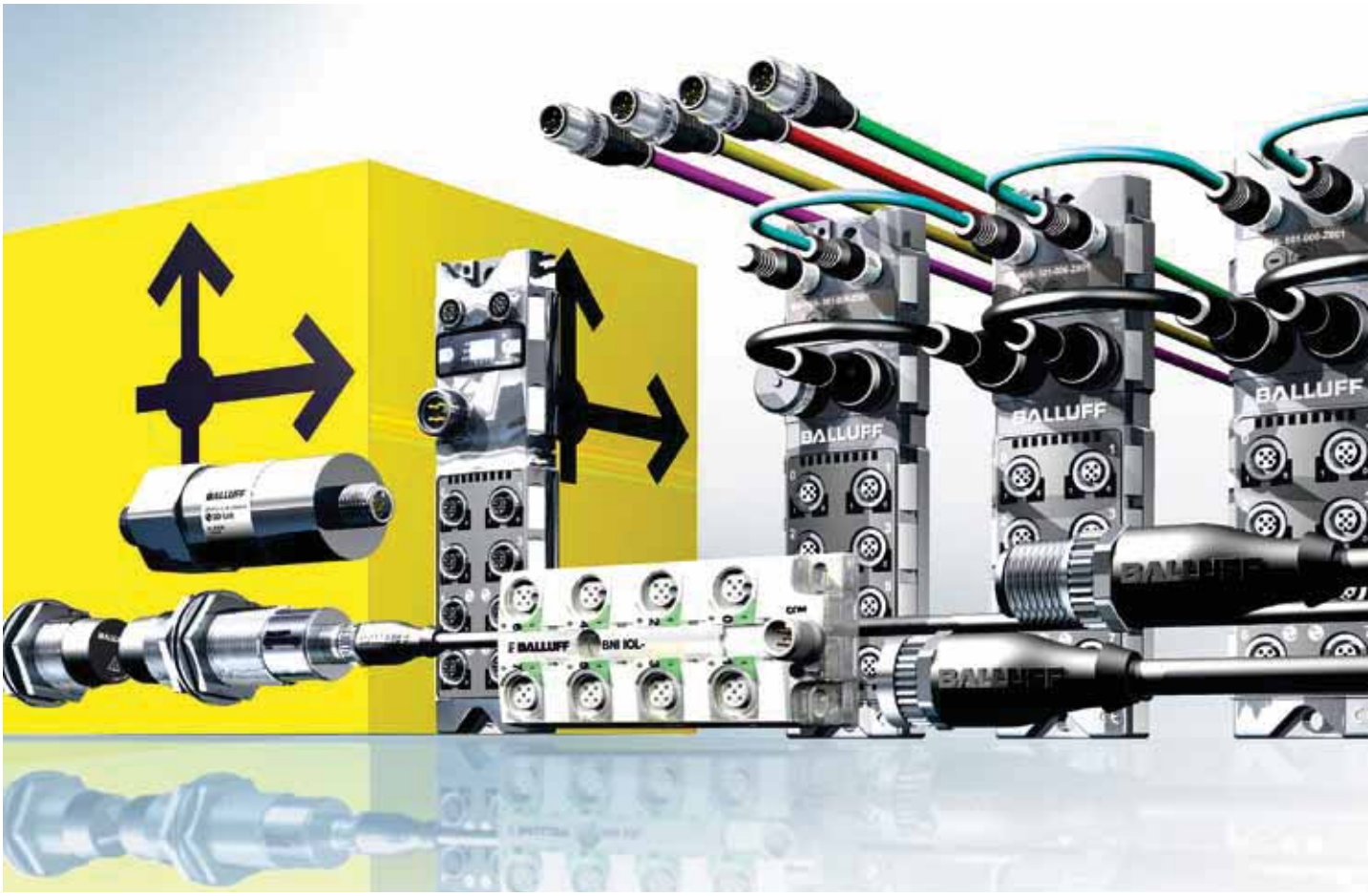
BALLUFF

sensors worldwide

Industrial Networking and Connectivity

A guide to industrial network architecture



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.

