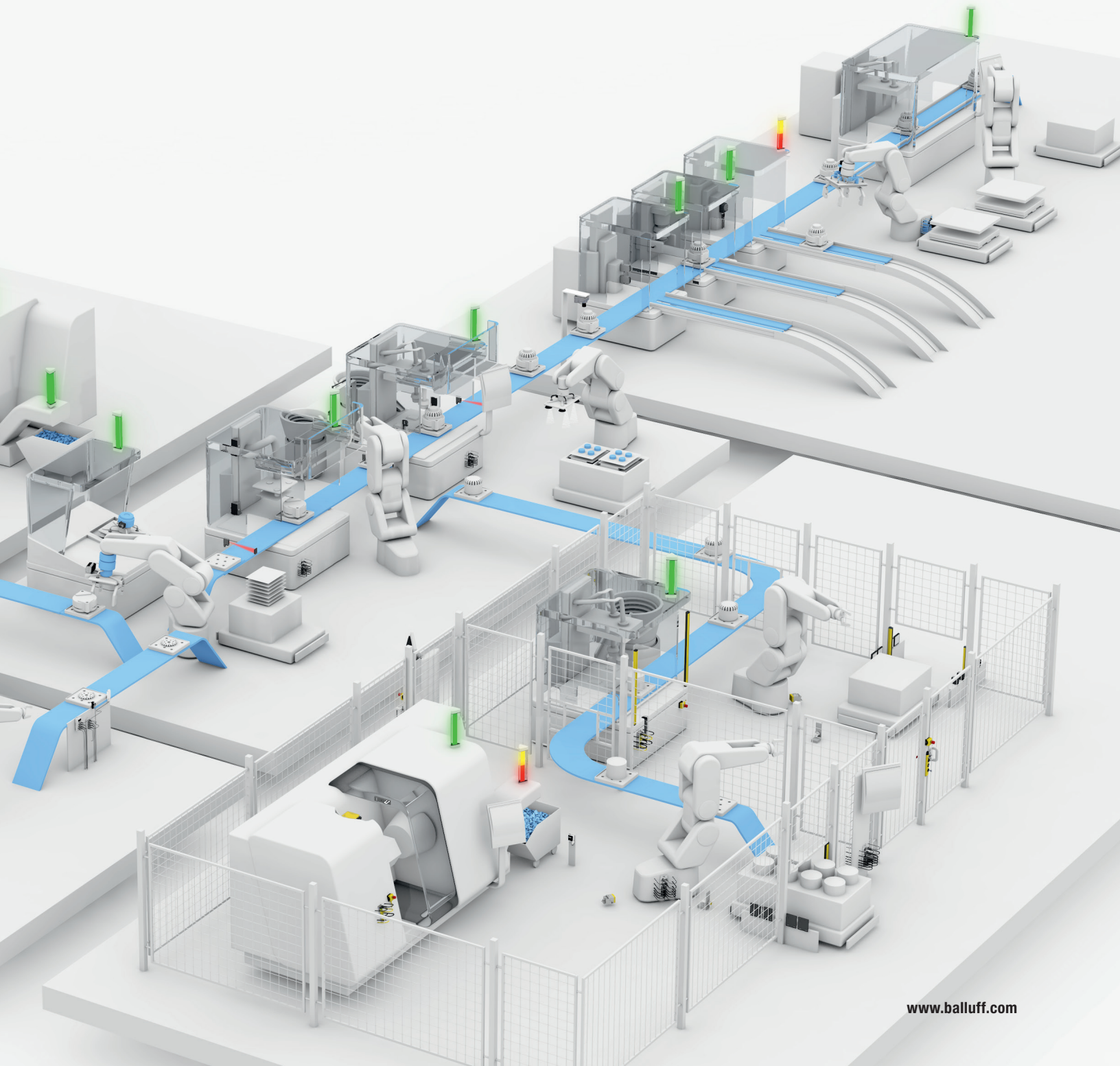
WHAT IS HAPPENING ON THE FACTORY FLOOR?



Manufacturers are driven by the need to increase production, reduce scrap and know exactly what is happening with their production equipment 24 hours a day. This need for data visibility has driven the installation of Ethernet protocols into the automation equipment of today. But it doesn't make sense to have an Ethernet-ready inductive proximity sensor. The overhead of switches and IP addresses, and the added cost to the sensor makes this infeasible, but the questions remain.

- How do I easily track recurring causes of downtime?
- How do I shorten the amount of time the line is down?
- How do I get more utilization and flexibility out of my equipment?
- How do I find maintenance technicians able to support Ethernet?
- How do I know what is happening now and in the past?

IO-Link



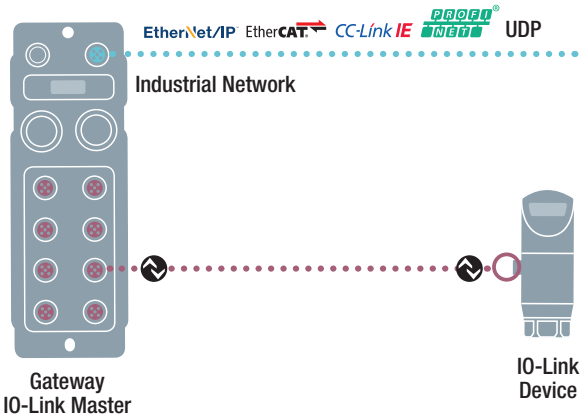
WHAT IS IO-LINK?

USE YOUR EXISTING NETWORK ARCHITECTURE

IO-Link technology utilizes your existing network infrastructure addressing is point-to-point with a master/device relationship.

Features

- Similar to USB architectures
- Typically one device per master port
- All major PLCs and industrial networks supported



CAN I GET THAT SENSOR WITH ETHERNET?

There is a technology that allows for multiple intelligent field devices to be installed on the industrial Ethernet network without costly overhead. This technology is called IO-Link. With IO-Link you will use the existing equipment infrastructure to connect multiple intelligent devices to one IP address through a master/device relationship.

