

# BALLUFF

sensors worldwide

## Industrial Networking and Connectivity

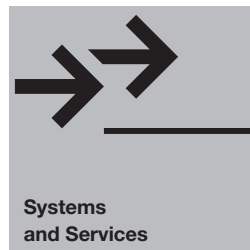
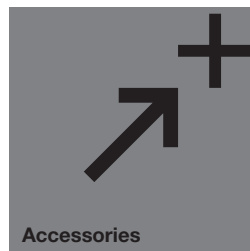
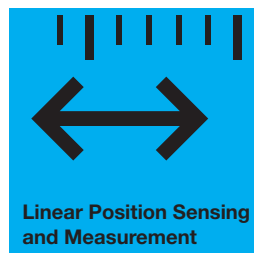
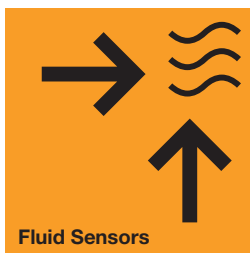
A guide to industrial network architectures and sensor connections













# SENSOR SOLUTIONS AND SYSTEMS

**BALLUFF**  
*sensors worldwide*

As a recognized partner in all sectors of the automation industry, Balluff offers comprehensive expertise in sensor technology and networking. We supply advanced technology and state-of-the-art electronics to our customers, who benefit from excellent service, application-specific solutions and individual consultation. You too can benefit from the excellent quality of our products and services.



<b>EtherCAT</b>	<b>1.9</b>	
<b>EtherNet/IP</b>	<b>1.13</b>	
<b>DeviceNet</b>	<b>1.21</b>	
<b>PROFINET</b>	<b>1.33</b>	
<b>PROFIBUS</b>	<b>1.37</b>	
<b>CC-Link</b>	<b>1.43</b>	
<b>IO-Link Distributed Modular I/O</b>	<b>2.1</b>	
<b>Cables, Cordsets, and Connectors</b>	<b>3.1</b>	
<b>Non-Contact Connectors</b>	<b>4.1</b>	
<b>Power Supplies</b>	<b>5.1</b>	
<b>Technical Reference</b>	<b>t.1</b>	
<b>Part Number/Order Code Look-up</b>	<b>t.26</b>	

## Balluff North America



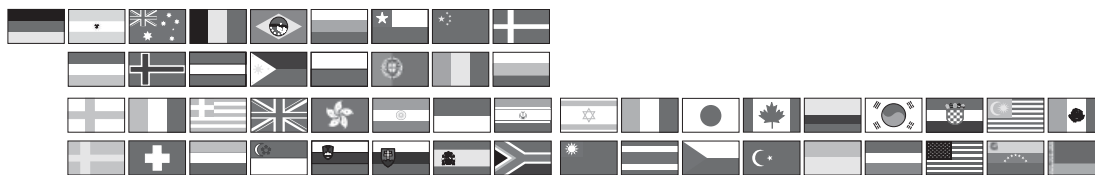
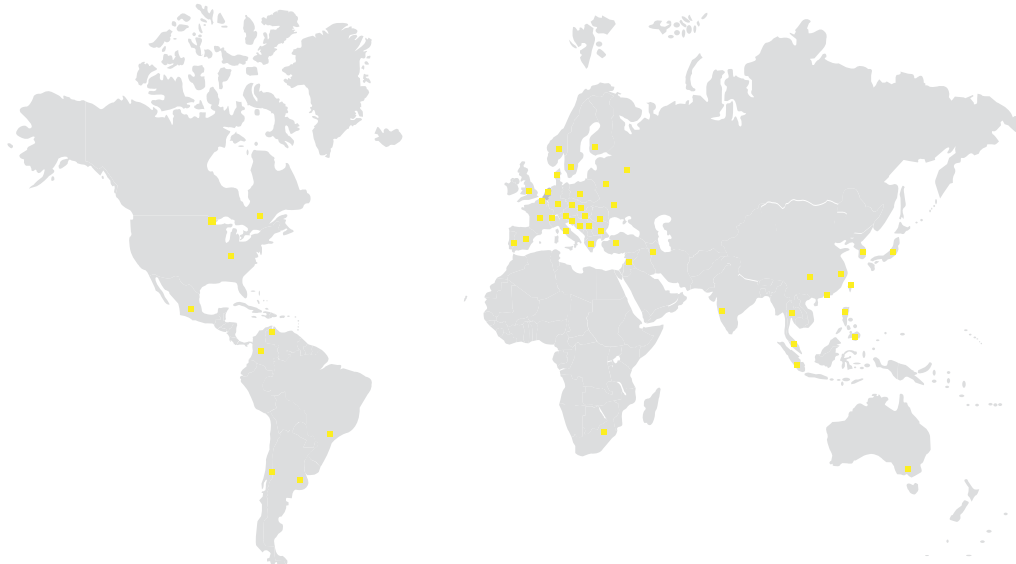
### Florence, Kentucky USA

Balluff's Florence, Kentucky United States headquarters is located just south of Cincinnati, Ohio. Our customers are in industries such as automotive, machine tool, robotics, injection molding, packaging, material handling, and more.

In addition to sales, marketing, and logistic functions, this facility manufactures Micropulse® magnetostrictive linear position sensors and warehouses over 60,000 products.

## The Balluff Global Network

Balluff spans the globe with representation in over 50 countries.



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| Austria   | Columbia       | Greece        | Italy    | Pakistan    | Slovakia     | Taiwan      |
| Belarus   | Croatia        | Hong Kong     | Japan    | Phillipines | Slovenia     | Turkey      |
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| Bulgaria  | Finland        | Indonesia     | Mexico   | Romania     | Sweden       |             |

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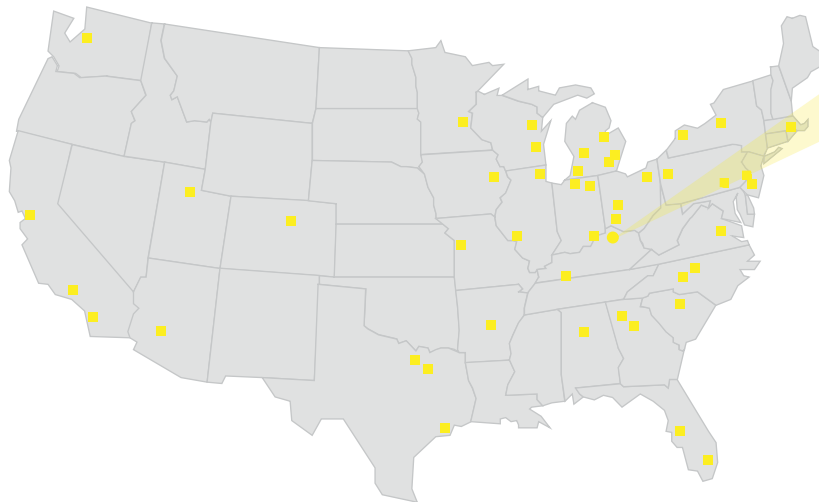
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Florence, KY

Our premier distributor network can quickly assist with applications and order fulfillment.

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E-mail us.

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## Warranty

**Balluff products are guaranteed to be free from defects in material and workmanship as follows:**

**Standard lifetime warranty** for inductive sensors and magnetically operated sensors sold to the original user.

**Standard 2-year warranty** from the date of shipment for photoelectric, capacitive sensors, read-write ID systems, magnetostrictive transducers\*, connectors and cables, electromechanical limit and rotary switches, and all products with electromechanical relays sold to the original user.

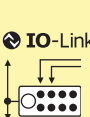
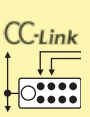
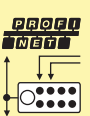
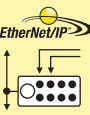
**Balluff will repair or replace** at our discretion, without charge, any unit which fails because of defective workmanship or material, during this guarantee period and which is returned to Balluff transportation

prepaid. This guarantee will not apply if, in the judgement of Balluff, damage or failure has resulted from accident, alteration, misuse, abuse, or operation on an incorrect power supply. This guarantee expressly does not include any other costs such as the cost of removal of the defective part, installation, labor or consequential damages of any kind. Balluff assumes no responsibility for selection and installation of its products. The foregoing is in lieu of all other guarantees expressed, implied or statutory and Balluff neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with said products.

### WARNING

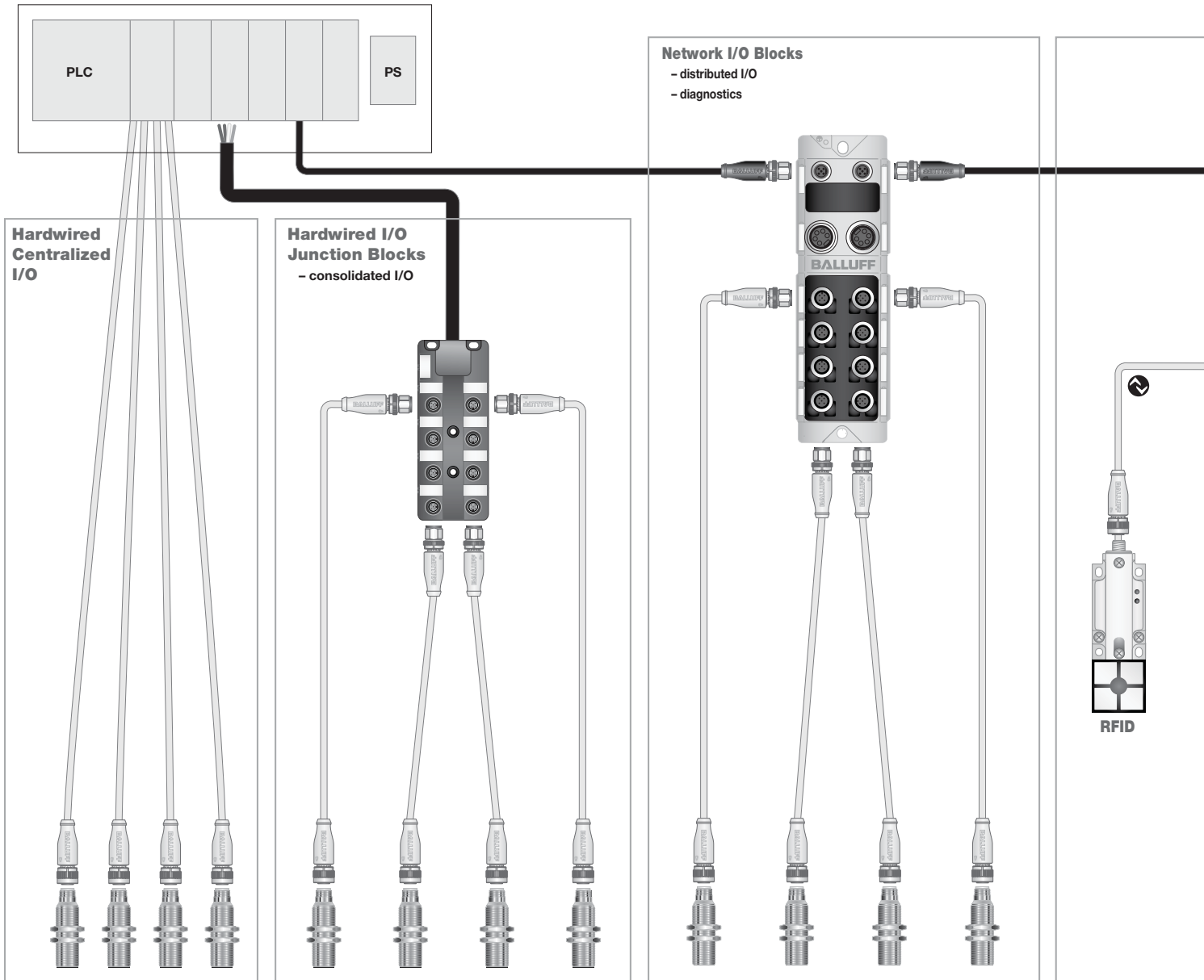
- Read, understand, and follow warnings and manual. Failure to do so could result in serious injury or death.
- NEVER USE AS A SENSING DEVICE FOR PERSONNEL PROTECTION
- Does NOT include self-checking redundancy circuitry required for use in personnel safety applications
- Does NOT meet OSHA and ANSI standards for point-of-operation devices

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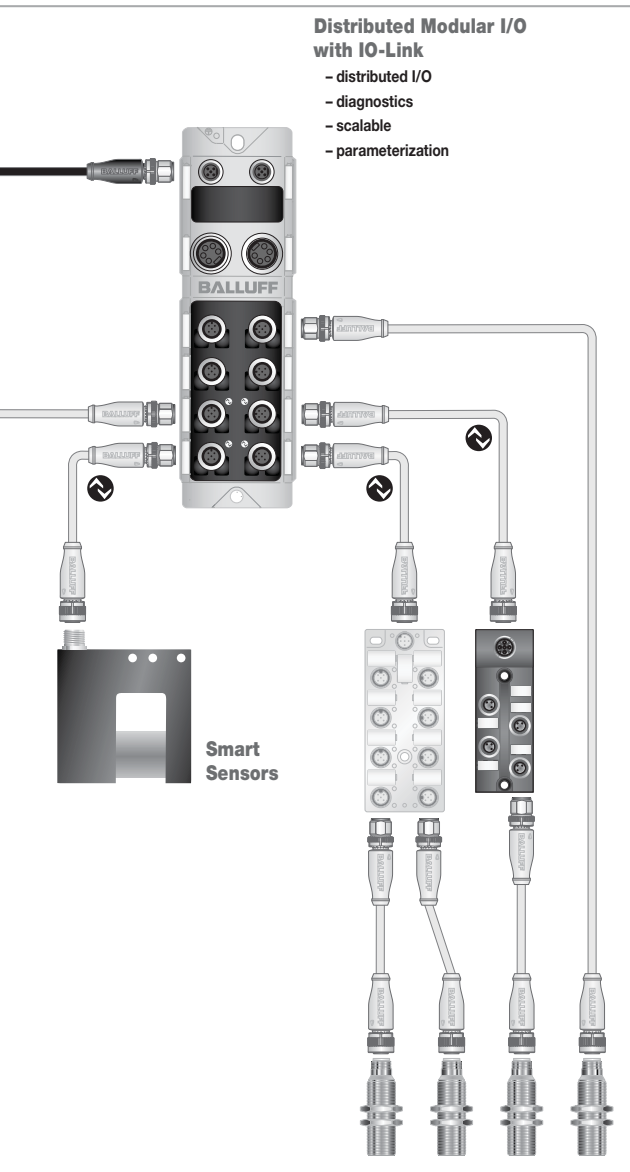
# Balluff Networking & Connectivity

## Advantages and disadvantages of I/O architectures



Style	Hardwired Centralized I/O	Hardwired I/O with Junction Blocks	Network I/O Blocks
<b>Advantages</b>	<ul style="list-style-type: none"> <li>Low component cost</li> <li>Basic electrical knowledge needed</li> <li>Low MRO costs</li> </ul>	<ul style="list-style-type: none"> <li>Low component cost</li> <li>Basic electrical knowledge needed</li> <li>Low MRO costs</li> <li>Fewer multi-conductor cables back to controls cabinet</li> <li>Shorter sensor cables</li> </ul>	<ul style="list-style-type: none"> <li>Diagnostics</li> <li>Faster troubleshooting</li> <li>One cable back to the controls cabinet</li> <li>Lower maintenance cost</li> <li>Shorter sensor cables</li> <li>Higher up time</li> </ul>
<b>Disadvantages</b>	<ul style="list-style-type: none"> <li>No diagnostics</li> <li>Hard to troubleshoot</li> <li>High maintenance cost</li> <li>Large number of cables routed to controls cabinet</li> <li>Long sensor cables</li> <li>Long downtime</li> </ul>	<ul style="list-style-type: none"> <li>No diagnostics</li> <li>Hard to troubleshoot</li> <li>High maintenance cost</li> <li>Long downtime</li> </ul>	<ul style="list-style-type: none"> <li>Higher component costs</li> <li>Network knowledge needed</li> </ul>

# Balluff Networking & Connectivity I/O product family



## Distributed Modular I/O with IO-Link

- Diagnostics
- Faster troubleshooting
- One cable back to the controls cabinet
- Lower maintenance cost
- Shorter sensor cables
- Higher up time
- Scalable
- Parameterization
- Higher component costs
- Network knowledge needed

## Industrial Network I/O

Industrial Network I/O	1
EtherCAT®	1.9
EtherNet/IP™	1.13
DeviceNet™	1.21
PROFINET	1.33
PROFIBUS	1.37
CC-Link	1.43
Accessories	1.49

## Distributed Modular I/O with IO-Link

Distributed Modular I/O with IO-Link	2
Master Blocks	2.6
Input/Output Devices	2.8
Connection Devices	2.12
RFID	2.16
Sensors	2.20

## Cables, Cordsets, and Connectors

Cables, Cordsets, and Connectors	3
BCC Part Number Matrix Breakdown	3.8
Sensor Cables (M5, M8, M12, 1/2" AC)	3.20
Mini Size Cables (7/8", 1", 1 1/8")	3.42
Junction Blocks	3.50
Receptacles	3.56
Field Attachables	3.62
DIN and Industry Style Actuator Cables	3.72
Accessories	3.74

## Non-Contact Connectors

4

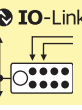
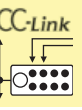
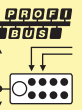
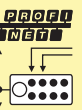
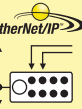
## Power Supplies

5

## Technical Reference

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# Balluff Networking & Connectivity

## I/O architecture evolution

### I/O Architecture Evolution

You can gain significant advantages when evolving to more technical I/O architectures. When moving from hardwired I/O to distributed I/O you gain faster setup/tear-down and shorter cable runs and everything becomes easier to troubleshoot. When transitioning from distributed I/O to networked I/O, you gain all of the benefits of distributed I/O plus easier setup/repair in the hardware side and easier troubleshooting from diagnostic data in the software side. Finally, if you move from networked I/O to decentralized I/O using IO-Link, you gain more diagnostics as well as the ability to change parameters of smart devices on the fly.

### Architectural benefits

**LESS**

#### Hardwired I/O (<50 I/O points)



#### Hardwired I/O (< 50 I/O points)

Hardware Bill of Materials

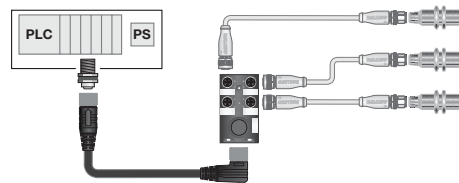
- Single-ended cordsets
- Power supplies

Advantages

- Low capital costs
- Basic electrical knowledge needed

**Faster set-up/teardown**

#### Hardwired I/O with Junction Blocks



#### Hardwired I/O with Junction Blocks

Hardware Bill of Materials

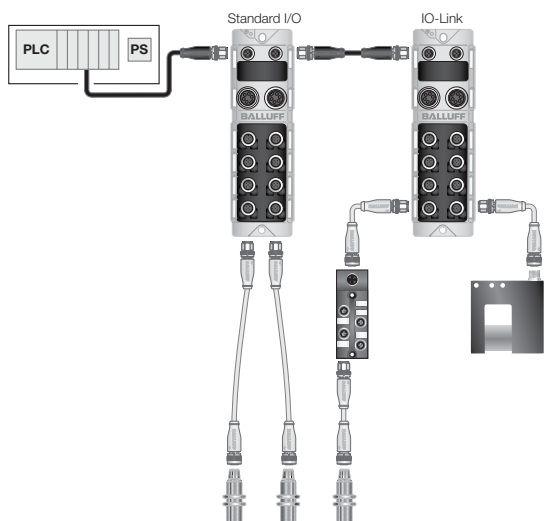
- Single & double-ended cordsets
- Power supplies
- Field attachables
- Receptacles
- Junction Blocks & MIBs

Advantages

- Low capital costs
- Basic electrical knowledge needed
- Fewer cable runs to the cabinet
- Shorter sensor cables

**Shorter cable runs**  
**Easier to troubleshoot**

#### Networked I/O



#### Networked I/O

Hardware Bill of Materials

- Single & double-ended cordsets
- Power supplies
- Field attachables
- Network I/O blocks
- Network cables
- Auxiliary power cables

Advantages

- Diagnostics (see page i.8)
- Fast troubleshooting
- Smaller controls cabinets
- Lower maintenance costs
- Shorter sensor cables
- More up time

#### Distributed Modular I/O using IO-Link

Hardware Bill of Materials

- I/O hubs
- Smart devices (sensors, RFID, etc.)

Advantages

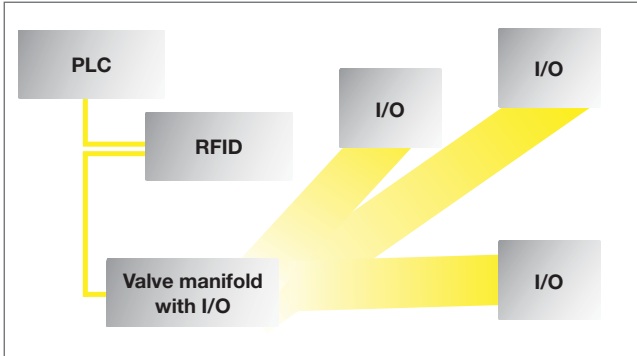
- Scalability
- Parameterization (see page i.8)
- Decentralized

**Diagnostics**  
**Parameterization**

**MORE**

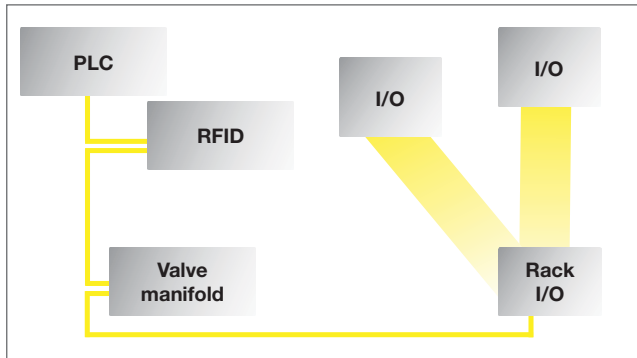
### Selecting your Network I/O Architecture

Once you've made the decision to use a network for your I/O, there are multiple decisions that need to be made. Since there are many automation components that can communicate over the network, it is important to select the architecture that is best for your controls application. Possible components could be concentrations of I/O, an industrial RFID system or even a solenoid valve manifold. Presented below are the four most popular solutions to networked I/O architectures.



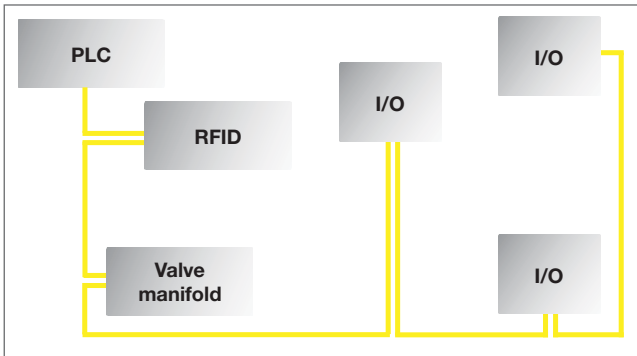
#### Centralized Valve Manifold with I/O

- Minimum of 2 nodes required in this example
- ↓ Some extremely long I/O cable runs
- ↑ Shorter network cable runs
- ↓ Cable routing and volume problems



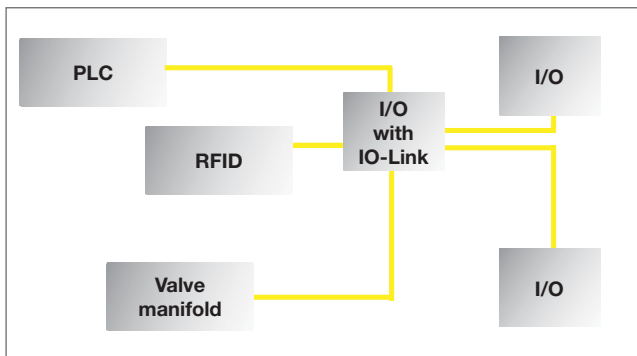
#### Centralized IP 67 Rack I/O

- Minimum of 3 nodes required in this example
- ↓ Long network cable runs
- ↓ Long I/O cable runs
- ↓ Cable routing problems



#### Traditional Network I/O in a Workcell

- ↓ Minimum of 5 nodes required in this example
- ↓ Long network cable runs
- ↑ Short I/O cables
- ↑ Simplified design and setup

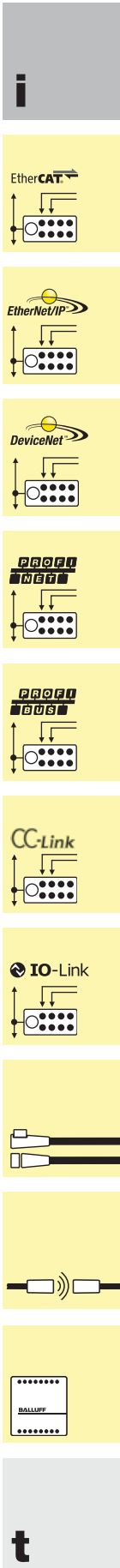


#### Distributed Modular I/O using IO-Link

- ↑ Minimum of 1 node required in this example
- ↑ Short I/O cable runs
- ↑ Short network cable runs
- ↑ Simple 3 conductor sensor cables for IO-Link communications

Visit section 2, Distributed Modular I/O, for Balluff IO-Link products and solutions.

Key: ↑ = positive ↓ = negative – = neutral



## Machine Mount I/O Block Diagnostics

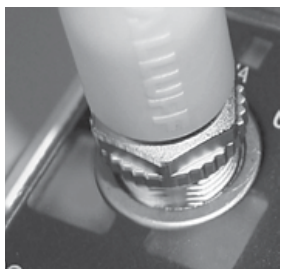
Diagnostic information from a device can give you continuous monitoring data and ensure reliable operation. Errors are centrally detected and with Balluff blocks, errors are quickly pinpointed to help increase system availability and lower maintenance costs.

### Input Short Circuit Detection



- Port LEDs indicate short
- Diagnostic bits indicate port location to PLC
- Resets automatically once short is removed
- Only one port shorts, not the whole block or system

### Output Overload Detection



- Port LEDs indicate overload
- Diagnostic bits indicate port and point location to PLC
- Need to reset using the PLC and a reset bit per output
- Only the one port is affected, not the whole block or system
- Handshake bit gives feedback that the output is fired

### Network and Power Status LEDs



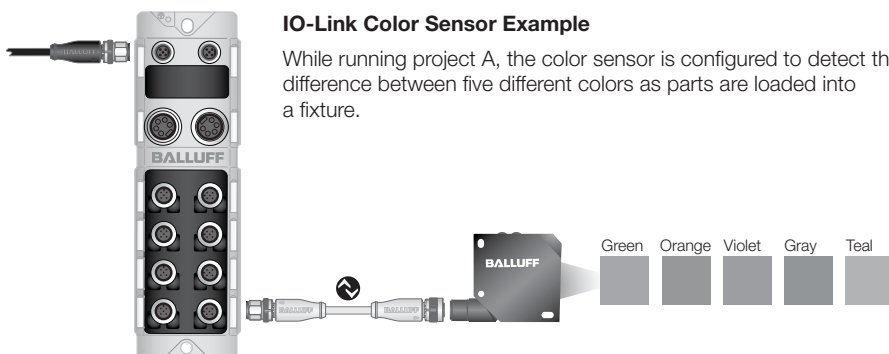
- Input auxiliary power < 18 V
- Output auxiliary power < 18 V
- Mod LED indicated soft faults, configuration errors, or node address changes on the block
- Net LED indicates communication with the PLC and bus status

## Device Parameterization via IO-Link

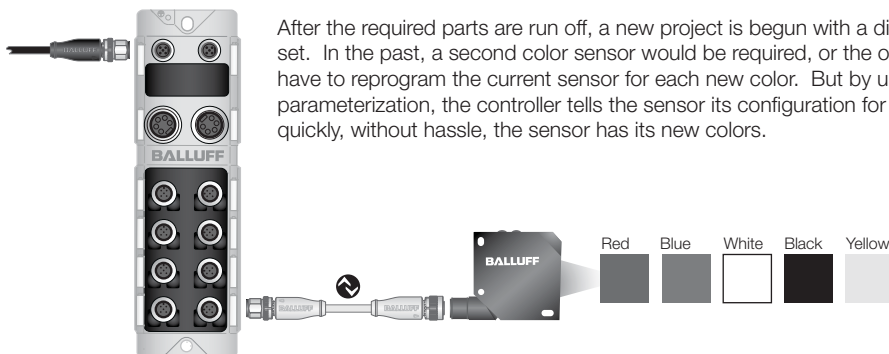
There are multiple advantages to device parameterization. The two major advantages are the ability to quickly swap out a failed device and the ability to reconfigure a device for a recipe or production change on the fly. The controller stores the necessary data for each setup and, when needed, it sends the parameters via the network to the IO-Link device. This can shorten setup times and increase efficiency.

### IO-Link Color Sensor Example

While running project A, the color sensor is configured to detect the difference between five different colors as parts are loaded into a fixture.



After the required parts are run off, a new project is begun with a different color set. In the past, a second color sensor would be required, or the operator would have to reprogram the current sensor for each new color. But by using IO-Link parameterization, the controller tells the sensor its configuration for project B and quickly, without hassle, the sensor has its new colors.