Industrial Networking and Connectivity

Condition Monitoring and Fluid Sensors

Linear Position Sensing and Measurement

Accessories

Industrial Identification

Object Detection

Systems and Services

Balluff Networking & Connectivity

Contents

Balluff Networking & Connectivity
Support and service

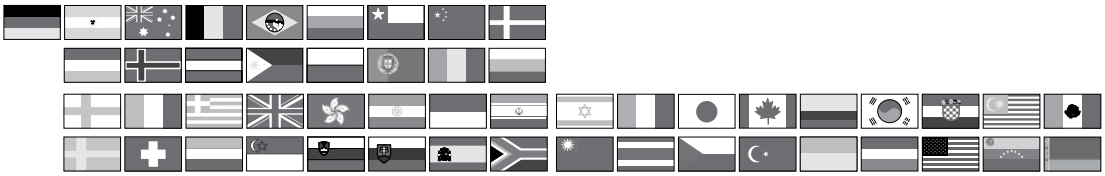
Balluff North America

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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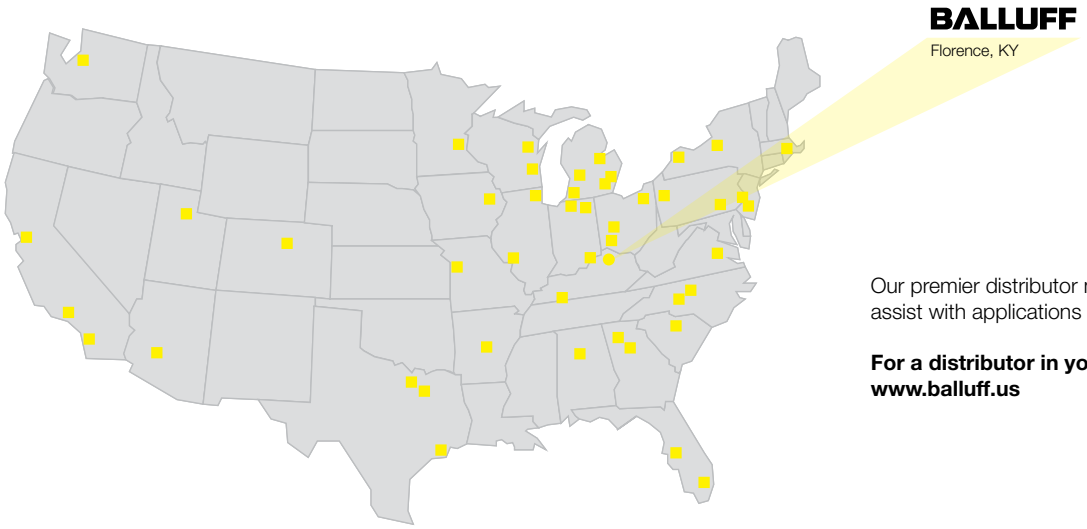
Local Premier Distributor Support



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

For a distributor in your area, visit www.balluff.us

Service

- **24 hour on-call service.**
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- **Fast, friendly experienced service – guaranteed!**
- **Same day shipping – in by 2:00 p.m. EST, out the same day!**

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Visit us online.