Features

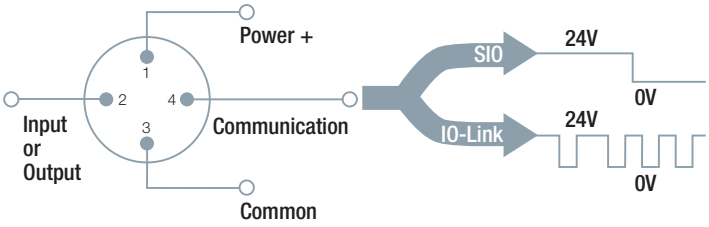
- Universal – Open vendor neutral standard (IEC 61131-9) that works with existing industrial protocols
- Smart – Flexibility and visibility down to the individual sensor with diagnostics and parameterization
- Easy – Simple maintenance and quick setup of new devices

M12 3-WIRE CONNECTION – POWER & COMMUNICATION

The digital signal is carried over pin 4 of a standard sensor cable and 24V power is provided to the device in a standard configuration. If required, the IO-Link port can be used for a standard I/O point.

Features

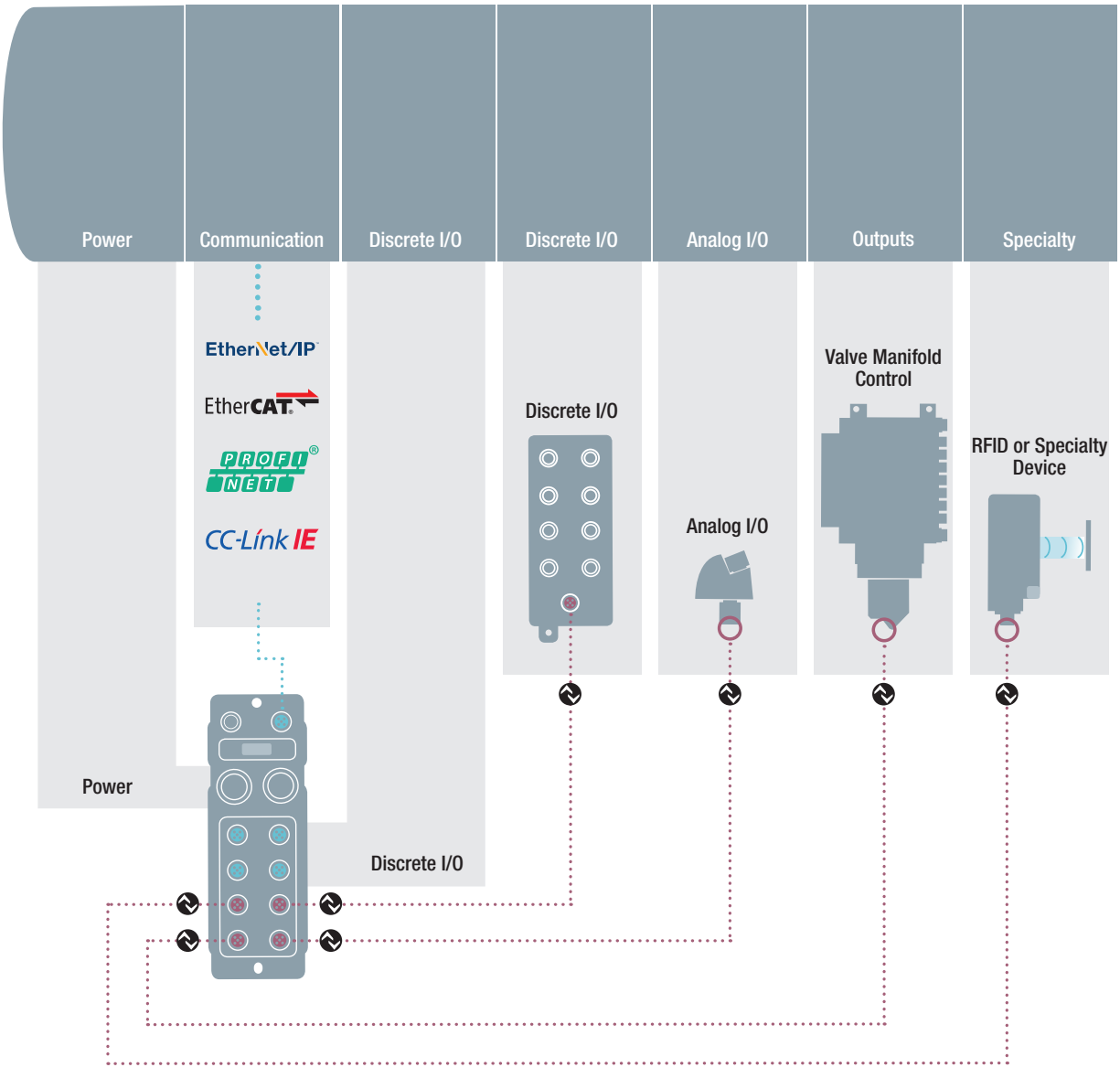
- High noise immunity due to the 24V-step serial signal
- Utilizes low cost unshielded 4-wire standard sensor cables
- Cable runs can be as long as 20 m



THE EXPANDABLE ARCHITECTURE OF IO-LINK

Think of a remote “slice” I/O solution. In a typical application, the communication head and the power supply sit on the left hand side and are followed along the backplane by the individual I/O devices, such as discrete 24V input cards or 0-10V analog cards. Usually there are a limited number of slots available in the backplane and individual slices of control components can be inserted.

In a similar fashion, a distributed modular I/O system with IO-Link has a communications head that talks over the desired industrial network on the left side and the right side acts as the backplane. Then each device is connected to the backplane with a sensor cable. With the ability to be installed within a 20 meter radius from the master, I/O devices can be easily distributed across the machine.



