BALLUFF

sensors worldwide

Industrial Networking and Connectivity

A guide to industrial network architectures and sensor connections

SENSOR SOLUTIONS AND SYSTEMS

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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.

Industrial Networking and Connectivity

Fluid Sensors

Linear Position Sensing and Measurement

Accessories

Industrial Identification

Object Detection

Systems and Services

Contents

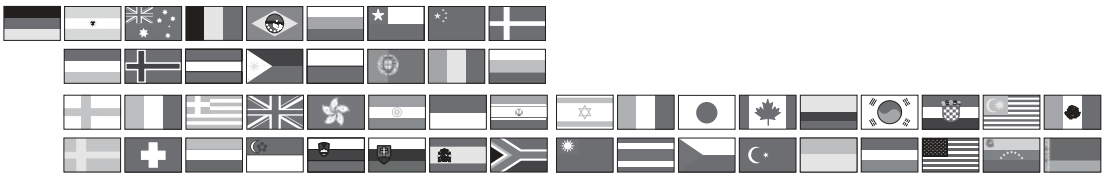
Balluff North America

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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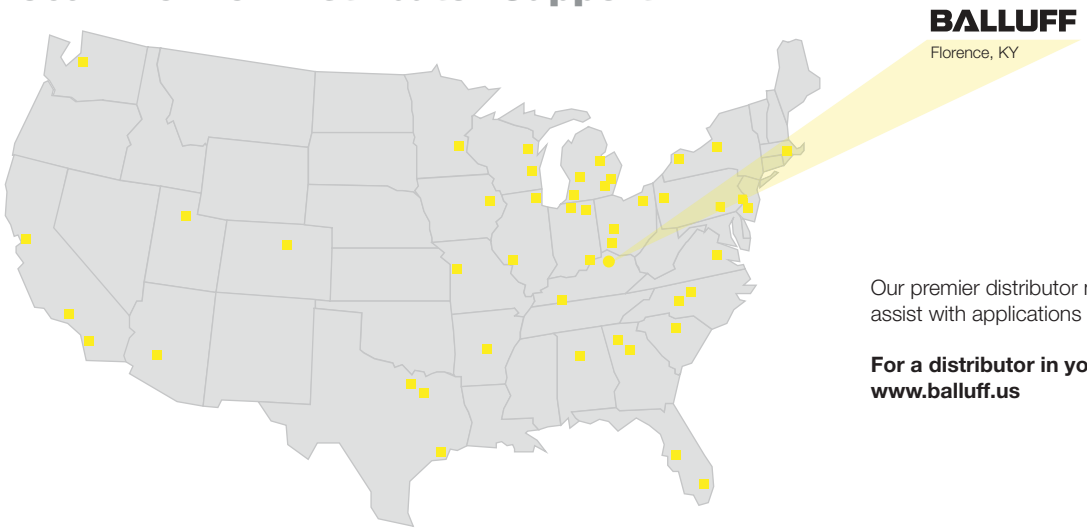

Our premier distributor network can quickly assist with applications and order fulfillment.

For a distributor in your area, visit www.balluff.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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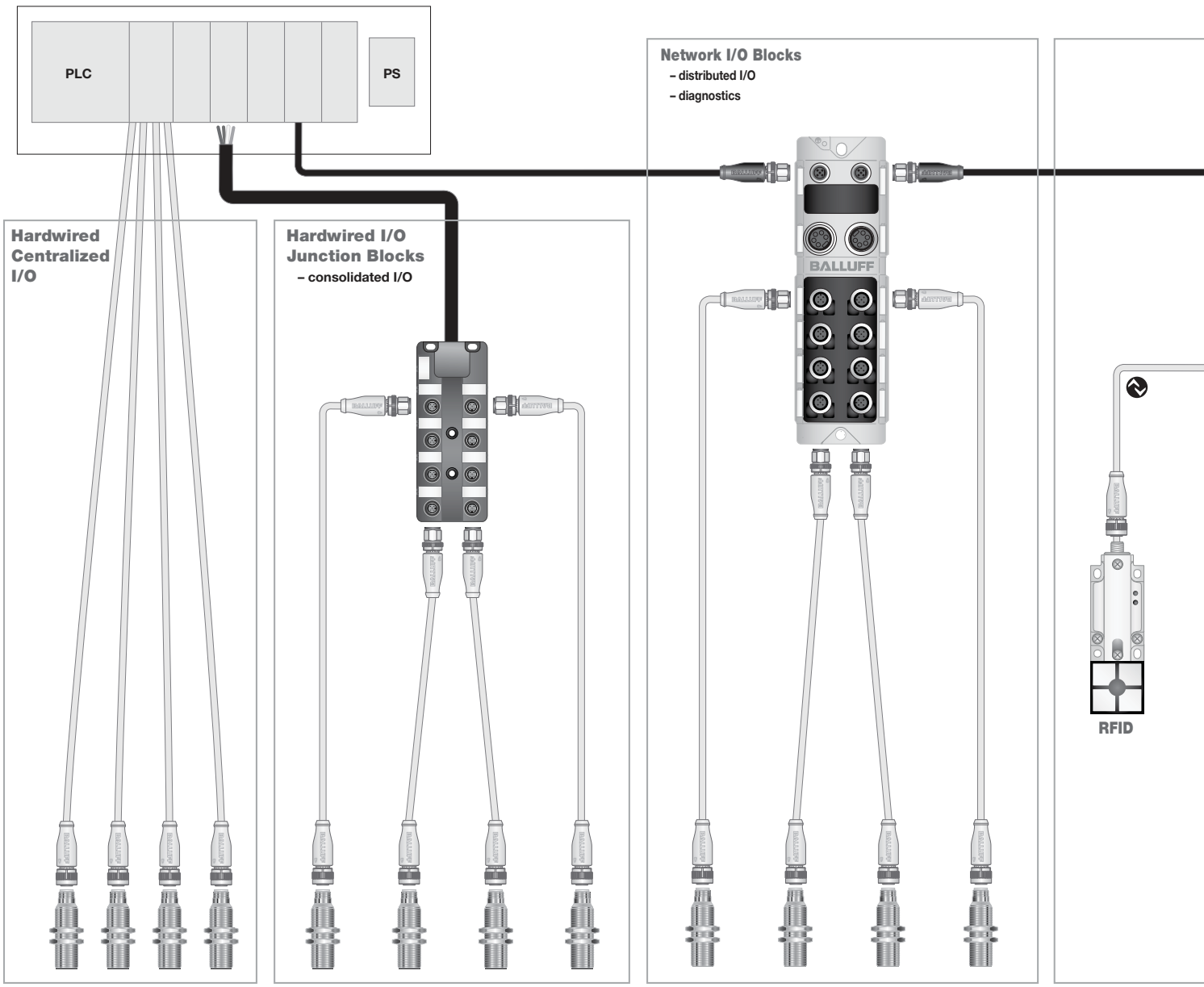
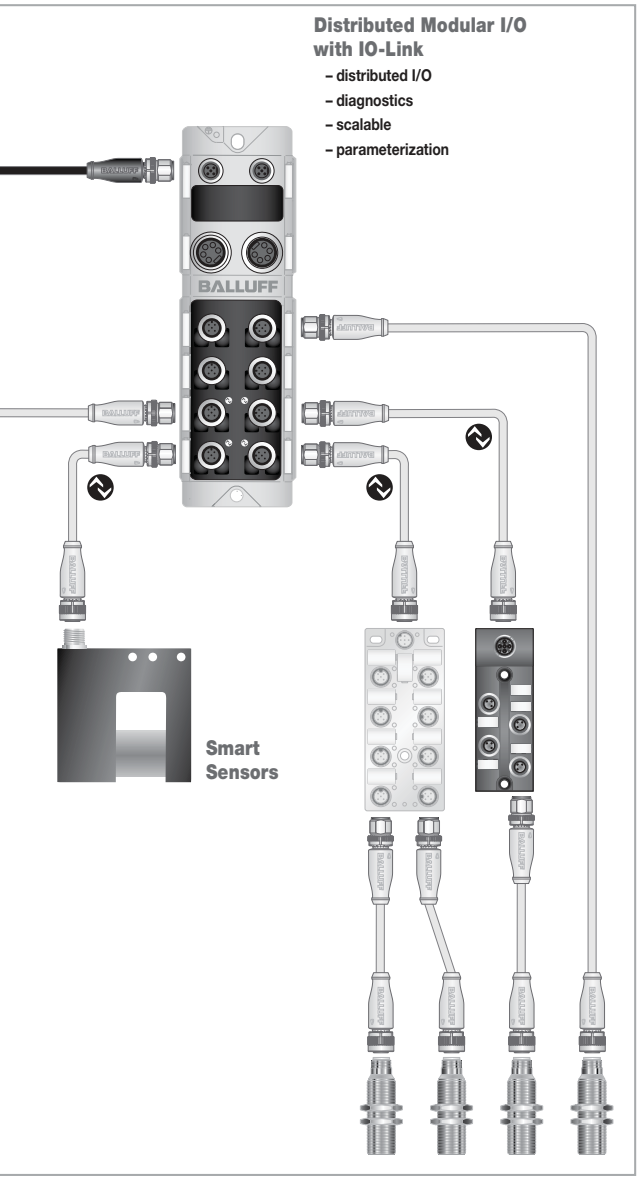
Advantages and disadvantages of I/O architectures



Style	Hardwired Centralized I/O	Hardwired I/O with Junction Blocks	Network I/O Blocks	
Advantages	■ Low component cost ■ Basic electrical knowledge needed ■ Low MRO costs	■ Low component cost ■ Basic electrical knowledge needed ■ Low MRO costs ■ Fewer multi-conductor cables back to controls cabinet ■ Shorter sensor cables	■ Diagnostics ■ Faster troubleshooting ■ One cable back to the controls cabinet ■ Lower maintenance cost ■ Shorter sensor cables ■ Higher up time	
Disadvantages	■ No diagnostics ■ Hard to troubleshoot ■ High maintenance cost ■ Large number of cables routed to controls cabinet ■ Long sensor cables ■ Long downtime	■ No diagnostics ■ Hard to troubleshoot ■ High maintenance cost ■ Long downtime	■ Higher component costs ■ Network knowledge needed	



	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

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.