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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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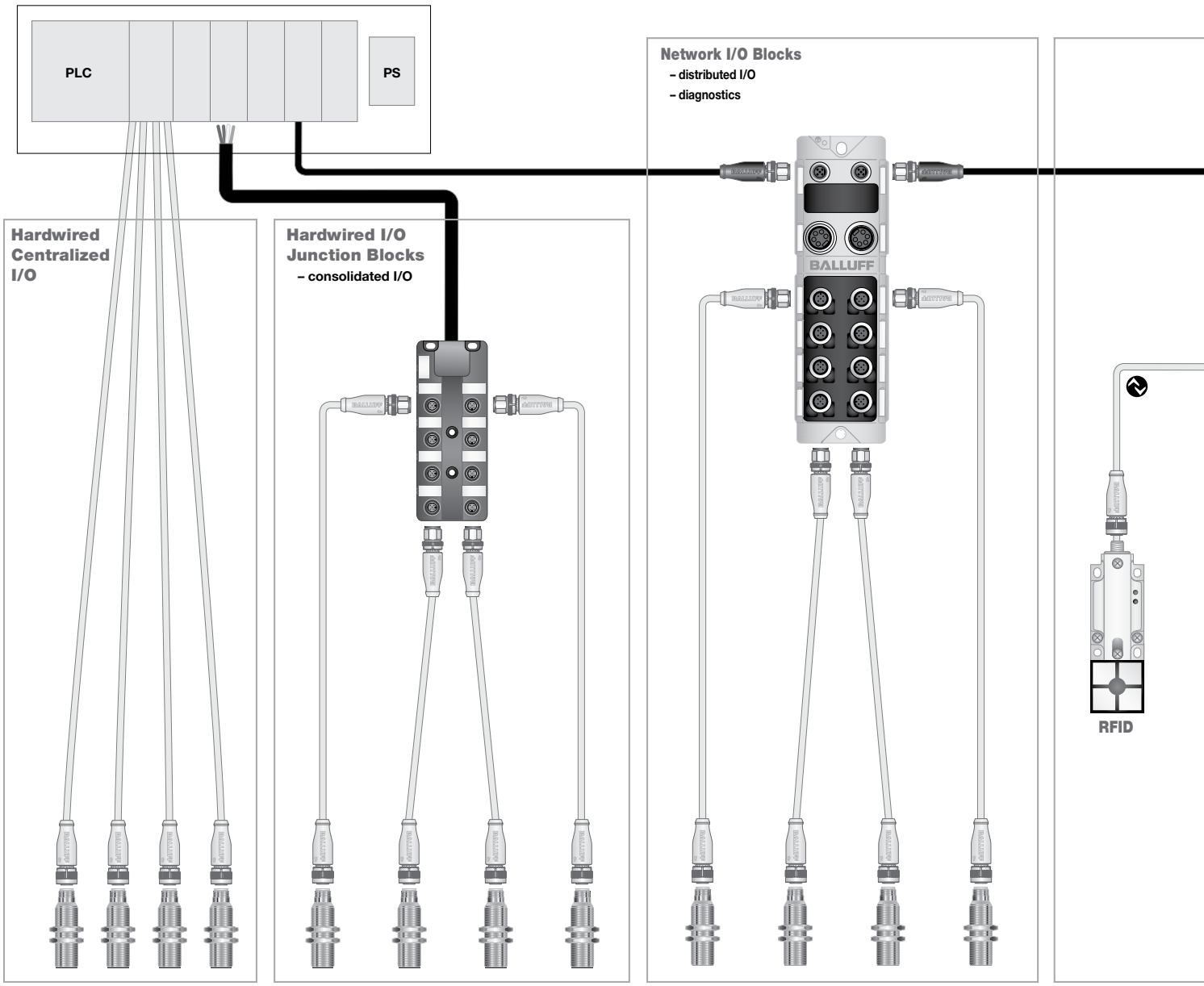
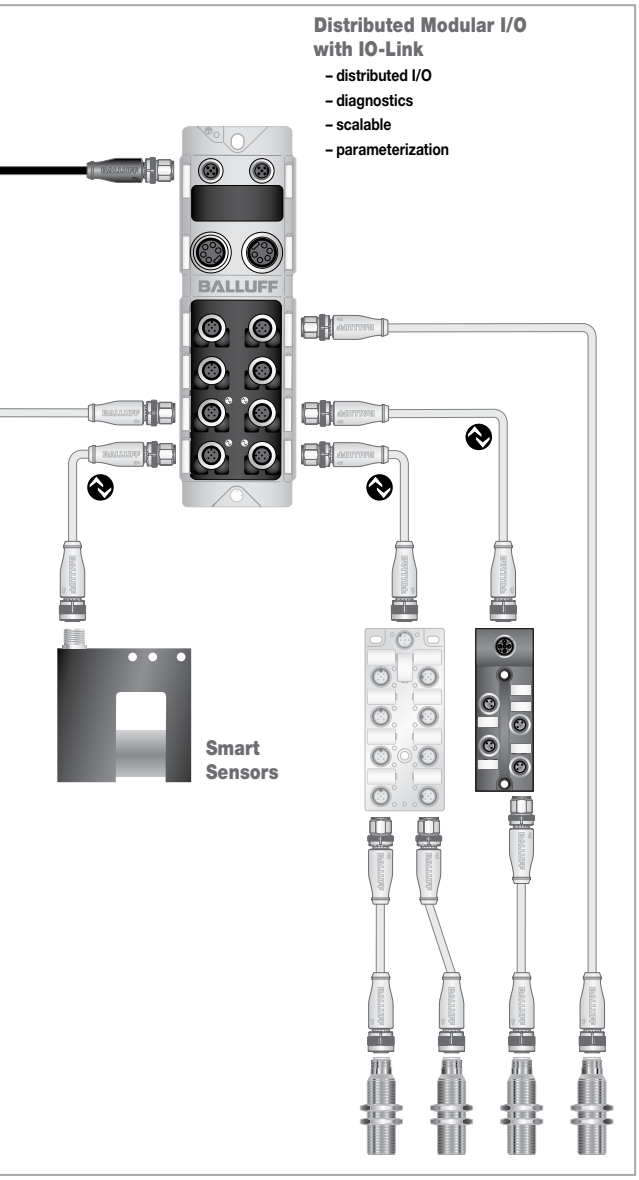
Balluff Networking & Connectivity