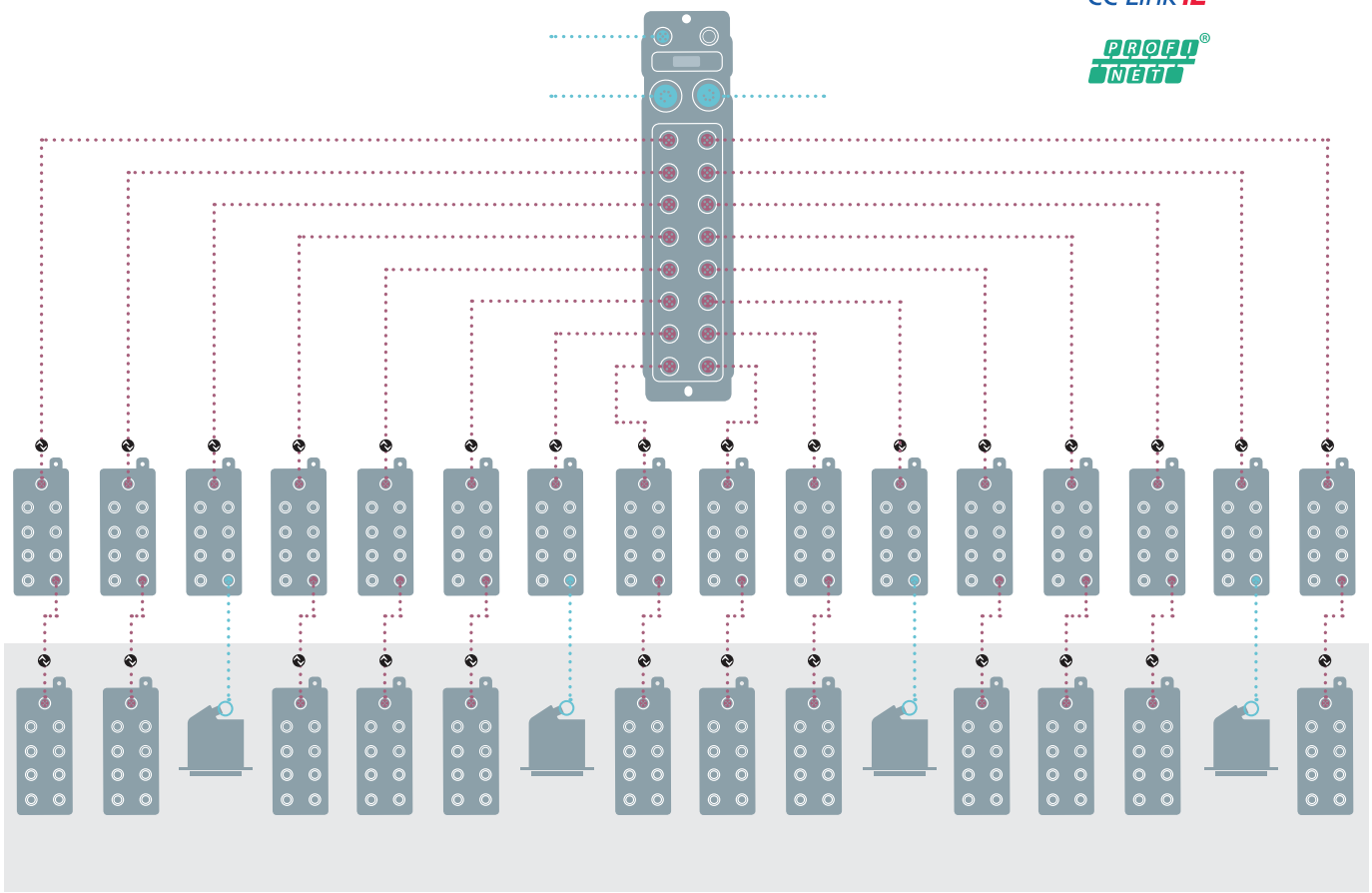
From stack lights to solenoid valves to proxes to measurement devices, a variety of inputs and outputs are required to make a production line run and flexibly operate. IP20 slice style solutions require a collection of other products like terminals, circuit breakers and control cabinets. By utilizing IO-Link, a machine can have dramatically reduced wiring, smaller electrical cabinets and provide diagnostics that allow for quick troubleshooting of I/O problems.

Features

- Use existing equipment infrastructure and networks
- IO-Link masters are available with 4, 8, and 16 ports
- Discrete I/O, analog I/O, valve manifold control
- Any vendor's IO-Link device can be utilized

Existing Industrial Networks

EtherNet/IP
EtherCAT
CC-Link IE
PROFINET



Balluff Expanded I/O

128-480 Discrete I/O Points on a Single Fieldbus Node

THE BENEFITS OF DEVICE PARAMETERIZATION

Most intelligent devices require configuration and this can become a headache for the common maintenance technician tasked to replace or swap a device. They have to figure out how the device works and then attempt to determine what values need to be programmed. By utilizing IO-Link, these problems can be reduced or even eliminated using parameterization.

Features

- Reduce the overall complexity of device setup for maintenance
- Stop deciphering manuals, push-button menus and potentiometers
- Make changeover faster when changing configurations
- Reduce downtime with faster device swapping and setup

FOUR OPTIONS FOR SETTING THE PARAMETERS OF AN IO-LINK DEVICE:

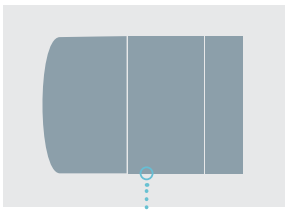
Option 1 – Controller Parameter Storage
- Store in a data-table in the controller
- Push by the controller to the device
- Store multiple configurations

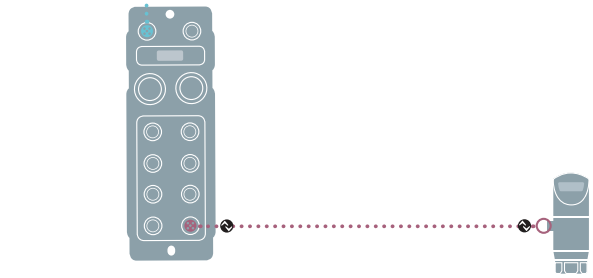
Option 2 – IO-Link Master Parameter Server
- Activate built-in parameter storage
- Store most recent parameters in the master
- Download automatically upon replacement

Option 3 – PC Storage with USB Master
- Store on a computer or IT network
- Connect via USB to the device
- Download parameters manually

Option 4 – Webserver Entry with IO-Link Master
- Store as a list in a document or file
- Connect via the webserver to the device
- Upload parameters manually