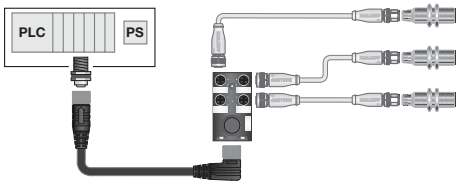
Architectural benefits

LESS

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

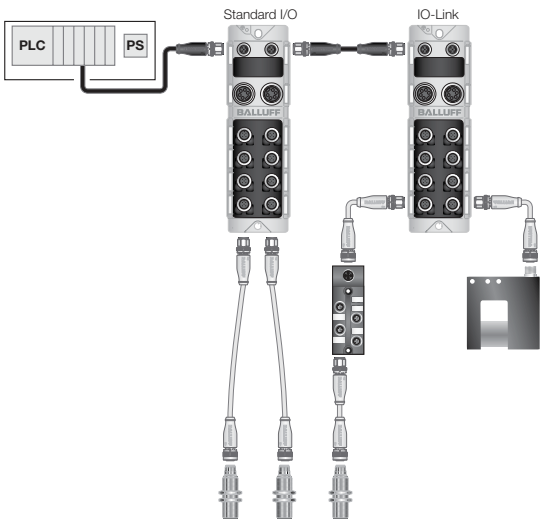
Faster set-up/teardown

Hardwired I/O with Junction Blocks



Shorter cable runs
Easier to troubleshoot

Networked I/O



Diagnostics
Parameterization

MORE

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

Hardware Bill of Materials
- Single-ended cordsets
- Power supplies

Advantages
- Low capital costs
- Basic electrical knowledge needed

Hardwired I/O with Junction Blocks

Hardware Bill of Materials
- Single & double-ended corsets
- 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

Networked I/O

Hardware Bill of Materials
- Single & double-ended corsets
- 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

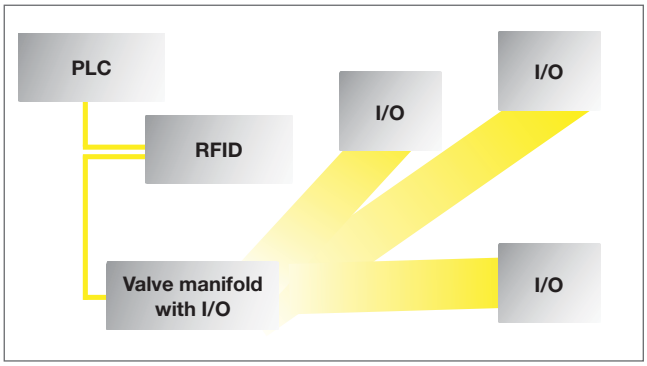
Distributed Modular I/O using IO-Link

Hardware Bill of Materials
- I/O hubs
- Smart devices (sensors, RFID, etc.)

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

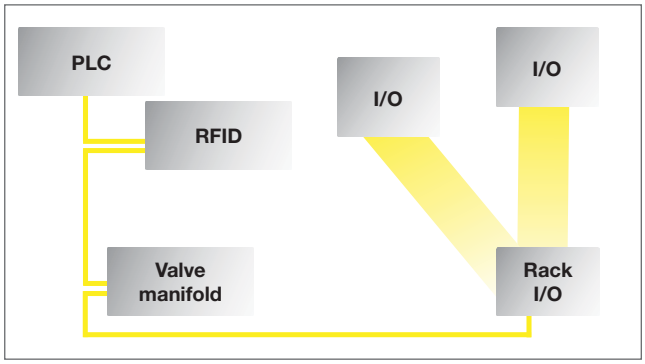
Selecting your Network I/O Architecture

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.



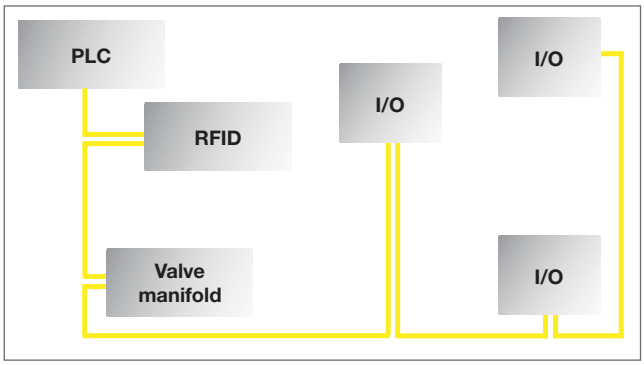
Centralized Valve Manifold with I/O

- — 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

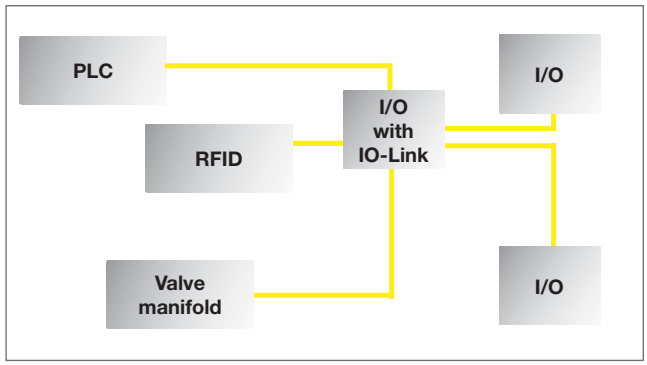
- — Minimum of 3 nodes required in this example
- ↓ Long network cable runs
- ↓ Long I/O cable runs
- ↓ Cable routing problems



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

Visit section 1, Industrial Network I/O, for products and solutions.



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

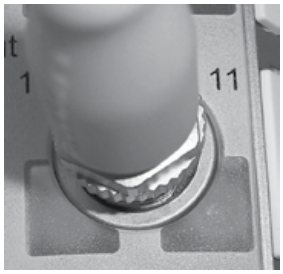
Visit section 2, Distributed Modular I/O, for Balluff IO-Link products and solutions.

Key: ↑ = postive ↓ = negative — = neutral

Machine Mount I/O Block Diagnostics

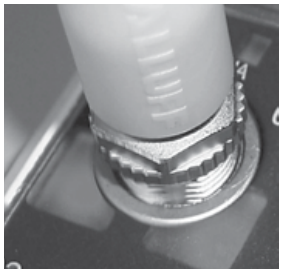
Diagnostic information from a device can give you continuous monitoring data and ensure reliable operation. Errors are centrally detected and with Balluff blocks, errors are quickly pinpointed to help increase system availability and lower maintenance costs.

Input Short Circuit Detection



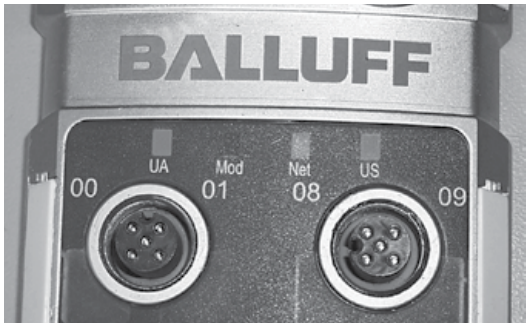
- Port LEDs indicate short
- Diagnostic bits indicate port location to PLC
- Resets automatically once short is removed
- Only one port shorts, not the whole block or system

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

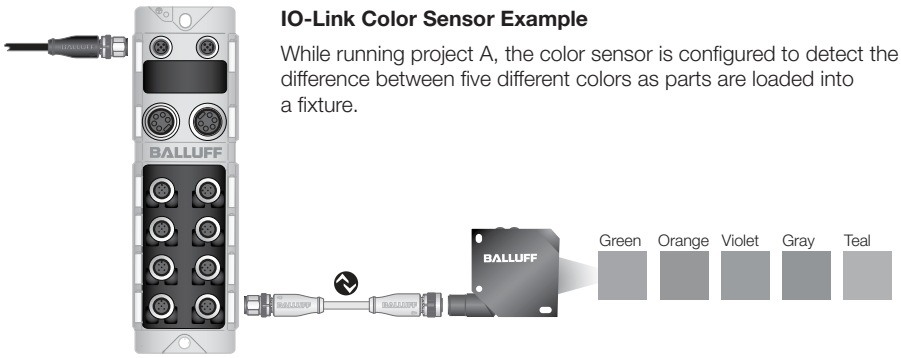
Network and Power Status LEDs



- 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

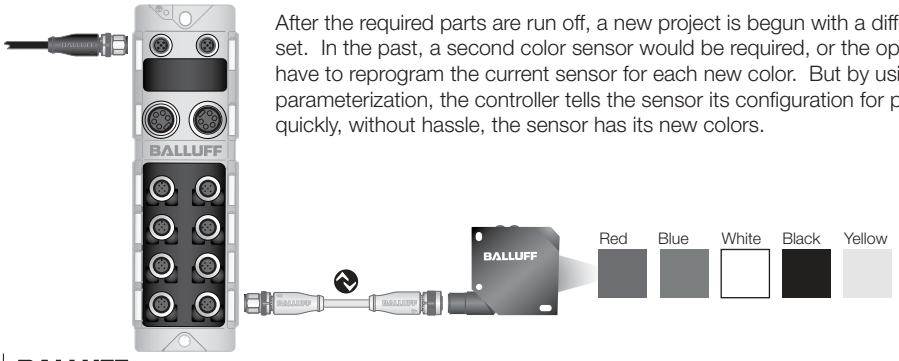
Device Parameterization via IO-Link

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.



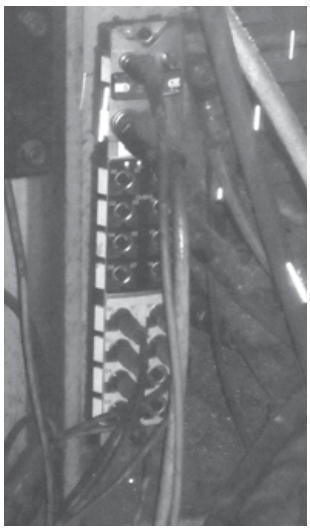
IO-Link Color Sensor Example

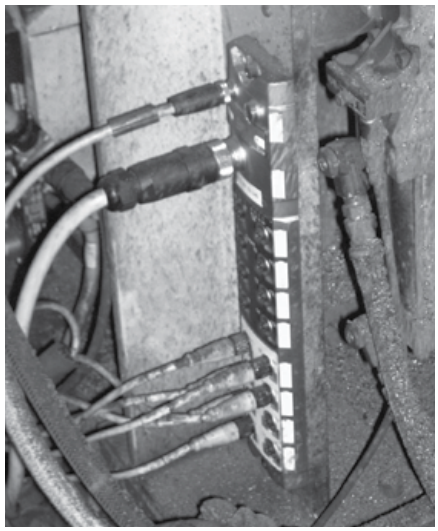
While running project A, the color sensor is configured to detect the difference between five different colors as parts are loaded into a fixture.



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.

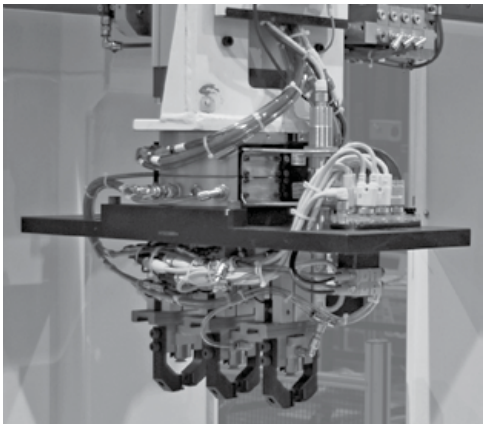
Rugged/Harsh Environments





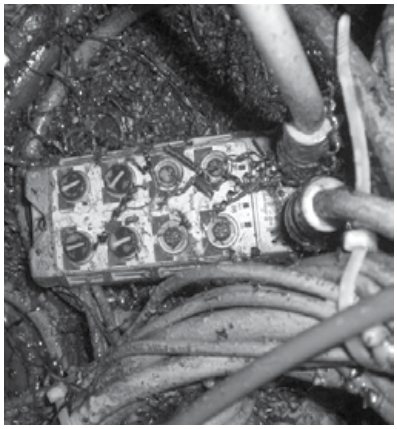
Many industrial applications require equipment to survive in rugged and harsh environments. The Balluff IP67 Machine Mount I/O Blocks meet this requirement in two ways. First, is the physical block itself. The Balluff blocks are fully potted within a metal shell, this gives the blocks a high degree of 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.


DeviceNet
CC-Link

Contents

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.

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.

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.

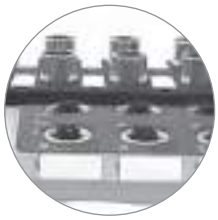
Multiple Protocols
EtherNet/IP, DeviceNet, Profibus, Profinet, CC-Link, IO-Link

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.