Advantages and disadvantages of I/O architectures



Style	Hardwired Centralized I/O	Hardwired I/O with Junction Blocks	Network I/O Blocks	
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.

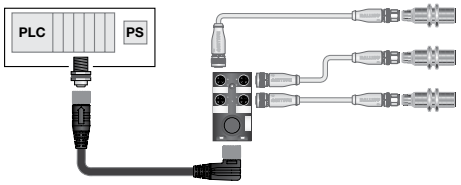
Architectural benefits

LESS

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

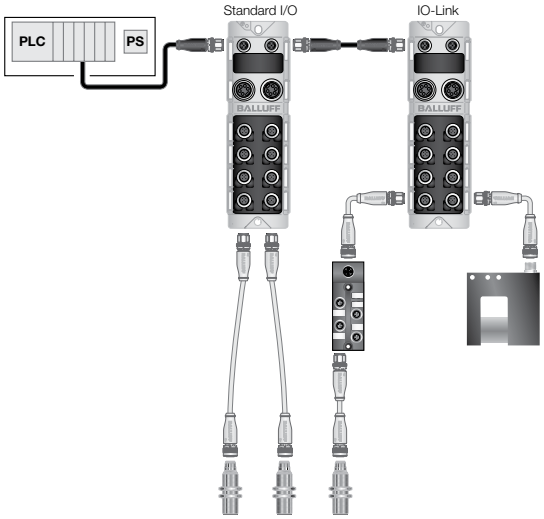
Faster set-up/teardown

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

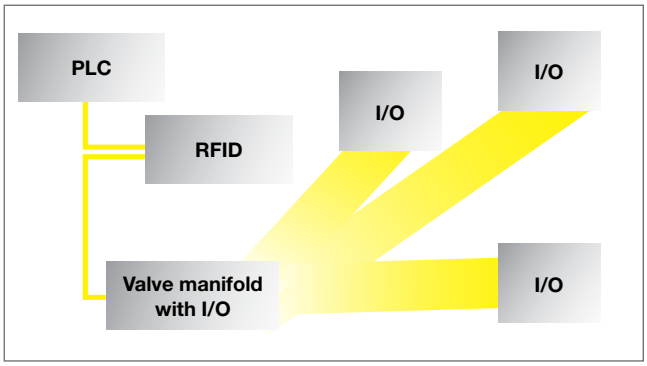
Distributed Modular I/O using IO-Link

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

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

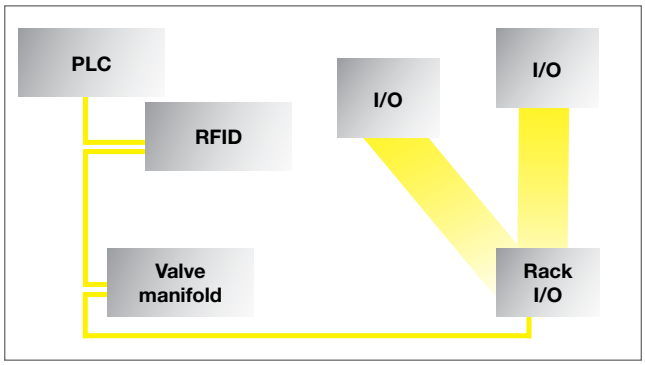
Selecting your Network I/O Architecture

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.



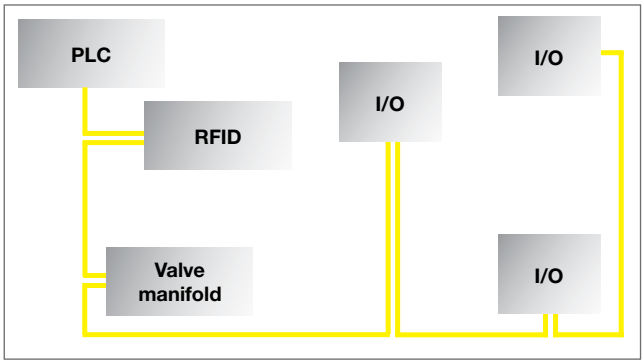