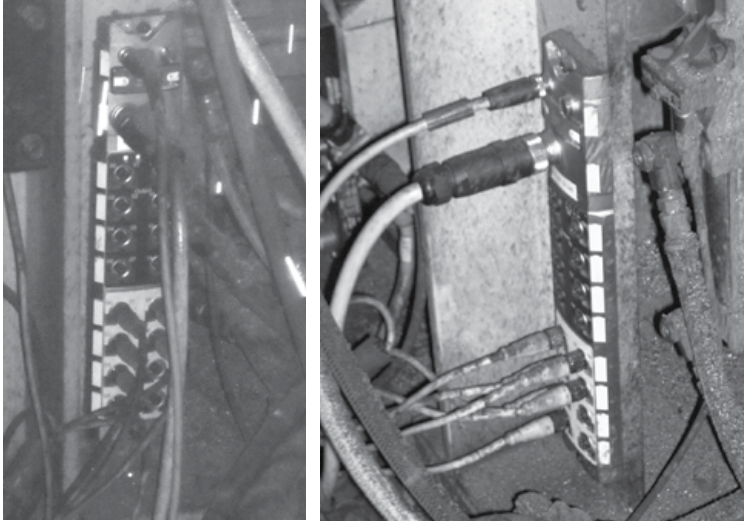




# Balluff Networking & Connectivity

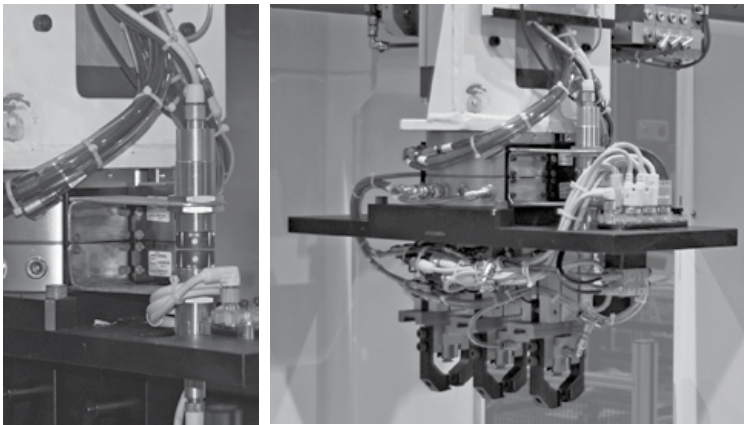
## Connectivity applications

### Rugged/Harsh Environments



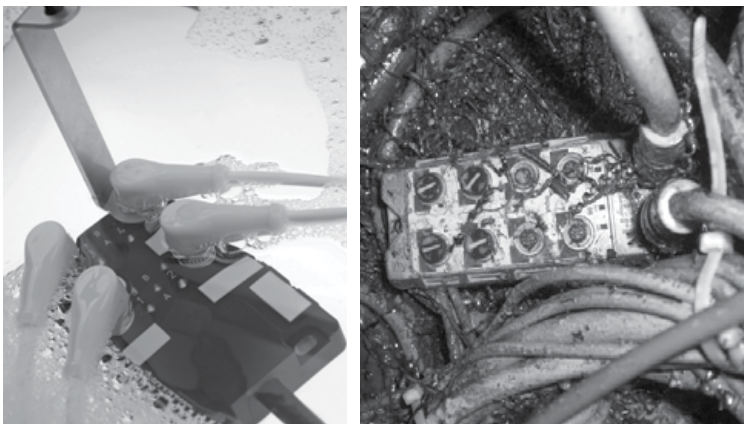
Many industrial applications require equipment to survive in rugged and harsh environments. The Balluff IP67 Machine Mount I/O Blocks meet this requirement in two ways. First, is the physical block itself. The Balluff blocks are fully potted within a metal shell, this gives the blocks a high degree of protection from shock, vibration, and physical damage. Second, is what you do not see. Balluff's network protocol stacks are among the best in the business. By having a reliable protocol stack, the potential for issues due to noise or other outside factor is greatly reduced. When choosing a network I/O block, it's best to know that the product will survive in the environment due to things you see and do not see.

### End Effector Tool Changing



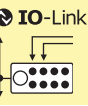
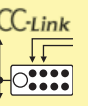
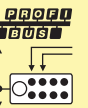
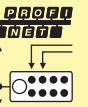
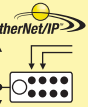
Utilizing two Balluff technologies, applications involving end effector tool changers are more reliable, have longer run cycles, and have greater flexibility. The first technology is IO-Link. Rather than a connect/disconnect network protocol (such as EtherNet/IP, DeviceNet, Profibus, etc.) which have slow boot times and are problematic when continually connecting and disconnecting, IO-Link provides a robust point to point serial connection which is stable, repeatable and faster in continual connect and disconnect applications. The second technology is Balluff's non-contact connector system. The non-contact connectors provide an air gap connection passing both power and signal, replacing the need for physical connections that can wear out over time. By combining the two technologies, end effector customers are provided a cleaner, faster, and more efficient methodology for their applications.

### Maintaining IP67 Ratings

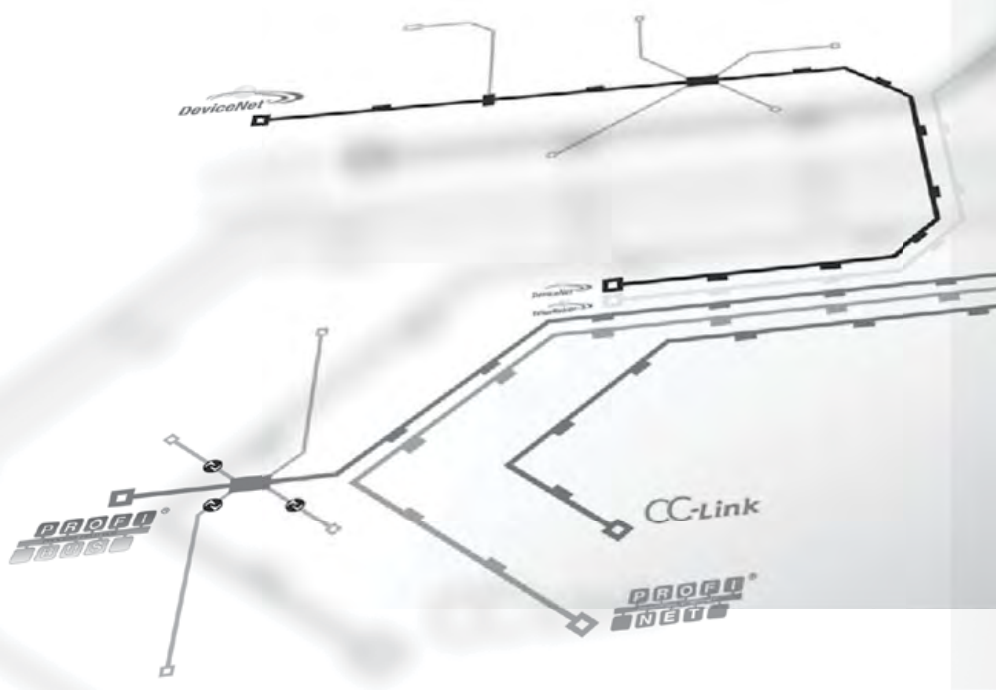


To reduce cost in applications, more and more I/O, controls, drives, etc. are being moved out of the cabinet and are being mounted in plant environments. These environments can range from cool and clean, to hot, humid, dusty, and even wet. Many customers verify that the products they purchase have an IP67 rating, but these products usually come with a disclaimer that the IP rating is dependent on the connection seals of the device's ports. Balluff's line of M8, M12, and 7/8" cordsets provide a connection method that verifies the port seals of the device meet an IP67 rating. With the use of hex coupling nuts and torque wrenches, Balluff's cordsets can help maintain an overall IP67 rating in most applications.

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## Balluff Network Products

Balluff has developed a comprehensive line of industrial network products that includes I/O blocks, switches, network cables and accessories. At the heart of the line are the I/O blocks. These blocks have a low initial cost per point and are designed to save money over the life of the system with maximum up time and easy maintenance.

<b>Introduction</b>	<b>1.2</b>
<b>EtherCAT®</b>	<b>1.9</b>
<b>EtherNet/IP™</b>	<b>1.13</b>
<b>DeviceNet™</b>	<b>1.21</b>
<b>PROFINET</b>	<b>1.33</b>
<b>PROFIBUS</b>	<b>1.37</b>
<b>CC-Link</b>	<b>1.43</b>



# Balluff Networking

## Machine mount I/O blocks

### Machine Mount I/O for Industrial Networks

As designers try to seamlessly integrate a broad range of compatible products from many manufacturers, they are turning to networks to ease design requirements, installation time and increase performance for their customers. Industrial networks are used to communicate input and output data from individual devices over simple media and hardware. Originally meant for communication inside the controls cabinet, industrial networks can now venture onto the machine and collect I/O data right where it's being created. This allows for easier machine setup and troubleshooting with sensors, actuators, and measurement devices.

#### Industry Standard Connectors

Every industrial network has its connection standards for IP67. Balluff conforms to these standards in our products and offers a full line of cables and accessories to help you build your network from the ground up.

#### Multiple Protocols

EtherNet/IP, DeviceNet, Profibus, Profinet, CC-Link, IO-Link

#### Powerful and Safe Outputs

With output currents of up to 2 amps, Balluff outputs are capable of driving almost any load. Each output incorporates low-trip overload protection with LED indication and a latching feature for easy troubleshooting.

#### IP67 Addressing

Whether the device has a push button display or rotary dials, Balluff's line of network I/O modules can withstand harsh environments and hold up against many fluids and debris. Easily program the node, station or IP address and setup the communication speed if required.

#### Clearly visible status LEDs

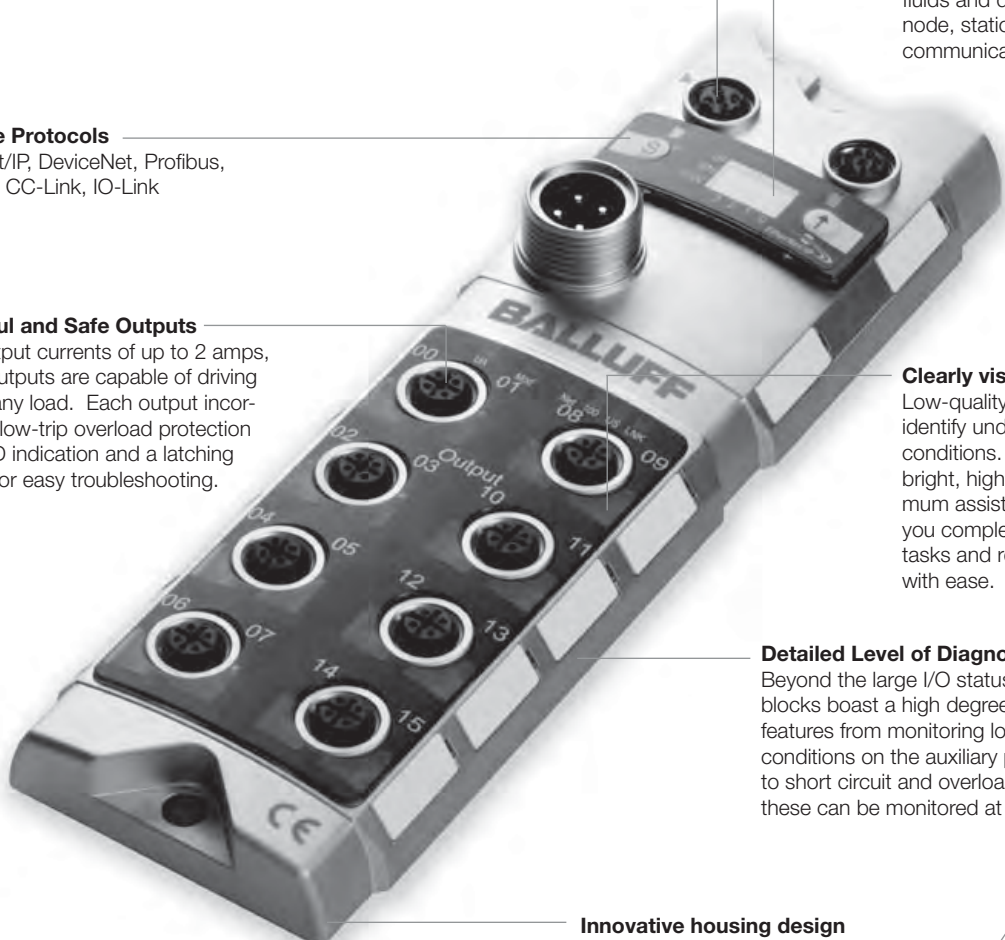
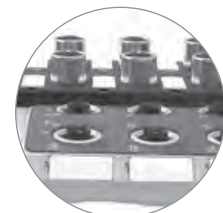
Low-quality LEDs are often difficult to identify under demanding production conditions. Balluff status LEDs are large, bright, highly visible, and provide maximum assistance. Balluff quality will help you complete setup and maintenance tasks and reduce machine downtime with ease.

#### Detailed Level of Diagnostics

Beyond the large I/O status LEDs, Balluff's blocks boast a high degree of diagnostic features from monitoring low voltage conditions on the auxiliary power connector to short circuit and overload status. All of these can be monitored at the controller.

#### Innovative housing design

The extra-flat profile reduces potential dangers posed by cables. Rounded corners offer highly visible locations for channel markers and two mounting points are sufficient to secure the robust metal housing.

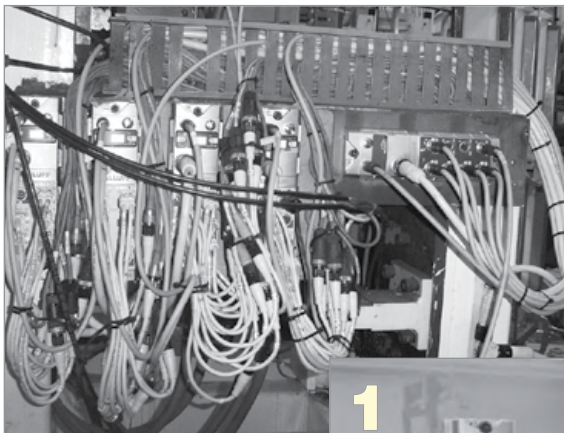
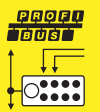
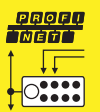
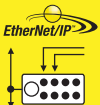
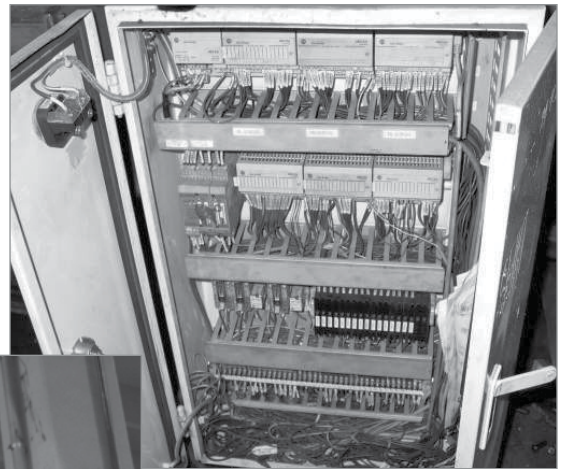




# Balluff Networking I/O block applications

## Do you currently wire all of your I/O back to a cabinet?

Every equipment designer goes through a phase of their design process where they need to decide how their I/O gets from the sensors and the valves to the controller. Some people use I/O cards on the PLC, or networks with IP20 solutions inside remote I/O cabinets. IP20 I/O in cabinets costs you money in initial equipment cost, construction time, installation and setup time. By using IP67 machine mount I/O, all of the sensors and actuators can be wired to blocks right on the machine and only the network needs to come back to the control cabinet. If you have multiple points, an IP67 Ethernet switch can be used to help collect I/O data and bring it back over one cable to the controller. The next time you are working on designing cost out of your machine, look at the labor and money you are putting into your remote I/O boxes and consider machine mount I/O instead.

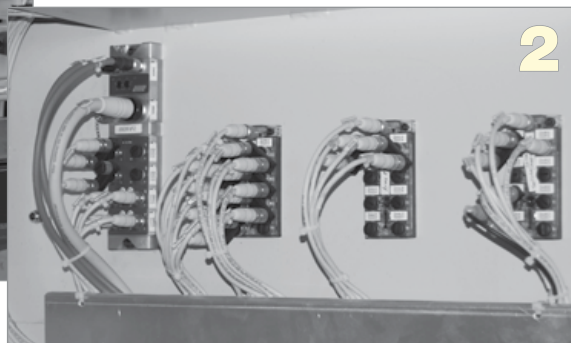
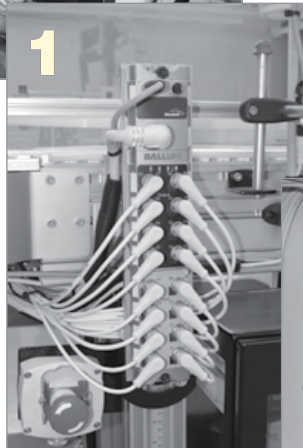


## Do you currently have a lot of IP67 I/O in one place?

If your machine requires a large amount of I/O data this may be a daily issue for you. IP67 I/O makes bringing data back to your controller easier, but there might be so many points that it requires a large number of addresses on your network. Balluff offers two different solutions to this problem.

**1. XXL Machine Mount I/O** allows for double the amount of I/O points as a standard I/O module and has a smaller footprint. This allows for the same amount of data with one less network address, fewer network cables, and depending on the machine, can reduce the number of switches required. (See EtherNet/IP on page 1.13)

**2. Distributed Modular I/O** allows for up to four smart devices to be connected to one network address. With one address you can get up to 76 I/O points versus five network nodes in the traditional way. Also, IO-Link communicates point to point over standard sensor cordsets which costs less money and are less hassle than a network cable. (See IO-Link in section 2)



# Balluff Networking

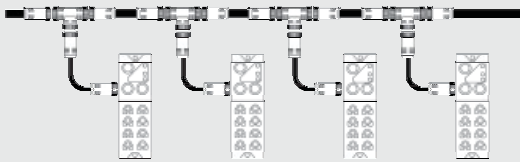
## Network architectures

### Balluff's Network Architecture Approach

Your machine designs should not be hampered by inflexible network topology. Balluff's networking products include cables, tees, and hubs that allow you to mix and match elements of all topologies. Raw cable, single-ended cables, and field attachable connectors ensure installation flexibility.

#### Trunk and Drop

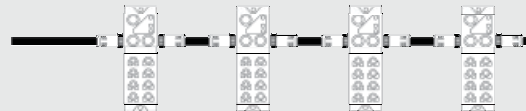
- Extra cable requirements lead to higher initial investment
- One device can be disconnected without disturbing the entire network
- Easiest to troubleshoot



DeviceNet CC-Link

#### Daisy Chain/Line

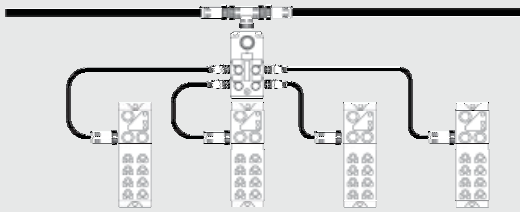
- Fewer cabling components lead to lower initial investment
- Disconnecting one device severs the network
- Most difficult to troubleshoot



EtherCAT EtherNet/IP PROFINET  
CC-Link DeviceNet PROFINET

#### Star

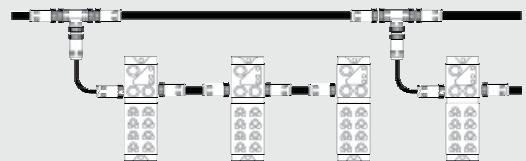
- Less expensive - only one splitter box needed
- Ideal for large clusters of I/O
- Easiest to troubleshoot



EtherNet/IP DeviceNet PROFINET IO-Link

#### Mixed Topology

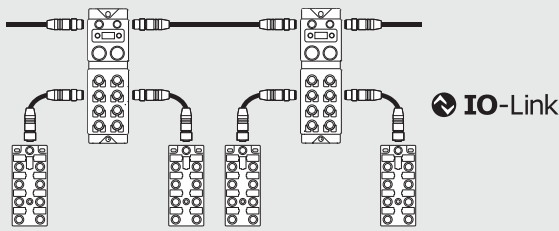
- Relatively easy to troubleshoot by combining into logic groups
- Popular method - ideal functionality/cost balance



DeviceNet CC-Link PROFINET PROFINET

#### Extended Star

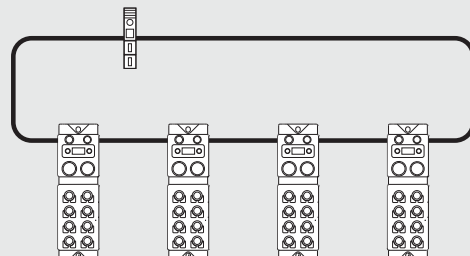
- Ideal for many large clusters of I/O
- Multiple I/O devices per address
- Least expensive - low-cost cables and hubs



EtherCAT EtherNet/IP PROFINET  
CC-Link DeviceNet PROFINET

#### Ring Topology

- Single point of failure resistant
- Easier to troubleshoot than Daisy Chain



EtherCAT EtherNet/IP PROFINET



# Balluff Networking

## Machine mount I/O product family



### Input

- 16 or 32 PNP inputs
- Short circuit protected
- Short circuit diagnostics
- Accepts polarized DC 2-wire inputs



### Input/Output

- 8 PNP inputs and 8 sourcing outputs or 16 PNP inputs and 16 sourcing outputs
- Short circuit protected
- Short circuit diagnostics
- Point level overload protection
- Rated output current 2.0 A per point
- Overload diagnostics
- User resettable overload latching



### Output

- 8 or 16 sourcing outputs
- Point level overload protection
- Rated output current 2.0 A per point
- Overload diagnostics
- User resettable overload latching



### Configurable

- Up to 16 PNP inputs or up to 16 sourcing outputs
- Short circuit and overload diagnostics
- Rated output current 2.0 A per point
- Overload diagnostics
- User resettable overload latching



### IO-Link Master Blocks

- Up to 4 IO-Link devices can be connected
- Input and configurable versions
- Short circuit protected
- Rated output current 1.6 A per IO-Link device



### Unmanaged Switch

- 9 port unmanaged switch
- Dual power source
- 10/100 base Tx ports
- Supports half/full duplex
- M12 D-coded female connectors
- Store and forward technology

### Shock and vibration

- EN 60068-2-6 Vibration (sinusoidal)
- EN 60068-2-27 Shocks
- EN 60068-2-29 Continuous shocks
- EN 60068-2-64 Broadband random noise

### Approvals



# Balluff Networking

## Industrial RFID and linear position transducer selector

### Industrial Identification



#### Suitable for any Industrial Environment

Balluff Industrial RFID guarantees a high degree of data reliability and quality, even in harsh environments. Balluff data carriers are resistant to shocks, vibrations, high electrical, inductive and electromagnetic interference and insensitive to aggressive materials.

#### Variety of Applications Covered by Four Distinct Product Lines

BIS C – Versatile & ideal for a wide range of applications: tool ID, high temperatures, harsh environments

BIS L – Simple & economical for logistics and assembly lines

BIS M – Wide variety of options with fast data transfer and large read/write distance for flexible applications and ISO standardized

BIS S – For applications with large quantities of data to control assembly and production facilities

#### 100% Data Reliability

Reliable traceability of the production and quality data brings maximum visibility to your supply and production chain; thereby preventing quality fluctuations.

#### Easy Onsite Troubleshooting

Diagnostic LEDs and bits communicated to the controller allow for easy troubleshooting at the HMI or at the device. If further work with the processor is required, a service port is available on most units allowing a direct connection to the processor to allow for easy access.

#### Many Head / Data Carrier Options

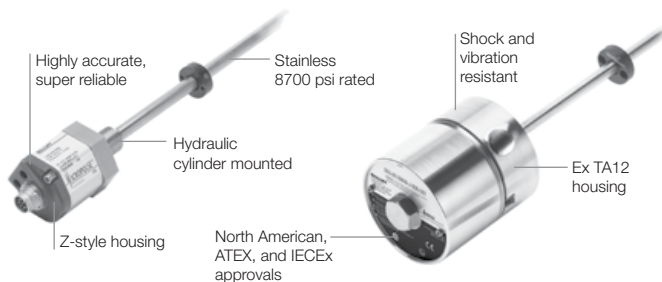
A wide variety of components are available cast in different shapes such as disc, cylinder, cube or handy credit card format. Simply choose from a comprehensive selection of system products according to your application requirements.



### Linear Position Transducers

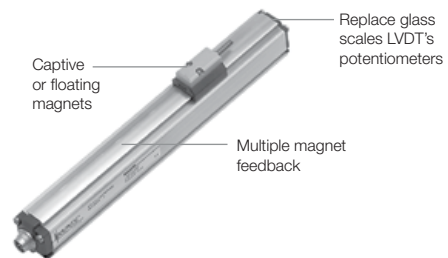
#### Rod Style Linear Position Transducers

Normally built into a hydraulic cylinder, the transducer provides continuous position and velocity information on the cylinder's position. This product is available for standard applications as well as explosion proof applications.



#### Profile Style Linear Position Transducers

Balluff profile style housings are a rugged, wear-free alternative to other linear feedback devices. Environmentally sealed to IP67, and utilizing either a sliding captive magnet or a free-floating magnet, the Profile housing Micropulse® transducer provides highly accurate linear position feedback in demanding harsh industrial applications.



Systems	Housings	Networking Options								Other Networks
		EtherCAT	EtherNet/IP	DeviceNet	PROFINET	PROFIBUS	CC-Link	IO-Link		
		Page 1.9	Page 1.13	Page 1.21	Page 1.33	Page 1.37	Page 1.43	Page 2.1	See RFID Catalog	
<b>Industrial Identification RFID Systems</b>										
BIS C System - Rugged and versatile	Plastic/Metal		Metal	Plastic/Metal	Plastic/Metal	Plastic/Metal				InterBus, TCP/IP
BIS L System - Economical logistics	Plastic/Metal BIS V	Yes	Yes		Yes	Yes	Yes		Plastic/Metal	InterBus, TCP/IP IO-Link
BIS M System - Faster data and longer distances	Plastic/Metal BIS V	Yes	Yes		Yes	Yes	Yes		Plastic/Metal	InterBus, TCP/IP IO-Link
BIS S System - Large quantities of data	Plastic/Metal		Metal	Plastic/Metal		Plastic/Metal				TCP/IP
BIS U System - Longest range UHF	Plastic/Metal				Metal					TCP/IP, Modbus TCP
<b>Micropulse Linear Position Transducers</b>										
Rod Style - Hydraulic cylinder position feedback	Rod-style (Standard) Rod-style (Ex-proof)	Yes				Yes				CANopen CANopen
Profile Style - Linear position feedback	Profile housing	Yes		Yes		Yes				CANopen
Low Profile Style - Linear position feedback	PF housing							Yes		

# Balluff Networking Industrial RFID system BIS V

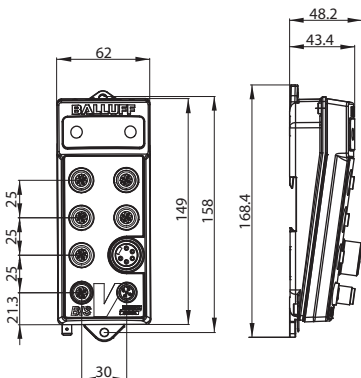
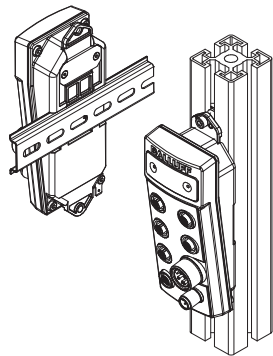
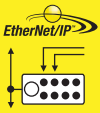
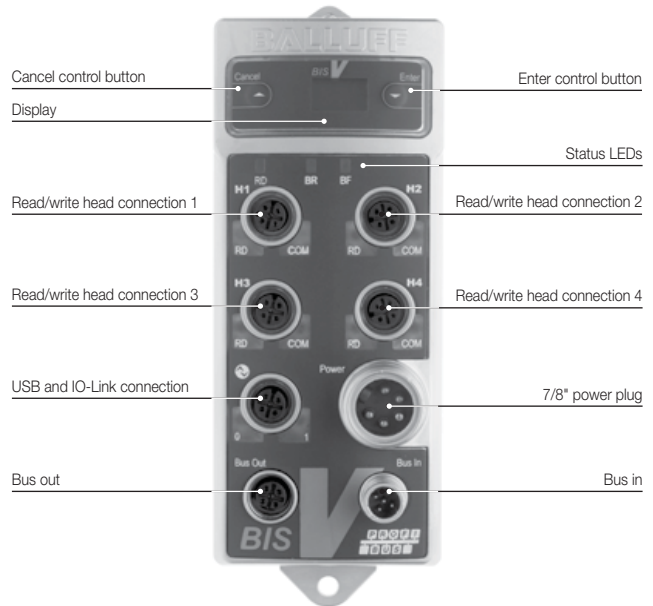
## A new generation system for more flexible RFID

**Combine up to four low and high frequency read/write heads with I/O in one device.**

The BIS V Radio Frequency Identification (RFID) system is founded on a new generation of RFID processors that maximize your flexibility by providing a single device for both low frequency 125Khz and high frequency 13.56Mhz read/write heads with an IO-Link master port. Combining up to four heads on either frequency with local analog, valve manifold or I/O access/control provides a solution you can apply to many types of RFID applications. This can save cost and time using a single processor platform across your application installation base. The BIS V system also allows you to draw on a single processor family with a wide array of read/write head and RFID tag options for both manufacturing and logistics solutions.

The BIS V RFID system offers a higher level of performance than other systems to solve today's industrial applications. Designed to maximize performance while improving usability out on the line, the BIS V processor provides a functional display and LED's making status and setup easier. And a USB service interface makes connection for setup to today's PC's simple. The BIS V offers these additional functions:

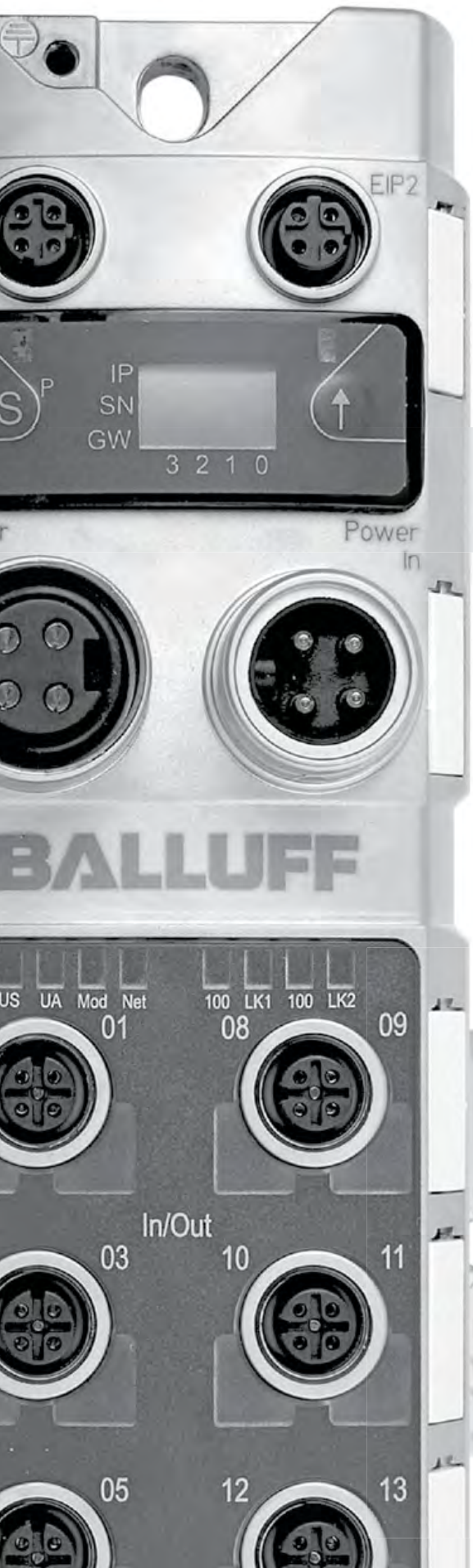
- Four asynchronous 125Khz and 13.56Mhz read/write antenna channels.
- LCD display with control buttons for setting and displaying the Profibus address and data carrier/tags UID.
- An integrated IO-Link master port for connecting discrete or analog I/O, or valve manifolds.
- Intelligent power plug option for saving parameters on the device.
- Industrial IP rated metal housing for any application environment.
- Flexible mounting options for hard-point or DIN rail.