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.

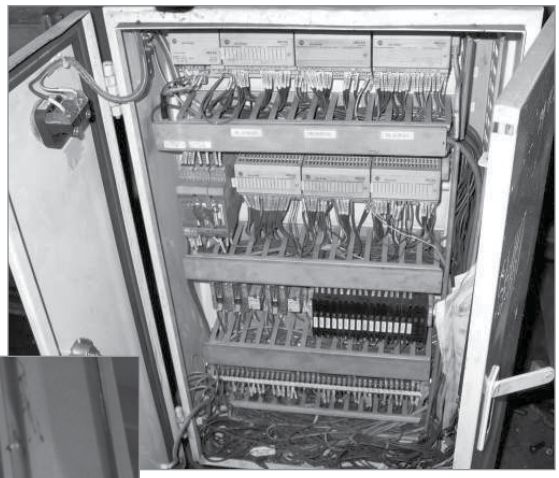
Detailed Level of Diagnostics
Beyond the large I/O status LEDs, Balluff's blocks boast a high degree of diagnostic features from monitoring low voltage conditions on the auxiliary power connector to short circuit and overload status. All of these can be monitored at the controller.

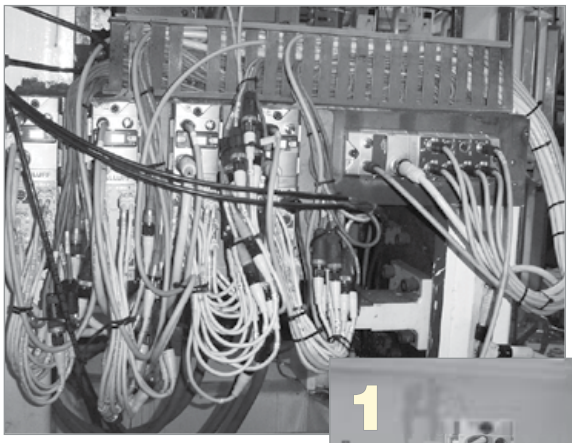
Innovative housing design
The extra-flat profile reduces potential dangers posed by cables. Rounded corners offer highly visible locations for channel markers and two mounting points are sufficient to secure the robust metal housing.

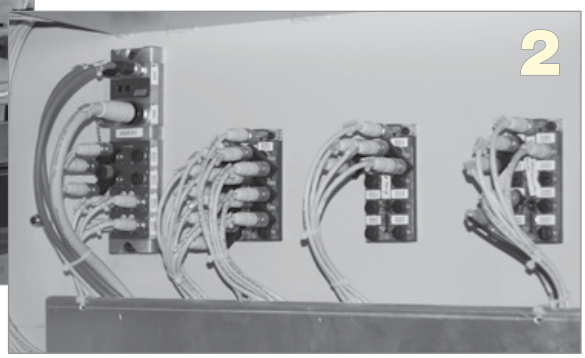


Do you currently wire all of your I/O back to a cabinet?

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.

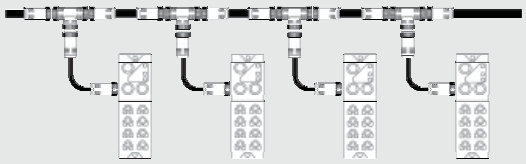
1. **XXL Machine Mount I/O** allows for double the amount of I/O points as a standard I/O module and has a smaller footprint. This allows for the same amount of data with one less network address, fewer network cables, and depending on the machine, can reduce the number of switches required. (See EtherNet/IP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

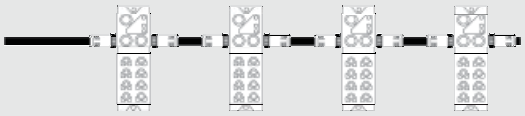
Your machine designs should not be hampered by inflexible network topology. Balluff's networking products include cables, tees, and hubs that allow you to mix and match elements of all topologies. Raw cable, single-ended cables, and field attachable connectors ensure installation flexibility.

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



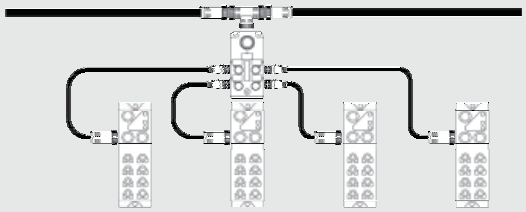
DeviceNet™ CC-Link

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



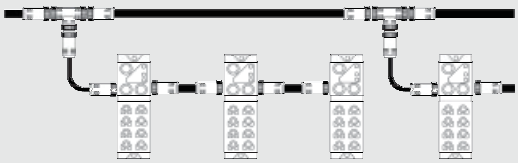
EtherCAT® EtherNet/IP™ PROFIBUS CC-Link DeviceNet™ PROFINET

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



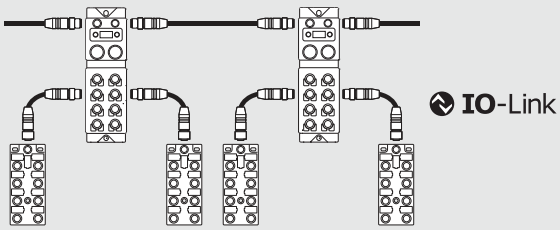
EtherNet/IP™ DeviceNet™ PROFINET IO-Link

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



DeviceNet™ CC-Link PROFIBUS PROFINET

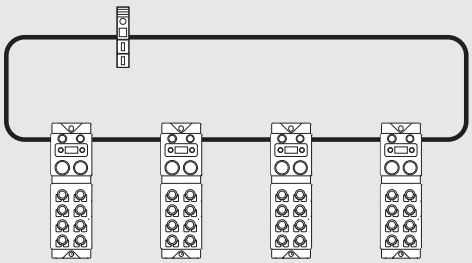
Extended Star
- Ideal for many large clusters of I/O
- Multiple I/O devices per address
- Least expensive - low-cost cables and hubs



IO-Link

EtherCAT® EtherNet/IP™ PROFIBUS CC-Link DeviceNet™ PROFINET

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



EtherCAT® EtherNet/IP™ PROFINET

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

Input/Output
- 8 PNP inputs and 8 sourcing outputs or 16 PNP inputs and16 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

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.

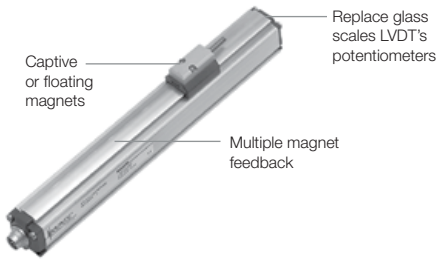
Easy Onsite Troubleshooting
Diagnostic LEDs and bits communicated to the controller allow for easy troubleshooting at the HMI or at the device. If further work with the processor is required, a service port is available on most units allowing a direct connection to the processor to allow for easy access.

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.



		EtherCAT	EtherNet/IP	DeviceNet	Profinet	Profibus	CC-Link	IO-Link	
Systems	**Housings**	**EtherCAT**	**EtherNet/IP**	**DeviceNet**	**Profinet**	**Profibus**	**CC-Link**	**IO-Link**	**Other Networks**
		Page 1.9	Page 1.13	Page 1.21	Page 1.33	Page 1.37	Page 1.43	Page 2.1	See RFID Catalog
Industrial Identification RFID Systems									
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		Metal	Plastic/Metal		Plastic/Metal		Plastic/Metal	InterBus, TCP/IP
	BIS V	Yes	Yes		Yes	Yes	Yes		IO-Link
BIS M System - Faster data and longer distances	Plastic/Metal		Metal	Plastic/Metal	Plastic/Metal	Plastic/Metal	Metal	Plastic/Metal	InterBus, TCP/IP
	BIS V	Yes	Yes		Yes	Yes	Yes		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
Micropulse Linear Position Transducers									
Rod Style - Hydraulic cylinder position feedback	Rod-style (Standard)	Yes				Yes			CANopen
	Rod-style (Ex-proof)					Yes			CANopen
Profile Style - Linear position feedback	Profile housing	Yes		Yes		Yes			CANopen
Low Profile Style - Linear position feedback	PF housing							Yes	

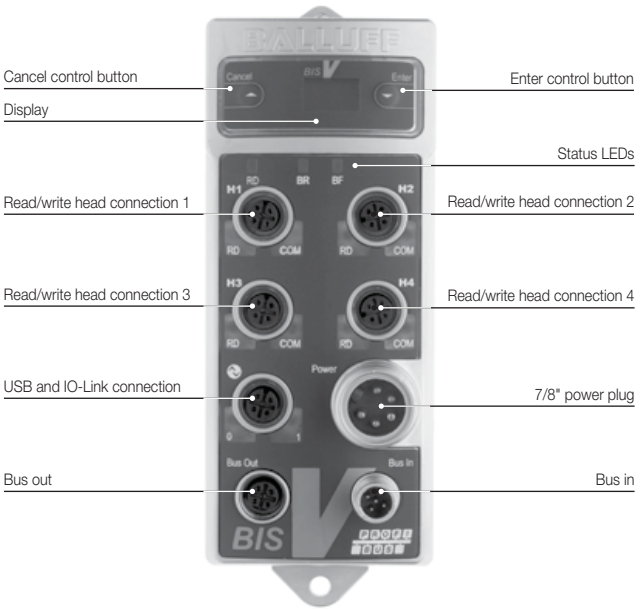
A new generation system for more flexible RFID

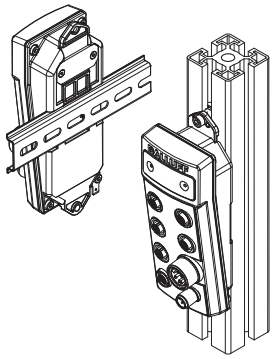
Combine up to four low and high frequency read/write heads with I/O in one device.

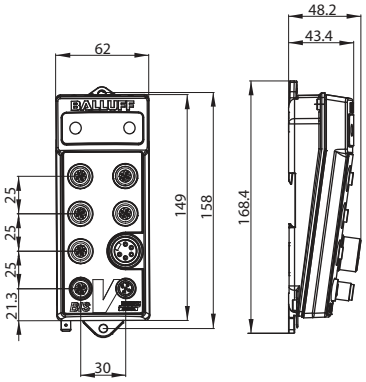
The BIS V Radio Frequency Identification (RFID) system is founded on a new generation of RFID processors that maximize your flexibility by providing a single device for both low frequency 125Khz and high frequency 13.56Mhz read/write heads with an IO-Link master port. Combining up to four heads on either 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.