Centralized Valve Manifold with I/O

- — 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

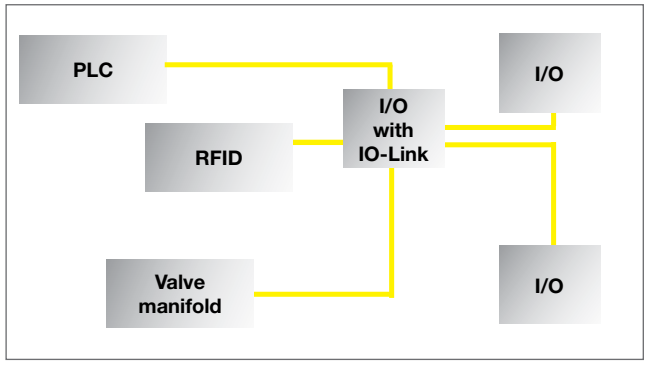
- — Minimum of 3 nodes required in this example
- ↓ Long network cable runs
- ↓ Long I/O cable runs
- ↓ Cable routing problems



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

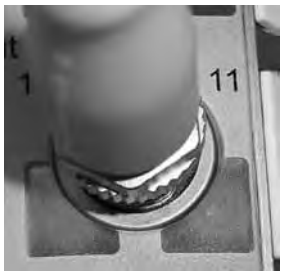
Visit section 2, Distributed Modular I/O, for Balluff IO-Link products and solutions.

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

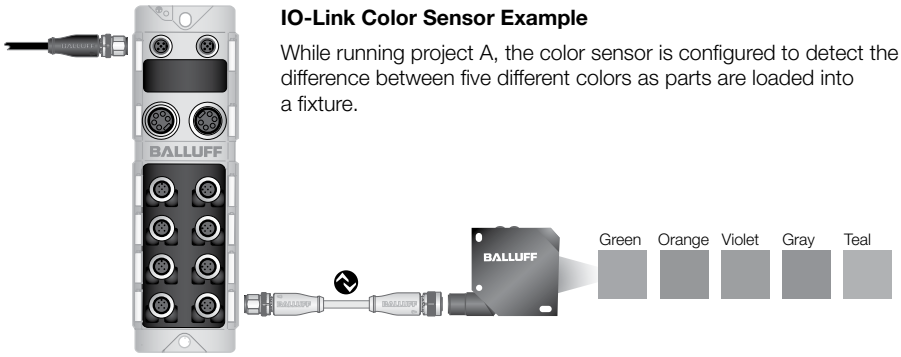
- Port LEDs indicate overload
- Diagnostic bits indicate port and point location to PLC
- Need to reset using the PLC and a reset bit per output
- Only the one port is affected, not the whole block or system
- Handshake bit gives feedback that the output is fired