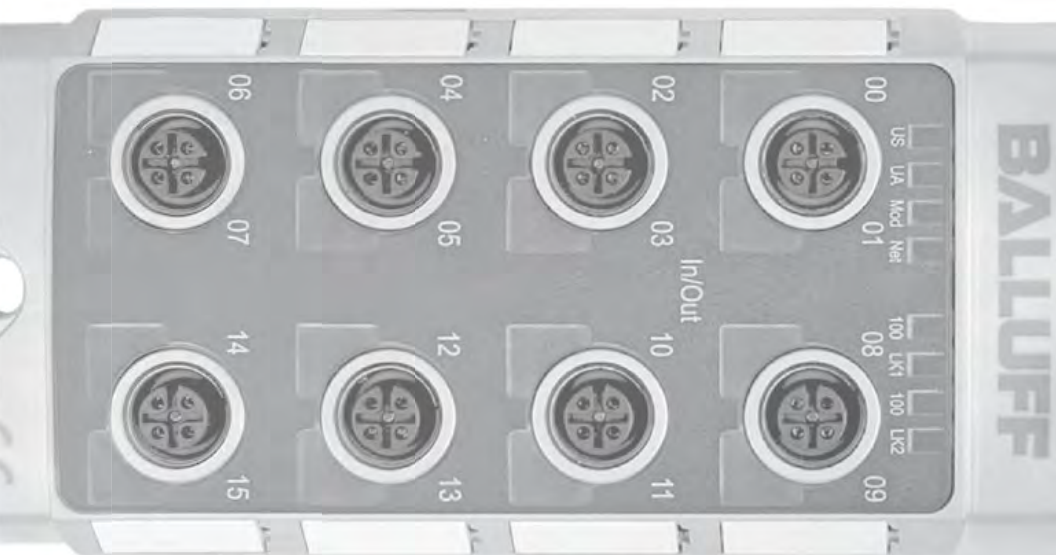
Description	BIS V RFID processor	
PROFIBUS	<b>Ordering code</b>	<b>BIS00T3</b>
	Part number	BIS V-6102-019-C001
EtherCAT	<b>Ordering code</b>	<b>BIS00U9</b>
	Part number	BIS V-6110-063-C002
CC-Link	<b>Ordering code</b>	<b>BIS010P</b>
	Part number	BIS V-6111-073-C003
EtherNet/IP	<b>Ordering code</b>	<b>BIS0122</b>
	Part number	BIS V-6106-034-C004
Power supply	24 V DC $\pm 10\%$ LPS Class 2	
Residual ripple	$\leq 10\%$	
Power supply	$\leq 2$ A	
Ambient temperature $T_a$	0...+60 °C	
Degree of protection as per IEC 60529	IP 65	
Housing material	Cast zinc	
Weight	800 g	
Connection H1...H4	M12 socket, 5-pin, A-coded	
Power connection	7/8" plug, 5-pin power (EtherNet/IP 4-pin power)	
Application interface	IO-Link 1.1, USB 2.0	
Application with read/write heads	BIS VM-3... and BIS VL-3...	

The compact EMC-protected metal housing with small dimensions (170x60x40 mm) is perfectly integrated and simple to mount. In control cabinets or in the field up to IP 65, on a top-hat rail, or on a profile.

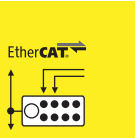




# EtherCAT®



When implementing EtherCAT into automation equipment, Balluff adds a unique set of benefits to the existing portfolio in the market. Whether you are in assembly automation, packaging, plastics, research, energy or any other industry, there is a need for tracking and communicating data. Requirements demand flexibility for change down the road, which Balluff brings with linear position monitoring, traceability and distributed modular I/O.

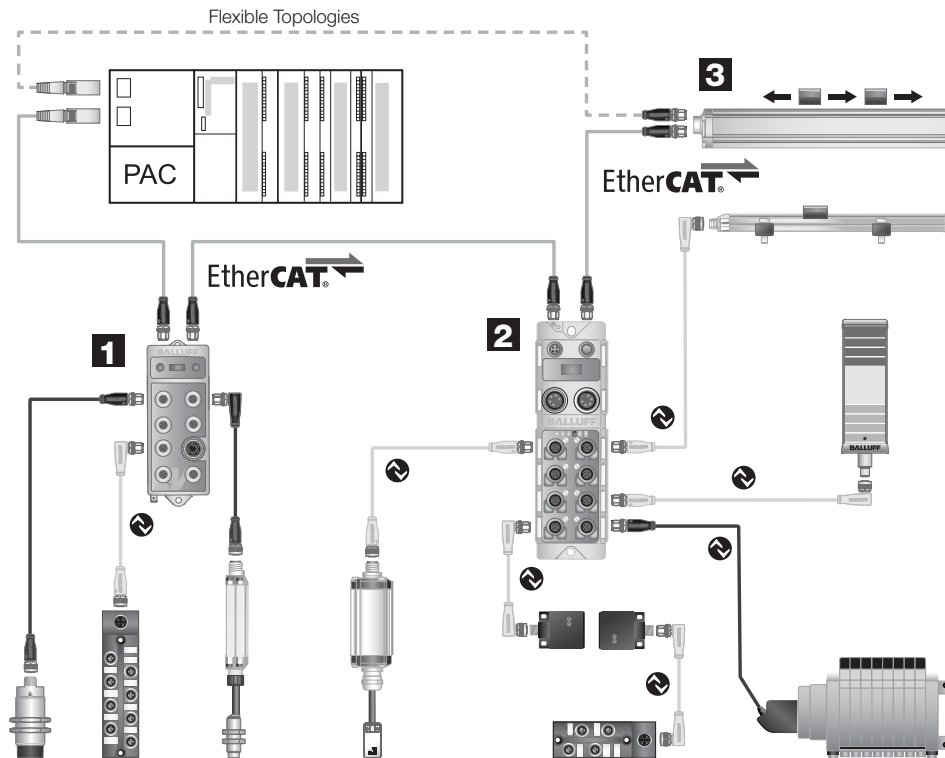


# EtherCAT®

<b>Expanding the Value</b>	<b>1.10</b>
<b>Distributed Modular I/O with IO-Link</b>	<b>1.11</b>



When implementing EtherCAT into automation equipment, Balluff adds a unique set of benefits to the existing portfolio in the market. Whether you are in assembly automation, packaging, plastics, research, energy or any other industry, there is a need for tracking and communicating data. Requirements demand flexibility for change down the road, which Balluff brings with linear position monitoring, traceability and distributed modular I/O.



### 1

#### Traceability with EtherCAT

Traceability is the act of documenting every step in a process chain. Manufacturers use this information to gain visibility to achieve on-time delivery, lean manufacturing, enhanced quality and regulatory compliance. It is also used to track assets, logistics and material movement. Traceability can be easily implemented over EtherCAT in a variety of ways. Using RFID systems native on EtherCAT with proven technology from Balluff makes traceability easy to integrate into any system or process.

### 2

#### Distributed Modular I/O over EtherCAT

Distributed Modular I/O with IO-Link gives EtherCAT access to many powerful technologies already available on the market from a variety of vendors. The universal, smart and easy IO-Link technology works like USB for industrial automation and is easily configured in the engineering software with simple byte selections. Key Balluff technologies available with IO-Link are: RFID, non-contact couplers, valve manifold connectors, the SmartLight indicator and smart sensors like linear transducers and pressure sensors.

### 3

#### Position Monitoring with EtherCAT

Position monitoring is a key technology utilized in automation designs. This is a necessity when working in precise and synchronized applications. EtherCAT is an ideal network for this. Linear transducers can be used to provide closed loop motion control or provide basic position measurement for applications that don't require closed loop control. Balluff offers linear transducers for mounting inside a hydraulic cylinder or externally mounting adjacent to the axis of motion.



# EtherCAT

## Distributed Modular I/O with IO-Link



Fieldbus	EtherCAT
Design	8x IO-Link, 16x I/O
<b>Ordering code</b>	<b>BNI0077</b>
Part number	BNI ECT-508-105-Z015
Supply voltage $U_B$	18...30 V DC
Indicators/input	Display/pushbutton
Function indicator	BUS/RUN
Module status indicator: Mod LED	Yes
Network status indicator: Net LED	Yes
Port status indicator	Black, red, yellow
Connection: Fieldbus	M12, D-coded, socket
Connection: AUX power	7/8", male, 5-pin
Connection: I/O ports	M12, A-coded, female
No. of I/O ports	8
Number of inputs	Max. 16
Number of outputs	Max. 16
Configurable inputs/outputs	Yes
Max. load current sensors/channel	200 mA
Max. output load current	1.2 A/2 A
Port status indicator (signal status)	Yellow LED
Port diagnostic indicator (overload)	Red LED
Total current $U_{Actuator}$	< 9 A
Total current $U_{Sensor}$	< 9 A
Degree of protection as per IEC 60529	IP 67 (when screwed into place)
Operating temperature $T_a$	-5...+70 °C
Storage temperature	-25...+70 °C
Mounting	2 mounting holes
Dimensions (LxWxH)	225x68x36.9 mm
Housing material	Nickel-plated die-cast zinc

### IO-Link Version 1.1

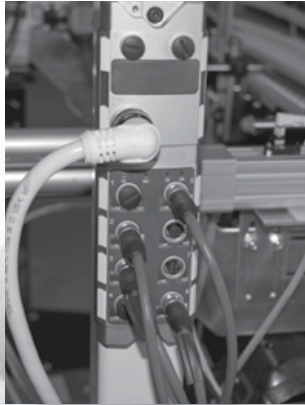
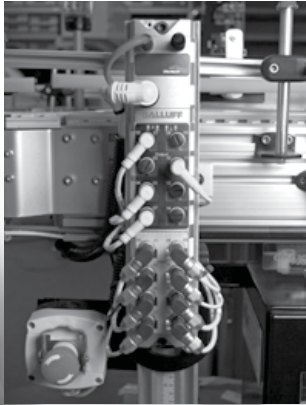
No. of IO-Link master ports	8x master
Operating modes (3-wire)	SIO, COM 1, COM 2, COM 3
Indicators	Communication
	Error
Max. load current for IO-Link device	1.2 A



For cables, connectors, and accessories use shielded cables from the EtherNet/IP section.



For 5-pole aux power cables and accessories, see pages 3.42-3.47



In many areas, EtherNet/IP is replacing DeviceNet and has become a globally recognized standard for network technology. Based on Ethernet, EtherNet/IP is considerably faster than DeviceNet and facilitates the integration of drive technology. Furthermore, EtherNet/IP can be quickly installed and integrated in existing networks.

In addition to time savings and considerable cost savings comes the added benefit of ease of operation. Only Balluff products can program IP addresses of the Ethernet blocks with a display and the display can be locked to protect against accidental changes. The innovative address plug also guarantees simple exchange of modules.

Use the extensive line of EtherNet/IP products for your high-performance system, because only an optimized network guarantees maximum efficiency.



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<b>Technology</b>	<b>1.14</b>
<b>Product Topology</b>	<b>1.16</b>
<b>Ethernet/IP Modules</b>	<b>1.17</b>
<b>Cables</b>	<b>1.18</b>
<b>Accessories</b>	<b>1.19</b>



# EtherNet/IP Technology

EtherNet/IP™ has become a popular network for connecting field devices to centralized control solutions from Allen Bradley™ and other suppliers. EtherNet/IP allows designers to seamlessly integrate a broad range of compatible connectivity products from many manufacturers.

Balluff has developed a comprehensive line of EtherNet/IP products that include two versions of machine-mount I/O blocks, unmanaged switches, network cables and accessories. At the heart of the line are the I/O blocks. These blocks have a low initial cost per point and are designed to save money over the life of the system with maximum up time and easy maintenance.

## I/O Block Network Features:

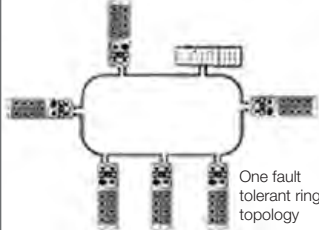
- Certified by ODVA to ensure reliable operation and complete interoperability
- Operates at 10 Mbit/s and 100 Mbit/s speeds for maximum throughput (auto-negotiate)
- Rugged M12 (D-coded) Ethernet connector
- Supports star topology for increased reliability, accurate troubleshooting, and fast commissioning
- Process data available via the UDP layer

## Easy, Flexible IP Addressing Methods

- BOOTP/DHCP
- IP67 quick change addressing plug (IPAP)
- Addressable display (100 series only)
- Webserver interface


## Webserver and DLR Capable

DeviceLevel Ring (DLR)

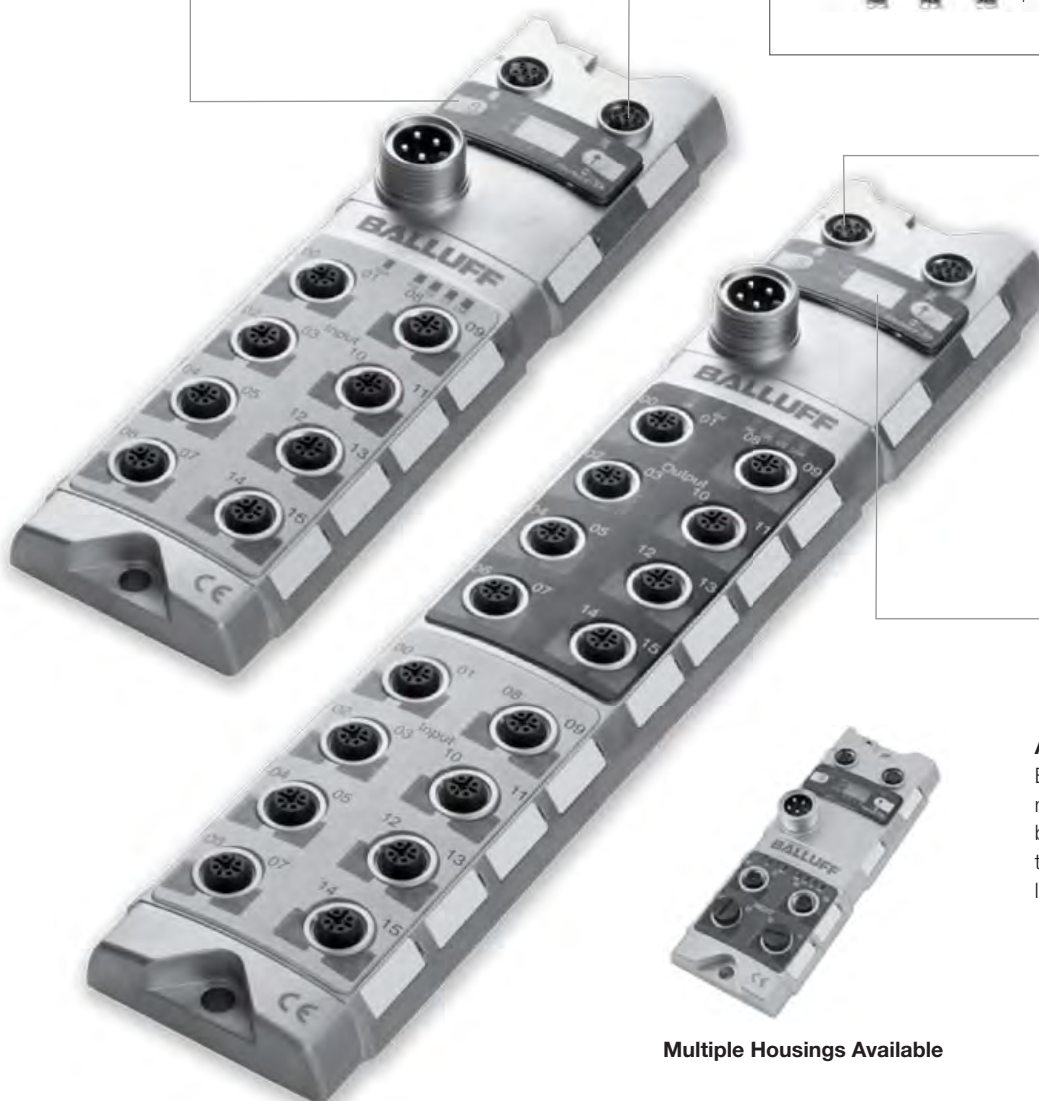


One fault tolerant ring topology

Webserver configuration and diagnostics



View LED status and configure parameters from anywhere



## User Defined LEDs (100 series only)

Similar to the IPAP, the display has the additional feature of red and green LEDs, which aid in troubleshooting.



## Addressable Display (100 series only)

Backlit display shows IP address, subnet mask, and gateway address. Push buttons allow the setting of any octet of the above addresses. The display can be locked out via the controller.

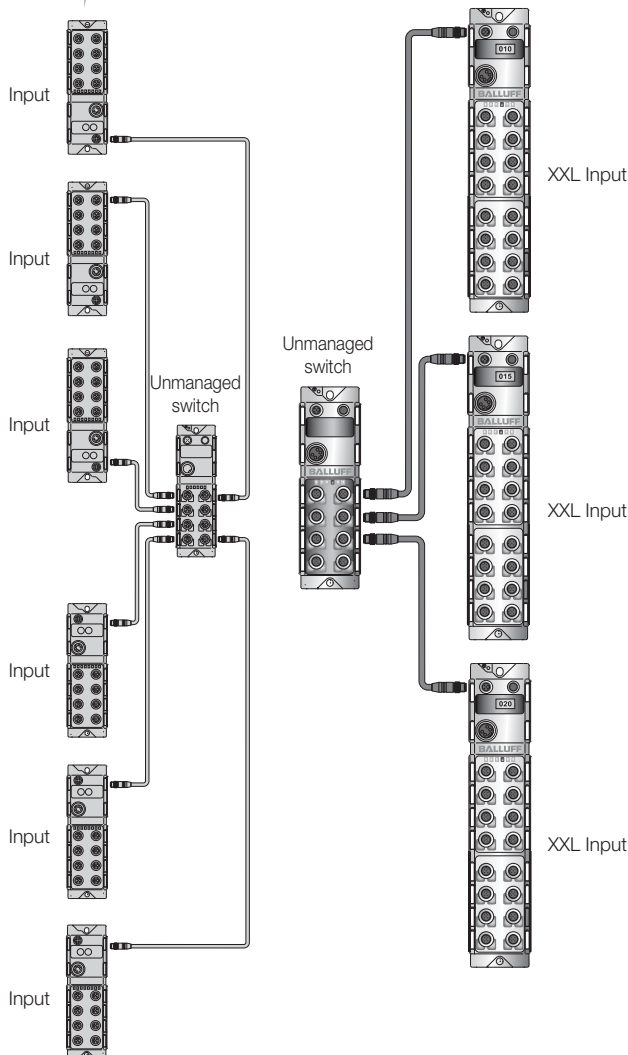
Multiple Housings Available

### Reduce Point Costs with High-Density XXL I/O Blocks

Using high density I/O blocks reduces the cost per point by consolidating the costs of communication hardware into one unit. For example, by replacing two 16-point input blocks with one 32-point input block, the cost per point is reduced by 20% for the I/O blocks alone! And the savings go on...

- Reduce switch utilization by 50% (eliminating one port)
- Eliminate one network cable
- Eliminate one auxiliary power cable
- Reduce mounting space by 20%

30%  
overall cost  
reduction



## 6 DeviceNet Sins Not to Repeat with EtherNet/IP

Here are six topics to consider in your new EtherNet/IP installations:

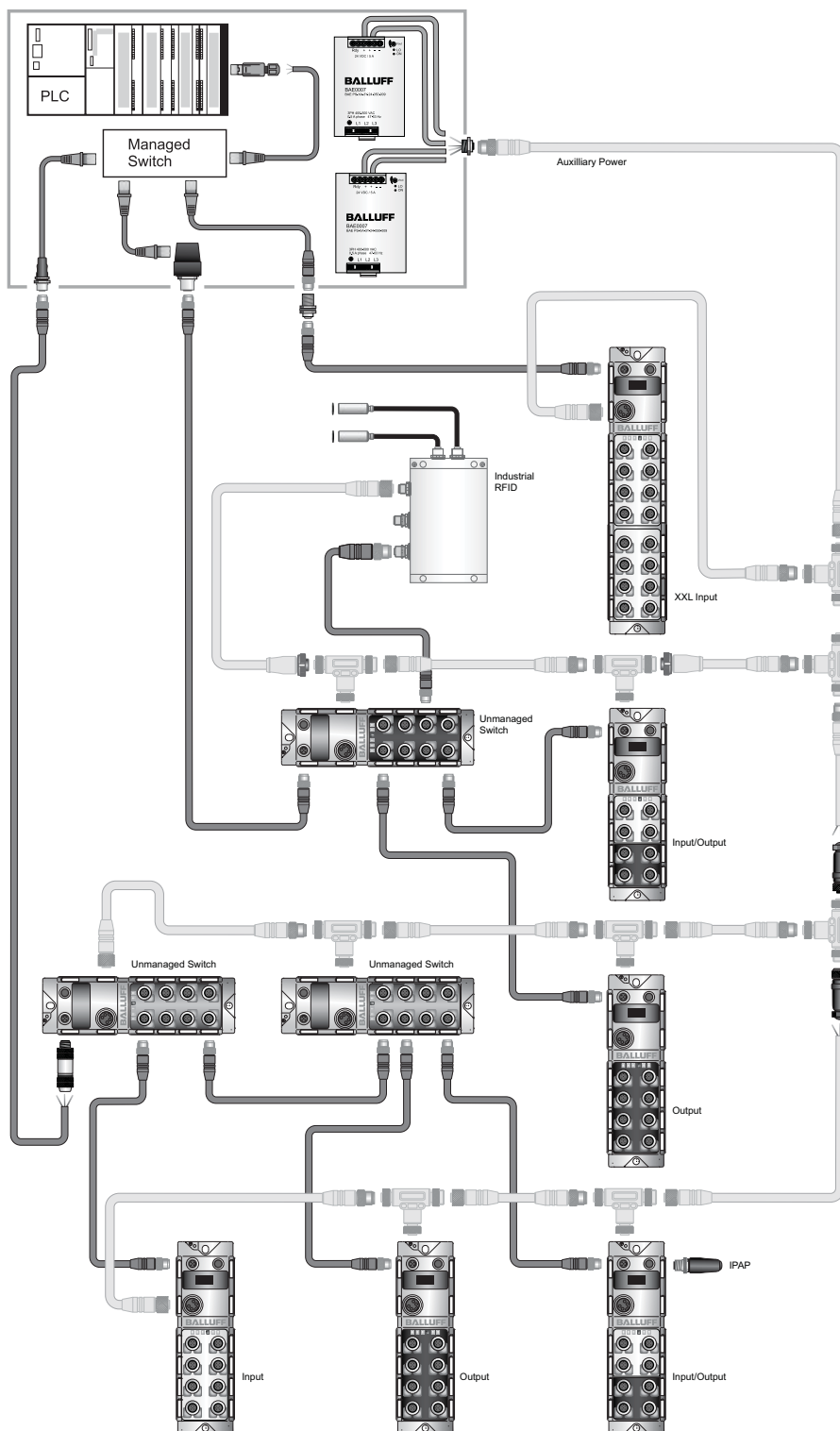
1. **Topology** – Star, Linear (Daisy Chain), Ring, which one is the best for your application? Star allows for quick troubleshooting where one cordset or device can easily be identified as faulty, but has a high usage of Ethernet switch ports. Linear is a great topology for applications with long network runs, like conveyors, but one faulty cordset or device will kill all devices down the line. Ring topology brings the advantage of one fault tolerance. One cordset problem will not bring the network to a halt, but there are added expenses to this feature, as well as product availability for such a topology.
2. **Document, Document, and Document** – This should be #1, but in the sequence of events, this comes after choosing a topology. How can you troubleshoot, add new devices, or do preventive maintenance without knowing what you have in your application? You need to know your cordset lengths, device locations, switch locations, cordset flexing locations, and known problem areas. Once you have this, make sure it's available - make multiple copies, keep one at the machine, save it on your server, and be able to access it from your HMI.
3. **Cable Routing** – Remember these are network cordsets, they carry a lot of data at a high speed. Stay away from high noise locations. Use the right cable jacket for the environment. Do not use standard cordsets in flexing applications. Use the correct cordsets at the beginning because it's always a pain to go back and fix it later.
4. **Diagnostics** – Many DeviceNet users ignored diagnostic data in their PLCs from either the communication cards and/or the individual devices in the field. Use what EtherNet/IP diagnostics are available to you via the communications cards, PLC, field devices and managed switches. Making this data available on your HMIs is also a big plus. Don't forget that many devices, PLCs, and switches have their own built in web servers.
5. **Establish Procedures** – Define procedures early. How do I swap out a device? If the switch is dead, how do I replace it and reconfigure it? Can I use a longer cordset to replace a shorter bad one? All these questions will come up at some point, be proactive and have a procedure in place.
6. **Bandwidth and Packet Usage** – “Just add another device, it will be fine.” Sometimes this statement starts a network down the wrong path making it unreliable. Know what a new device will do to your network traffic. Yes, EtherNet/IP is faster, yes it can pass more packets, but it does have its limits. Know where your funnel point is in your network, for most industrial Ethernet networks it is at the communication card in the PLC chassis. Know its limitations; be able to calculate its bandwidth and packet usage. Document your calculations and have a procedure to update these values when anything changes.



Seamless Communication Right Down to the Sensors

In line with our reputation for durability, Balluff has designed and built a powerful line of machine-mount I/O blocks, along with supporting cables and accessories.

No other industrial network has seen a growth explosion like industrial Ethernet. The rapid growth is fueled by the seamless communication from plant level down to the sensors and actuators. With high-speed, deterministic throughput and the proven reliability of the physical layer, industrial Ethernet networks will continue to grow for years to come.





# EtherNet/IP

## Machine mount I/O blocks



	Standard I/O Blocks	Standard I/O Blocks	XXL I/O Blocks
	With Service Port	With Embedded Switch	With Service Port
16 Input	<b>BNI0014</b> BNI EIP-104-100-Z016	<b>BNI004M</b> BNI EIP-104-105-Z015	
8 Output	<b>BNI0015</b> BNI EIP-202-100-Z016	<b>BNI005J</b> BNI EIP-202-105-Z015	
16 Output	<b>BNI0016</b> BNI EIP-206-100-Z016		
8 Input / 8 Output	<b>BNI0017</b> BNI EIP-305-100-Z016		
8 Configurable (Shorty 4 port)	<b>BNI0044</b> (shorty) BNI EIP-307-100-Z014		
16 Configurable	<b>BNI0036</b> BNI EIP-302-100-Z016	<b>BNI004F</b> BNI EIP-302-105-Z015	
12 Configurable, 4 IO-Link		<b>BNI004A</b> BNI EIP-502-105-Z015	
8 Configurable, 8 IO-Link		<b>BNI006A</b> BNI EIP-508-105-Z015	
32 Input			<b>BNI0018</b> BNI EIP-105-100-Z010
16 Input / 16 Output			<b>BNI0019</b> BNI EIP-306-100-Z010

Note: For standard specifications and technical drawing, see page 1.18.  
For bitmaps and pinouts, see technical reference section t.