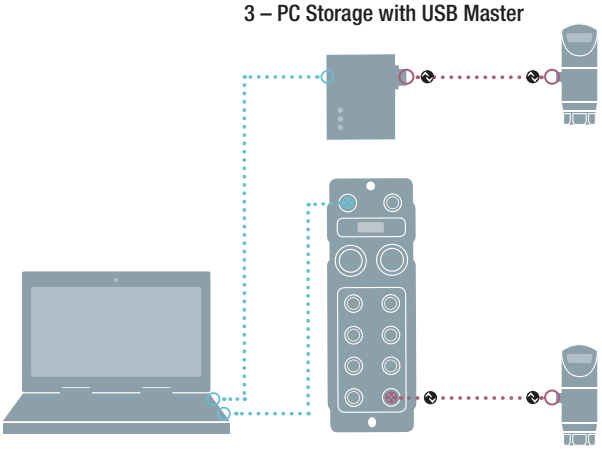
1 – Controller Parameter Storage





2 – IO-Link Master Parameter Server

3 – PC Storage with USB Master



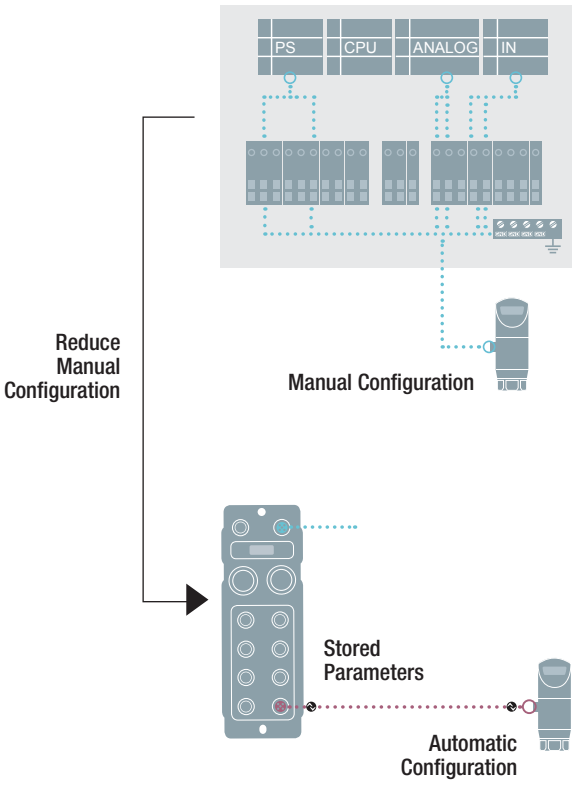
4 – Webserver Entry with IO-Link Master

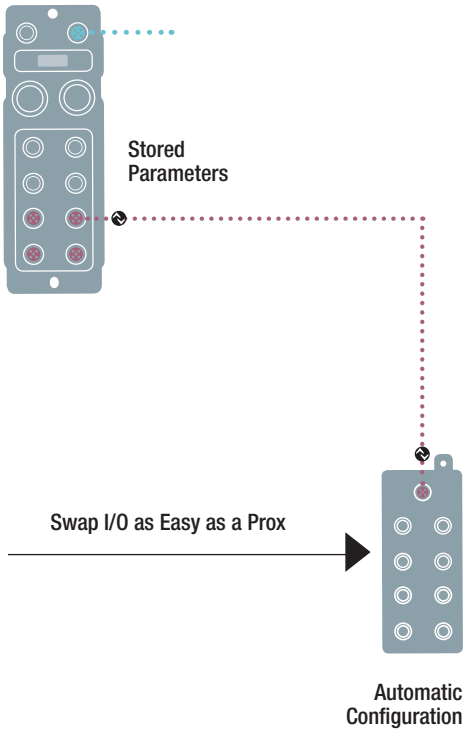
ERROR FREE RE-CALIBRATION

Smart field devices require a higher degree of skill for technicians to be able to replace a device. The result is typically increased downtime and costs associated with replacement and possible application re-validation when replacing these smart components. IO-Link allows for the field device parameters to be stored and downloaded automatically to any new replacement part. No longer are manuals, push-button teaching, setting of switches or potentiometers necessary to re-calibrate. 100% correct calibration is assured, and performed promptly by the control system upon replacement.

HOT SWAP FAILED DEVICES

Duration of downtime can be significantly reduced and can require less skill to replace with IO-Link. When a typical I/O device is damaged in production, the maintenance technician has to swap the old device for a new one and then program the IP address, set any configurations required and re-establish network communication. In addition, there is little verification that the proper part was reinstalled. With IO-Link, the I/O hub is swapped and the master verifies the correct device is connected then automatically configures the device without any effort from the technician.





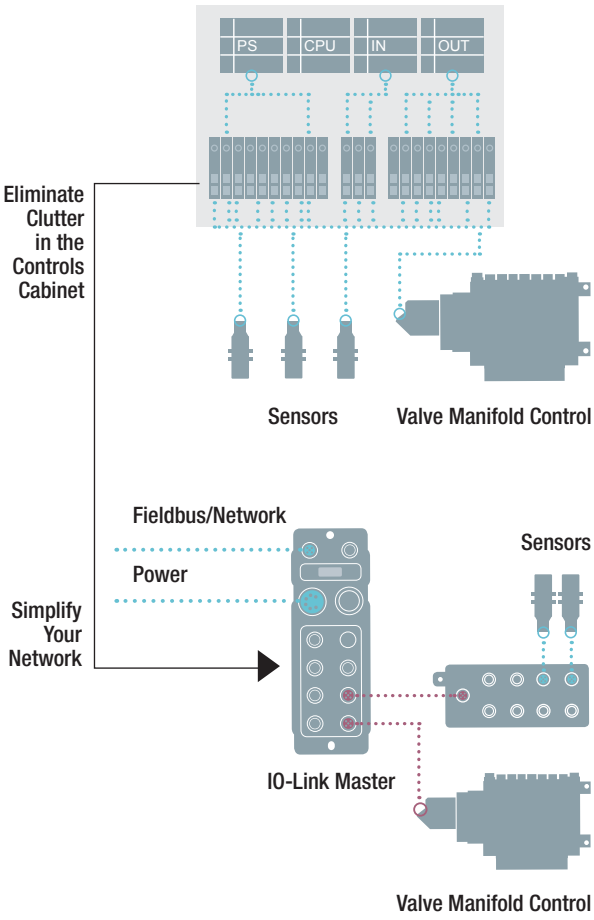
THE BENEFITS OF IO-LINK FOR MANUFACTURERS