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

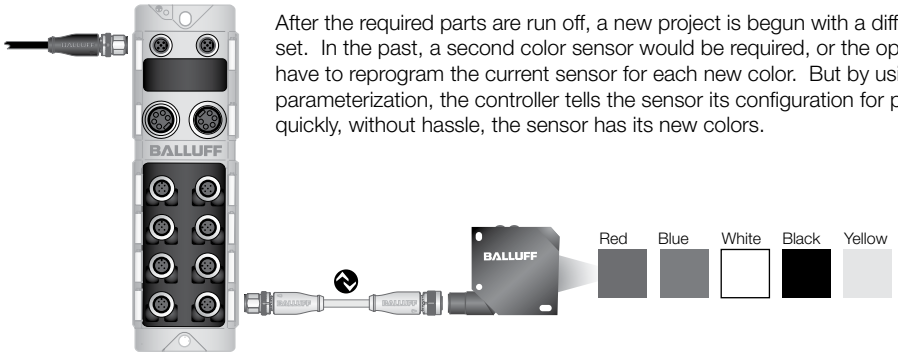
Device Parameterization via IO-Link

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.



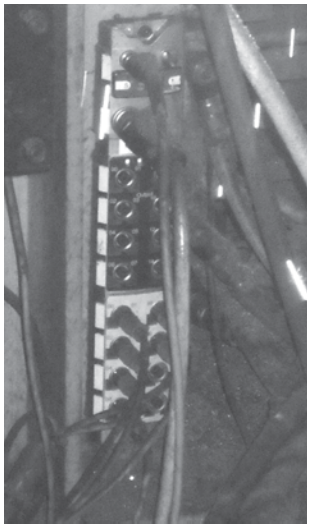
IO-Link Color Sensor Example

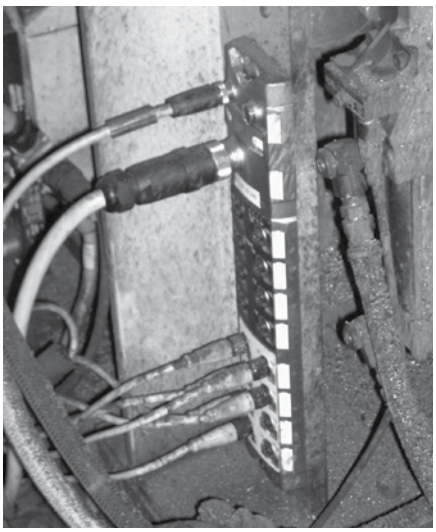
While running project A, the color sensor is configured to detect the difference between five different colors as parts are loaded into a fixture.



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.

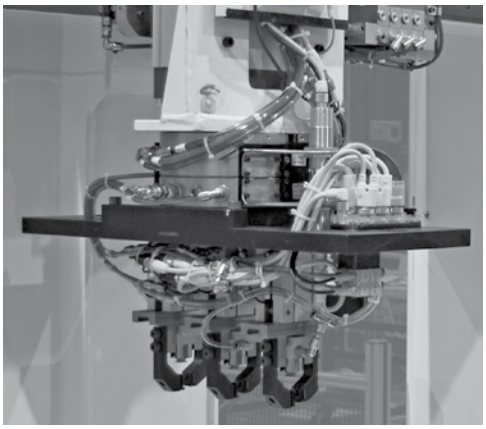
Rugged/Harsh Environments





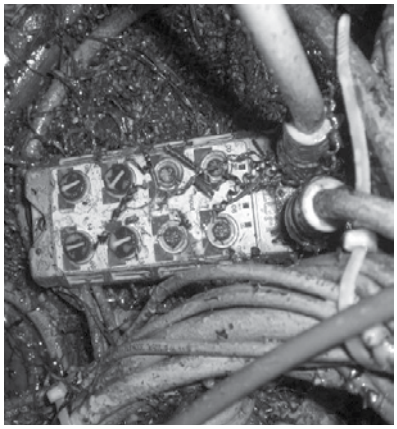
Many industrial applications require equipment to survive in rugged and harsh environments. The Balluff IP67 Machine Mount I/O Blocks meet this requirement in two ways. First, is the physical block itself. The Balluff blocks are fully potted within a metal shell, this gives the blocks a high degree of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