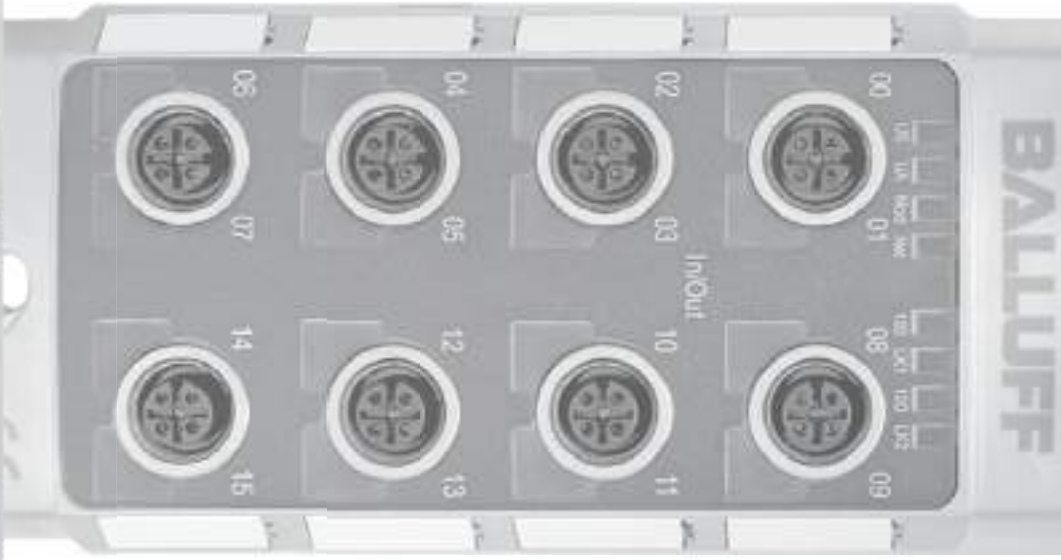


Description		BIS V RFID processor
PROFIBUS	**Ordering code**	**BIS00T3**
	Part number	BIS V-6102-019-C001
EtherCAT	**Ordering code**	**BIS00U9**
	Part number	BIS V-6110-063-C002
CC-Link	**Ordering code**	**BIS010P**
	Part number	BIS V-6111-073-C003
EtherNet/IP	**Ordering code**	**BIS0122**
	Part number	BIS V-6106-034-C004
Power supply		24 V DC ±10% LPS Class 2
Residual ripple		≤ 10%
Power supply		≤ 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 (170×60×40 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.


EIP2
IP
SN
GW
3 2 1 0
Power
In
BALLUFF
US UA Mod Net
100 LK1 100 LK2
01
08
09
In/Out
03
10
11
05
12
13

EtherCAT®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BALLUFF

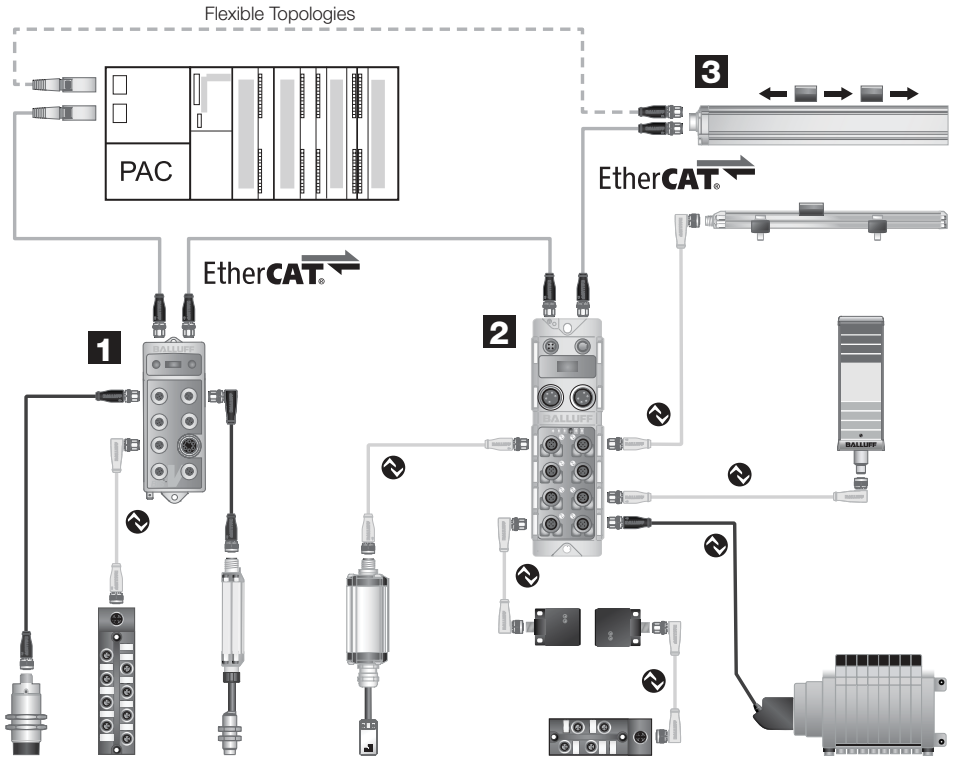
Contents

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®

Expanding the value of 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.



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.

Distributed Modular I/O with IO-Link

Fieldbus	EtherCAT
Design	8× IO-Link, 16× I/O
Ordering code	**BNI0077**
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 (L×W×H)	225×68×36.9 mm
Housing material	Nickel-plated die-cast zinc

IO-Link Version 1.1

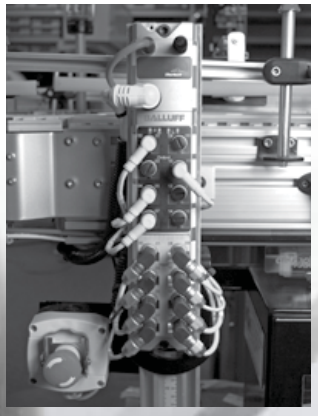
No. of IO-Link master ports		8× master
Operating modes (3-wire)		SIO, COM 1, COM 2, COM 3
Indicators	Communication	Green LED
	Error	Red LED
Max. load current for IO-Link device		1.2 A

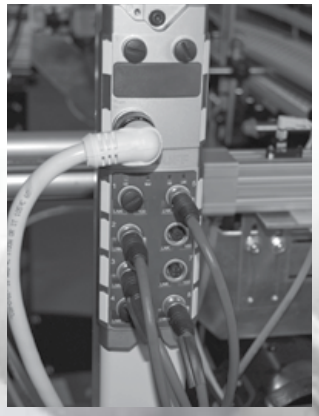
IO-Link Version 1.1

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

EtherNet/IP™





EtherNet/IP
Contents

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.

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.

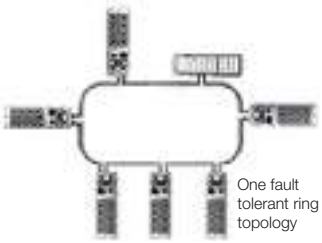
Balluff has developed a comprehensive line of EtherNet/IP products that include two versions of machine-mount I/O blocks, unmanaged switches, network cables and accessories. At the heart of the line are the I/O blocks. These blocks have a low initial cost per point and are designed to save money over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

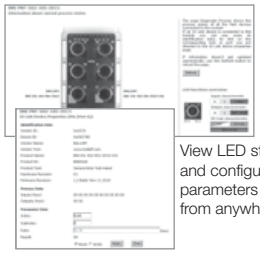
Webserver and DLR Capable

DeviceLevel Ring (DLR)



One fault tolerant ring topology

Webserver configuration and diagnostics



View LED status and configure parameters from anywhere

Easy, Flexible IP Addressing Methods
- BOOTP/DHCP
- IP67 quick change addressing plug (IPAP)
- Addressable display (100 series only)
- Webserver interface

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.

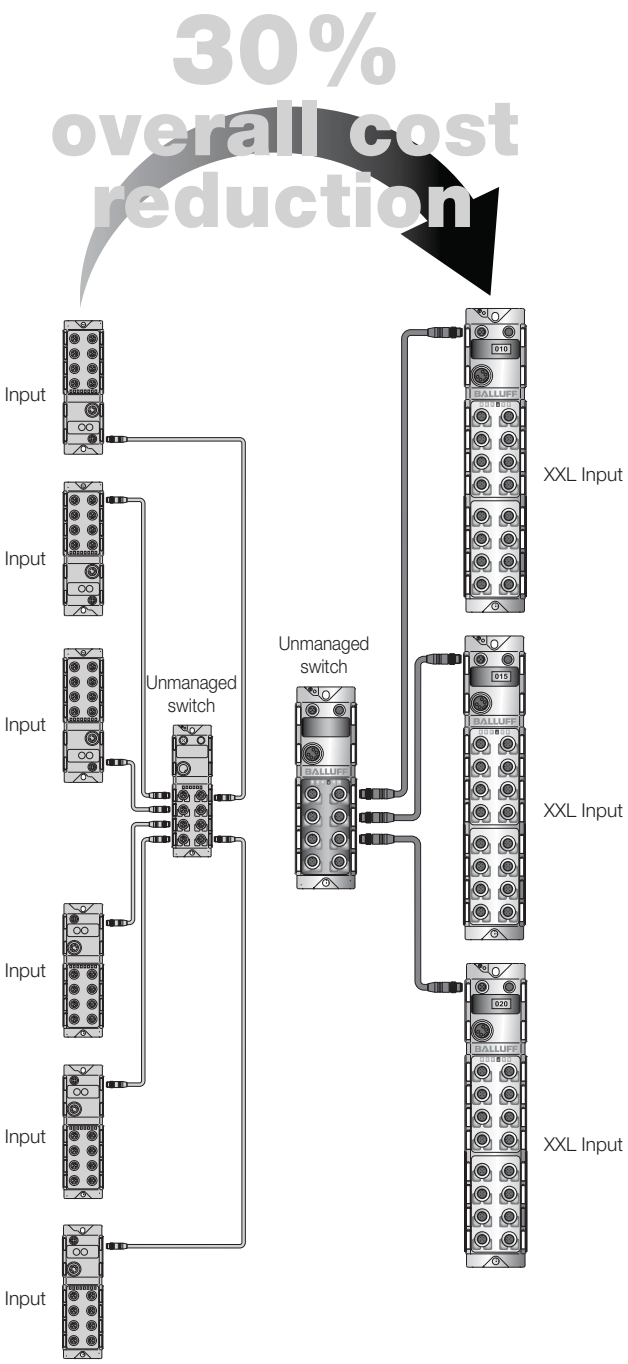
Addressable Display (100 series only)
Backlit display shows IP address, subnet mask, and gateway address. Push buttons allow the setting of any octet of the above addresses. The display can be locked out via the controller.

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%



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.