### Unmanaged Switches

5 port, IP20	<b>BNI005E</b> BNI TCP-951-000-E028	
8 port, IP20	<b>BNI0067</b> BNI TCP-952-000-E029	
9 port, IP67		<b>BNI000F</b> BNI EIP-950-000-Z009

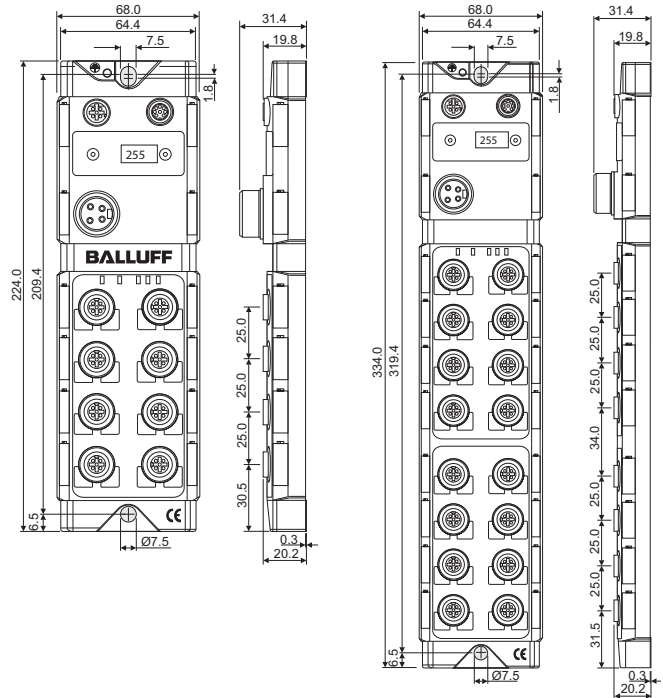
# EtherNet/IP

## I/O block specifications

### Cables

#### I/O Block Standard Specifications

Supply Voltage	24V
Connection: Fieldbus	M12, D-Coded
Connection: AUX Power	7/8" 4pin
Connection: I/O Ports	M12, A-Coded
Max Load Current/Channel	200mA
Rated Output Current/Channel	2A
Total Sensor Current/Block	9A
Total Actuator Current/Block	9A
Degree of Protection	IP67
Operating Temperature	-5°C...+55°C
Housing Material	GD-Zn nickel plated
Software Resettable Outputs	Yes
Overload Protected	Yes
Short Circuit Protected	Yes
Input/Output Type	PNP inputs / Sourcing outputs
Approvals	CE, ODVA, Shock & Vibration



#### ODVA Compliant Cordsets

Cable Type	Conductor	Jacket	Ratings	M12 Straight to M12 Straight	M12 Right to M12 Straight
Unshielded UTP 2pair	Stranded	TPE	600V, CMX Flex 10mio	BCC M414-M414-6D-366-EX64N9-__ _	BCC M424-M414-6D-366-EX64N9-__ _*
Shielded STP 2pair	Stranded	PVC	Riser, CMR	BCC M414-M414-6D-338-VS64N8-__ _*	
		TPE	Flex 5mio	BCC M414-M414-6D-338-ES64N9-__ _	
		TPE	non-ODVA, FT1	BCC M414-M414-6D-338-ES64N8-__ _	

\*Contact factory for availability

Standard lengths available:

006 = 0.6 m	100 = 10.0 m	400 = 40.0 m
010 = 1.0 m	150 = 15.0 m	500 = 50.0 m
020 = 2.0 m	200 = 20.0 m	600 = 60.0 m
050 = 5.0 m	300 = 30.0 m	

# EtherNet/IP Accessories



## Receptacles and Bulkheads

Order Code	Description
<b>BCC03WP</b>	M12-RJ45 Receptacle, 2m, industrial Ethernet
<b>BCC06YP</b>	M12-M12 Female Bulkhead
<b>BCC085F</b>	M12-RJ45 Straight Bulkhead
<b>BCC085H</b>	M12-RJ45 Right Angle Bulkhead
<b>BCC08KW</b>	M12 D-coded, Shield Break Plug
<b>BCC0F2R</b>	RJ45 Coupler
<b>BCC0F3M</b>	RJ45 Bulkhead



## Field Attachables

Order Code	Description
<b>BCC03WZ</b>	M12, D-coded, Straight Male
<b>BCC03Y0</b>	M12, D-coded, Right-Angle Male
<b>BCC03Y1</b>	M12, D-coded, Straight Female
<b>BCC03Y2</b>	M12, D-coded, Right-Angle Female
<b>BCC06FH</b>	RJ45, Straight Male, 8-position, 4wire (for EtherNet/IP cables only)

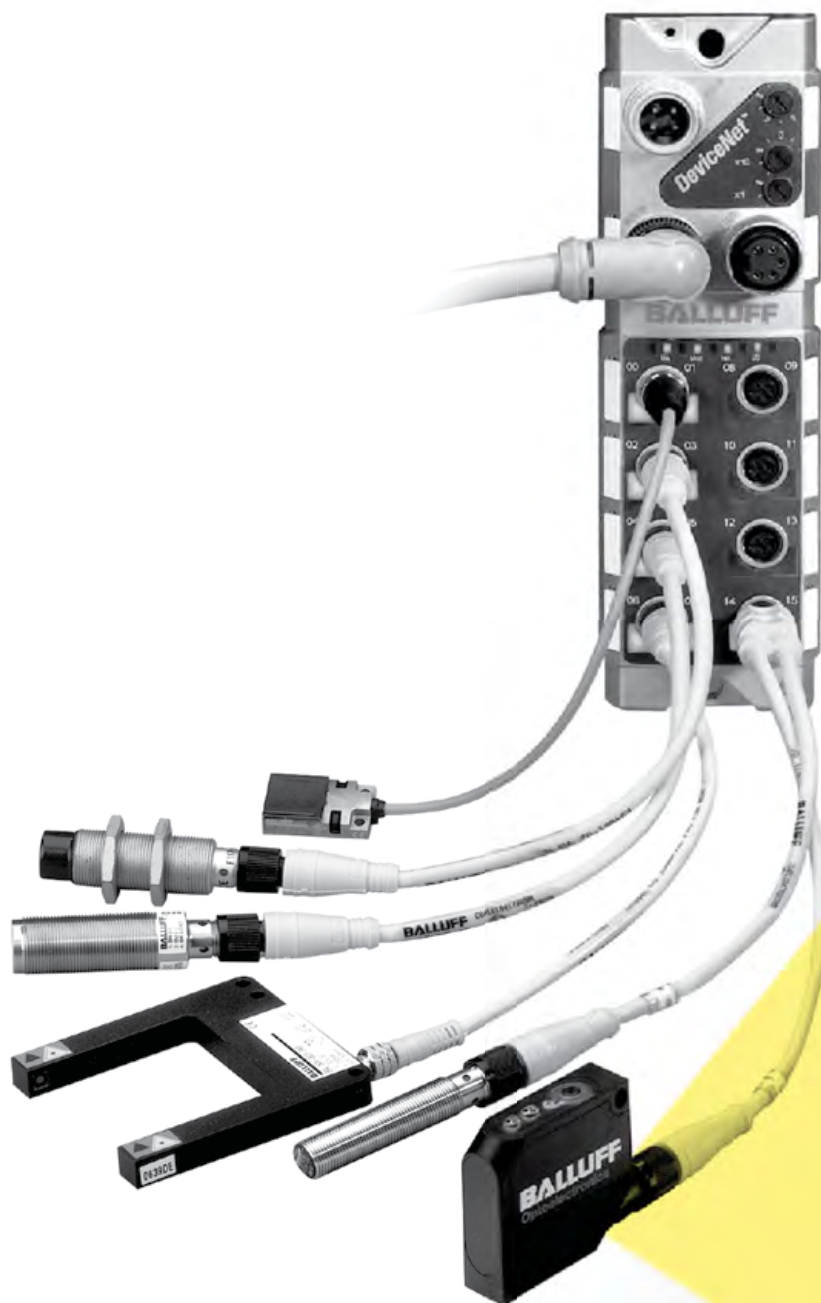


M12 Right to M12 Right	M12 Straight to RJ45	M12 Right to RJ45	RJ45 to RJ45	Bulk Cable (100m)
BCC M424-M424-6D-366-EX64N9-___*	BCC M414-E894-8G-695-EX64N9-___	BCC M424-E894-8G-695-EX64N9-___*	BCC E894-E894-90-367-EX64N9-___	<b>BCC0CN3</b>
	BCC M414-E894-8G-672-VS64N8-___*		BCC E894-E894-90-339-VS64N8-___*	<b>BCC0AZ9</b>
	BCC M414-E894-8G-672-ES64N9-___		BCC E894-E894-90-339-ES64N9-___	<b>BCC0AUJ</b>



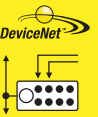
For 4-pole aux power cables and accessories, see pages 3.42-3.47

For a simple choice of outstanding network components, Balluff offers the entire spectrum of high-performance network technology. For applications in the USA, such as with Rockwell Automation and other controller manufacturers, you will find all modules for efficient DeviceNet installation at Balluff. You save time, resulting in lower costs.





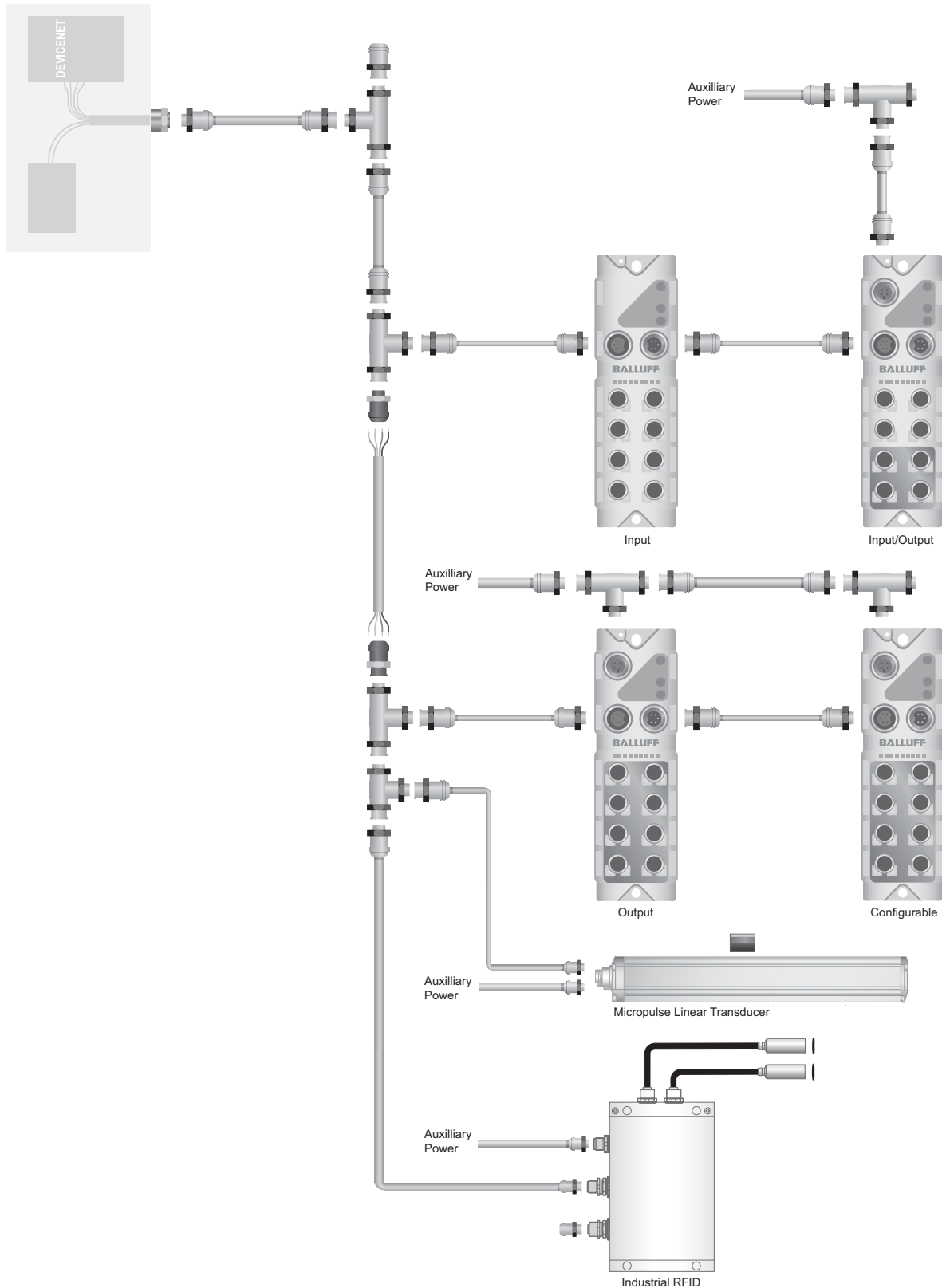
Product Topology	1.22
DeviceNet I/O Blocks	1.23
7/8" Cables	1.24
M12 Cables	1.26
Accessories	1.28
Troubleshooting Tools	1.31





## DeviceNet Product Topology

High-quality connectors and compatible accessories are required to create an efficient DeviceNet system. Balluff offers all the components you need for constructing and supporting a first-class DeviceNet network. From industrial RFID processors for plant floor data tracking to Micropulse® linear transducers for precision measurement applications, Balluff offers many solutions for use on your industrial DeviceNet network.



# DeviceNet

## Machine mount I/O blocks

### The heart of Balluff's Network Component System

The old "home-run" wiring approach has proven too costly and inflexible for today's machine designers. Distributed I/O has become an essential part of OEM machine design and an accepted method for users to reduce their cost by eliminating long wire runs between field devices and the control system.

DeviceNet™ has become the preferred North American I/O network for connecting field devices to centralized control solutions from Allen Bradley™ and other control system suppliers. DeviceNet™ allows designers to integrate a broad range of compatible connectivity products from many manufacturers. But which components are best suited for your application?

As a leading supplier of sensors and other input devices for the manufacturing industry, Balluff's entry into the machine mountable I/O block market did not come as an afterthought. We have studied the needs of this market for many years. Armed with our experience and knowledge, Balluff has designed and built a line of machine-mount I/O blocks, along with supporting cables and accessories that include all the features our customers have asked for. Simply put, we've made your network component search easy.



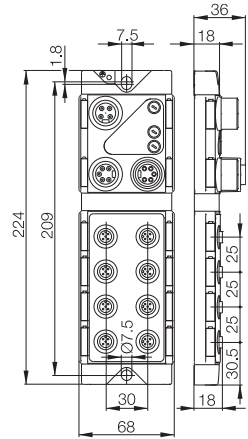
#### Short Protected Ports

Don't let one short on your network bring the entire DeviceNet network to its knees, these blocks only short at the port, leaving your network and more importantly, your process up and running.



#### IP67 Rotary Dials

Protected switches allow you to easily set the communication baud rate as well as the node address of the block.



#### High Density I/O

Each port of standard input and output blocks can be run with inputs and/or outputs on pin 2 and pin 4 allowing for multiple inputs/outputs per port.

DeviceNet modules	Order code	Part number
16 input	<b>BNI0001</b>	BNI DNT-104-000-Z004
8 output	<b>BNI0002</b>	BNI DNT-202-000-Z005
16 configurable	<b>BNI0003</b>	BNI DNT-302-000-Z005
8 input/8 output	<b>BNI0004</b>	BNI DNT-305-000-Z005
4 IO-Link/12 config	<b>BNI005A</b>	BNI DNT-502-100-Z001*

\*Consult factory for availability

Supply Voltage	24 V
Connection: Fieldbus	7/8" 5-pin
Connection: AUX Power	7/8" 4-pin
Connection: I/O Ports	M12, A-Coded
Max Load Current/Channel	200 mA
Rated Output Current/Channel	2 A
Total Sensor Current/Block	9 A
Total Actuator Current/Block	9 A
Degree of Protection	IP67
Operating Temperature	-5°C...+55°C
Housing Material	GD-Zn nickel plated
Software Resettable Outputs	Yes
Overload Protected	Yes
Short Circuit Protected	Yes
Input/Output Type	PNP inputs / Sourcing outputs
Approvals	CE, ODA, Shock and Vibration

7/8" single- and double-ended cables



7/8" Thick DeviceNet Media

Head 1/Head 2	Single-Ended	7/8" Male Straight	7/8" Male Right Angle
Single-Ended	BCC 0000-0000-00-030_ S85N4-10X	BCC A315-0000-20-030_ S85N4-___	BCC A325-0000-20-030_ S85N4-___
7/8" Female Straight	BCC A315-0000-10-030_ S85N4-___	BCC A315-A315-30-330_ S85N4-___	BCC A315-A325-30-330_ S85N4-___
7/8" Female Right Angle	BCC A325-0000-10-030_ S85N4-___	BCC A325-A315-30-330_ S85N4-___	BCC A325-A325-30-330_ S85N4-___

V = standard thick

P = flex-rated thick

Standard lengths available:

010 = 1.0 m

020 = 2.0 m

050 = 5.0 m

100 = 10.0 m

200 = 20.0 m



7/8" Mid DeviceNet Media

Head 1/Head 2	Single-Ended	7/8" Male Straight	7/8" Male Right Angle
Single-Ended	BCC 0000-0000-00-030-VS85N5-10X	BCC A315-0000-20-030-VS85N5-___	BCC A325-0000-20-030-VS85N5-___
7/8" Female Straight	BCC A315-0000-10-030-VS85N5-___	BCC A315-A315-30-330-VS85N5-___	BCC A315-A325-30-330-VS85N5-___
7/8" Female Right Angle	BCC A325-0000-10-030-VS85N5-___	BCC A325-A315-30-330-VS85N5-___	BCC A325-A325-30-330-VS85N5-___

Standard lengths available:

010 = 1.0 m

020 = 2.0 m

050 = 5.0 m

100 = 10.0 m

200 = 20.0 m

# DeviceNet

## 7/8" single- and double-ended cables



### 7/8" Thin DeviceNet Media

Head 1/Head 2	Single-Ended	7/8" Male Straight	7/8" Male Right Angle
Single-Ended	BCC 0000-0000-00-030- _S85N6-10X	BCC A315-0000-20-030- _S85N6-__	BCC A325-0000-20-030- _S85N6-__
7/8" Female Straight	BCC A315-0000-10-030- _S85N6-__	BCC A315-A315-30-330- _S85N6-__	BCC A315-A325-30-330- _S85N6-__
7/8" Female Right Angle	BCC A325-0000-10-030- _S85N6-__	BCC A325-A315-30-330- _S85N6-__	BCC A325-A325-30-330- _S85N6-__

V = standard thick

P = flex-rated thick

Standard lengths available:

010 = 1.0 m

020 = 2.0 m

050 = 5.0 m

100 = 10.0 m

200 = 20.0 m



### DeviceNet Bulk Cable

	Thick Standard	Thick Flex	Mid Standard	Thin Standard	Thin Flex
<b>Order Code</b>	<b>BCC0AEL</b>	<b>BCC0AEM</b>	<b>BCC0AEN</b>	<b>BCC0AEP</b>	<b>BCC0AER</b>
<b>Length</b>	100 m	100 m	100 m	100 m	100 m
<b>Jacket Color</b>	Grey	Grey	Grey	Grey	Grey
<b>Jacket Material</b>	PVC	PUR	PVC	PVC	PUR
<b>Temperature Rating</b>	-40...80°C	-40...80°C	-20...75°C	-40...80°C	-40...80°C
<b>Bending Cycles</b>	n/a	> 1 million	> 2,000	n/a	> 1 million
<b>Cable Diameter (inches)</b>	12.19 ± 0.38 mm	12.19 ± 0.38 mm	10.64 mm	7.62 ± 0.254 mm	7.62 ± 0.254 mm
<b>Cable Gauge</b>	<b>Communication</b>	18 AWG	18 AWG	24 AWG	24 AWG
	<b>Power Pair</b>	15 AWG	15 AWG	22 AWG	22 AWG



For 4-pole aux power cables and accessories, see pages 3.42-3.47

## 7/8"-M12 double-ended cables M12 single and double-ended cables



### 7/8"-M12 Thin DeviceNet Media

Head 1/Head 2	M12 Female Straight	M12 Female Right Angle	M12 Male Straight	
7/8" Female Straight			BCC A315-M415-3E-330- S85N6-__	
7/8" Female Right Angle			BCC A325-M415-3E-330- S85N6-__	
7/8" Male Straight	BCC M415-A315-3F-330- S85N6-__	BDN C-__-BC-EDA-01-__M		
7/8" Male Right Angle	BCC M415-A325-3F-330- S85N6-__	BDN C-__-BD-EDA-01-__M		

Cable types:

D11 = standard thin  
D12 = flex-rated thin

Standard lengths available:

005 = 0.5 m    060 = 6.0 m  
010 = 1.0 m    100 = 10.0 m  
030 = 3.0 m    200 = 20.0 m



### M12 Thin DeviceNet Media

Head 1/Head 2	Single-Ended	M12 Male Straight	M12 Male Right Angle
Single-Ended		BCC M415-0000-2A-030- S85N6-__	BDN C-__-DN-EDN-01-__M
M12 Female Straight	BCC M415-0000-1A-030- S85N6-__	BCC M415-M415-3A-330- S85N6-__	BDN C-__-AD-EDD-01-__M
M12 Female Right Angle	BDN C-__-BN-EDN-01-__M	BDN C-__-BC-EDD-01-__M	BDN C-__-BD-EDD-01-__M

Cable types:

D11 = standard thin  
D12 = flex-rated thin

Standard lengths available:

005 = 0.5 m    060 = 6.0 m  
010 = 1.0 m    100 = 10.0 m  
030 = 3.0 m    200 = 20.0 M





<b>M12 Male Right Angle</b>
<b>BDN C-___-AD-EAD-01-___M</b>
<b>BDN C-___-BD-EAD-01-___M</b>

#### Open-style Thin DeviceNet Media

<b>Head 1/Head 2</b>	<b>Open Style</b>
<b>Single-Ended</b>	<b>BDN C-D11-RN-OON-01-___M</b>
<b>7/8" Male Straight</b>	<b>BDN C-D11-RC-EOA-01-___M</b>
<b>M12 Male Straight</b>	<b>BDN C-D11-RC-EOD-01-___M</b>



#### CANopen

<b>Head 1/Head 2</b>	<b>Single-Ended</b>	<b>7/8" Male Straight</b>	<b>M12 Male Straight</b>
<b>Single-Ended</b>		<b>BCC A315-0000-20-067-PS75N6-___</b>	<b>BCC M415-0000-2A-067-PS75N6-___</b>
<b>7/8" Female Straight</b>	<b>BCC A315-0000-10-067-PS75N6-___</b>	<b>BCC A315-A315-30-344-PS75N6-___</b>	
<b>M12 Female Straight</b>	<b>BCC M415-0000-1A-067-PS75N6-___</b>		<b>BCC M415-M415-3A-344-PS75N6-___</b>

Standard lengths available:

006 = 0.6 m    050 = 5.0 m  
 010 = 1.0 m    100 = 10.0 m  
 020 = 2.0 m

#### Raw Cable Data

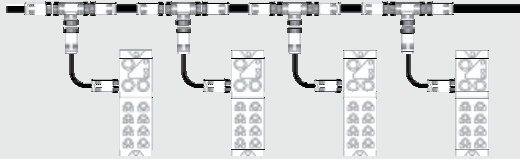
	<b>BDN Thin Standard</b>	<b>BDN Thin Flex</b>	<b>CANopen</b>
<b>Jacket Color</b>	Grey	Grey	Violet
<b>Jacket Material</b>	PVC	TPE	PUR
<b>Temperature Rating</b>	-20...105°C	-20...105°C	-20°C...80°C
<b>Bending Cycles</b>	n/a	> 1 million	n/a
<b>Cable Diameter (inches)</b>	6.86 mm	7.62 mm	7.2 ± 0.3 mm
<b>Cable Gauge</b>	<b>Communication</b>	22 AWG	24 AWG
	<b>Power Pair</b>	22 AWG	22 AWG



For 4-pole aux power cables and accessories, see pages 3.42-3.47

### Trunk and Drop Topology

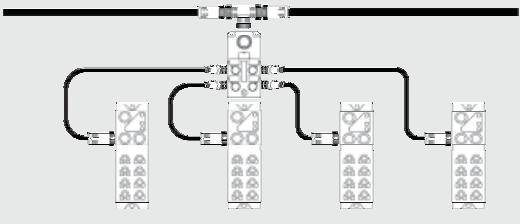
- Easiest to troubleshoot
- One device can be disconnected without disturbing the entire network
- Extra cable requirements lead to higher costs



Description	Pass-Thru	Drop	Order Code
Standard Tee	7/8"	7/8"	BCC07WP
Standard Tee	7/8"	M12	BCC07WZ
Standard Tee	M12	M12	BCC07WR
Diagnostic Tee	7/8"	7/8"	BCC07WT
U-Style Drop	7/8"	7/8"	BCC07Y6
U-Style Drop	M12	M12	BCC08CA

### Star Topology

- Easy to troubleshoot
- Ideal for large clusters of I/O
- Less expensive - only one splitter box needed



Configuration	Drop Ports	No. Ports	Order Code
7/8" Bus In	7/8"	4	BPI005F
7/8" Bus In/Out	7/8"	4	BPI005K
7/8" Bus In	M12	4	BPI005H
7/8" Bus In/Out	M12	4	BPI005L

DeviceNet  
**Terminating resistors**  
**Inline connectors**  
**Network power taps**



**Terminating Resistors**

Size	Configuration	Order code
7/8"	Female	<b>BCC07Y7/BCC0A0A*</b>
7/8"	Female with diagnostics LED	<b>BCC07Y8</b>
7/8"	Male	<b>BCC07Y9/BCC0A09*</b>
7/8"	Male with diagnostics LED	<b>BCC07YA</b>
M12	Female	<b>BCC07YE/BCC0A08*</b>
M12	Male	<b>BCC07YC/BCC09MR</b>

\*Consult factory for availability



**Inline Connectors**

Size	Configuration	Description	Order Code
7/8"	Male to Male	Gender Changer	<b>BCC07Y2</b>
7/8"	Female to Female	Gender Changer	<b>BCC07Y3</b>
7/8"	Female to Male	Right Angle	<b>BCC07Y4</b>
7/8"	Female to Male	Inline Diagnostic	<b>BCC07WU</b>



**Network Power Taps**

Size	Configuration	Description	Order Code
7/8"	7/8" 4-pole Male	Power Drop Tee, one direction	<b>BCC07WY</b>
7/8"	7/8" 4-pole Male	Power Tap with Fuses, bidirectional	<b>BPI005J</b>

Field attachables, receptacles, and bulkheads



Field Attachables

Size	Description	Order Code
7/8"	Straight Female	BCC07A9
7/8"	Straight Male	BCC07AA
M12	Straight Female	BCC07AC
M12	Straight Male	BCC07AE



Receptacles

	7/8" Female threads 1/2"- 14NPT	7/8" Male threads 1/2"- 14NPT	M12 Female threads 1/4"-18NPT	M12 Male threads 1/4"-18NPT
Std. Thick (2 m)	BDN C-R01-EN-AAN-01-020M	BDN C-R01-FN-AAN-01-020M		
Std. Mid (2 m)	BDN C-R04-EN-AAN-01-020M	BDN C-R04-FN-AAN-01-020M		
Flying Leads (1 ft)		BDN C-R30-FN-AAN-02-010F	BDN C-R30-EN-ADN-01-010F	BDN C-R30-FN-ADN-01-010F



Bulkheads

Size	Description	Order Code
7/8"	Female to Male	BCC07J7
M12	Female to Male	BCC07J5

## DeviceNet Troubleshooting Products

### DeviceNet NetMeter Diagnostic Tool

**Part number**                      **DN-MTR**

This device makes it simple for maintenance personnel to troubleshoot and diagnose an installed DeviceNet network. Simply connect the device to the network and it quickly analyzes your network data traffic as well as the network power. It can help identify issues with bus traffic, power voltage, shielding issues, CAN Differential and Voltages. This device uses a simple easy to use interface with a large read display.



Part Number	Description
<b>BNI ACC-A03-01-01</b>	DeviceNet Analyzer and Supporting Accessories Case
<b>BSS EDU-O-250-002</b>	DeviceNet Analyzer User Training Course (order per person, minimum 4)
<b>BSS CSL-O-250-001</b>	On-site Services utilizing the DeviceNet Analyzer (order per day, minimum 1)

The new DeviceNet Analyzer is a particularly powerful tool for analyzing, commissioning, monitoring and maintaining DeviceNet/CAN bus systems. Maintenance technicians, integrators, technical experts, or anyone who requires reliable information on the functional status of their DeviceNet system can use the DeviceNet analyzer to increase the overall efficiency of their facility. On-site testing and analysis simplify your working day, increase reliability and save you time.

### Diagnostic Services with the DeviceNet Analyzer

Customers not interested in purchasing the Analyzer or the User Training still can get value out of this device. Balluff can send a trained engineer with our equipment to your facility in one day increments and work with your technicians on your networks to take a snapshot of the total health of the network. This total network health can help identify which nodes to work on and where to perform preventative maintenance. In addition, multiple measurements could be made over a number of different hours or days to help give a better picture of effects being felt on the networks in the facility. On-site you will receive a report from the Balluff engineer detailing each network's total health and highlighting poor node health.



### DeviceNet Analyzer User Training

Customers using this tool have been most successful when they purchased user training along with the device. This one day training course enables someone to use the DeviceNet Analyzer to effectively troubleshoot a DeviceNet network. The course includes continuous hands-on experience with a PLC and multiple nodes. It also includes a student manual for the course plus an additional procedures guide for working in the field. Topics include: basic functionality, applications where it can be used, performing baud rate scan, station scan, on-line measurements, wire test, creating a log file, calculating the quality of a node and how to trouble shoot a network using the analyzer.



For more information, please visit [www.balluff.us](http://www.balluff.us) or call 1-800-543-8390.





With Profinet, industrial automation has made a significant advancement. Profinet operates on an Ethernet basis and is considerably faster than Profibus. Other advantages: Profinet can be fully integrated from the control level to the drive, even in harsh environments. With Profinet, you also directly link drives and safety technology to the network environment.

Profinet and Profibus can also be combined with no additional work. Connection is also extremely simple with IO-Link. IO-Link not only ensures freedom of installation, but also guarantees simplified wiring, integrated diagnostics, and central configuration, with time savings and tangible cost benefits included.





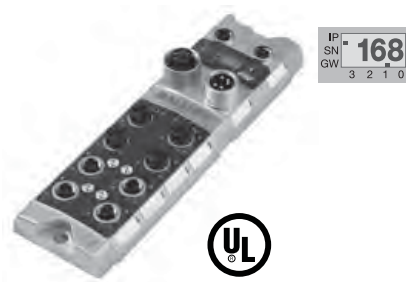
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Profinet I/O Blocks	1.34
Cables	1.35
Accessories	1.35



# PROFINET

## Machine mount I/O blocks

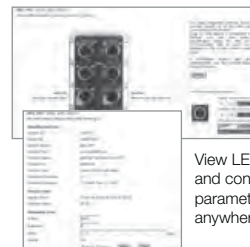


### Profinet I/O Blocks\*

	With Display, Embedded Switch
16 Input	<b>BNI0053</b> BNI PNT-104-105-Z015
8 Output	<b>BNI005F</b> BNI PNT-202-105-Z015
16 Configurable	<b>BNI0052</b> BNI PNT-302-105-Z015
8 Input/8 Output	<b>BNI005K</b> BNI PNT-305-105-Z015
12 Configurable, 4 IO-Link	<b>BNI004U</b> BNI PNT-502-105-Z015
8 Configurable, 8 IO-Link	<b>BNI005H</b> BNI PNT-508-105-Z015

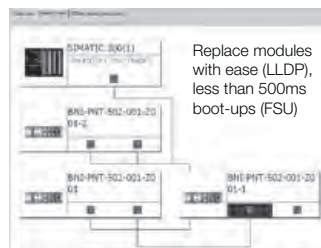
\*AIDA versions available, contact factory

### Webserver configuration and diagnostics



View LED status and configure parameters from anywhere

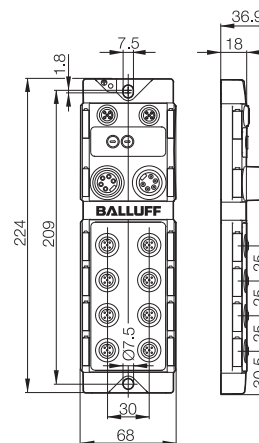
### Fast Start Up (FSU) and Link Layer discovery Protocol (LLDP)



Replace modules with ease (LLDP), less than 500ms boot-ups (FSU)

Supply Voltage	24V
Connection: Fieldbus	M12, D-Coded
Connection: AUX Power	7/8" 5pin
Connection: I/O Ports	M12, A-Coded
Max load Current/Channel	200mA
Rated output Current/Channel	2A
Total Sensor Current/Block	9A
Total Actuator Current/Block	9A
Degree of Protection	IP67
Operating Temperature	-5°C...+55°C
Housing Material	GD-Zn nickel plated
Software Resettable Outputs	Yes
Overload Protected	Yes
Short Circuit Protected	Yes
Input/Output Type	PNP inputs / Sourcing outputs
Approvals	CE, PI Certified

For pinouts, see technical reference section.