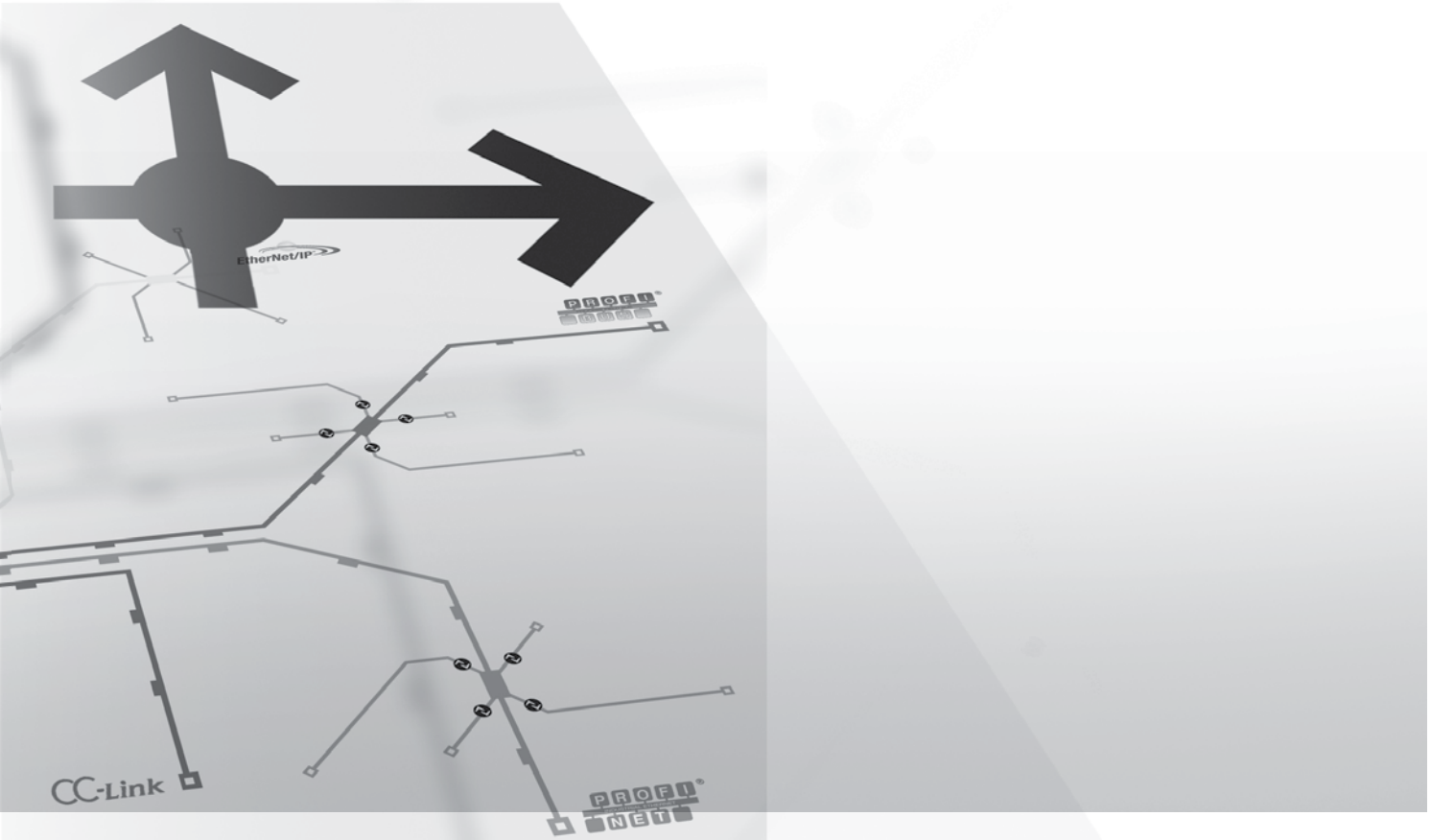
To reduce cost in applications, more and more I/O, controls, drives, etc. are being moved out of the cabinet and are being mounted in plant environments. These environments can range from cool and clean, to hot, humid, dusty, and even wet. Many customers verify that the products they purchase have an 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
DeviceNet
EtherNet/IP
CC-Link
PROFI BUS
PROFI NET