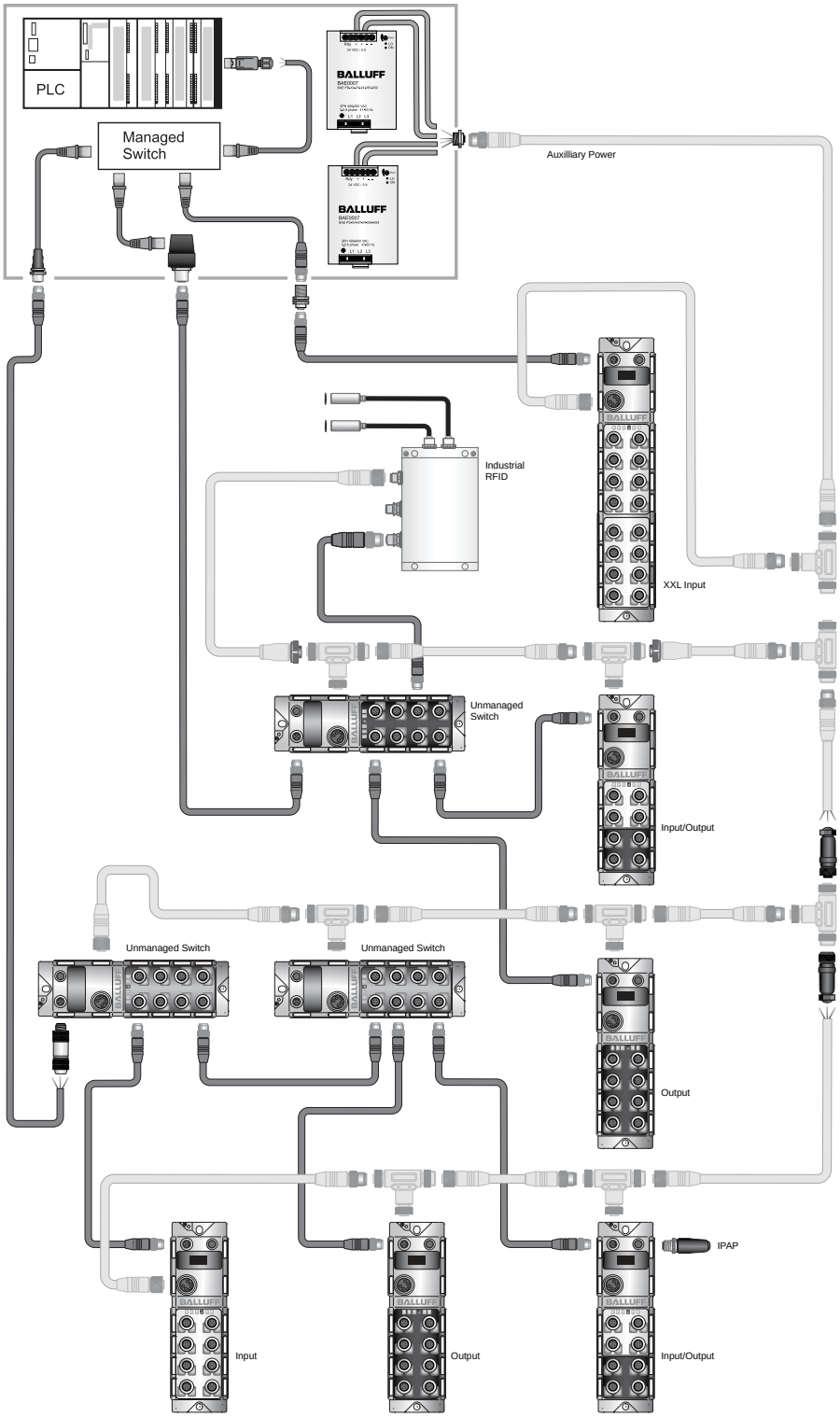
5. **Establish Procedures** – Define procedures early. How do I swap out a device? If the switch is dead, how do I replace it and reconfigure it? Can I use a longer cordset to replace a shorter bad one? All these questions will come up at some point, be proactive and have a procedure in place.

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.



Machine mount I/O blocks

DLR Capable

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

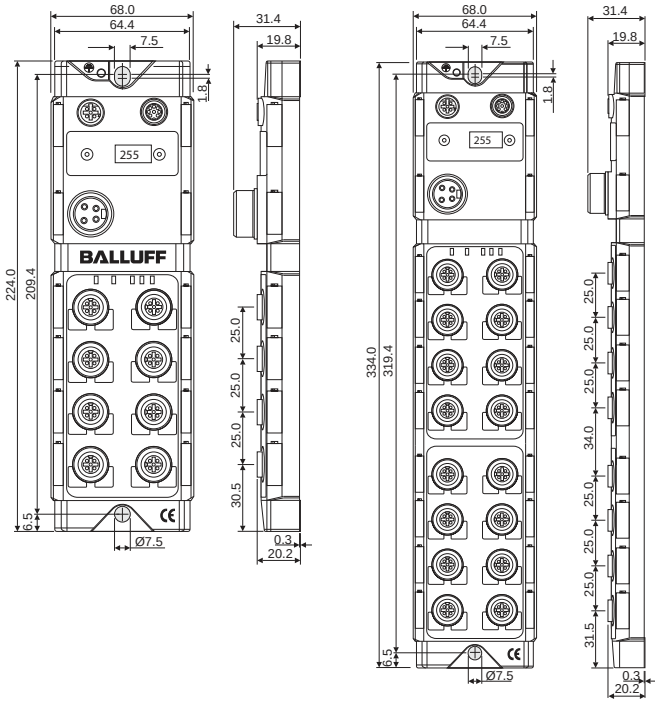
Note: For standard specifications and technical drawing, see page 1.18.
For bitmaps and pinouts, see technical reference section t.

Unmanaged Switches		
5 port, IP20	**BNI005E**	
	BNI TCP-951-000-E028	
8 port, IP20	**BNI0067**	
	BNI TCP-952-000-E029	
9 port, IP67		**BNI000F**
		BNI EIP-950-000-Z009

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	

Receptacles and Bulkheads

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

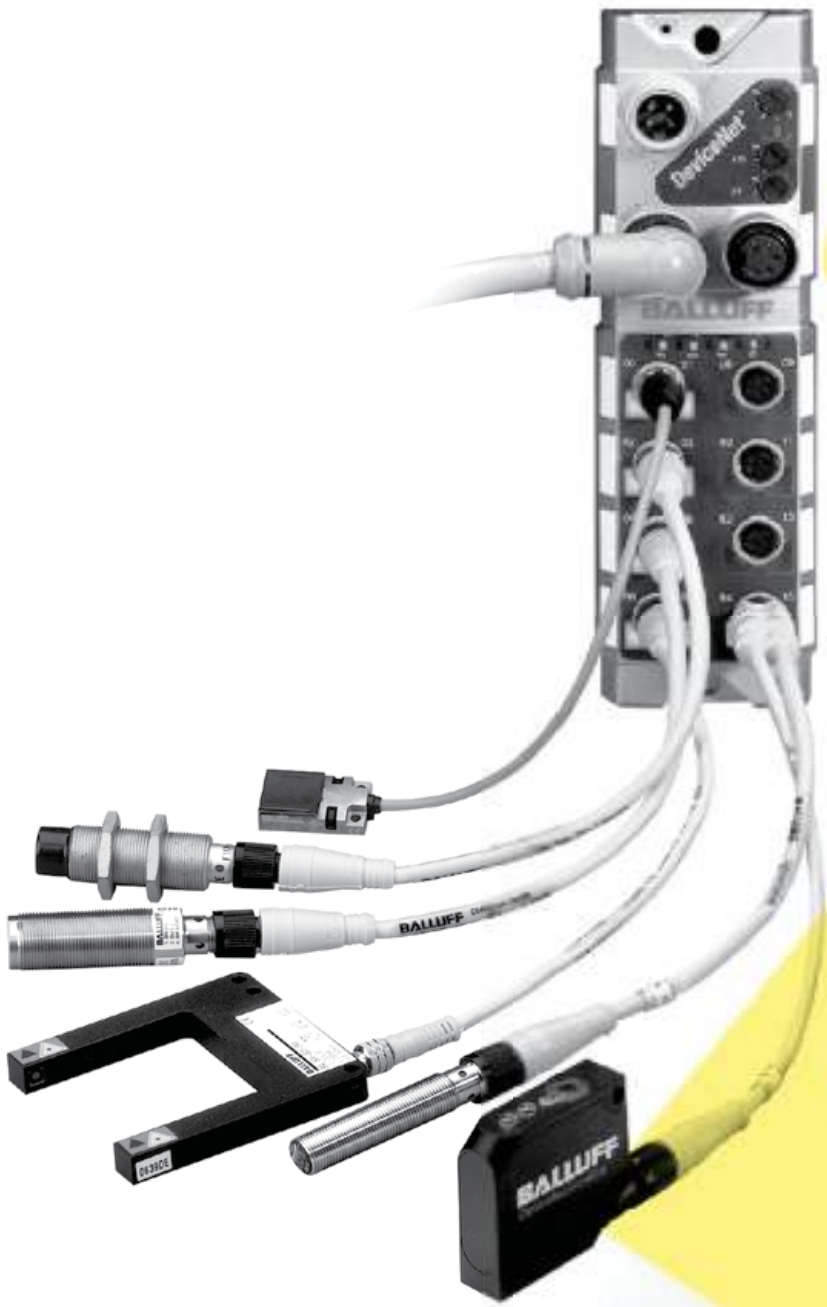
Field Attachables

Order Code	Description
BCC03WZ	M12, D-coded, Straight Male
BCC03Y0	M12, D-coded, Right-Angle Male
BCC03Y1	M12, D-coded, Straight Female
BCC03Y2	M12, D-coded, Right-Angle Female
BCC06FH	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-___	**BCC0CN3**
		BCC M414-E894-8G-672-VS64N8-___*		BCC E894-E894-90-339-VS64N8-___*	**BCC0AZ9**
		BCC M414-E894-8G-672-ES64N9-___		BCC E894-E894-90-339-ES64N9-___	**BCC0AUJ**

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

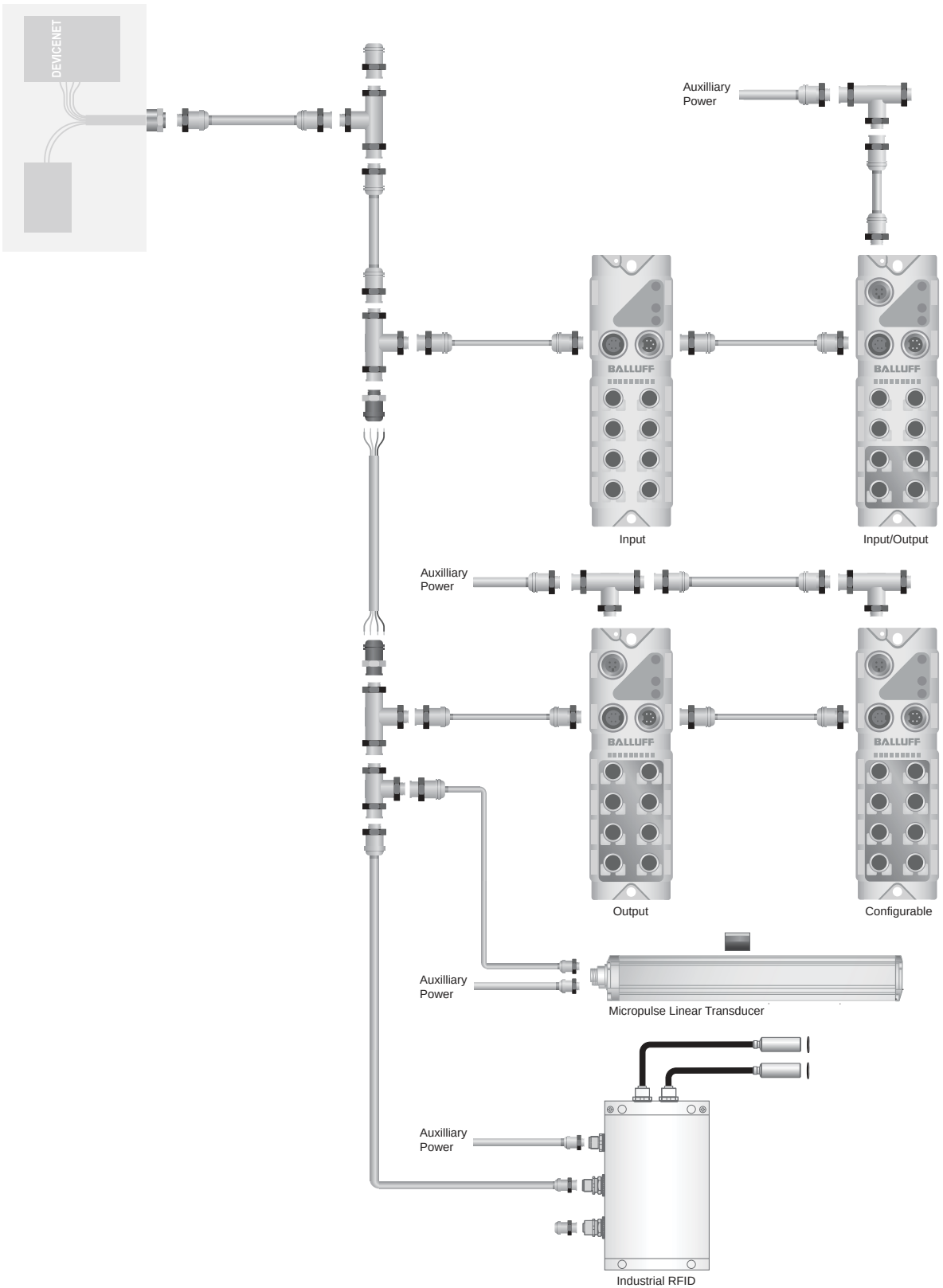
For a simple choice of outstanding network components, Balluff offers the entire spectrum of high-performance network technology. For applications in the USA, such as with Rockwell Automation and other controller manufacturers, you will find all modules for efficient DeviceNet installation at Balluff.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



Contents

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.