# PROFINET

## Cables and accessories



### Double-Ended Cables\*

Raw Cable Rating	Profinet Starquad
<b>M12 Straight Male/M12 Straight Male</b>	<b>BCC M414-M414-6D-331-PS54T2-_-_-</b>
<b>M12 Straight Male/RJ45 Straight Male</b>	<b>BCC M414-E834-8G-668-PS54T2-_-_-</b>
<b>RJ45 Straight Male/RJ45 Straight Male</b>	<b>BCC E834-E834-90-334-PS54T2-_-_-</b>

\*AIDA versions available, contact factory

Standard available lengths:

006 = 0.6 m    150 = 15 m  
 020 = 2 m    200 = 20 m  
 050 = 5 m    300 = 30 m  
 100 = 10 m



### Profinet Accessories

Description	Order Code
M12, D-coded, Straight Male	<b>BCC03WZ</b>
M12, D-coded, Right-Angle Male	<b>BCC03Y0</b>
M12, D-coded, Straight Female	<b>BCC03Y1</b>
M12, D-coded, Right-Angle Female	<b>BCC03Y2</b>
RJ45, Straight Male, 8-position, 4-wire	<b>BCC06FH</b>



### Profinet Accessories

Description	Order Code
M12-RJ45 Receptacle, 2 m	<b>BCC03WP</b>
M12-M12 Female Bulkhead	<b>BCC06YP</b>
M12-RJ45 Straight Bulkhead	<b>BCC085F</b>
M12-RJ45 Right Angle Bulkhead	<b>BCC085H</b>
M12 D-coded, Shield Break Plug	<b>BCC08KW</b>
Bulk Cable, 100 m Starquad Ethernet	<b>BCC0AC6</b>



For 5-pole aux power cables and accessories, see pages 3.42-3.47

In use for 20 years, Profibus stands for well engineered fieldbus technology and reliably supports modern manufacturing. As a full-service provider, Balluff offers a wide range of components for optimum Profibus use. Regardless of controller manufacturer, Balluff has the perfect solution in store for you: for efficient field and process communication with simple wiring, fast integration through direct installation in your system and the possibility of fast modifications. Balluff Profibus solutions are IO-Link capable, allowing you to take advantage of solid IO-Link benefits. Wiring is made even simpler. Integrated diagnostics prevent system failure and through central configuration, systems are quickly returned to operation. You save time and benefit from real cost advantages. In addition, Profibus offers investment security, since standard IEC 61158/EN 50170 simplifies expansion of your system. Balluff contributes to increased efficiency and growing cost savings.







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Profibus I/O Blocks	1.38
Cordsets	1.40
Field Attachables	1.40
Accessories	1.41



# PROFIBUS

## Machine mount I/O blocks IO-Link masters

Standard I/O blocks allow I/O data to be quickly collected and passed to the controller via Profibus. These blocks are used to collect discrete inputs and outputs from the machine.

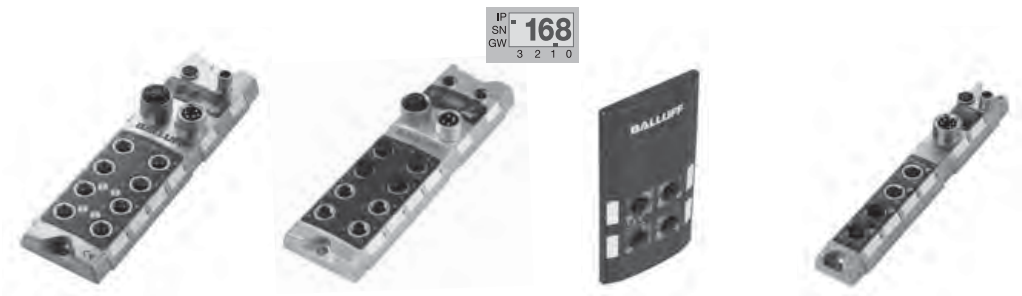


### Standard I/O Blocks

	With Rotary Dials	With Display
16 Input	<b>BNI0009</b> BNI PBS-104-000-Z001	<b>BNI005C</b> BNI PBS-104-101-Z001
8 Output	<b>BNI002J</b> BNI PBS-202-000-Z001	<b>BNI0057</b> BNI PBS-202-101-Z001
16 Output	<b>BNI002K</b> BNI PBS-206-000-Z001	
16 Configurable (standard)	<b>BNI000A</b> BNI PBS-302-000-Z001	<b>BNI0047</b> BNI PBS-302-101-Z001
16 Configurable (180° rotated display)		<b>BNI003Z</b> BNI PBS-302-102-Z001
16 Configurable (alternate bitmap)		<b>BNI0054</b> BNI PBS-302-103-Z001

For pinouts, see technical reference section.

These IO-Link blocks can be used like standard I/O blocks but are only fully utilized along with IO-Link capable devices. To learn more about IO-Link, see section 2.



### IO-Link Blocks

4 IO-Link / 4 Configurable			<b>BNI0030</b> BNI PBS-504-001-K008	<b>BNI003P</b> BNI PBS-507-001-Z011
4 IO-Link / 12 Configurable	<b>BNI003K</b> BNI PBS-502-001-Z001	<b>BNI005R</b> BNI PBS-502-101-Z001		

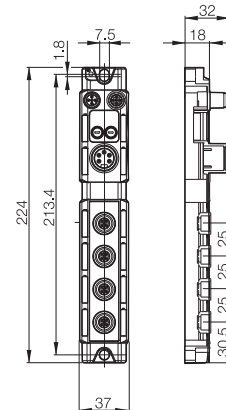
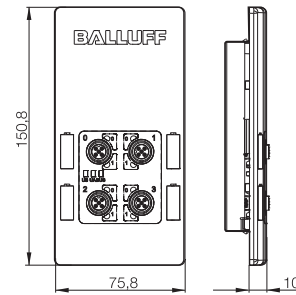
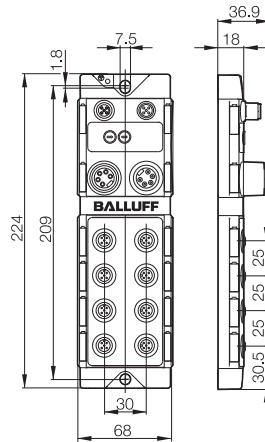
# PROFIBUS Transducer interface

This Profibus/Micropulse interface block combines discrete, analog, and linear positioning devices into one Profibus node, saving time and money in installation and component costs. You can connect up to four economical Micropulse START/STOP linear transducers and use up to 15 position magnets on each Micropulse transducer.

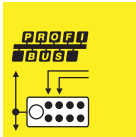


## Profibus/ Micropulse Transducer Interface Block

4 P-111 / 8 Input	<b>BNI001A</b>
	BNI PBS-551-000-Z001
4 P-111 / 4 Analog Input (0-10V or 4-20mA)	<b>BNI002H</b>
	BNI PBS-552-000-Z001



Supply Voltage	24V
Connection: Fieldbus	M12, B-Coded
Connection: AUX Power	7/8" 5 PIN
Connection: I/O Ports	M12, A-Coded
Max load Current/Channel	200mA
Rated output Current/Channell	2A
Total Sensor Current/Block	9A
Total Actuator Current/Block	9A
Degree of Protection	IP67
Operating Temperature	-5°C...+55°C
Housing Material	GD-Zn nickel plated
Software Resettable Outputs	Yes
Overload Protected	Yes
Short Circuit Protected	Yes
Input/Output Type	PNP inputs / Sourcing outputs
Approvals	CE, PI Certified



**PROFIBUS**  
**Network cordsets**  
**Field attachables**



**Profibus Network Cordsets**

	Single-Ended	M12 Straight Male
Single-Ended		BCC M412-0000-2B-031-PS72N1-__ _
M12 Straight Female	BCC M415-0000-1B-031-PS72N1-__ _	BCC M415-M412-3B-329-PS72N1-__ _

Single-Ended Lengths:

- 020 = 2 m
- 050 = 5 m
- 100 = 10 m

Double-Ended Lengths:

- 003 = 0.3 m
- 006 = 0.6 m
- 010 = 1.0 m
- 020 = 2 m
- 050 = 5 m
- 100 = 10 m
- 150 = 15 m
- 200 = 20 m



**Profibus Field Attachables**

Description	Order Code
M12 Straight Male	<b>BCC0714</b>
M12 Straight Female	<b>BCC0715</b>
M12 Right Angle Male	<b>BCC0716</b>
M12 Right Angle Female	<b>BCC0717</b>



**Profibus Accessories**

Description	Order Code
M12 Male Terminating Resistor	<b>BCC0718</b>
M12 Male Terminating Resistor with LED	<b>BCC0719</b>
M12 Shield Break	<b>BCC08HM</b>
M12 Female Receptacle, 2 m	<b>BCC0A7T</b>
M12 Male Receptacle, 2 m	<b>BCC0A7U</b>
Profibus Bulk Cable, 100 m	<b>BCC0ACA</b>



**Profibus 9-pin D-sub Connectors**

Description	Order Code
M12 Straight Connectors, 9-pin D-sub	<b>BCC0C0Y</b>
M12 Angled Connectors, 9-pin D-sub	<b>BCC0C0Z</b>
Straight Field Attachable, 9-pin D-sub	<b>BCC0C10</b>
Angled Field Attachable, 9-pin D-sub	<b>BCC0C11</b>



For 5-pole aux power cables and accessories, see pages 3.42-3.47





**BALLUFF**

S P  
06  
156k  
625k  
2M5  
5M  
10M  
CC-Link  
↑

Y0  
US UA  
Y1

RUN ERR  
Y8

Y3  
Input/Output  
YA

Y9

YB



# CC-Link

## CC-Link

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<b>Product Topology</b>	<b>1.44</b>
<b>Applications</b>	<b>1.45</b>
<b>CC-Link I/O Blocks</b>	<b>1.46</b>
<b>Power Cables</b>	<b>1.47</b>
<b>Accessories</b>	<b>1.47</b>



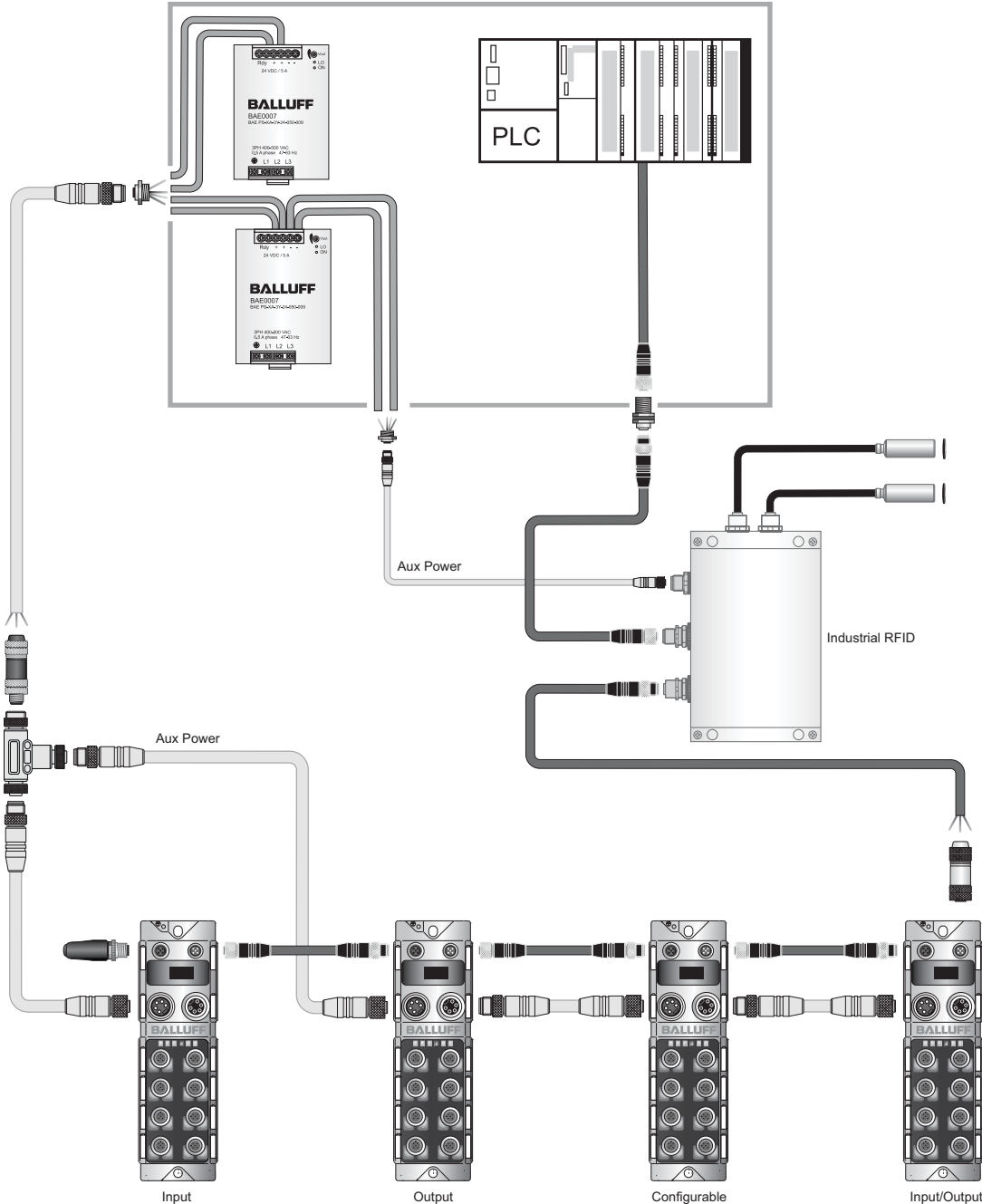
CC-Link is the most dominant and fastest growing fieldbus technology in Asia. The open network is supported by the global CC-Link partner association CLPA, which comprises more than 1,000 companies. CC-Link is a standardized fieldbus designed to integrate different automation components from a wide range of providers. CC-Link is an effective integral system that will fulfill 100% of your application requirements. Utilize the extensive, high-quality CC-Link portfolio from Balluff to implement your own powerful control topologies using products from a single source.

# CC-Link Topology

Balluff is your established partner for fieldbus expansion modules. CC-Link IO modules enable the consistent, cost-optimized implementation of requirements using decentralized installation technology and lead the way in harsh industrial applications.

CC-Link offers the following advantages:

- Constant data throughput, even when processing large data volumes
- Deterministic response for reliable real time control
- Controllers programmed over the network
- Powerful diagnostic system for clear identification of problem areas
- Network stations switched on and off during operation
- Network stations restored automatically
- Standby master function
- Optional configuration software





## Get Rid of Remote I/O Cabinets Once and For All

Every equipment designer goes through a phase of their design process where they need to decide how their I/O gets from their sensors and their valves to their controller. Some people use I/O cards on their PLC, or networks with IP20 solutions inside remote I/O cabinets.

**Remote I/O cabinets are costing you money in three ways:**

### 1. Initial Equipment Costs

You have to purchase a remote NEMA Box, bulkhead pass through connectors or gaskets, the remote I/O network connection as well as the required input and output cards for the application.

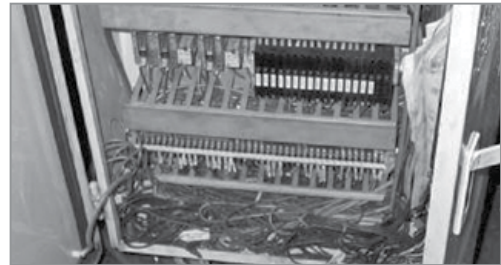
### 2. Installation Time

The box needs to be mechanically mounted in its designated space and installed with all of the wires and connectors run to it. An electrician then needs to come in and wire everything to the I/O ports. If you are using PNP or NPN sensors, there are three terminations per sensor that the electrician needs to connect.

### 3. Setup Time

If for some reason the machine needs to be torn down and shipped someplace else (which many machines do), many hours can be spent disconnecting the I/O only to be reassembled in the final destination.

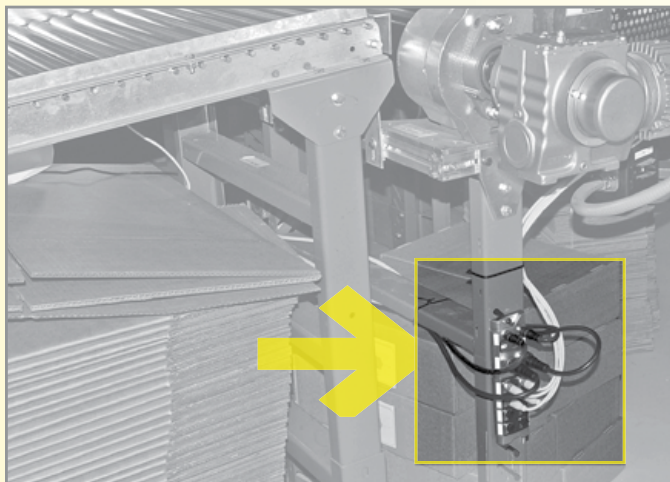
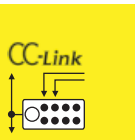
These costs in time and money can be reduced by looking at industrial network I/O mounted right on the machine. IP67 I/O gives quick industrial connection for the network communication and power cables. Most of the sensor and actuator cables can stay with the block because the I/O block is mounted right on the machine where the I/O is needed. Look at the labor and money you are putting into your remote I/O boxes and consider machine mount I/O the next time you are working on designing cost out of your machine.



Before



After



## Inputs and Outputs without an Enclosure

Most CC-Link networks used for I/O are run out of the controls cabinet near concentrated sensors and actuators. A bulky enclosure is installed and everything is terminated and wired into an IP20 I/O module with high labor and component costs. This can be simplified by using IP67 rated Input and Output devices. The smaller footprint and ease of setup will reduce installation material costs and labor, as well as decrease maintenance troubleshooting and repairs.

## Machine mount I/O blocks

CC-Link is the most dominant and fastest growing fieldbus technology in Asia, and it's quickly gaining popularity in the US. The open network is supported by the global CC-Link partner association CLPA, which comprises more than 1000 companies. CC-Link is a standardized fieldbus designed to integrate different automation components from a wide range of providers. Utilize the high-quality CC-Link portfolio from Balluff to implement your own powerful control topologies using products from a single source. These modules are the first decentralized I/O modules for the CC-Link fieldbus system available on the market.

### Addressable Display

Backlit display quickly shows the remote device station address, the communication baud rate, and the hardware/software versions. Pushbuttons allow the setting of the station address and the baud rate right at the block. The display can be locked out via the controller.

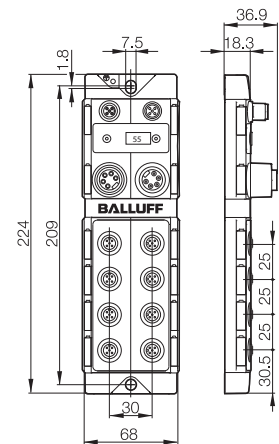


### Industrial Standard Inputs

Important for many established users of CC-Link controllers, is the use of 2-wire polarized sensors. These same sensor inputs can be used with the Balluff blocks as well as 3-wire PNP or NPN inputs.

### IP67 Industrial I/O

In most established CC-Link networks, I/O is ran into an IP20 enclosure, and then sensors are terminated in the box with intensive labor and space requirements. Process data is well protected with these IP67 blocks and the space and labor requirements are dramatically reduced.



Supply Voltage Us	24V
AUX Output Power Status LED	UA / US
Network Status Indicator: Run LED	Yes
Network Status Indicator: Err LED	Yes
Port Status Indicators	Red, yellow, green
Connection: Fieldbus	M12, A-Coded
Connection: AUX Power	7/8", male, 5 PIN
Connection: I/O Ports	M12, A-Coded, female
No. of I/O Ports	8
No. of Inputs	max 16
No. of Outputs	max 16
Max. Load Current/Channel	200 mA
Rated Output Current/Channel	2A
Total Sensor Current/Block	9A
Total Actuator Curret/Block	9A
Degree of Protection	IP67
Operating Temperature	-5°C...+55°C
Housing Material	GD-Zn nickel plated
Software Resettable Outputs	Yes
Overload Protected	Yes
Short Circuit Protected	Yes
Output Type	Sourcing outputs
Approvals	CE, CLPA

CC-Link modules	Stations	Order code	Part number
16 input (PNP)	1	<b>BNI002F</b>	BNI CCL-104-100-Z001
16 input (NPN)	1	<b>BNI0049</b>	BNI CCL-106-100-Z001
8 output	1	<b>BNI002E</b>	BNI CCL-202-100-Z001
16 configurable	1	<b>BNI002A</b>	BNI CCL-302-100-Z001
8 input/8 output	1	<b>BNI002C</b>	BNI CCL-305-100-Z001
12 config/4 IO-Link	3 (4)	<b>BNI0040</b>	BNI CCL-502-100-Z001



**CC-Link**  
**Accessories and cables**



**CC-Link Cables**

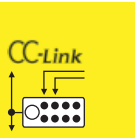
Head 1/Head 2	Single-Ended Female	M12 A-Coded Straight Male
Single-Ended Male	---	BCC M414-0000-2A-068-VS24N7-___
M12 A-Coded Straight Female	BCC M415-0000-1A-068-VS24N7-___	BCC M415-M414-3A-337-VS24N7-___

Single-Ended Standard Lengths:

- 020 = 2.0 m
- 050 = 5.0 m
- 100 = 10.0 m

Double-Ended Standard Lengths:

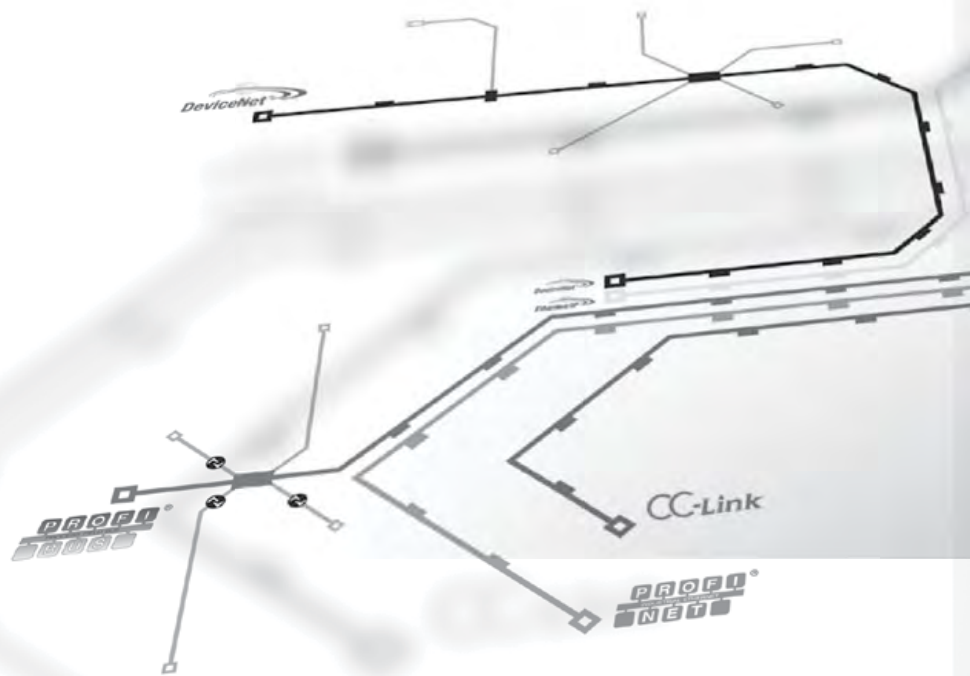
- 006 = 0.6 m
- 020 = 2.0 m
- 050 = 5.0 m
- 100 = 10.0 m
- 150 = 15.0 m



Description	Order Code
Bulkhead Passthru M12 A-coded Female to Male	<b>BCC07J5</b>
Field Attachable Male M12 A-coded Straight	<b>BCC06F7</b>
Field Attachable Female M12 A-coded Straight	<b>BCC06F6</b>
Terminating Resistor M12 A-coded Male	<b>BCC06Y4</b>
U-Style Drop M12 A-coded	<b>BCC08CA</b>
T-Style Drop M12 A-coded	<b>BCC07WR</b>
Bulk Cable, 100 m	<b>BCC0ACE</b>



For 5-pole aux power cables and accessories, see pages 3.42-3.47



# Networking Accessories

## Contents

### Accessories for Balluff Network Products

As products are installed and integrated into the manufacturing process, unused ports must be covered. Designers of equipment want to be able to quickly change out broken parts or make things as tamper proof as possible. Balluff offers a solid offering of accessories in port covers, caps, and labels. If you want to make your network device tamper proof, we offer dial covers for use with Balluff network blocks. And if you are currently using someone else's network block and want to install a Balluff block, we make it easy by offering a mounting plate with major competitor hole patterns already set-up in it for easy swap out. Check out the Balluff accessories in this section for your network architecture's needs.



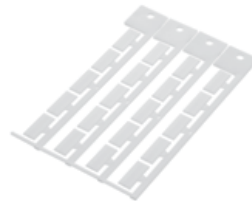
# Networking Accessories

## Caps, labels, and covers



### I/O Block Caps

Order Code	BAM01C1	BAM01C2	BAM0115	
Part Number	BAM CS-XA-001-M8-C	BAM CS-XA-002-M12-A	BKS-12-CS-02	
Size	M8x1	M12x1	M12x1	
Threads	External	External	External	
Material	Plastic	Plastic	Plastic	
Use	M8 Female Port	M12 Female Port	M12 Female Port	



### I/O Block Labels and Covers

Order Code	BAM01KW	BAM01JU	BAM01JT	
Part Number	BAM IA-XA-005-1X12-Y*	BAM IA-XA-004-4X6-Y	BAM IA-XA-003-4X5-Y	
Type	Block Labels	Block Labels	Block Labels	
Size	10x5	17x9	20x8	
Use With	M8 Plastic Hubs	M12 Plastic Hubs	M12 Metal Blocks	
Compatibility	BNI IOL ...-K018 BNI IOL ...-K019 BNI IOL ...-K020 BNI IOL ...-K021	BNI IOL ...-K006	BNI EIP...BNI DNT... BNI PBS...BNI PNT... BNI CCL ... BNI IOL ...Z012 BNI IOL ...Z013	

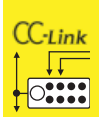
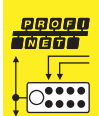
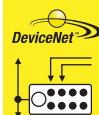
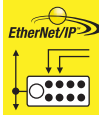
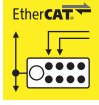
\*Consult factory for availability

# Networking Accessories

## Caps, labels, and covers



<b>BAM0114</b>	<b>BAM01LT</b>	<b>BAM012T</b>	<b>BAM012U</b>
BKS-12-CS-01	BAM CS-XA-006-M12-1	BKS-7/8-CS-00-A	BKS-7/8-CS-00-I
M12x1	M12x1	7/8"-16UN	7/8"-16UN
External	Internal	External	Internal
CuZn	CuZn	CuZn	CuZn
M12 Female Port	M12 Male Port	7/8" Female Port	7/8" Male Port



<b>BAM01H4</b>	<b>BAM01J0</b>		<b>BCC08HL</b>
BAM FK-NI-DNT-01-C	BAM FK-NI-PBS-01-C	BNI ACC-M01-001	BCC M415-M412-3A-RA012-000
Dial Cover	Dial Cover	Mounting Plate	Non-polarized to Polarized
		68x224	M12
7/8" Network Connections	M12 Network Connections	BNI Blocks	BNI Blocks
BNI DNT...	BNI EIP... BNI PBS... BNI PNT... BNI CCL...	BNI EIP... BNI DNT... BNI PBS... BNI PNT... BNI CCL ...	BNI EIP... BNI DNT... BNI PBS... BNI PNT... BNI CCL ...



### Networking Installations in Welding Applications

#### An identified complication and recommendation for mitigation

#### Complication

In welding applications where network devices have been mounted to an active welding surface, there is a possibility that the device may have communication issues.

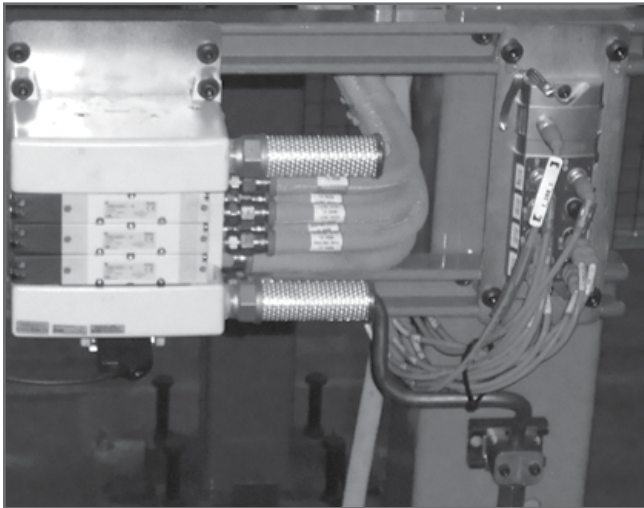
An active welding surface is defined as the part of the tool or work piece that is part of the weld circuit and carries the current to and from the welding transformer. Active welding surfaces may not be obvious and may require electrical measurement to determine potentials and isolation.

#### Primary Recommendation

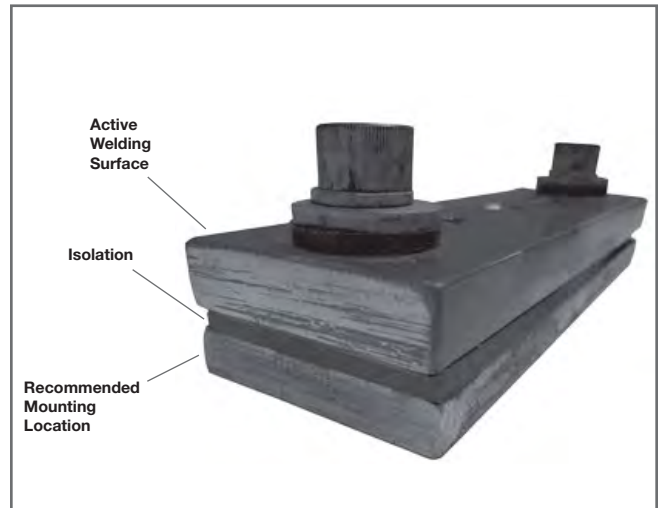
It is strongly recommended that networking devices do not come in direct contact with the weld application and that they be electrically isolated from the active welding surface. Successful installations are mounted onto a non-current-carrying component of a work cell.