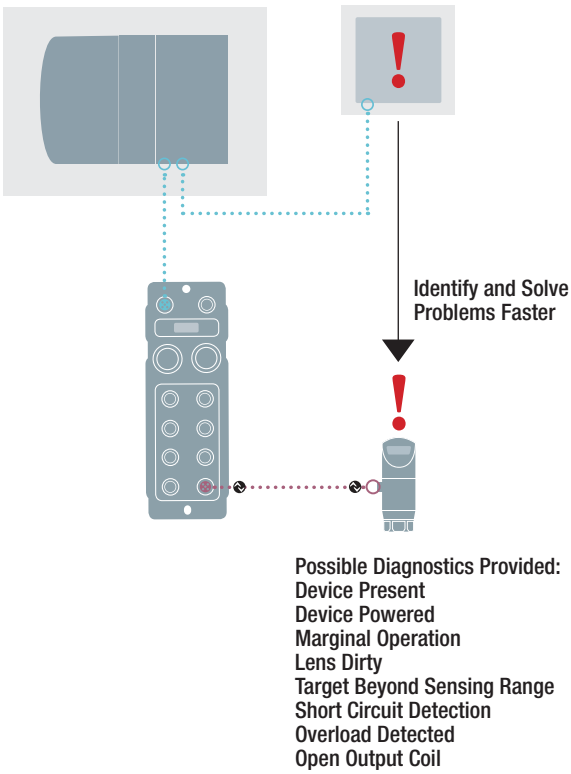
REDUCE ARC FLASH HAZARDS – SIMPLIFY YOUR NETWORK

When looking for simple ways to reduce exposure to arc flash, consider the benefits of implementing machine mount I/O products. These types of distributed I/O products are typically IP67 and can be mounted outside the control cabinet. They allow for the controls to be diagnosed, troubleshot and replaced without ever needing to open an electrical cabinet. This reduces the number of times the maintenance technician has to enter an unsafe environment.

TROUBLESHOOT FASTER AND REDUCE DOWNTIME

Time is a valuable resource. Maintenance crews and operators need to quickly find a solution to a problem and get the equipment running. By implementing IP67 machine mount I/O, the failed points become more visible and accessible. In addition, diagnostics provided by the individual intelligent devices can help narrow the scope of the problem and speed recovery. Operators can provide technicians exact details of the failure and time can be saved for the technician by knowing and preparing for the problem before they even arrive at the equipment.

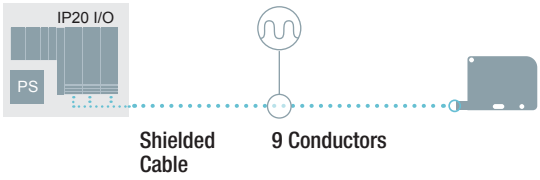




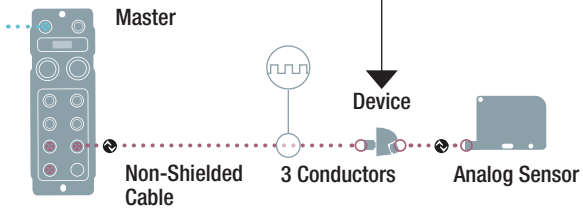
ELIMINATE ANALOG HEADACHES

When using analog devices on a machine it can be difficult to find a path for the shielded cable that does not incur noise from motors or other complications. By utilizing IO-Link, the analog to digital conversion is done inside the device, and then a standard sensor cable can be used for the connection, providing feedback noise – free. In addition, the smart device reports engineering units (mm, PSI,°C) which reduces the effort to program and integrate.

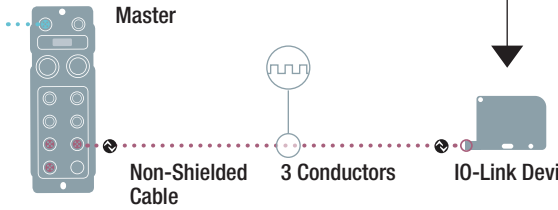
Analog Output – Measuring Signal and Set Points



Analog to Digital Conversion

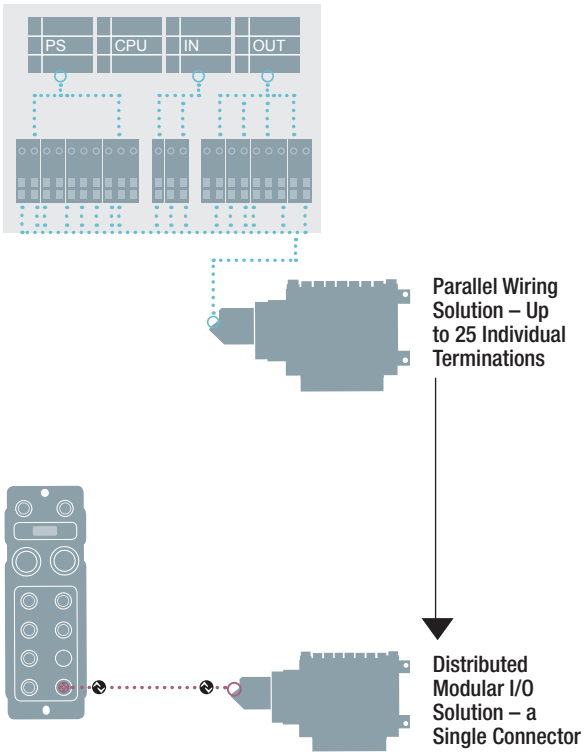


Analog to Digital Conversion



KEEP VALVE MANIFOLDS SIMPLE

Trying to find a short in or replacing and rewiring a 25 conductor cable run can be time consuming and costly. By implementing valve manifold connectors with IO-Link integrated into them, the wiring of the valve is dramatically reduced and taking the installation from 25 termination to a simple M12 connector makes it quick to repair. In addition, the valve manifold controller with IO-Link can provide basic diagnostic information for troubleshooting any issues on the equipment quickly.