Machine mount I/O blocks

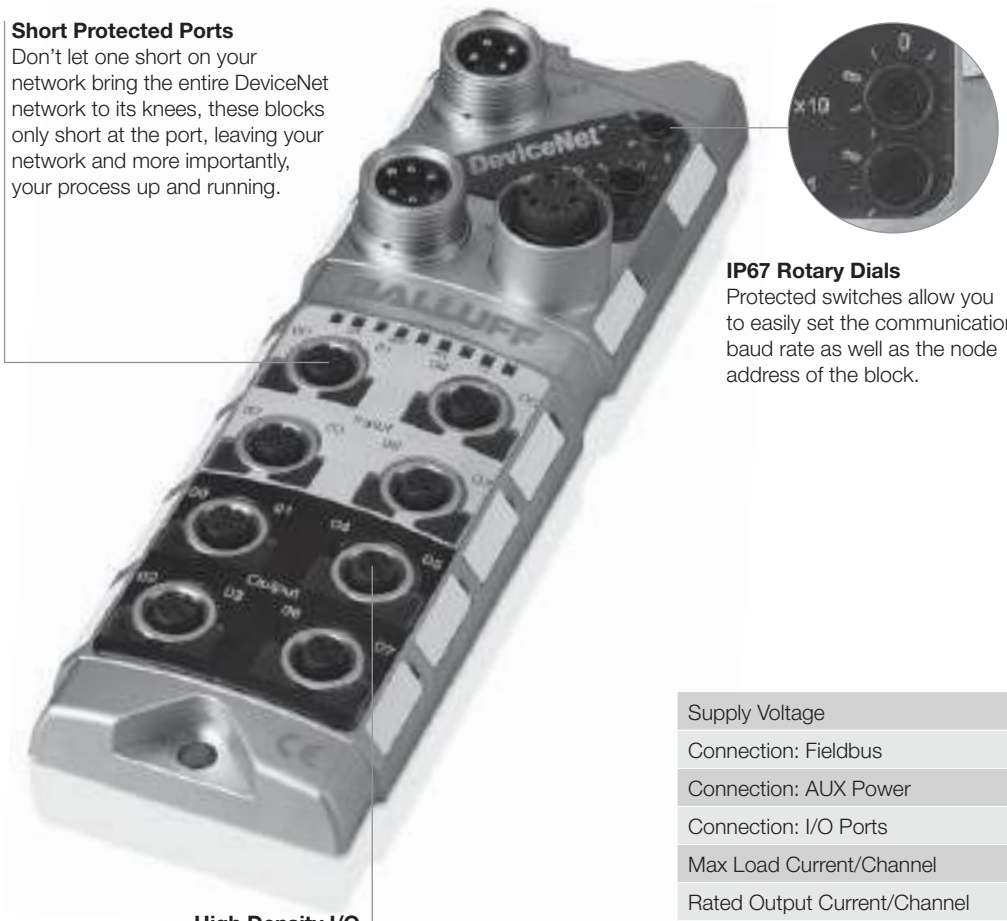
The heart of Balluff's Network Component System

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.

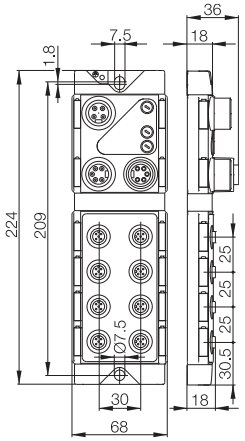
DeviceNet™ has become the preferred North American I/O network for connecting field devices to centralized control solutions from Allen Bradley™ and other control system suppliers. DeviceNet™ allows designers to integrate a broad range of compatible connectivity products from many manufacturers. But 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	**BNI0001**	BNI DNT-104-000-Z004
8 output	**BNI0002**	BNI DNT-202-000-Z005
16 configurable	**BNI0003**	BNI DNT-302-000-Z005
8 input/8 output	**BNI0004**	BNI DNT-305-000-Z005
4 IO-Link/12 config	**BNI005A**	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, ODVA, 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

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
Order Code		BCC0AEL	BCC0AEM	BCC0AEN	BCC0AEP	BCC0AER
Length		100 m	100 m	100 m	100 m	100 m
Jacket Color		Grey	Grey	Grey	Grey	Grey
Jacket Material		PVC	PUR	PVC	PVC	PUR
Temperature Rating		-40…80°C	-40…80°C	-20…75°C	-40…80°C	-40…80°C
Bending Cycles		n/a	> 1 million	> 2,000	n/a	> 1 million
Cable Diameter (inches)		12.19 ± 0.38 mm	12.19 ± 0.38 mm	10.64 mm	7.62 ± 0.254 mm	7.62 ± 0.254 mm
Cable Gauge	Communication	18 AWG	18 AWG	20 AWG	24 AWG	24 AWG
	Power Pair	15 AWG	15 AWG	16 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
010 = 1.0 m
030 = 3.0 m
060 = 6.0 m
100 = 10.0 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

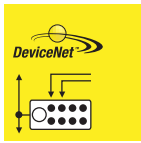
Cable types:
D11 = standard thin
D12 = flex-rated thin

Standard lengths available:
005 = 0.5 m
010 = 1.0 m
030 = 3.0 m
060 = 6.0 m
100 = 10.0 m
200 = 20.0 M

	M12 Male Right Angle
	BDN C-_ _ _-AD-EAD-01-_ _ _M
	BDN C-_ _ _-BD-EAD-01-_ _ _M

Open-style Thin DeviceNet Media

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



CANopen

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

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

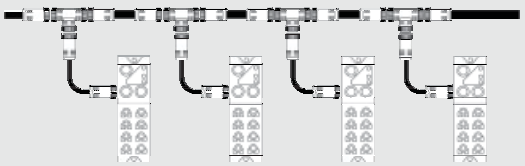
		BDN Thin Standard	BDN Thin Flex	CANopen
Jacket Color		Grey	Grey	Violet
Jacket Material		PVC	TPE	PUR
Temperature Rating		-20...105°C	-20...105°C	-20°C…80°C
Bending Cycles		n/a	> 1 million	n/a
Cable Diameter (inches)		6.86 mm	7.62 mm	7.2 ± 0.3 mm
Cable Gauge	Communication	22 AWG	24 AWG	24 AWG
	Power Pair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

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

Topology accessories

Trunk and Drop Topology

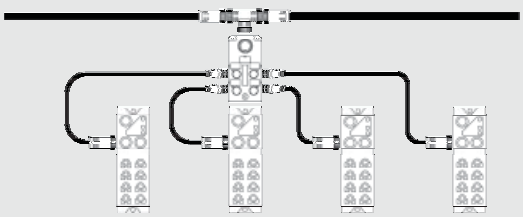
- Easiest to troubleshoot
- One device can be disconnected without disturbing the entire network
- Extra cable requirements lead to higher costs



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**

Terminating Resistors

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

*Consult factory for availability

Inline Connectors

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

Network Power Taps

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

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
BNI ACC-A03-01-01	DeviceNet Analyzer and Supporting Accessories Case
BSS EDU-O-250-002	DeviceNet Analyzer User Training Course (order per person, minimum 4)
BSS CSL-O-250-001	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 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.

Contents

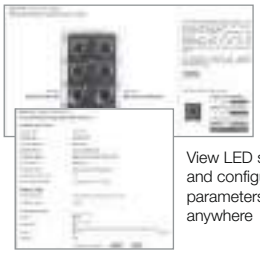
Machine mount I/O blocks

Profinet I/O Blocks*

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

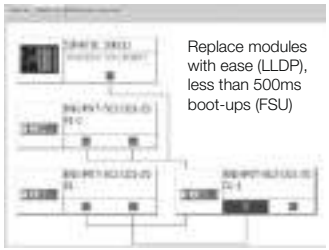
*AIDA versions available, contact factory

Webserver configuration and diagnostics



View LED status and configure parameters from anywhere

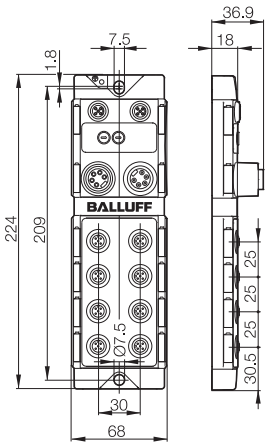
Fast Start Up (FSU) and Link Layer discovery Protocol (LLDP)



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.



Double-Ended Cables*

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

*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	**BCC03WZ**
M12, D-coded, Right-Angle Male	**BCC03Y0**
M12, D-coded, Straight Female	**BCC03Y1**
M12, D-coded, Right-Angle Female	**BCC03Y2**
RJ45, Straight Male, 8-position, 4-wire	**BCC06FH**