#### Cautionary Recommendation

If the application demands that the device must mount to an active welding surface, it is recommended that, at a minimum, the device should be electrically isolated from the active welding surface. It is highly recommended for these installations that the communication be tested and diagnosed for potential additional complications.



Successful installations are mounted onto a non-current-carrying component in the work cell.



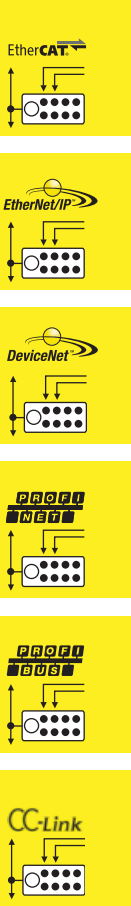
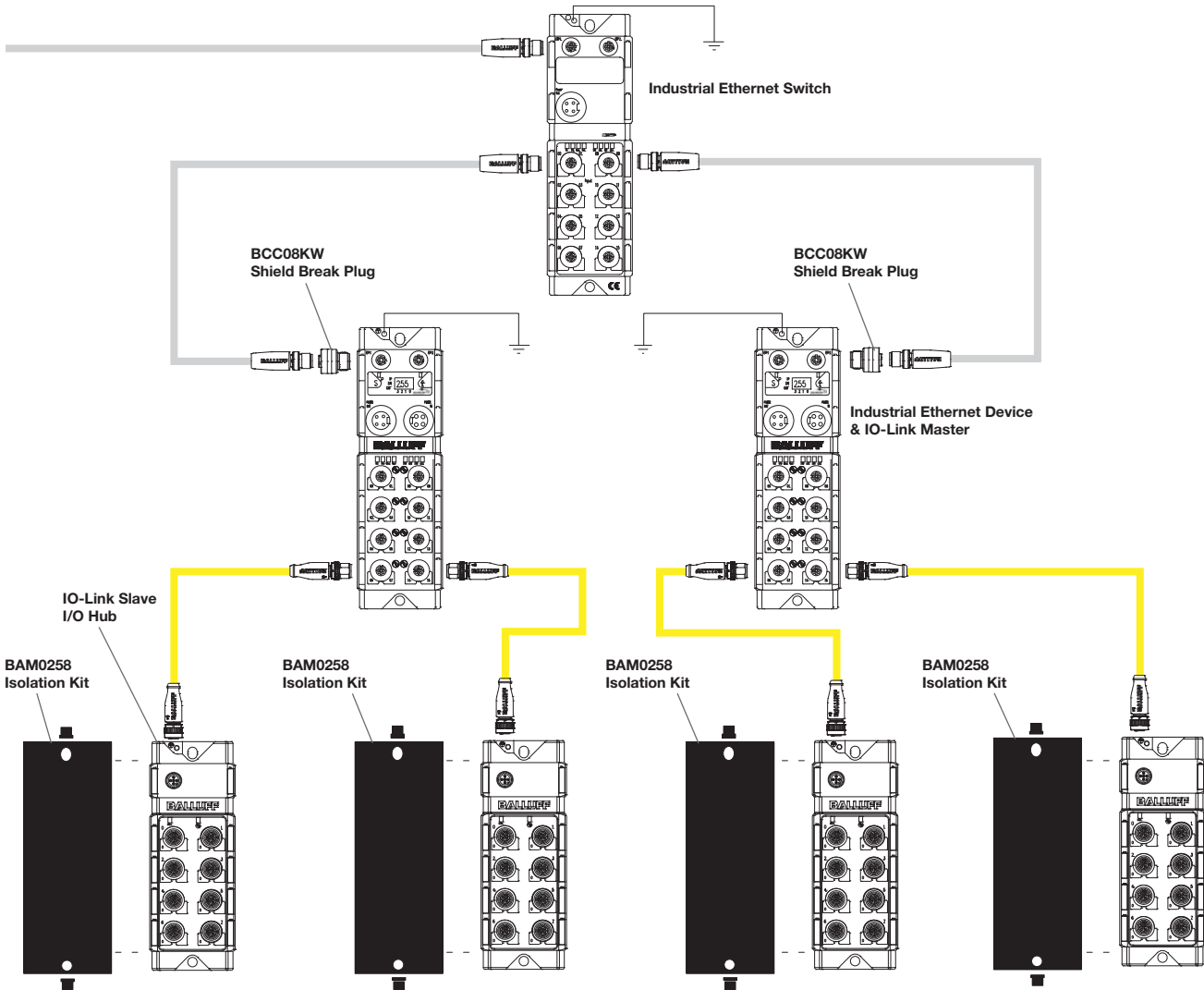
It is recommended that, at a minimum, the device should be electrically isolated from the active welding surface.

### Networking Installations that Require Electrical Isolation

#### Products for use with metal I/O blocks to mitigate grounding & bonding issues

In all applications where communications cables and networked devices are installed, they must be analyzed for possible grounding & bonding complications. When a potential issue arises, products are offered to assist the installer with electrically isolating. For networks like EtherNet/IP, it is typically recommended by the ODVA that the shielded ethernet cable be grounded only on the switch end of the

cable. For IO-Link slave devices, it is typically recommended that they be electrically isolated from tooling carrying high current; and in some instances recommended to add the use of shielded cables. Balluff offers a detailed installation guide for reducing issues (contact Balluff tech support).



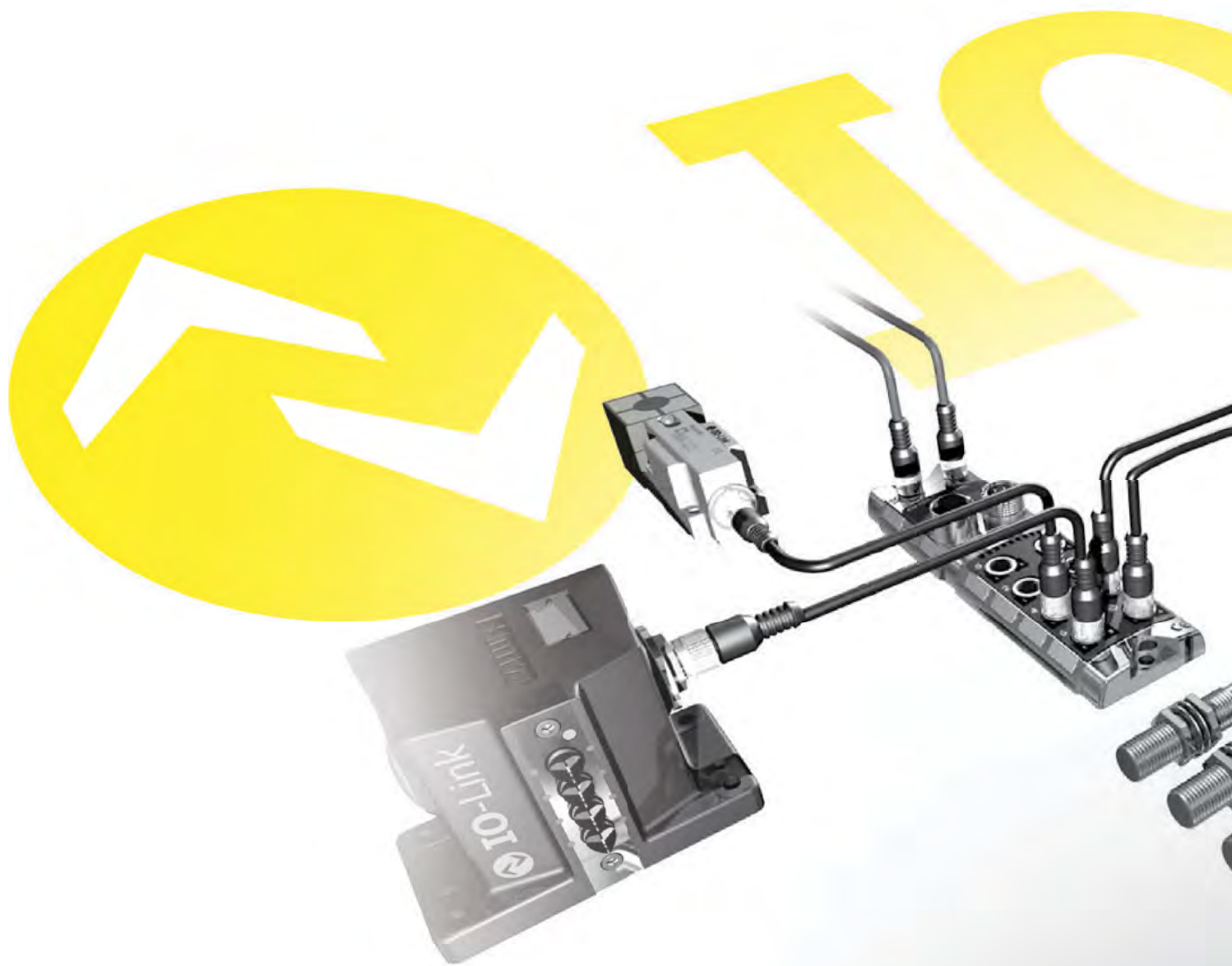
Part Number	Base / Mate Device	Description
<b>Industrial EtherNet - Shield Break Devices</b>		
<b>BCC08KW</b>	---	M12 D-coded, plastic, shielded cable continuity break device
<b>BAV000N</b>	BNI EIP-104-105-Z015	EtherNet/IP, 16x PNP Input, with shield break plug permanently installed
<b>BAV000P</b>	BNI EIP-302-105-Z015	EtherNet/IP, 16x Configurable I/O, with shield break plug permanently installed
<b>BAV000R</b>	BNI EIP-502-105-Z015	EtherNet/IP, 12x Config I/O, 4x IO-Link, with shield break perm. installed
<b>BAV000T</b>	BNI EIP-508-105-Z015	EtherNet/IP, 8x Config I/O, 8x IO-Link, with shield break perm. installed
<b>BNI Electrical Isolation Kit (Plastic plate with 2x bushings) *</b>		
<b>BAM0258</b>	BNI IOL-... (L=183mm)	Isolation Kit for BNI IOL Metal Slave I/O Hubs
<b>BAM0259</b>	BNI ... (L=225mm)	Isolation Kit for 8x port BNI I/O Blocks and IO-Link Masters

\* Pre-assembled I/O blocks with Isolations Kits available, contact factory for details.

As the first standardized, uniform, universally applicable interface in control technology, IO-Link transmits all sensor and actuator signals to the controller. Likewise, IO-Link passes control data down to the lowest sensor level. All of this makes automation even more powerful than ever before.

IO-Link advantages at a glance

- Easy to get started, time-saving installation
- Automatic adjustment during operation
- Continuous monitoring



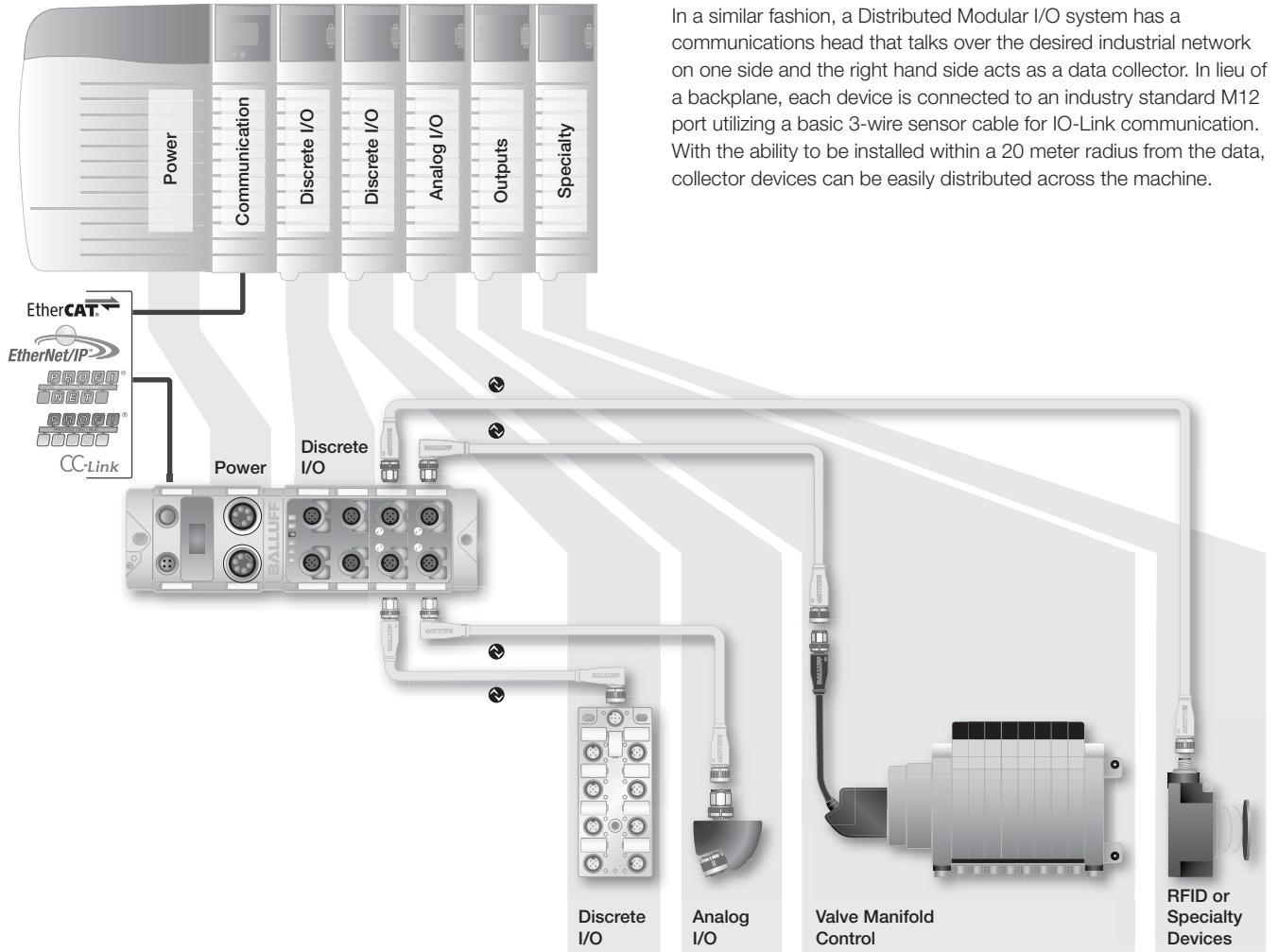
# **IO-Link** Distributed Modular I/O

<b>Technology</b>	<b>2.2</b>
<b>Applications</b>	<b>2.5</b>
<b>IO-Link Master Blocks</b>	<b>2.6</b>
<b>IO-Link Input/Output Devices</b>	<b>2.8</b>
IP20 Terminal Hubs	2.9
Analog Plugs	2.9
M8 and M12 Hubs	2.10
<b>IO-Link Connection Devices</b>	<b>2.12</b>
Non-Contact Connectors	2.13
USB Master	2.13
Valve Manifold Connectors	2.14
<b>IO-Link RFID</b>	<b>2.16</b>
Read Only Systems	2.17
Read/Write Systems	2.18
<b>IO-Link Advantages of Intelligent Sensors</b>	<b>2.20</b>
Ultrasonic Sensors	2.21
Pressure Sensors	2.22
IO-Link Intelligent Sensors	2.24
SmartLight	2.26



## What is Distributed Modular I/O?

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.



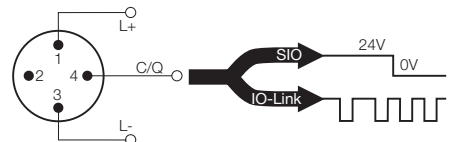
## The backplane of Distributed Modular I/O = IO-Link

Utilizing a widely accepted and open point to point technology, IO-Link, a Distributed Modular I/O system is fieldbus independent, is easily configured and is vendor neutral. Process data shows up as simple packets of bytes in the controller for easy integration. The parameterization data allows the devices to be quickly configured using simple read/write commands, and best of all, there is no “sub-bus” to cause headaches, nor is there some new protocol to be educated on. The digital signal is carried over pin 4 of a standard 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.

### 3 Wire or 4 Wire Sensor Cable



20 Meters maximum



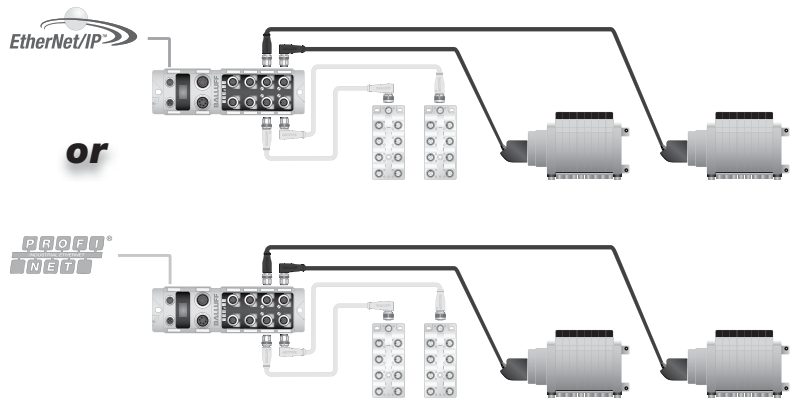


# IO-Link

## Advantages of Distributed Modular I/O

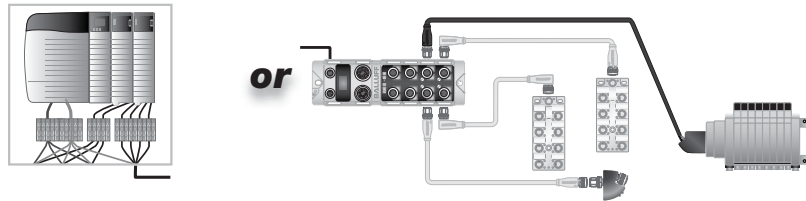
### Simplify Controls Quotation Process

Utilize the same components for I/O regardless of the PLC brand or industrial network selected. Pricing for control equipment can be standardized from machine to machine and calculations are easily expandable.



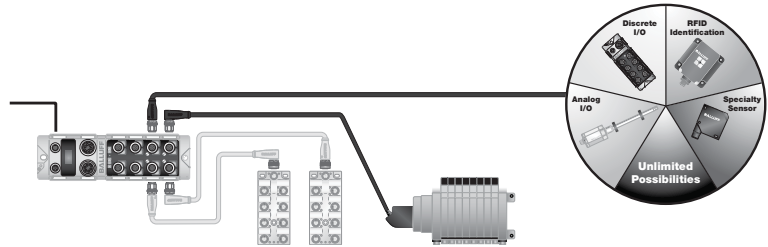
### Reduce Total Cost per Point

Simplify the labor involved in parallel wiring a valve manifold or terminating a set of discrete sensors. Analog devices can get costly with shielded cable runs and expensive four channel analog input cards, especially when there is only a need for one analog channel. Distributed Modular I/O reduces hardware setup labor and can be customized to reduce I/O hardware costs.













### Maximize Spares

Most initial designs include a set of spare I/O points for later development or modifications. Whether the customer wants to add a few discrete sensors to the design or there is a need to add a single channel of analog to the machine, spares and additions to the design can add major cost to the control's bill of materials. With this solution, spare connections can be a flexible placeholder for any type of I/O until the need arises.



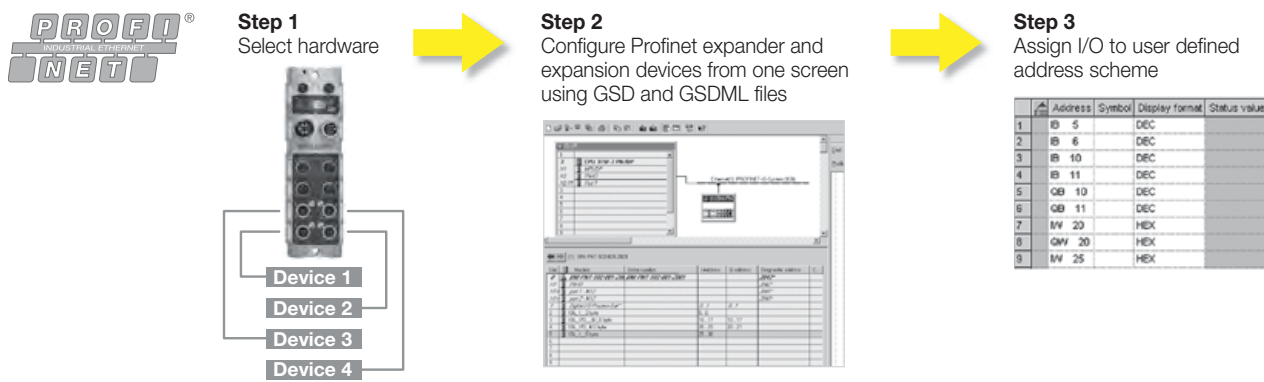
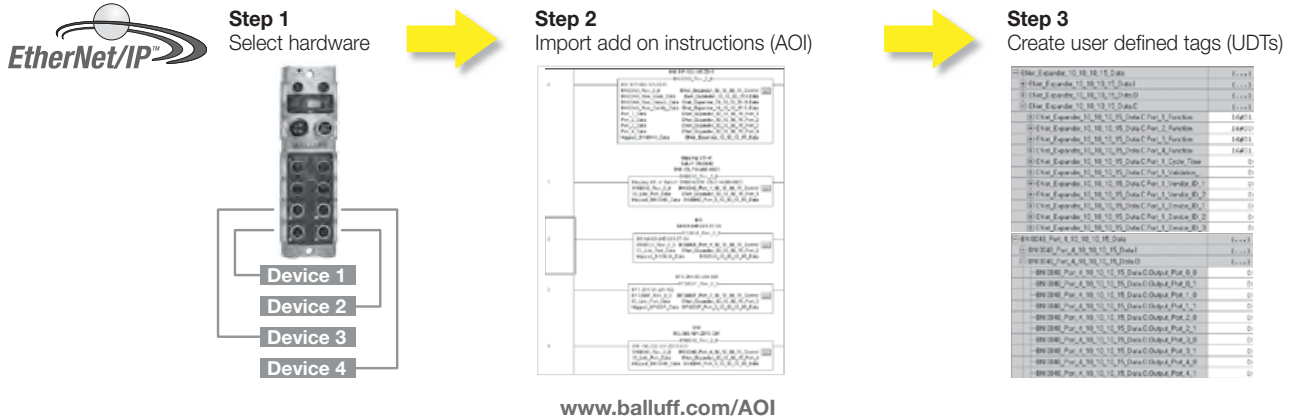
## Types of Distributed Modular I/O devices



Discrete I/O	Analog I/O	Valve Manifold Control	Specialty Devices and RFID
 <p>M8 ports – Up to 16 inputs</p>	 <p>1 channel (14 bit) – 0-10 V in/out – 4-20mA in/out – PT100 in</p>	 <p>25 pin D-sub</p>	 <p>Measurement and position sensors</p>
 <p>M12 ports – Up to 16 inputs – 16 outputs – 16 configurable</p>	 <p>4 channels (10 bit) – 0-10 V – 4-20mA – plus 8 inputs</p>	 <p>IP67 &amp; Terminal</p>	 <p>RFID – Read/write – Read only</p>
 <p>IP20 terminals – Up to 16 configurable</p>			 <p>Non-contact connectors – 3 bytes to 11 bytes</p>



While hardware selection is important to the success of a project, if the hardware is not easily integrated into the engineering software, any benefits gained could be lost. However, Distributed Modular I/O is easily integrated into typical engineering software with an easy three step process. Below are examples of how to integrate industrial ethernet solutions. These steps can also be easily implemented on industrial bus networks.

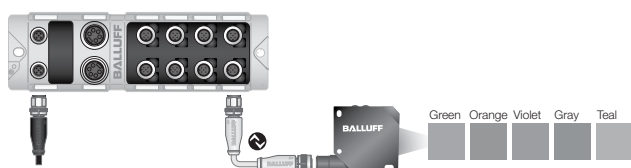


## Device parameterization and configuration

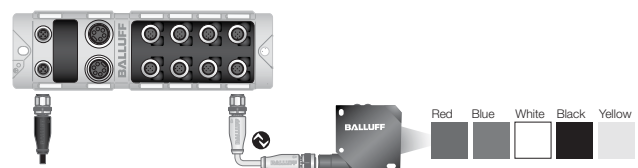
There are multiple advantages to device parameterization. The two major advantages are the ability to quickly swap out a failed device and the ability to reconfigure a device for a recipe or production change on the fly. The controller stores the necessary data for each setup and, when needed, it sends the parameters via the network over the backplane to the slave device. This can shorten setup times and increase efficiency.

### Color Sensor Example

While running project A, the color sensor is configured to detect the difference between five different colors as parts are loaded into a fixture.



After the required parts are run off, a new project is begun with a different color set. In the past, a second color sensor would be required, or the operator would have to reprogram the current sensor for each new color. By using device parameterization, the controller tells the sensor its configuration for project B and quickly, without hassle, the sensor has its new colors.

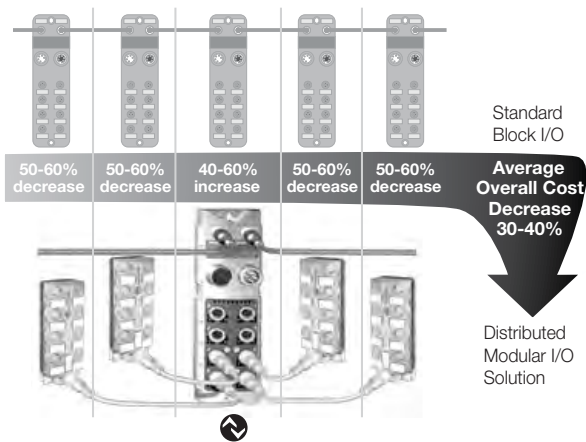


# IO-Link

## Distributed Modular I/O applications

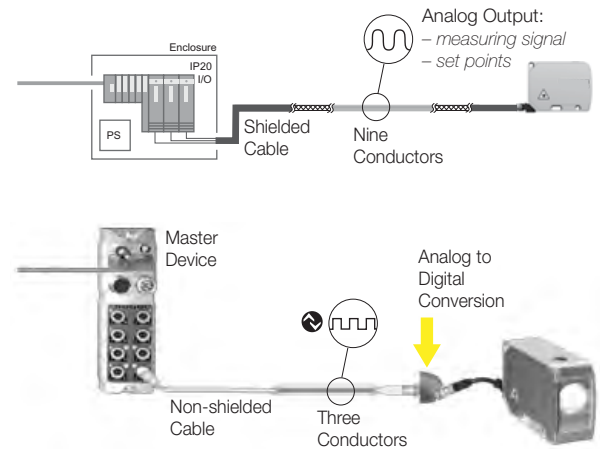
### Discrete I/O Savings

Machine builders looking to lower the cost per point for discrete I/O gain many advantages with Distributed Modular I/O. Reduced cable and device costs can save an OEM 15-60% over traditional I/O systems.



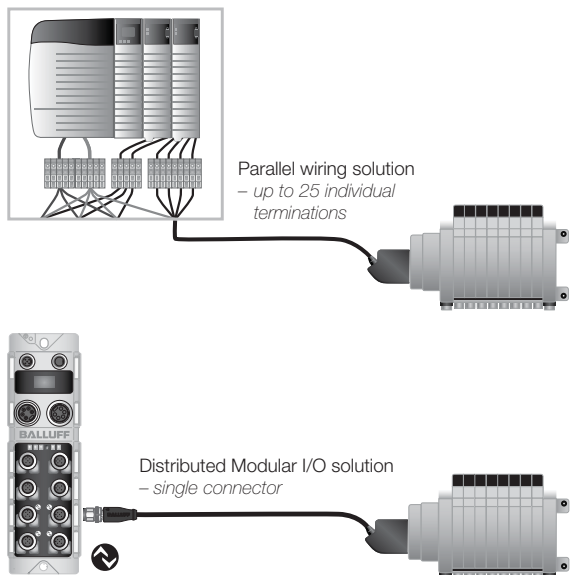
### Analog I/O Savings

One channel of analog I/O can add significant cost to a typical machine design in components, cables, and labor. By putting the analog I/O right at the signal's source, the complications and costs can be significantly reduced.



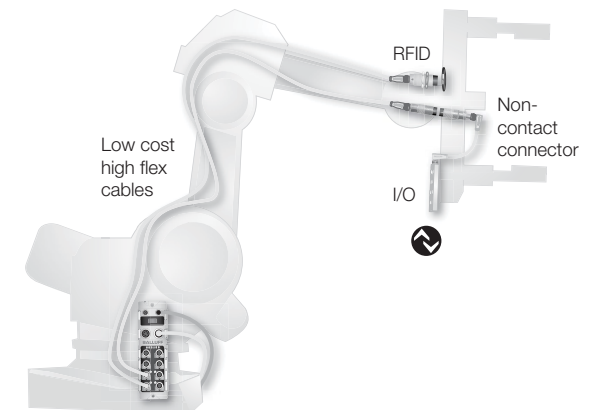
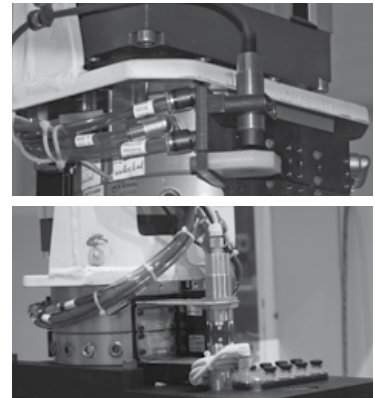
### Valve Manifold Control

Every pneumatic action requires valve control. The typical parallel wiring of valve manifolds can be labor intensive and add dramatically to cabinet space and setup time.