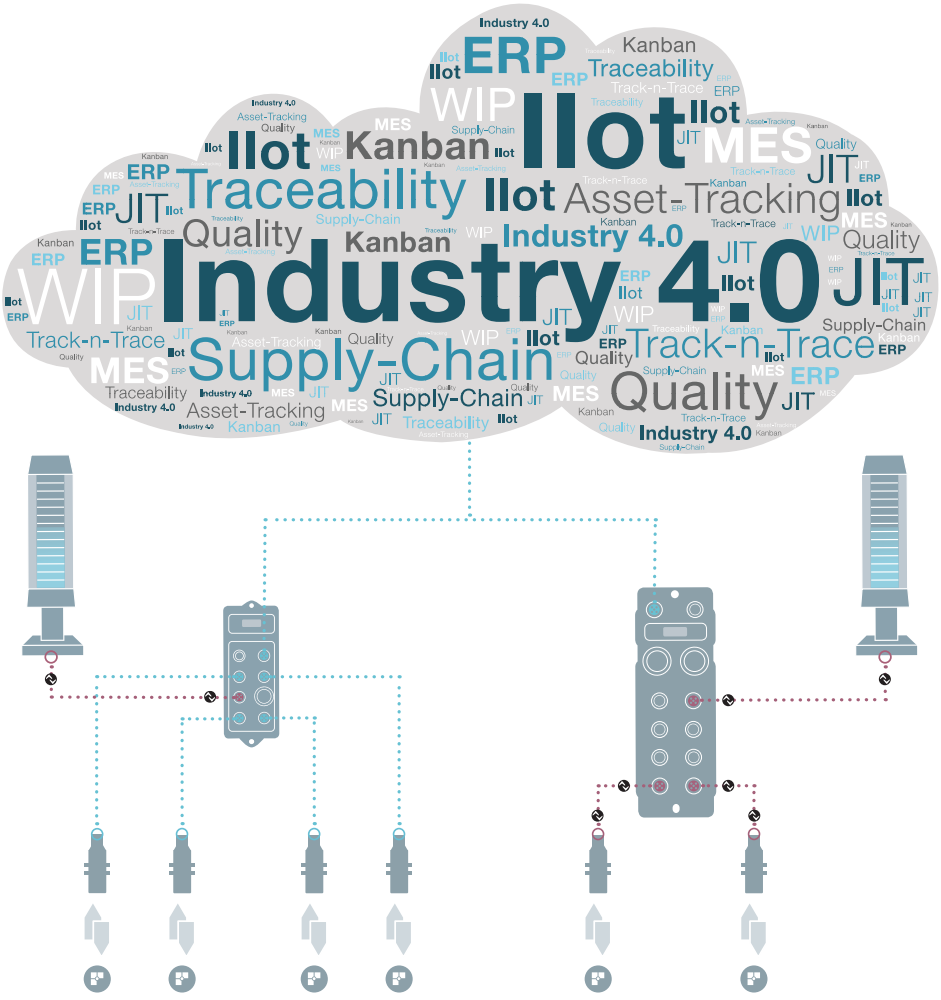


DATA VISIBILITY THROUGHOUT THE FACILITY

The desire for visibility into production, customer satisfaction, profits and compliance are pushing many manufacturers to look at plant floor visibility and plant-wide traceability as a long-term strategy. Whether you want to improve how your operators, drivers and technicians interact with the production equipment, or you want to start tracking assets, production rates and material flow, IO-Link makes it easy to implement data solutions and can quickly give you visibility into your entire facility.

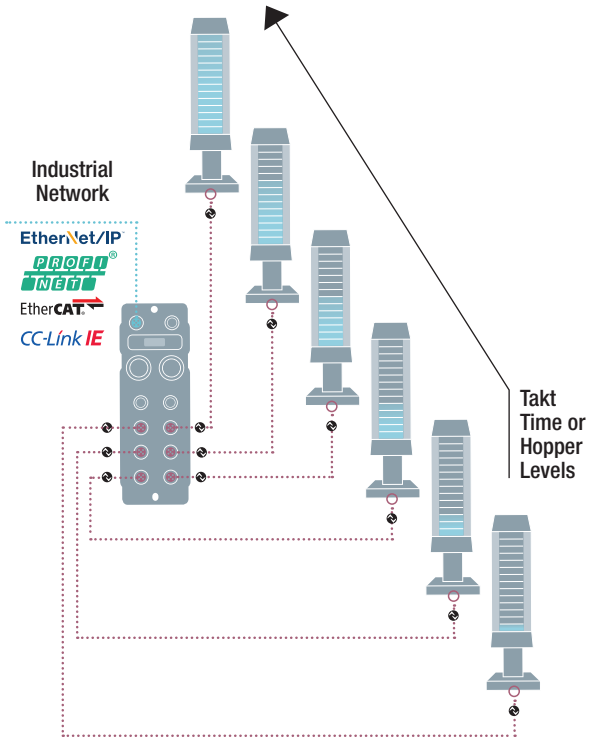
Features

- Instantaneous feedback of machine, operation, station status
- Visibility for operators and supervisors of tank, hopper, bowl levels
- Easily track valuable assets and material flow within production
- Track work in process and intralogistics throughout the plant



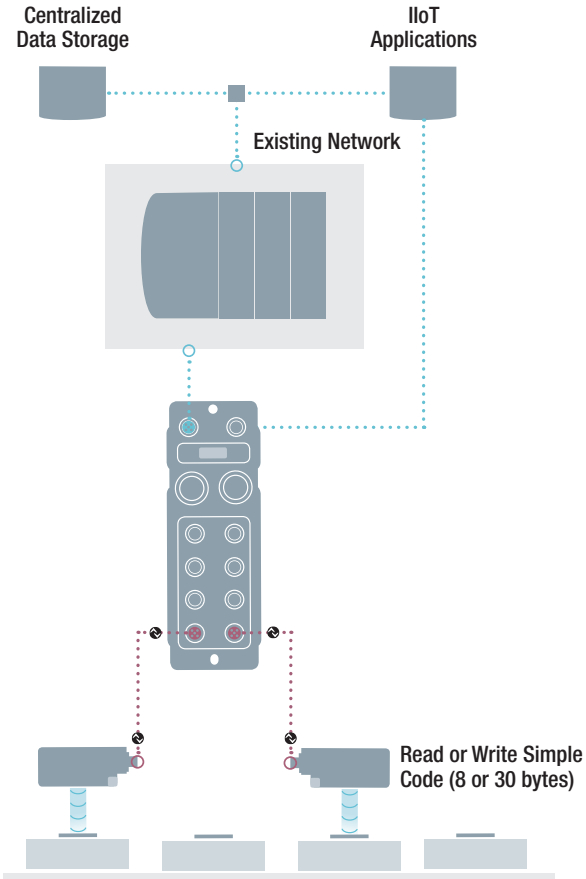
SEE YOUR PROCESS IN ACTION

Routinely there is a need to communicate the status of something or to visualize a measurement. Typical technologies employed for this are a HMI, digital bar meter or display. These require costly items like analog outputs or elements like an enclosure and remote I/O devices. The SmartLight's level mode is easily used for a variety of indications like: machine speed, throughput, output quality, operator performance to quota, position of a part, feeder bowl level, hopper level, tank level, output bin level, kanban or pick-to-light systems.