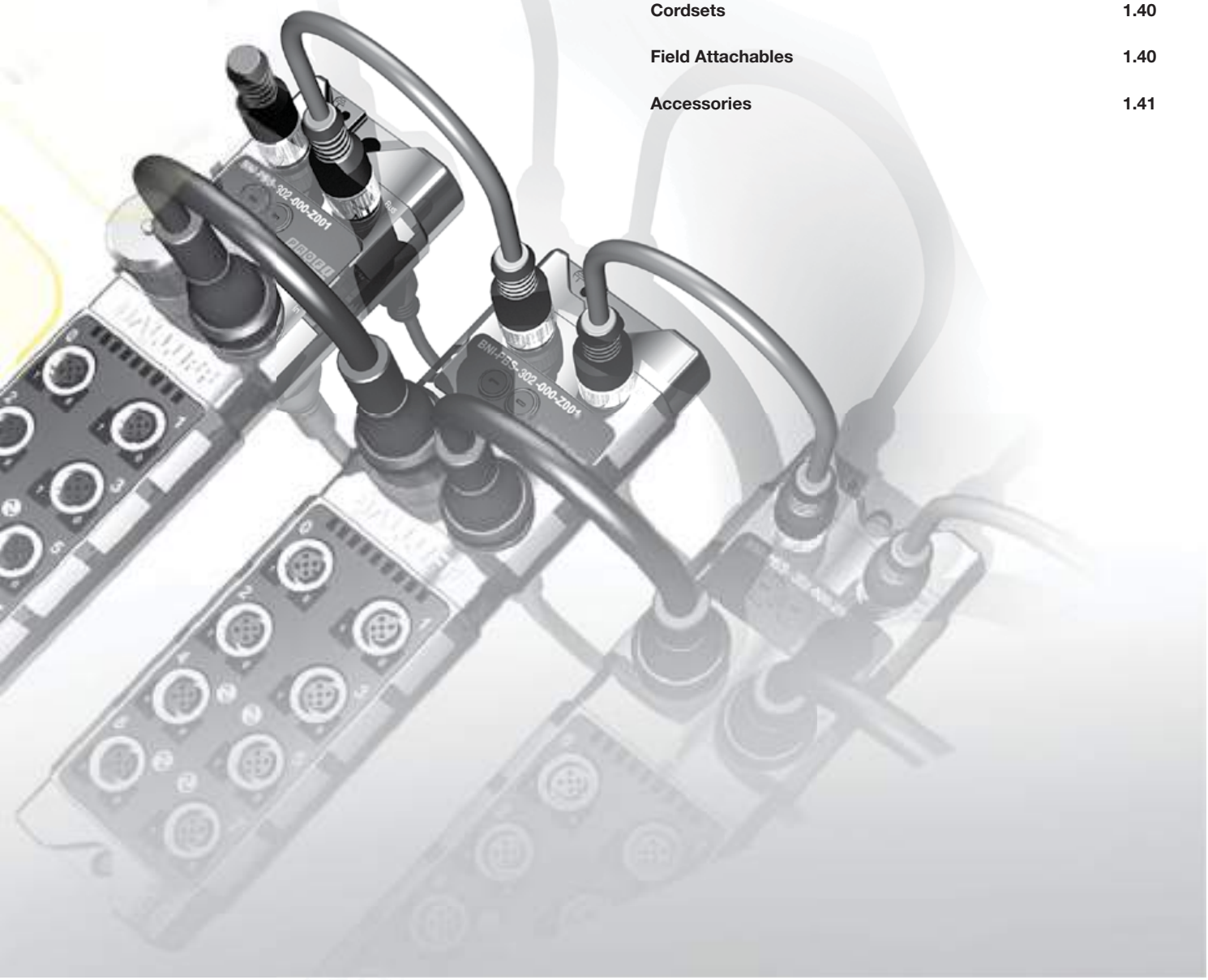
Profinet Accessories

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

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.

Contents



Machine mount I/O blocks
IO-Link masters

Standard I/O blocks allow I/O data to be quickly collected and passed to the conroller 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	**BNI0009**	**BNI005C**
	BNI PBS-104-000-Z001	BNI PBS-104-101-Z001
8 Output	**BNI002J**	**BNI0057**
	BNI PBS-202-000-Z001	BNI PBS-202-101-Z001
16 Output	**BNI002K**	
	BNI PBS-206-000-Z001	
16 Configurable (standard)	**BNI000A**	**BNI0047**
	BNI PBS-302-000-Z001	BNI PBS-302-101-Z001
16 Configurable (180° rotated display)		**BNI003Z**
		BNI PBS-302-102-Z001
16 Configurable (alternate bitmap)		**BNI0054**
		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

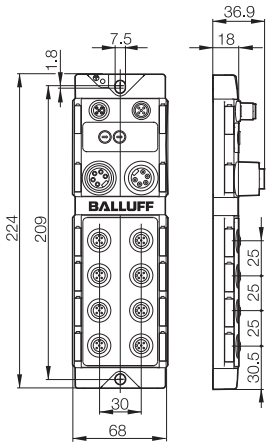
4 IO-Link / 4 Configurable			**BNI0030**	**BNI003P**
			BNI PBS-504-001-K008	BNI PBS-507-001-Z011
4 IO-Link / 12 Configurable	**BNI003K**	**BNI005R**		
	BNI PBS-502-001-Z001	BNI PBS-502-101-Z001		

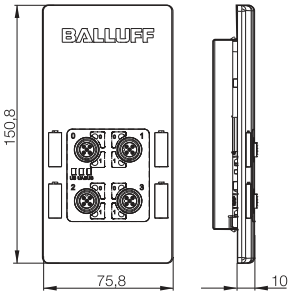
PROFIBUS
Transducer interface

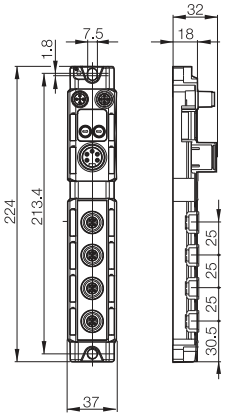
This Profibus/Micropulse interface block combines discrete, analog, and linear positioning devices into one Profibus node, saving time and money in installation and component costs. You can connect up to four economical Micropulse START/STOP linear transducers and use up to 15 position magnets on each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

Profibus/ Micropulse Transducer Inferface Block

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

	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

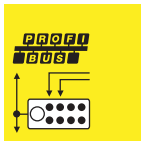
Double-Ended Lengths:
003 = 0.3 m
006 = 0.6 m
010 = 1.0 m
020 = 2 m
050 = 5 m
100 = 10 m
150 = 15 m
200 = 20 m

Profibus Field Attachables

Description	Order Code
M12 Straight Male	**BCC0714**
M12 Straight Female	**BCC0715**
M12 Right Angle Male	**BCC0716**
M12 Right Angle Female	**BCC0717**

Profibus Accessories

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



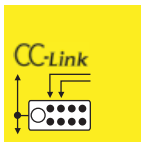
Profibus 9-pin D-sub Connectors

Description	Order Code
M12 Straight Connectors, 9-pin D-sub	**BCC0C0Y**
M12 Angled Connectors, 9-pin D-sub	**BCC0C0Z**
Straight Field Attachable, 9-pin D-sub	**BCC0C10**
Angled Field Attachable, 9-pin D-sub	**BCC0C11**

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


BALLUFF
CC-Link
06
156k
625k
2M5
5M
10M
Power
US
UA
RUN
ERR
Input/Output

CC-Link



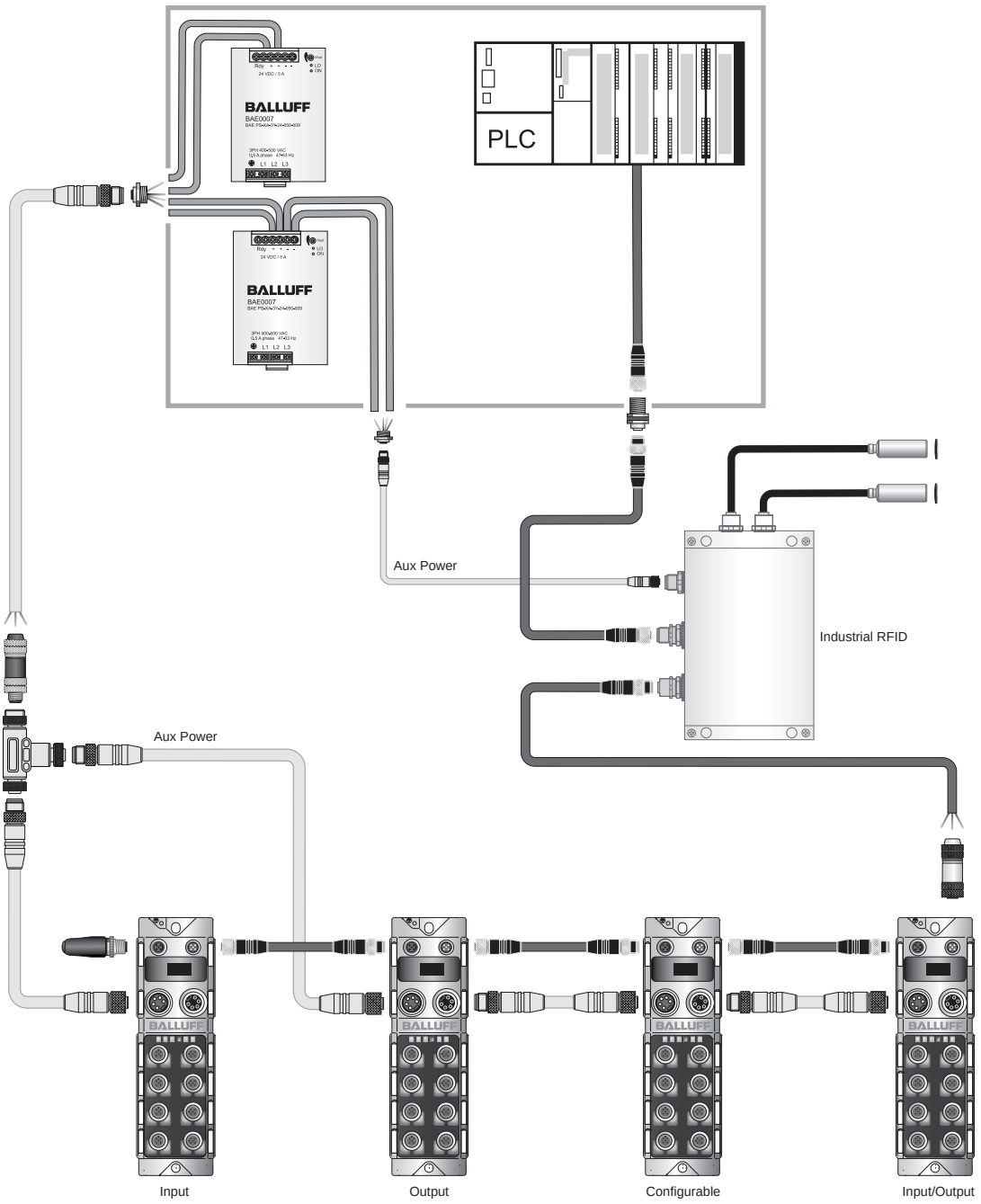
CC-Link is the most dominant and fastest growing fieldbus technology in Asia. The open network is supported by the global CC-Link partner association CLPA, which comprises more than 1,000 companies. CC-Link is a standardized fieldbus designed to integrate different automation components from a wide range 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.

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.

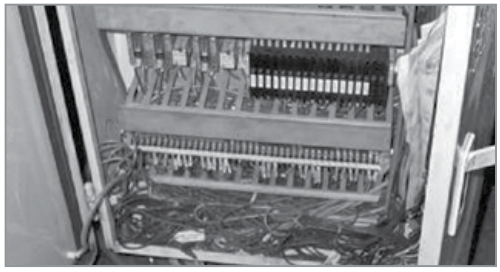
CC-Link offers the following advantages:

- 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.



Before

After

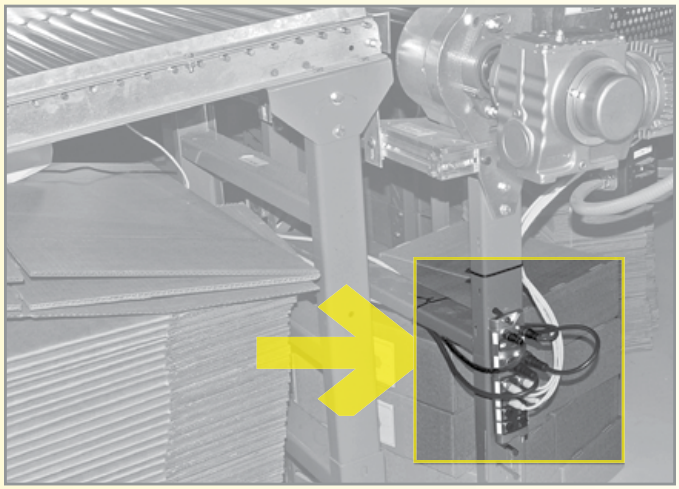
Remote I/O cabinets are costing you money in three ways:

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.