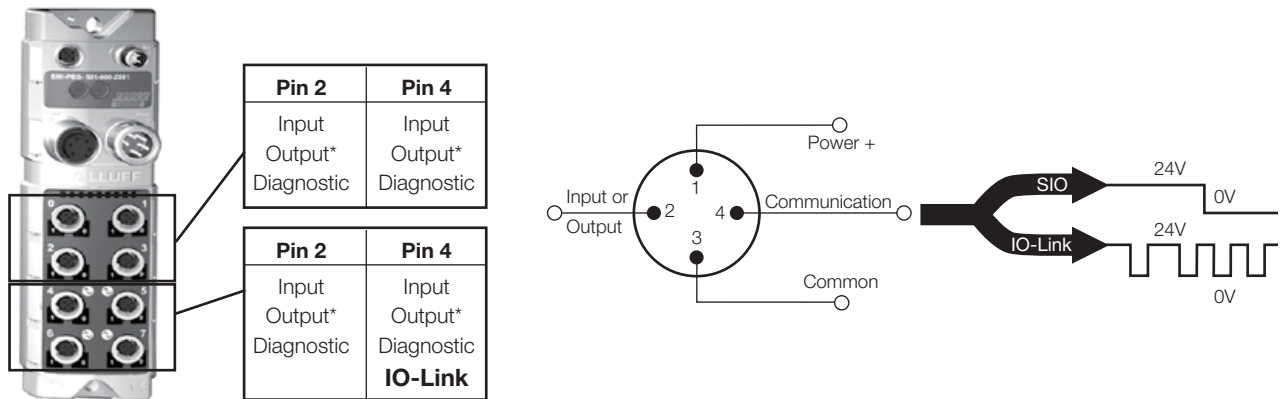
### Quick Tool Change

With the increasing demand for multiple recipe manufacturing, the need to quickly change tooling on a robot or in a fixture is growing. Utilizing multiple technologies, the connection can be made quickly without failure; tool verification can be included with RFID. This speed has improved our customers' throughput by 15%.



## Flexible IO-Link Master Blocks

Each port of the Balluff IO-Link master block can be configured to fit any IO-Link and/or discrete application. The top 4 ports can be configured as NO/NC inputs, outputs, or diagnostic points depending on the block type. The bottom 4 ports can be configured as IO-Link or as any of the discrete settings, depending on the block type.

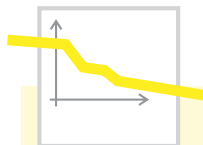


\*Only available in configurable versions



Network Protocol	EtherNet/IP (UDP)	DeviceNet	EtherCAT	ProfiNet
Addressing	Display	Display	Display	Display
1 IO-Link / 4 RFID BIS VM or VL	<b>BIS0122</b> BIS V-6106-034-C004		<b>BIS00U9</b> BIS V-6110-063-C002	<b>BIS013U*</b> BIS V-6108-048-C002
4 IO-Link / 4 Configurable				
4 IO-Link / 12 Configurable	<b>BNI004A</b> BNI EIP-502-105-Z015	<b>BNI005A</b> BNI DNT-502-100-Z001		<b>BNI004U</b> BNI PNT-502-105-Z015
8 IO-Link / 8 Configurable	<b>BNI006A</b> BNI EIP-508-105-Z015		<b>BNI0077</b> BNI ECT-508-105-Z015	<b>BNI005H</b> BNI PNT-508-105-Z015

\*Consult factory for availability



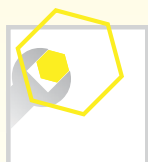
## Reduce Costs

- Connect devices with standard sensor/actuator cordset
- Simplify cordset stocking with universal M12 standard connectors on IO-Link devices
- Secure investment with open standard, valid from all manufacturers
- Future-proof, with greatest flexibility in project planning



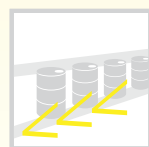
## Reduce Engineering and Commissioning

- Commissioning performed by the controller, not at each individual IO-Link device
- Scalability of each IO-Link port
- Same architecture for different network protocols
- Fewer network nodes and IP addresses to commission



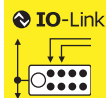
## Reduce Maintenance

- Capability of plug, play, and walk away
- Automatic read adjustment of parameters
- Reliable error detection
- Troubleshoot a point-to-point connection, rather than a network



## Increase Uptime

- Recipe driven parameterization of IO-Link devices
- Health diagnostics down to the IO-Link device level
- Network cable can be removed from harsh areas, replaced by standard sensor/actuator cordsets
- Continuous monitoring of process parameters



Profibus	Profibus	Profibus	Profibus	CC-Link
Rotary Dials	Display	Rotary Dials	Rotary Dials	Display
	<b>BIS00T3</b>			<b>BIS010P</b>
	BIS V-6102-019-C001			BIS V-6111-073-C003
		<b>BNI003P</b>	<b>BNI0030</b>	
		BNI PBS-507-001-Z011	BNI PBS-504-001-K008	
<b>BNI003K</b>	<b>BNI005R</b>			<b>BNI0040</b>
BNI PBS-502-001-Z001	BNI PBS-502-101-Z001			BNI CCL-502-100-Z001

# IO-Link

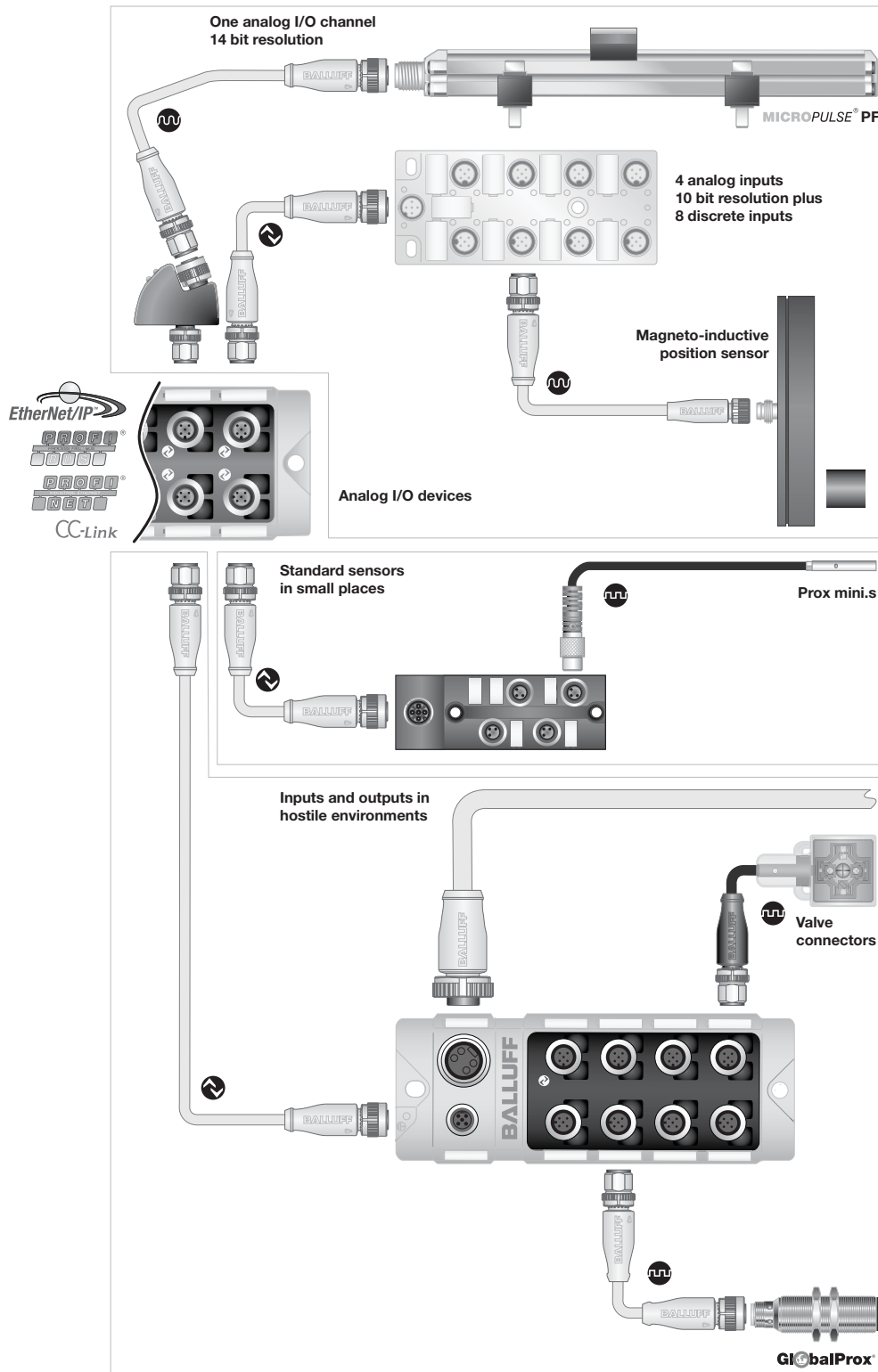
## Input/output devices

### IO-Link Input/Output Devices

One of the major values of IO-Link over standard network I/O is the ability to run many sensors and actuators back through one node or IP address. This is accomplished using the many varieties of I/O hubs offered by Balluff.

- Multiple analog sensors can be run into an input hub with discrete inputs as well
- Balluff's full line of mini sensors can be run in small spaces using M8 hubs
- Metal Inputs and Outputs allows for I/O in the most hostile environments

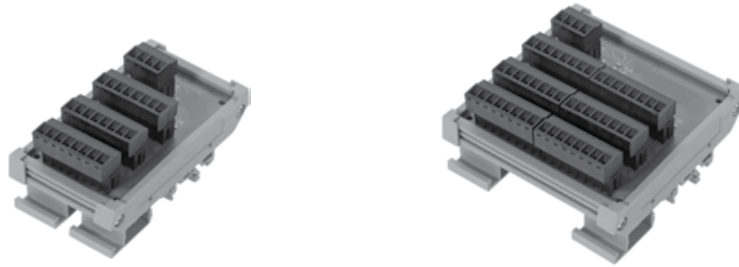
### I/O Devices



# IO-Link

## IP20 terminal I/O hubs

### M12 analog I/O plugs



IP20 terminal I/O hubs are designed for use in custom projects like small push button or indicator stations.

Connection Type	Spring Terminal	Screw Terminal	Spring Terminal	Screw Terminal
8 Configurable with terminals	<b>BNI004K</b>			
	BNI IOL-309-000-K024			
8 Configurable without terminals	<b>BNI007P</b>	<b>BNI007P</b>		
	BNI IOL-309-000-K024-001			
terminal set with labels	<b>BAM01ZJ</b>	<b>BAM01ZF</b>		
	BAM IA-NI-010-K024	BAM IA-NI-008-K024		
16 Configurable with terminals			<b>BNI004L</b>	
	BNI IOL-310-000-K025			
16 Configurable without terminals			<b>BNI007R</b>	<b>BNI007R</b>
	BNI IOL-310-000-K025-001			
terminal set with labels			<b>BAM01ZK</b>	<b>BAM01ZH</b>
	BAM IA-NI-010-K025			BAM IA-NI-008-K025
Max Output Current/Channel	400 mA		400 mA	
Max Current	<1.4 A		<1.4 A	
Mounting	DIN Rail		DIN Rail	
Data	1 Byte IN, 1 Byte OUT		2 Bytes IN, 2 Bytes OUT	

M12 analog I/O plugs are designed for applications where you need analog I/O without the cost or hassle of an analog input card.



Type	Inputs	Outputs	Order Code/Part Number
0-10 V Analog (14 bit), 3-wire input	1		<b>BNI0042</b>
			BNI IOL-714-000-K023
4-20 mA Analog (14 bit), 3-wire input	1		<b>BNI0041</b>
			BNI IOL-712-000-K023
PT100 Analog (14 bit), 3-wire input	1		<b>BNI004T</b>
			BNI IOL-716-000-K023
0-10 V Analog (14 bit), 3-wire output		1	<b>BNI004E</b>
			BNI IOL-724-000-K023
4-20 mA Analog (14 bit), 3-wire output		1	<b>BNI004C</b>
			BNI IOL-722-000-K023



# IO-Link

## M8 discrete I/O hubs M12 discrete I/O hubs M12 analog I/O hubs

I/O hubs come in multiple form factors and configurations and can be used for almost any basic I/O applications, including analog inputs.



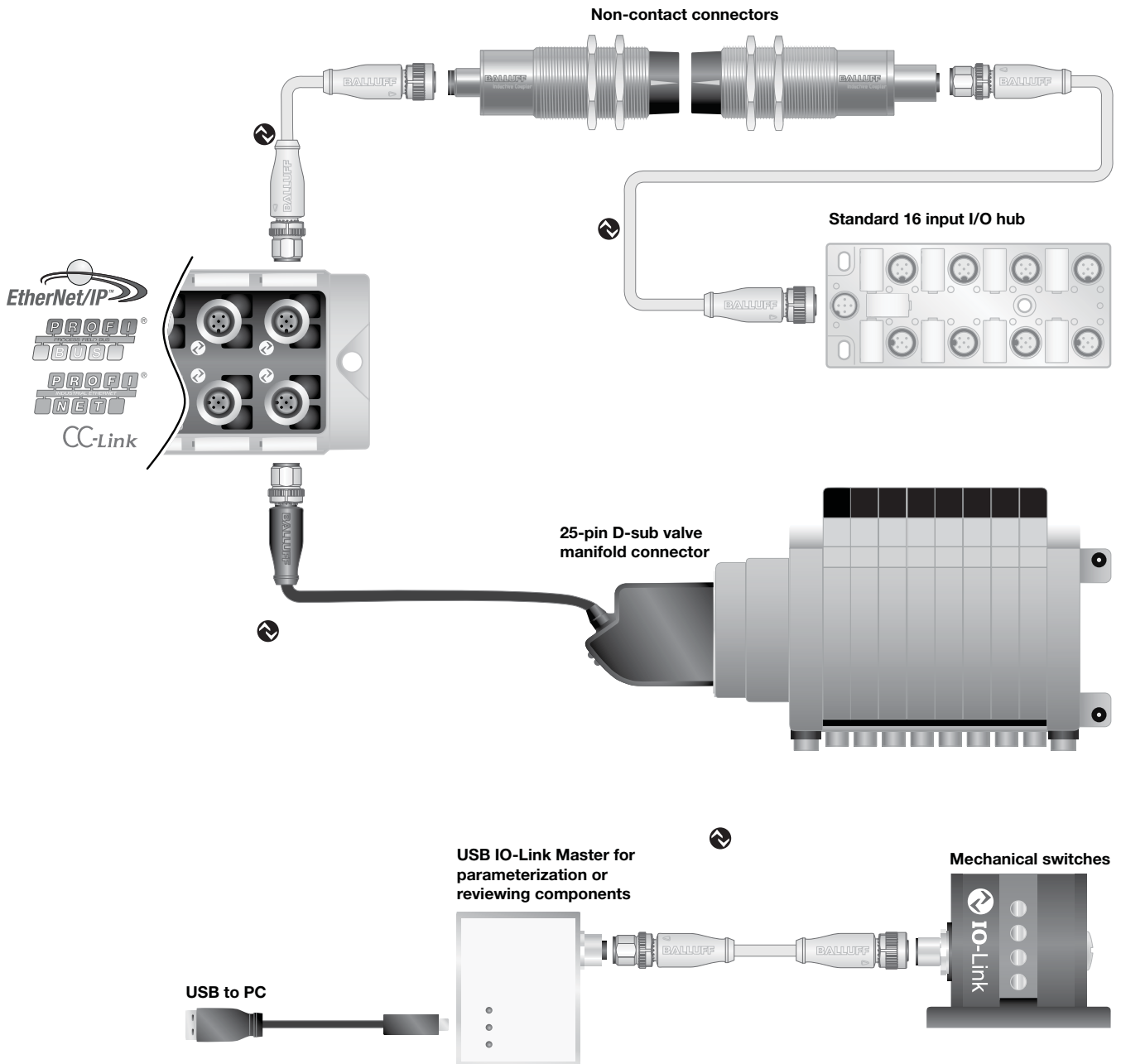
Type	Inputs	Outputs	M8 Plastic	M8 Plastic	M12 Plastic	
Variation						
Number of Ports			4	8	8	
Max Output per port/per block					-	
<b>3-wire input</b>	4 or 8 PNP	-	<b>BNI000P</b> (4 input) BNI IOL-101-000-K018	<b>BNI000R</b> (8 input) BNI IOL-102-000-K019		
<b>3-wire input, w/diagnostics</b>	4 or 8 PNP	-	<b>BNI001W</b> (4 input) BNI IOL-101-S01-K018	<b>BNI001Y</b> (8 input) BNI IOL-102-S01-K019		
<b>4-wire input</b>	8 or 16 PNP	-		<b>BNI0021</b> (16 input) BNI IOL-104-000-K021	<b>BNI0005</b> (8 input) BNI IOL-102-000-K006	
<b>4-wire input w/diagnostics</b>	16 PNP	-		<b>BNI0022</b> (16 input) BNI IOL-104-S01-K021		
<b>4-wire output</b>	-	8				
<b>4-wire output, w/diagnostics</b>	-	8				
<b>5-wire input</b>	16x PNP (or NPN)	-			<b>BNI0006</b> 16x PNP	<b>BNI0074</b> 16x NPN
<b>5-wire input, w/diagnostics</b>	16x PNP (or NPN)	-				
<b>5-wire input, w/diagnostics, w/2 bytes ID data</b>	16x PNP (or NPN)	-				
<b>5-wire input, w/diagnostics, w/4 bytes ID data</b>	16x PNP	-				
<b>5-wire output</b>	-	16				
<b>5-wire output w/diagnostics</b>	-	16				
<b>5-wire configurable</b>	max 16 PNP	max 16			<b>BNI005L</b> BNI IOL-302-000-K006	
<b>5-wire configurable, w/diagnostics</b>	max 16 PNP	max 16			<b>BNI005T</b> BNI IOL-302-S01-K006	
<b>5-wire configurable, w/diagnostics, w/2 bytes ID data</b>	max 16 PNP	max 16			<b>BNI005W</b> BNI IOL-302-S01-K006-C01	
<b>0-10 V analog (10 bit) 5-wire input</b>	4x VDC 8x PNP	-			<b>BNI0008</b> BNI IOL-710-000-K006	
<b>4-20 mA analog (10 bit) 5-wire input</b>	4x mA 8x PNP	-			<b>BNI0007</b> BNI IOL-709-000-K006	



### Connectivity Products with IO-Link

IO-Link's versatility can be seen in the deep product offering covered in these pages. There are times when a standard sensor cable is just not enough. Maybe you need to have I/O on constantly changing end effectors or a rotating fixture. Valve banks with built in network control can add additional costs to a project. Then there are the times you wish you could just hook the device to your computer, just to get that extra bit of interaction with the device. All of these things are capable with IO-Link by Balluff.

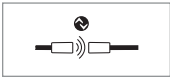
- Non-contact connectors allow for quick change out and free rotation without loss of power or signal
- Remove costly valve bank network controllers and go to an intelligent 25-pin D-sub connector
- Connect directly to any IO-Link device with your computer for easy setup or parameterization



# IO-Link

## Non-contact connectors

### USB master



#### Non-Contact Connectors

<b>Base</b>	<b>BIC0070</b> BIC 1B0-ITA50-Q40KFU-SM4A4A	<b>BIC005A</b> BIC 1I0-I2A50-Q40KFU-SM4A4A	<b>BIC000C</b> BIC 1I0-I2A50-M30MI3-SM4A4A	<b>BIC0053</b> BIC 1I0-IAA50-M30MI3-SM4A4A
<b>Remote</b>	<b>BIC0071</b> BIC 2B0-ITA50-Q40KFU-SM4A5A	<b>BIC005C</b> BIC 2I0-I2A50-Q40KFU-SM4A5A	<b>BIC000E</b> BIC 2I0-I2A50-M30MI3-SM4A5A	<b>BIC0054</b> BIC 2I0-IAA50-M30MI3-SM4A5A
<b>Housing Type</b>	40x40	40x40	M30	M30
<b>Remote Side, Max Current</b>	500 mA	500 mA	500 mA	500 mA
<b>Transmission Range</b>	0...5 mm	0...5 mm	0...5 mm	0...5 mm
<b>Max Data Transmitted</b>	Process & parameters	3 bytes in process only	3 bytes in process only	10 bytes in process only
<b>Process Data</b>	32 bytes in / 32 bytes out	4 bytes in	4 bytes in	11 bytes in

For more information on applications for these products, visit section 4



Optional – M12-M12 cable for power control of IO-Link BIC

Ordering code BCC0E5T, 0.3 m



#### USB Master Features:

- Standard parameterization
- Troubleshooting by device
- PC backup of parameter data



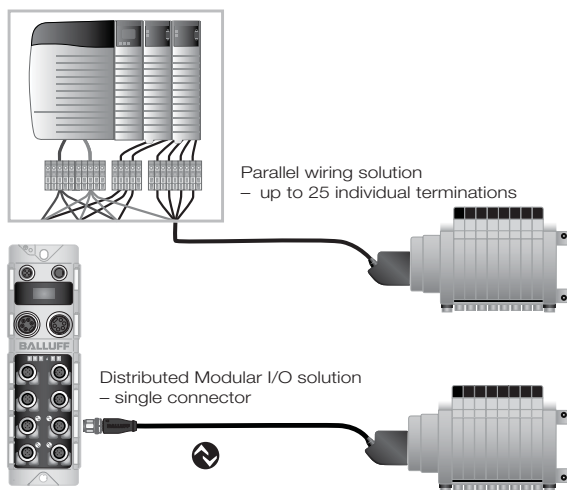
#### USB Master

<b>USB Master</b>	<b>BNI0073</b> BNI USB-901-013-A501
<b>Number of IO-Link Ports</b>	1
<b>USB, Max Current</b>	50 mA
<b>External Power, Max Current</b>	1.6 A
<b>Software Included</b>	Yes

## Valve manifold control utilizing Distributed Modular I/O

When controls engineers get involved in specifying valve manifolds a slippery slope can develop. Where does the mechanical design end and the electrical design begin? Being able to order simple valve manifolds with 25-pin D-sub connectors removes this situation and provides multiple advantages: these valves are low cost, they are simple to wire and they are typically standard off the shelf components so they are easy to repair. But terminating the 25 wires and trying to troubleshoot these multiple connections can be time consuming and costly. By utilizing an industrial network and a Distributed Modular I/O valve manifold connector, cost and time of installation and repair can be dramatically reduced.

- Max 0.7A per output and up to 1.1A total can be active at once
- Connector provides a 0V common on pin 25 and 24V signals
- Up to 16 output positions can be controlled per manifold
- Up to 4 manifolds can be controlled per master device
- Communication speeds between the master and valve control of 2ms



### Valve Mainifold Control over EtherNet/IP

In this conveyor application, a few cylinders are being used for gate control to help sort packages as they come through the process. The valve manifold has a simple 25pin D-sub connector controlling 7 positions on the conveyor. Controlling the valve manifold is a 25pin D-sub valve manifold controller with IP40 protection. This connector is then plugged into an EtherNet/IP master device and the controller sees the valve manifold over the network as a simple 2 bytes of output data. An auxiliary power output, from the master, controls the device power and can turn on or off control to the outputs when necessary. Four manifolds can be controlled on one EtherNet/IP master and the manifolds can be up to 20 meters from the master device.



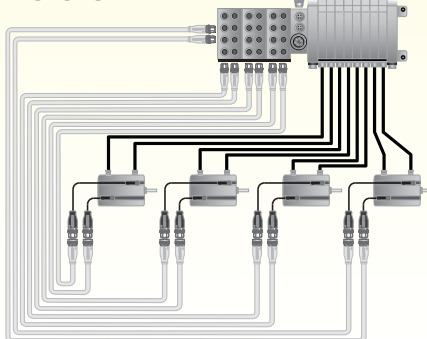
### Valve Mainifold Control via Distributed Modular I/O

Pneumatic Systems Improvement – BMF V-Twin & Valve Manifold Control

#### Network Manifold with Reed Switches

- Centralized Air and I/O
- Congested with pipes and cables
- Reed switches prone to failure

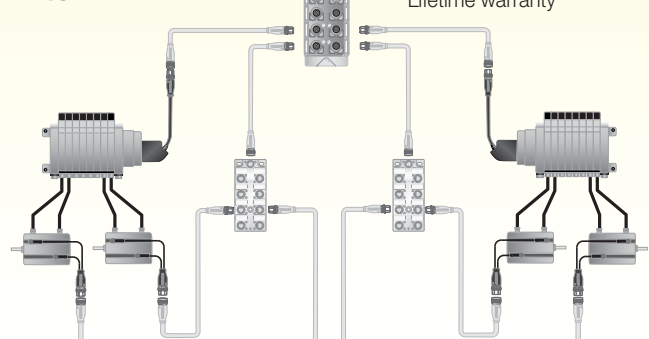
Before



#### BMF V-Twin & Valve Manifold Control

- Distributed I/O and Air
- Small manifolds mounted near actuators
- BMF V-Twin: Less cables, Lifetime warranty

After





# IO-Link

## Valve manifold control



### Part Overview

Part Number	BNI IOL-751-V_-K007	BNI IOL-770-V06-A027	BNI IOL-77_-000-_027*
<b>Connection Type</b>	D-Sub 25-pin	M26 26-pin IP54	flying leads
<b>Max Active Current</b>	1.1A	1.1A	1.1A
<b>Output Type</b>	24VDC outputs, OVDC commons	24VDC outputs, OVDC commons	24VDC supply, 24VDC outputs, OVDC commons
<b>Diagnostics</b>	basic device fault events and information	basic device fault events, point level open coil detection	basic device fault events and information
<b>Inputs/Outputs</b>	16 or 24 outputs	24 outputs	1=16 or 2=8* configurable
<b>Housing Material</b>	plastic	metal	K=plastic, A=metal*

\*Consult factory for availability

Control by Manufacturer	Connector Type	Max Positions	Balluff Ordering Code Balluff Part Number	Accessory	Accessory Description
<b>MAC Valve Manifolds</b>					
MACConnect	D-sub 25pin	16	<b>BNI001L</b> BNI IOL-751-V02-K007		
<b>Bosch Rexroth Valve Manifolds</b>					
LS04, HFO2-LG, HFO3-LG, HFO4	D-sub 25pin	24	<b>BNI001K</b> BNI IOL-751-V01-K007		
<b>Festo Valve Manifolds</b>					
MPA, VUVB	D-sub 25pin	24	<b>BNI001K</b> BNI IOL-751-V01-K007	<b>BAM01RC</b> BAM PC-NI-009-4	For some models, cover plate
CPV	D-sub 25pin	8	<b>BNI001L</b> BNI IOL-751-V02-K007	<b>BAM01RC</b> BAM PC-NI-009-4	For some models, cover plate
<b>SMC Valve Manifolds</b>					
FD0 connector kit	D-sub 25pin	24	<b>BNI001M</b> BNI IOL-751-V03-K007		
MD0 connector kit	M26 26pin	24	<b>BNI004W</b> BNI IOL-770-V06-A027		
<b>Numatics Valve Manifolds</b>					
AKJ connector	D-sub 25pin	22	<b>BNI006R</b> BNI IOL-751-V13-K007		
AKF terminals	screw terminals	16	<b>BNI005M *</b> BNI IOL-771-000-K027		
AKR connector kit	M26 26pin	22	Contact Factory *		
<b>Parker Valve Manifolds</b>					
L2 End Plate Kit D-sub 25pin versions	D-sub 25pin	24	<b>BNI001M</b> BNI IOL-751-V03-K007		
Terminal Housing versions	screw terminals	16	<b>BNI005M *</b> BNI IOL-771-000-K027		
<b>Norgren Valve Manifolds</b>					
VS45	D-sub 25pin	24	<b>BNI001M</b> BNI IOL-751-V03-K007		
VS45	screw terminals	16	<b>BNI005M *</b> BNI IOL-771-000-K027		

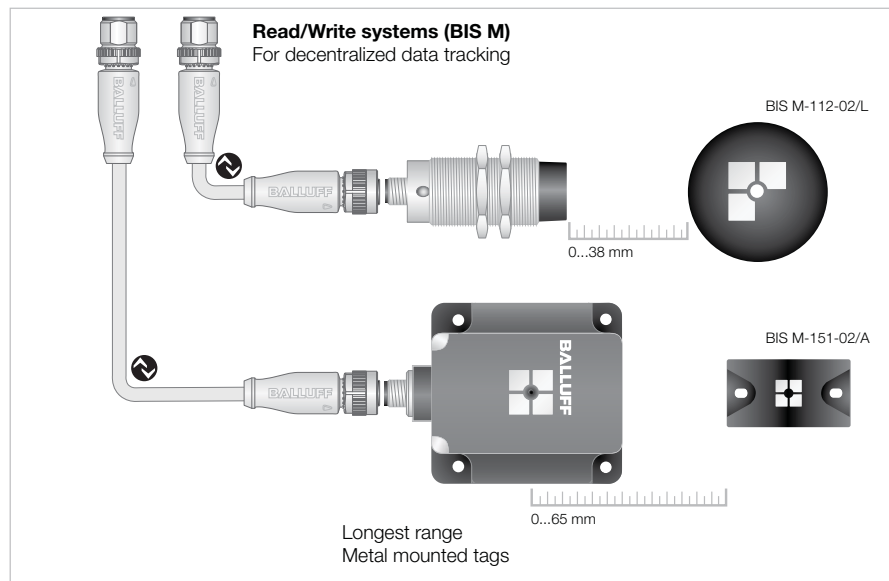
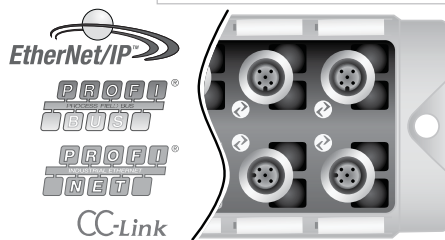
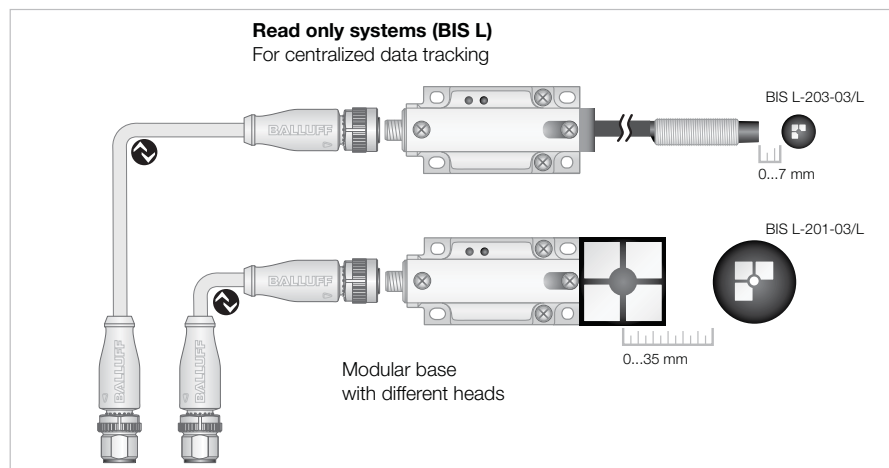
\*Consult factory for availability



### Data Tracking with Industrial RFID using IO-Link

In today's manufacturing environment, it is becoming more and more important to track every step of the production process. Many manufacturers have installed barcode systems or hand written paper work filed by operators or maintenance crews. This can be time consuming and prone to failure. Industrial RFID systems can be used to track production data and record plant floor information in every step of the process. There are two main ways to track part data.