TRACEABILITY WITH EASE

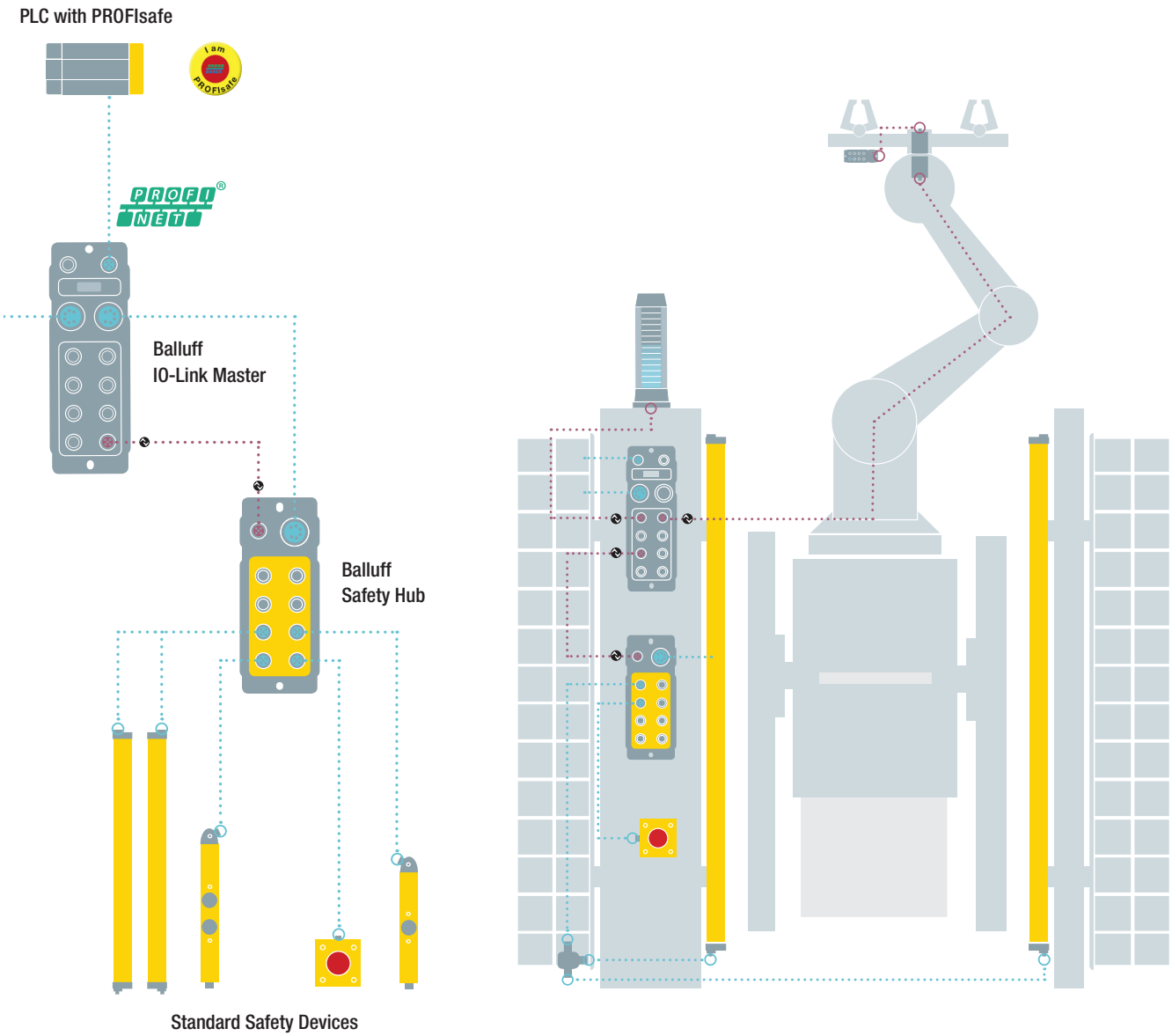
With IO-Link, RFID can now be integrated in the simplest way. With centralized data storage, a code is stored on the asset or work in process and then all of the exact data tied to that code is stored on a central database. The code shows up in the control in the data table as a 30 byte integer depending on the technology selected. More data can be read or written if needed, but with this basic code, you can easily retrofit existing equipment for most traceability applications like material flow, asset tracking and work in progress.



SAFETY OVER IO-LINK

Many users are realizing that neither an Ethernet-based safety protocol, nor a device level safety protocol can meet all their needs, especially if they are trying to implement a cost-effective, comprehensive safety solution which can also support their IIoT needs. Safety over IO-Link combines automation and safety and represents efficient safety concepts in a single system. Best of all, the functionality of the overall system remains unchanged. Safety is provided nearly as an add-on.

Like IO-Link in general, Safety over IO-Link is characterized by simple system construction, time-and cost-saving wiring using M12 connectors, reduction in control cabinet volume and leaner system concepts. Safety over IO-Link delivers the proven benefits of IO-Link but with the added benefit of protecting your people and equipment.



ENABLING IIOT WITH IO-LINK

IO-Link is a major enabling force for Industry 4.0 and smart manufacturing. Motivations for flexible manufacturing, efficient production and visibility require that manufacturers have more diagnostics and data available for analysis and monitoring.