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.

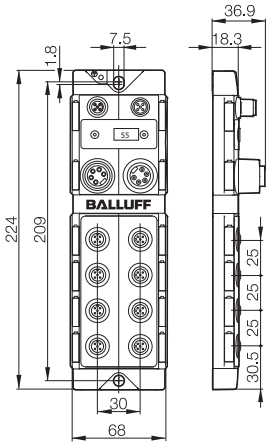
CC-Link
Machine mount I/O blocks

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.



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

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 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

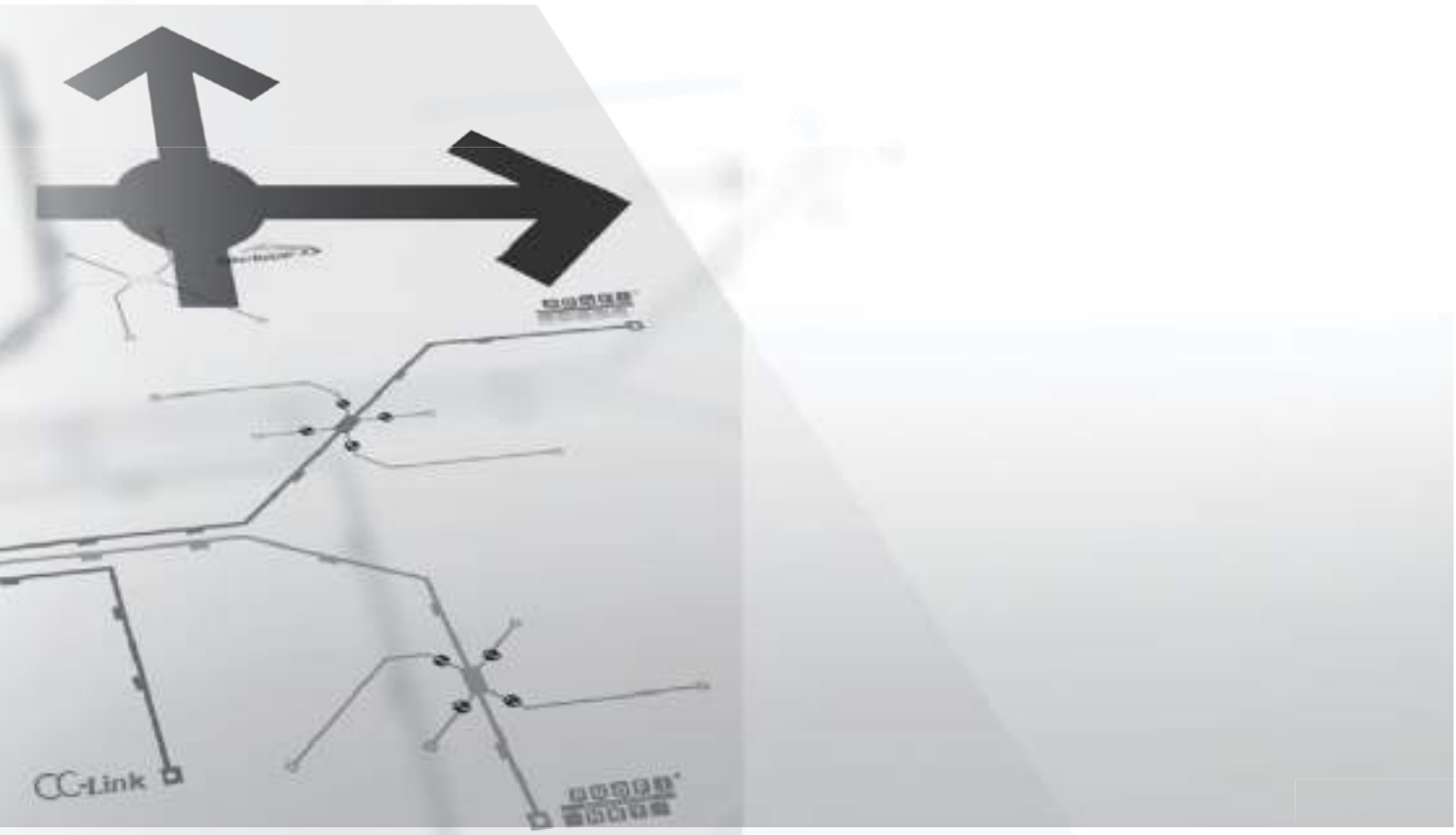
Description	Order Code
Bulkhead Passthru M12 A-coded Female to Male	**BCC07J5**
Field Attachable Male M12 A-coded Straight	**BCC06F7**
Field Attachable Female M12 A-coded Straight	**BCC06F6**
Terminating Resistor M12 A-coded Male	**BCC06Y4**
U-Style Drop M12 A-coded	**BCC08CA**
T-Style Drop M12 A-coded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


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


DeviceNet
CC-Link
PROFI BUS
PROFI NET

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.





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

	BAM0114	BAM01LT	BAM012T	BAM012U
	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

	BAM01H4	BAM01J0		BCC08HL
	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 …

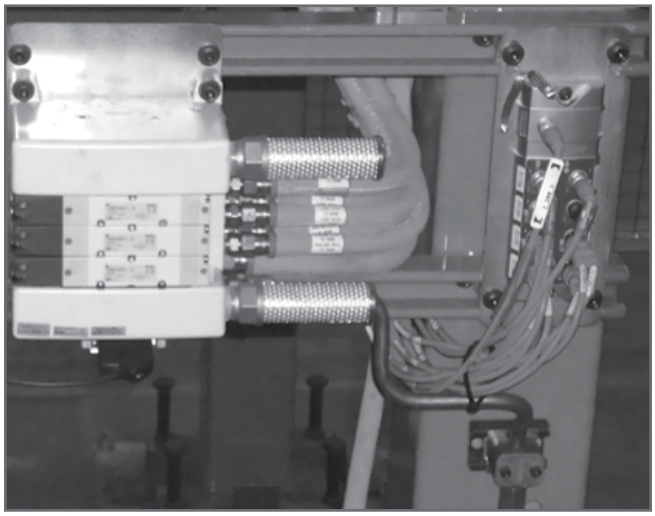
Networking Installations in Welding Applications
An identified complication and recommendation for mitigation

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.

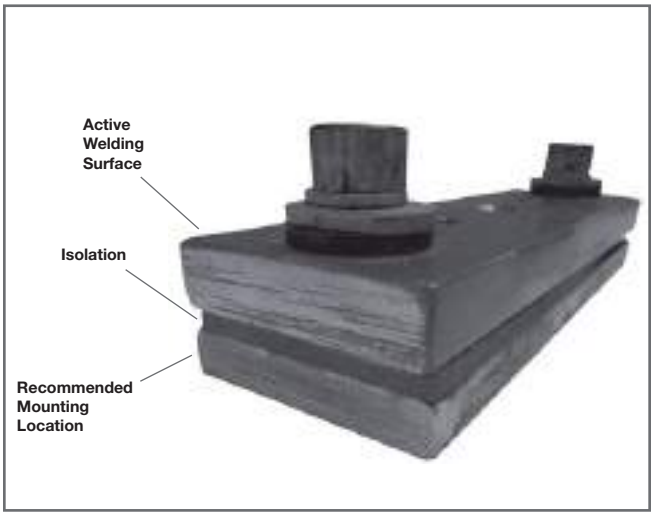
An active welding surface is defined as the part of the tool or work piece that is part of the weld circuit and carries the current to and from the welding transformer. Active welding surfaces may not be obvious and may require electrical measurement to determine potentials and isolation.

Primary Recommendation
It is strongly recommended that networking devices do not come in direct contact the with 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.



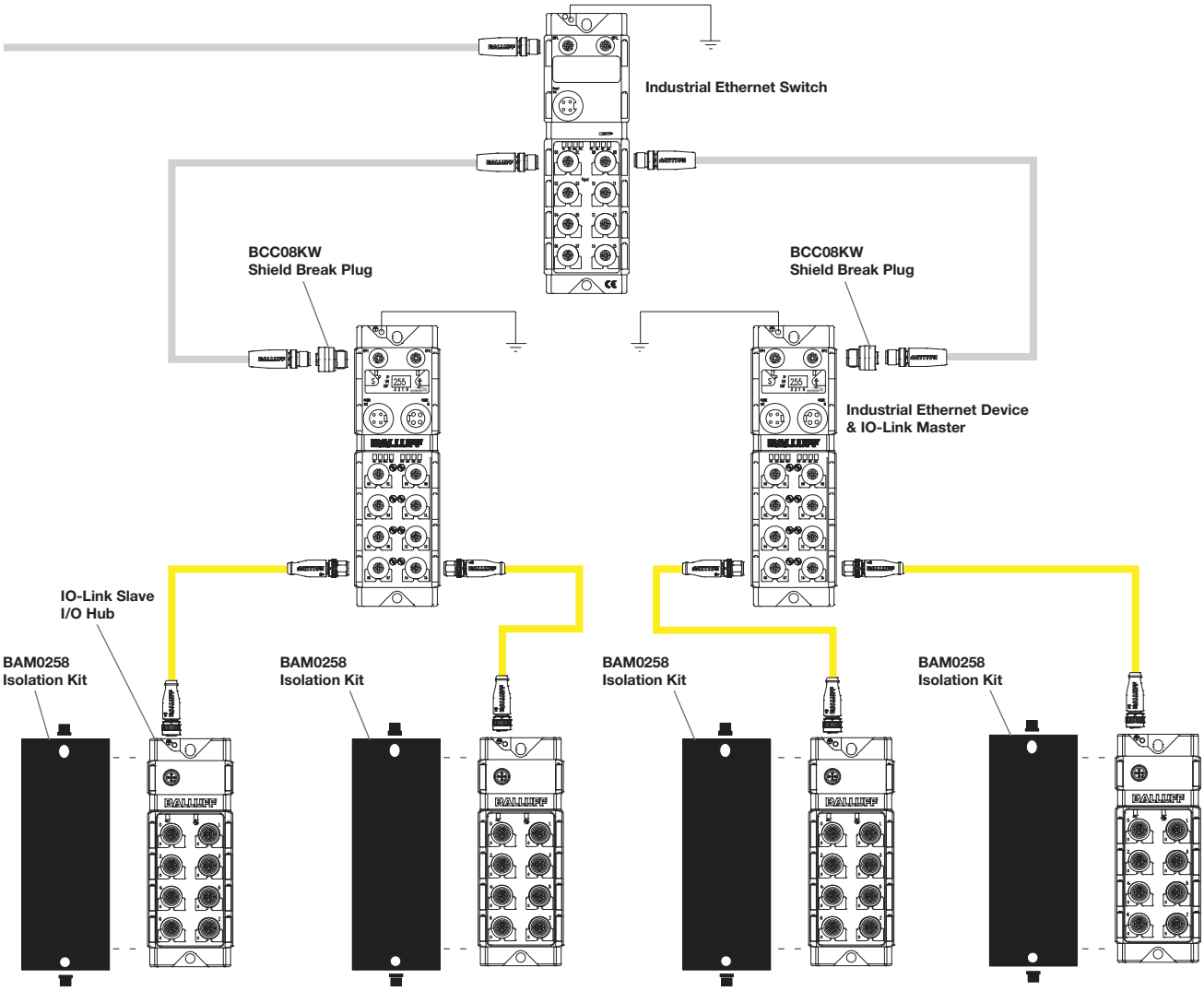
Successful installations are mounted onto a non-current-carrying component in the work cell.



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