- Centralized Data Tracking:** All of the information is stored in a central computer and the RFID system is used only for identification of the part in the work cell. This is a very similar concept to barcoding, but it is more rugged and 100% reliable. (Read Only Systems)
- Decentralized Data Tracking:** Data per part is stored on the RFID tag and is written to the tag at each workstation. This concept allows for the data to always stay with the part throughout the production process.



## Select your RFID system in 4 easy steps:

1. Decide whether you need to write data to a data carrier.

Yes → see page 2.18

No → see page 2.17

2. Choose the appropriate data carrier form factor.

3. Determine the head based on distance.

4. Determine your required memory capacity.



Size	M12	M18	25x50	40x40
<b>IO-Link Processors</b>	<b>BIS00E1</b>	<b>BIS00E0</b>	<b>BIS00E2</b>	<b>BIS00CZ</b>
<b>Read only</b>	BIS L-409-045-003-07-S4	BIS L-409-045-002-07-S4	BIS L-409-045-004-07-S4	BIS L-409-045-001-07-S4
<b>BIS0035</b>	---	0...15 mm	0...15 mm	0...25 mm
BIS L-100-05/L-RO				
<b>BIS0038</b>	---	0...18 mm	0...18 mm	0...35 mm
BIS L-101-05/L-RO				
<b>BIS003C</b>	---	---	---	0...48 mm
BIS L-102-05/L-RO				
<b>BIS003F</b>	0...7 mm	0...10 mm	0...10 mm	0...16 mm
BIS L-103-05/L-RO				
<b>BIS003R</b>	---	0...15 mm	0...15 mm	0...25 mm
BIS L-200-03/L				
<b>BIS003T</b>	---	0...18 mm	0...18 mm	0...35 mm
BIS L-201-03/L				
<b>BIS003U</b>	---	---	---	0...48 mm
BIS L-202-03/L				
<b>BIS003W</b>	0...7 mm	0...10 mm	0...10 mm	0...16 mm
BIS L-203-03/L				

**Note:**

The BIS L-1\_\_-05/L-RO uses a single write data carrier with 192 bytes.

The BIS L-2\_\_-03/L uses read only data carriers with a fixed “unique number” of five bytes (40 bits).

No repetition of the unique number or delivery of sequential numbers is possible.

All IO-Link RFID processors require a shielded cable. See page 2.19 for suggested part numbers.





Size			M15.5	M18
IO-Link Processors 10 bytes			<b>BIS00LJ</b>	<b>BIS00LW</b>
			BIS M-400-045-002-07-S4	BIS M-402-045-002-07-S4
IO-Link Processors 32 bytes			<b>BIS0104</b>	<b>BIS0105</b>
			BIS M-400-072-002-07-S4	BIS M-402-072-002-07-S4
Read/Write Heads				
752 bytes	2000 bytes	8000 bytes*		
<b>BIS0048</b>	<b>BIS004A</b>		0...5(6) mm	0...5 mm
BIS M-122-01/A	BIS M-122-02/A			
<b>BIS0040</b>	<b>BIS0042</b>		0...6(9) mm	0...5 mm
BIS M-105-01/A	BIS M-105-02/A			
	<b>BIS0044</b>		0...15 mm	0...8 mm
	BIS M-110-02/L			
<b>BIS003Y</b>			0...15 mm	
BIS M-101-01/L				
<b>BIS003Z</b>			0...18 mm	
BIS M-102-01/L				
	<b>BIS0043</b>	<b>BIS0111</b>	0...20 m	
	BIS M-108-02/L	BIS M-108-20/A		
	<b>BIS0045</b>		0...20 mm	
	BIS M-111-02/L			
	<b>BIS0046</b>		0...28 mm	
	BIS M-112-02/L			
<b>BIS0047</b>				
BIS M-120-01/L				

\* only for use with 32 byte processors

For reliable traceability: All data carriers have a 4-byte unique ID contained in the read/write memory. This number is read-only. All IO-Link RFID processors require a shielded cable. See page 2.19 for suggested part numbers.



Size		80x84
IO-Link Processors 10 bytes		<b>BIS00LM</b>
		BIS M-451-045-001-07-S4
IO-Link Processors 32 bytes		<b>BIS0103</b>
		BIS M-451-072-001-07-S4
Read/Write Heads		
<b>BIS004F</b>		0...65 mm
BIS M-150-02/A (vertical mount)		
<b>BIS004H</b>		0...65 mm
BIS M-151-02/A (horizontal mount)		

Metal Mount Series: These tags provide highly reliable RFID performance mounted on any metal surface.

- Features:
- No reduction in range, regardless of metal alloy
  - Large read/write range
  - Compatible with all M processors

Metal mounting plate 40x22mm  
BIS Z-MP-001 please order separately (10 to a package). Required if no metal substrate is used.

IO-Link  
RFID read/write systems  
Shielded cable options



M30	25x50	80x84
<b>BIS00LH</b>	<b>BIS00M1</b>	<b>BIS00LK</b>
BIS M-400-045-001-07-S4	BIS M-402-045-004-07-S4	BIS M-401-045-001-07-S4
<b>BIS0108</b>	<b>BIS0106</b>	<b>BIS0102</b>
BIS M-400-072-001-07-S4	BIS M-402-072-004-07-S4	BIS M-401-072-001-07-S4
	0...5 (8) mm	
0...7(11) mm	0...6 (8) mm	
0...20 mm	0...15 mm	0...30 mm
0...20 mm		0...28 mm
0...28 mm		0...45 mm
0...28 mm		0...40 mm
0...28 mm		0...40 mm
0...38 mm		0...60 mm
		0...50 mm



Shielded Cable Options

Size	M12 - M12	M12
<b>Configuration</b>	Female - Male	Female with Male Field Attachable
<b>Jacket</b>	Shielded PUR Black	Shielded PUR Black
<b>Conductors</b>	4x 0.34 mm <sup>2</sup>	4x 0.34 mm <sup>2</sup>
<b>Available Lengths</b>	1 m, 2 m, 2.5 m, 5 m	2 m, 5 m, 10 m, 20 m
<b>Double-Ended Straight-Straight</b>	<b>BCC M415-M414-3A-305-PS0434-___*</b>	
<b>Single-Ended Straight Female</b>		<b>BCC M415-0000-1A-014-PS0434-___</b>
<b>Single-Ended Right Angle Female</b>		<b>BCC M425-0000-1A-014-PS0434-___</b>
<b>Field Attachable Straight Male</b>		<b>BCC M474-0000-2A-000-01X475-000</b>

\* 010 = 1 m, 020 = 2 m, 025 = 2.5 m, 050 = 5 m, 100 = 10 m



## Advantages of intelligent sensors

As manufacturing becomes even more competitive and the demand for flexibility rises, we begin to ask tough questions to ourselves, our machine builders and our component suppliers:

- How do I increase my production throughput and maintain quality?
- How can I predict sensor or machine failure?
- What can I do to decrease my unplanned downtime?
- Where and how often are most failures occurring?
- How do I get more detailed information out of the system?

The ideal solution to these questions is a system that can easily provide status information from the health of a PLC and industrial network down to the individual sensor location at one work station. The system could predict impending issues and automatically direct action to solve the issue before it causes production to stop. In addition the system should be able to be flexible and adjust to multiple configurations, sizes, colors, etc.

Intelligent sensors are part of this solution. By providing Constant Condition Monitoring, Preventative Diagnostics and Automatic Configuration over common industrial networks, intelligent sensors provide the flexibility and detailed data required in a modern manufacturing facility.

**Detailed sensor information**  
**Exact failure location**

*"I'm working!"*

**Constant  
Condition  
Monitoring**

**Over the industrial network**  
**Sensor health indication**  
**Standard indication** (ON/OFF, measurement, etc.)

**Decreasing unplanned downtime**  
**Predicting failures**

*"Something changed!"*

**Preventative  
Diagnostics**

**Unstable application diagnostics**

- Dirty lens
- Target too close
- Target outside ideal range

**Increasing equipment throughput**  
**Increasing process reliability**  
**Maintaining high quality**

*"Tell me what to do!"*

**Automatic  
Configuration**

**Parameter configuration**

- Remote program from the PLC
- Multiple Configurations stored on the PLC
- Control over features and functions

## Applications of intelligent sensors

### Printing and Paper Example

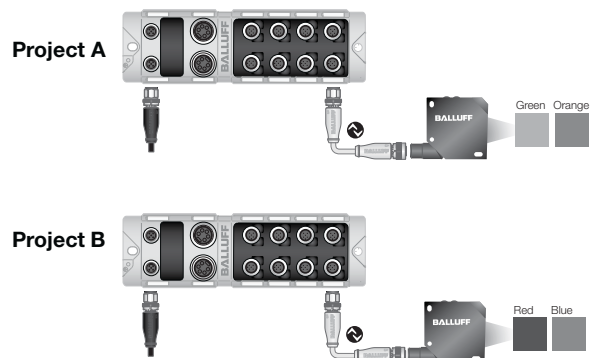
Reliable diagnostics are extremely important for highly dynamic machines. You can identify quality issues linked to the manufacturing process in real-time and take appropriate measures immediately. In the printing and paper machine industry, for example, the machine must react to faults within milliseconds.



### Color Sensor Example

While running project A, the color sensor is configured to detect the difference between five different colors as parts are loaded into a fixture.

After the required parts are run off, a new project is begun with a different color set. In the past, a second color sensor would be required, or the operator would have to reprogram the current sensor for each new color. By using device parameterization, the controller tells the sensor its configuration for project B and quickly, without hassle, the sensor has its new colors.



# IO-Link

## Ultrasonic sensors



<b>Scanning range</b>	<b>20...150 mm</b>	<b>30...250 mm</b>
-----------------------	--------------------	--------------------

### Straight

Resolution		0.069 mm	0.069 mm
push/pull	NO/NC	<b>Ordering code</b>	<b>BUS0020</b>
	IO-Link	Part number	BUS M18M1-GPXI-02/015-S92G
			BUS M18M1-GPXI-03/025-S92G

### Angled

Resolution		0.069 mm	0.069 mm
push/pull	NO/NC	<b>Ordering code</b>	<b>BUS0023</b>
	IO-Link	Part number	BUS W18M1-GPXI-02/015-S92G
			BUS W18M1-GPXI-03/025-S92G

Size	M18x1	M18x1
Supply voltage	10...30 V DC	10...30 V DC
Output current	200 mA	200 mA
Degree of protection as per EN 60529	IP 67	IP 67
Operating temperature	-25...+70 °C	-25...+70 °C
Material	Housing: Nickel-plated brass tube	Nickel-plated brass tube
	Plastic parts: PBT	PBT
	Sensing surface: Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection	M12 connector, 5-pin	M12 connector, 5-pin

**C**onstant **C**ondition **M**onitoring



<b>Scanning range</b>	<b>65...350 mm</b>	<b>120...1000 mm</b>
-----------------------	--------------------	----------------------

### Straight

Resolution		0.069 mm	0.069 mm
push/pull	NO/NC	<b>Ordering code</b>	<b>BUS004Z</b>
	IO-Link	Part number	BUS M18M1-GPXI-07/035-S92G
			BUS M18M1-GPXI-12/100-S92G

### Angled

Resolution		0.069 mm	0.069 mm
push/pull	NO/NC	<b>Ordering code</b>	<b>BUS004Y</b>
	IO-Link	Part number	BUS W18M1-GPXI-07/035-S92G
			BUS W18M1-GPXI-12/100-S92G

Size	M18x1	M18x1
Supply voltage	10...30 V DC	10...30 V DC
Output current	200 mA	200 mA
Degree of protection as per EN 60529	IP 67	IP 67
Operating temperature	-25...+70 °C	-25...+70 °C
Material	Housing: Nickel-plated brass tube	Nickel-plated brass tube
	Plastic parts: PBT	PBT
	Sensing surface: Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection	M12 connector, 5-pin	M12 connector, 5-pin

**C**onstant **C**ondition **M**onitoring





Two switching points  
(NO or NC)



One switching point and  
analog output 0...10 V DC

PNP pressure sensors

<b>-1...2 bar</b> (-14.5...29 psi)	<b>Ordering code</b>	<b>BSP0086</b>	<b>BSP008L</b>
	Part number	BSP V002-EV002-D00S1B-S4	BSP V002-EV002-A00S1B-S4
<b>-1...10 bar</b> (-14.5...145 psi)	<b>Ordering code</b>	<b>BSP0087</b>	<b>BSP008M</b>
	Part number	BSP V010-EV002-D00S1B-S4	BSP V010-EV002-A00S1B-S4
<b>0...2 bar</b> (0...29 psi)	<b>Ordering code</b>	<b>BSP0088</b>	<b>BSP008N</b>
	Part number	BSP B002-EV002-D00S1B-S4	BSP B002-EV002-A00S1B-S4
<b>0...5 bar</b> (0...73 psi)	<b>Ordering code</b>	<b>BSP0089</b>	<b>BSP008P</b>
	Part number	BSP B005-EV002-D00S1B-S4	BSP B005-EV002-A00S1B-S4
<b>0...10 bar</b> (0...145 psi)	<b>Ordering code</b>	<b>BSP008A</b>	<b>BSP008R</b>
	Part number	BSP B010-EV002-D00S1B-S4	BSP B010-EV002-A00S1B-S4
<b>0...20 bar</b> (0...290 psi)	<b>Ordering code</b>	<b>BSP008C</b>	<b>BSP008T</b>
	Part number	BSP B020-EV002-D00S1B-S4	BSP B020-EV002-A00S1B-S4
<b>0...50 bar</b> (0...725 psi)	<b>Ordering code</b>	<b>BSP008E</b>	<b>BSP008U</b>
	Part number	BSP B050-EV002-D00S1B-S4	BSP B050-EV002-A00S1B-S4
<b>0...100 bar</b> (0...1450 psi)	<b>Ordering code</b>	<b>BSP008F</b>	<b>BSP008W</b>
	Part number	BSP B100-EV002-D00S1B-S4	BSP B100-EV002-A00S1B-S4
<b>0...250 bar</b> (0...3626 psi)	<b>Ordering code</b>	<b>BSP008H</b>	<b>BSP008Y</b>
	Part number	BSP B250-EV002-D00S1B-S4	BSP B250-EV002-A00S1B-S4
<b>0...400 bar</b> (0...5802 psi)	<b>Ordering code</b>	<b>BSP008J</b>	<b>BSP008Z</b>
	Part number	BSP B400-EV002-D00S1B-S4	BSP B400-EV002-A00S1B-S4
<b>0...600 bar</b> (0...8702 psi)	<b>Ordering code</b>	<b>BSP008K</b>	<b>BSP0090</b>
	Part number	BSP B600-EV002-D00S1B-S4	BSP B600-EV002-A00S1B-S4
Housing Material		PA 6.6 and stainless steel	PA 6.6 and stainless steel
Plug connector		M12 connector, 4-pin	M12 connector, 4-pin
Process connection		Internal thread G1/4" per DIN EN 3852	Internal thread G1/4" per DIN EN 3852

Design	Relative nominal pressure		Overload pressure		Burst pressure ≥		Permitted vacuum
-1...2 bar	29 psi	2 bar	58 psi	4 bar	145 psi	10 bar	vacuum proof
-1...10 bar	145 psi	10 bar	290 psi	20 bar	508 psi	35 bar	
0...2 bar	29 psi	2 bar	58 psi	4 bar	145 psi	10 bar	
0...5 bar	73 psi	5 bar	145 psi	10 bar	218 psi	15 bar	
0...10 bar	145 psi	10 bar	290 psi	20 bar	508 psi	35 bar	
0...20 bar	290 psi	20 bar	580 psi	40 bar	1088 psi	75 bar	
0...50 bar	725 psi	50 bar	1450 psi	100 bar	2176 psi	150 bar	
0...100 bar	1450 psi	100 bar	2900 psi	200 bar	3626 psi	250 bar	
0...250 bar	3626 psi	250 bar	5802 psi	400 bar	6527 psi	450 bar	
0...400 bar	5802 psi	400 bar	9428 psi	650 bar	10153 psi	700 bar	
0...600 bar	8702 psi	600 bar	10878 psi	750 bar	11603 psi	800 bar	

BSP Accessories



Manometer screw  
connection per  
DIN EN 837



<b>Ordering code</b>	<b>BAM01KP</b>	<b>BAM01KR</b>	<b>BAM01UJ</b>
Part number	BAM AD-SP-008-1G4/1G4-4	BAM AD-SP-008-1G4/1G4-4-EN837	BAM AD-SP-008-1G4/1G2-4
Process Connection	G1/4"	G1/4"	G1/4"
Electrical Connection	G1/4"	G1/4"	G1/2"



One switching point and analog output 4...20 mA



Two switching points (NO or NC)



One switching point and analog output 0...10 V DC



One programmable point and analog output 4...20 mA

<b>BSP0091</b> BSP V002-EV002-A02S1B-S4	<b>BSP004Y</b> BSP V002-EV003-D00A0B-S4	<b>BSP0050</b> BSP V002-EV003-A00A0B-S4	<b>BSP0052</b> BSP V002-EV003-A02A0B-S4
<b>BSP0092</b> BSP V010-EV002-A02S1B-S4	<b>BSP004Z</b> BSP V010-EV003-D00A0B-S4	<b>BSP0051</b> BSP V010-EV003-A00A0B-S4	<b>BSP0053</b> BSP V010-EV003-A02A0B-S4
<b>BSP0093</b> BSP B002-EV002-A02S1B-S4	<b>BSP0021</b> BSP B002-EV003-D00A0B-S4	<b>BSP002A</b> BSP B002-EV003-A00A0B-S4	<b>BSP002N</b> BSP B002-EV003-A02A0B-S4
<b>BSP0094</b> BSP B005-EV002-A02S1B-S4	<b>BSP0022</b> BSP B005-EV003-D00A0B-S4	<b>BSP002C</b> BSP B005-EV003-A00A0B-S4	<b>BSP002P</b> BSP B005-EV003-A02A0B-S4
<b>BSP0095</b> BSP B010-EV002-A02S1B-S4	<b>BSP0023</b> BSP B010-EV003-D00A0B-S4	<b>BSP002E</b> BSP B010-EV003-A00A0B-S4	<b>BSP002R</b> BSP B010-EV003-A02A0B-S4
<b>BSP0096</b> BSP B020-EV002-A02S1B-S4	<b>BSP0024</b> BSP B020-EV003-D00A0B-S4	<b>BSP002F</b> BSP B020-EV003-A00A0B-S4	<b>BSP002T</b> BSP B020-EV003-A02A0B-S4
<b>BSP0097</b> BSP B050-EV002-A02S1B-S4	<b>BSP0025</b> BSP B050-EV003-D00A0B-S4	<b>BSP002H</b> BSP B050-EV003-A00A0B-S4	<b>BSP002U</b> BSP B050-EV003-A02A0B-S4
<b>BSP0098</b> BSP B100-EV002-A02S1B-S4	<b>BSP0026</b> BSP B100-EV003-D00A0B-S4	<b>BSP002J</b> BSP B100-EV003-A00A0B-S4	<b>BSP002W</b> BSP B100-EV003-A02A0B-S4
<b>BSP0099</b> BSP B250-EV002-A02S1B-S4	<b>BSP0027</b> BSP B250-EV003-D00A0B-S4	<b>BSP002K</b> BSP B250-EV003-A00A0B-S4	<b>BSP002Y</b> BSP B250-EV003-A02A0B-S4
<b>BSP009A</b> BSP B400-EV002-A02S1B-S4	<b>BSP0028</b> BSP B400-EV003-D00A0B-S4	<b>BSP002L</b> BSP B400-EV003-A00A0B-S4	<b>BSP002Z</b> BSP B400-EV003-A02A0B-S4
<b>BSP009C</b> BSP B600-EV002-A02S1B-S4	<b>BSP0029</b> BSP B600-EV003-D00A0B-S4	<b>BSP002M</b> BSP B600-EV003-A00A0B-S4	<b>BSP0030</b> BSP B600-EV003-A02A0B-S4
PA 6.6 and stainless steel	Stainless steel	Stainless steel	Stainless steel
M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
Internal thread G1/4" per DIN EN 3852	Internal thread G1/4" per DIN EN 3852	Internal thread G1/4" per DIN EN 3852	Internal thread G1/4" per DIN EN 3852



**BAM0209**

BAM AD-SP-008-1G4/M20X1.5-4

G1/4"

M20x1.5



**BAM01RP**

BAM AD-SP-008-1G4/1R4-4

G1/4"

R1/4"



**BAM01KT**

BAM AD-SP-008-1G4/1N4-4

G1/4"

NPT1/4"



**Internal thread**

**BAM01TR**

BAM AD-SP-011-1G4/1N4-4

1/4" NPT

Internal Thread NPT1/4"



**Inductive Measurement Sensors**

Ordering Code	BAW002F	BAW003A
Part Number	BAW M18MI-BLC50B-S04G	BAW Z01AC-BLD50B-DP03
Range	1...5 mm	1...5 m
Switch Points	0	3
Resolution	± 8 µm	± 10 µm
Analog Value Range	0000...03FF	0000...03FF
Process Data	3 bytes	2 bytes

**Measure**  
**Constant Condition Monitoring**

**Measure**  
**ON OFF**  
**Constant Condition Monitoring**  
**Preventative Diagnostics**  
**Automatic Configuration**



**Inductive Positioning Sensors**

Ordering Code	BIP0004
Part Number	BIP LD2-T040-02-S4
Range	0...40 mm
Target Width	14 mm
Resolution	40 µm
Process Data	2 bytes

**Laser Measurement Sensors**

Ordering Code	BOD0012
Part Number	BOD 63M-LI06-S4
Range	200...6000 mm
Resolution	≤ 1 mm
Repeatability	≤ ± 4 mm
Analog Value Range	00C8...1770
Process Data	3 bytes/1 byte

**Measure**  
**Constant Condition Monitoring**  
**Preventative Diagnostics**

**Measure**  
**ON OFF**  
**Constant Condition Monitoring**  
**Preventative Diagnostics**  
**Automatic Configuration**



**Mechanical Switches**

Part Number	BNS 819-...
Housing Series Available	40, 46, 61, 62, 100

**Inductive Sensors**

Ordering code	BES04FK
Part number	BES M12MI-PSIC20L-S04G
Range	0.5...2mm program
SIO mode	yes
Process data	1 byte

**ON OFF**  
**Constant Condition Monitoring**

**Measure**  
**ON OFF**  
**Constant Condition Monitoring**  
**Preventative Diagnostics**  
**Automatic Configuration**

# IO-Link

## IO-Link intelligent sensors



### Edge Detection

<b>30 mm</b>	<b>Ordering Code</b>	<b>BGL0035</b>
	Part Number	BGL 30C-007-S4
<b>50 mm</b>	<b>Ordering Code</b>	<b>BGL003F</b>
	Part Number	BGL 50C-007-S4
Resolution		0.08 mm
Light Spot		28 mm x 3 mm
Air Blowoff		Built-in
Analog Value Range		0...1024



### Color Sensing

<b>Ordering Code</b>	<b>BFS000F</b>
Part Number	BFS 26K-GI-L04-S92
Diffuse Range	12...32 mm
Reflector Range	50...200 mm
Working Colors	5
Process Data	1 byte
Light Spot	Ø4 mm at 22 mm



### Linear Position Transducer

<b>Ordering Code</b>	
Part Number	BTL6-U100-M____-PF-S4*
Stroke Length	50 mm...4572 mm (2" to 180")
Resolution	5 µm
Analog Value Range	32 bit signed integer

\*Consult factory for availability

#### Ordering Instructions:

**M\_ \_ \_ \_ = desired stroke length in mm (0051 to 4572)**



### Photoelectric BOS 50K - Diffuse sensor

<b>Ordering Code</b>	<b>BOS01JJ</b>
Part Number	BOS 50K-PI-RD11-S4
Scanning range	1...3500 mm
Light type	Red light
Supply voltage $U_b$	10...30 VDC
Interface	IO-Link
Setting/configuration	Teach-in or IO-Link
Switching frequency	200 Hz
Housing material	PC/ABS
Optical surface	Glass
Degree of protection	IP 67
Ambient temperature $T_a$	-5 to +55°C
Connection	M12 connector, 4-pin

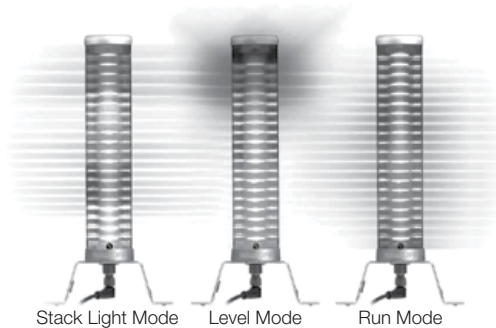




### Stack light & visualization functions with one configurable part number

Whether you are a machine builder interested in reducing the total cost of your machine or an end-user trying to keep your machine operational on a daily basis, the selection of control components can directly impact your success. This is even more true when it comes to the selection of status indicators in your process. It is also important for workers like operators, fork truck drivers, maintenance, and management to clearly and visually understand the status of their workstation, their next load, their next fix or understand the bottlenecks in the production. In these types of applications a stack light or HMI is typically integrated to communicate the status of the process. By using a software-configurable SmartLight to indicate machine status, you can simplify the visual indication with a single part number that costs less than most HMIs.

The Balluff SmartLight can be connected to virtually any industrial network via the open and universal standard, IO-Link. This device can be used with a variety of IP67 distributed modular I/O products offered from a variety of IO-Link vendors which eliminates the need to have a remote I/O box simply to control an indicator light. Balluff's SmartLight can function in any of three modes, can be configured on the fly, and is controlled using simple bitmaps for the outputs.



#### Stack Light Mode

- Program 1-5 positions of 20 rows of 360° LEDs
- Choose from 5 standard colors or configure new
- Easily switch between solid, flashing, and blinking

#### Level Mode

- Tie a bar meter type scale to an analog value
- Program high level or low level indication
- Freely configure the colors, zones, and levels

#### Run Mode

- Indicate running status with a simple scrolling light
- Signal a problem or action required
- Freely configure the color or the scrolling light, background, and speed

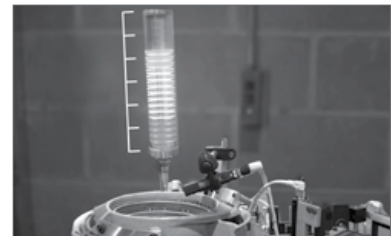
### Stack Light Process Indication

Stack lights in use today come in an overwhelming variety of options and configurations that can make keeping the right spare parts and light bulbs in the store room frustrating. This happens for end users because the equipment comes in with a variety of hardware or because the machine builders' customers specify all different brands and configurations. The SmartLight allows for one part number to cover all applications. Since this device uses an industry standard M12 connector and is IP54, it can be mounted right on the machine for simple and quick installation without the need for a remote I/O box or multiple terminations in the controller.



### Level Visualization

Sometimes there is a need to communicate status beyond just on/off or the need to visualize a measurement or speed. These kinds of indications can be expensive, requiring an HMI for a simple meter, a digital bar meter, or a display with analog outputs. Other costly elements like an enclosure and remote I/O devices could also be needed. The SmartLight's level mode can be used for a variety of indications such as: machine speed, throughput, output quality, operator performance to quota, position of a part, feeder bowl level, hopper level, container level, tank level, output bin level, kanban systems, or pick-to-light.



# IO-Link SmartLight



IO-Link	Device	Device	Device
Designation	SmartLight with buzzer, 1-5 zones	SmartLight, 1-5 zones	SmartLight, 1-3 zones
<b>Ordering code</b>	<b>BNI0085</b>	<b>BNI0072</b>	<b>BNI007F</b>
Part number	BNI IOL-802-102-Z037	BNI IOL-802-000-Z036	BNI IOL-801-000-Z036
Supply voltage $U_B$	18...30 V DC	18...30 V DC	18...30 V DC
Function indicator IO-Link RUN	Green LED	Green LED	Green LED
Power-on indicator	Green LED	Green LED	Green LED
Connection: IO-Link	M12, A-coded, male	M12, A-coded, male	M12, A-coded, male
Connection $U_A$	via IO-Link interface	via IO-Link interface	via IO-Link interface
Configurable	Yes	Yes	Yes
Max. load current of actuators	0.35 A	0.35 A	0.35 A
Degree of protection as per IEC 60529	IP 54 (only in plugged-in and screwed-down state)	IP 54 (only in plugged-in and screwed-down state)	IP 54 (only in plugged-in and screwed-down state)
Operating temperature $T_a$	-5...+70 °C	-5...+70 °C	-5...+70 °C
Storage temperature	-25...+70 °C	-25...+70 °C	-25...+70 °C
Mounting	M18 thread	M18 thread	M18 thread
Dimensions (L×W×H)	55×55×295 mm	55×55×295 mm	55×55×213 mm
Housing material	Transparent polycarbonate, nickel-plated die-cast zinc	Transparent polycarbonate, nickel-plated die-cast zinc	Transparent polycarbonate, nickel-plated die-cast zinc



## IO-Link Version 1.1

Transfer rate	COM 2 (38.4 kBaud)	COM 2 (38.4 kBaud)	COM 2 (38.4 kBaud)
Cycle time	5 ms with IO-Link 1.1 Master 20 ms with IO-Link 1.0 Master	5 ms with IO-Link 1.1 Master 20 ms with IO-Link 1.0 Master	5 ms with IO-Link 1.1 Master 20 ms with IO-Link 1.0 Master
Indicators	Communication: Flashing green LED Power supply: Static green LED	Communication: Flashing green LED Power supply: Static green LED	Communication: Flashing green LED Power supply: Static green LED
IO-Link process data length	3 byte output	3 byte output	3 byte output



Part number	Description
<b>BAM0255</b>	Wall Mount, Right Angle Bracket
<b>SET014H</b>	Pole or Wall Mount, 150 mm Al Rod, Variable Foot, Knuckle & M18 Bracket
<b>SET014J</b>	Pole or Wall Mount, 250 mm Al Rod, Variable Foot, Knuckle & M18 Bracket