The Industrial Internet of Things (IIoT) is simply about connecting devices on the plant floor to a network. These connections provide new ways to generate and collect useful data. This network can provide visibility down into the machine, enabling predictive maintenance and big data analytics. IIoT, improves overall equipment effectiveness and provides new insights into your business.

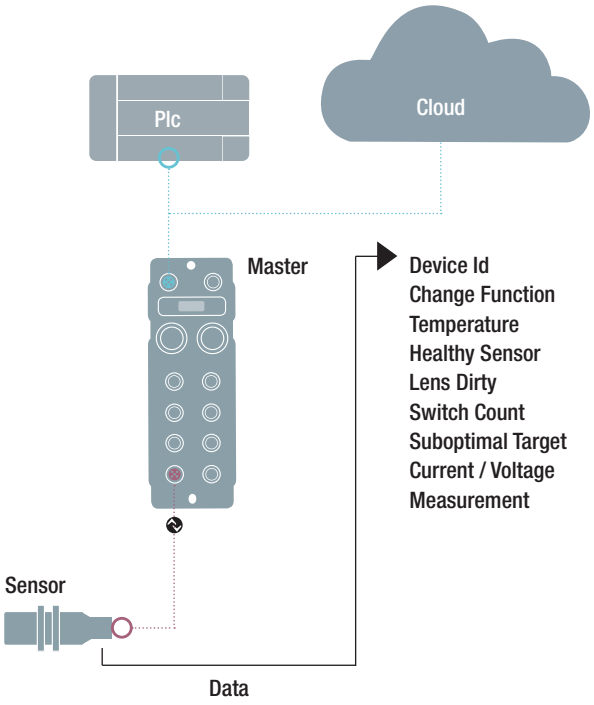
VISIBILITY DOWN TO A SENSOR

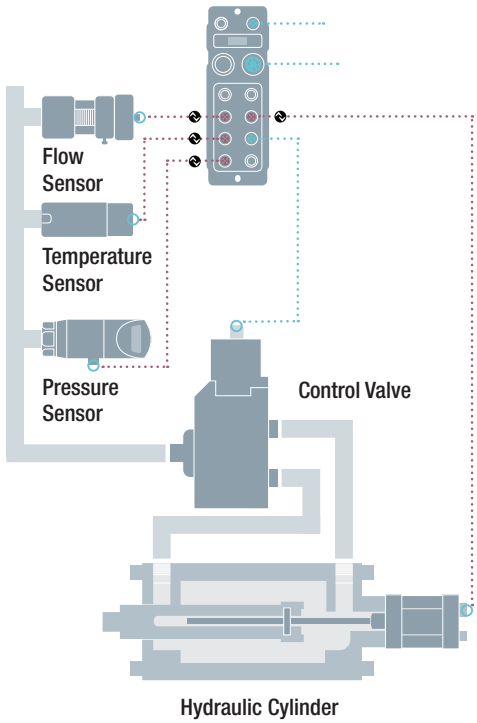
IIoT is about connecting devices on the plant floor to a network. These connections deliver new ways to generate and collect useful data. By providing visibility down into the process, IIoT allows for significant improvements to productivity and quality, including more predictive maintenance and big data analytics.

With IO-Link you can create visibility down to every sensor in the plant and gain the flexibility and reliability that you need for sustainable competitiveness in the global market. More than just control, data can be captured and the resulting analytics can be used to drive your decisions.

MACHINE CONDITION MONITORING

To implement predictive maintenance, repair or replacement work, it is essential to have information about the condition of the sensors, the process chain and the workpieces. IO-Link sensors not only provide information about system control; they also gather machine data which serves as information in higher level systems. Continuous condition monitoring of machines provides information in real-time and ensures proper control and utilization of the production processes. This lowers costs and at the same time optimizes productivity. IO-Link sensors and systems developed for machine monitoring can be installed directly in the desired production system or retrofitted simply.





IO-Link

THE BALLUFF IO-LINK ADVANTAGE

Balluff IO-Link has been widely adopted across many industries and has the broadest offering of IO-Link devices and masters.

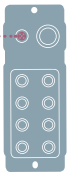
Features

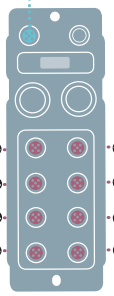
- Easy to implement with tools like AOIs and function blocks available online
- Quick troubleshooting and ease of maintenance
- Built-in scalability and flexibility for the future

IO-LINK MASTERS
- 4 port and 8 port versions
- Parameter server functionality
- Fully programmable display

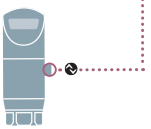
SMARTLIGHT
- Tower lights, indicators and pick-to-lights
- Buzzers, levels, runlight, segments
- Configure: colors, brightness, levels, etc.

DISCRETE I/O
- Up to 128 I/O per IP address
- IP67 metal or plastic, M8 or M12
- Inputs, outputs, configurable
- PNP or NPN, 2-wire DC, safety

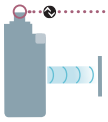




ANALOG I/O
- Up to 8 channels at 16 bit
- Thermocouple, voltage, current, RTD, and more.
- Reduces shielded cable runs

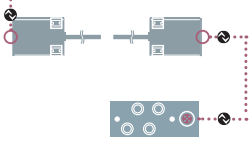


SMART SENSORS
- Photoeye, inductive, ultrasonic, pressure sensors, magnetic field, capacitive temperature, and more
- Software storable and programmable parameters
- Diagnostics and digital measurements



RFID TRACEABILITY
- Simple to implement, easy to use
- 10 byte or 32 byte read/write versions
- Enables flexibility and visibility in the machine

VALVE MANIFOLD CONTROL
- Compatible with most major manifold brands
- 24 VDC, up to 1.1 amps active at one time
- Up to 24 position controls via 25 pin D-sub or M25



NON-CONTACT COUPLERS
- Power and signal transmission over the air gap
- Power: 24 VDC, up to 0.5 amps transmitted
- Signal: any IO-Link device, appears transparent

LINEAR POSITION SENSORS
- No shielded cable runs and 32 bit signed integer
- Programmable stroke and set points
- Available from 2" to 180"
- Magnetic encoders up to 40 m

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HOW TO REACH US

Doc. No. 898017 EN · E19; Product specifications, availability, and pricing are subject to change without notice. Replaces K16.