Balluff Networking
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.



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.

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.

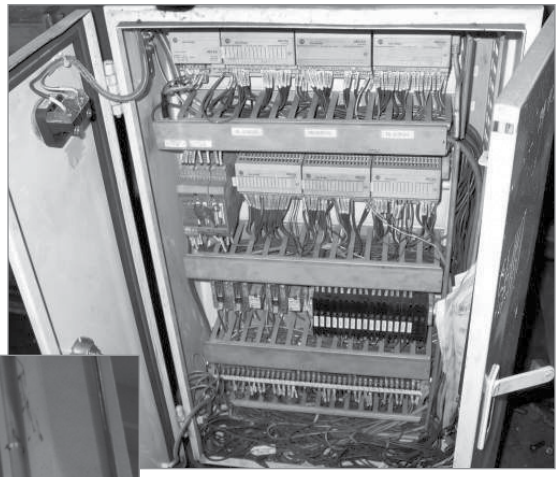
Clearly visible status LEDs
Low-quality LEDs are often difficult to identify under demanding production conditions. Balluff status LEDs are large, bright, highly visible, and provide maximum assistance. Balluff quality will help you complete setup and maintenance tasks and reduce machine downtime with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



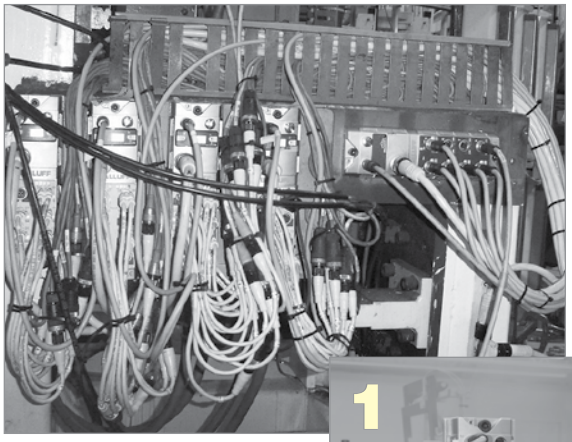
EtherNet/IP

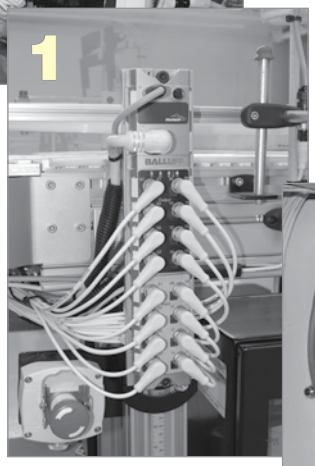
DeviceNet

PROFINET

PROFIBUS

CC-Link



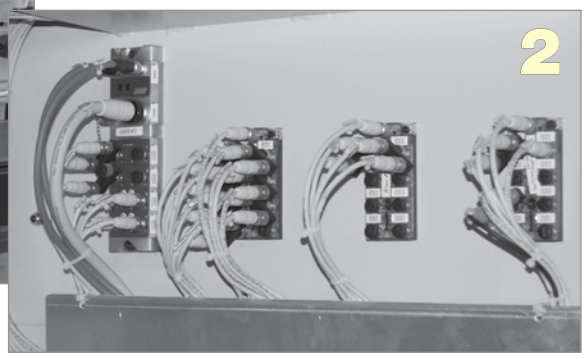


Do you currently have a lot of IP67 I/O in one place?

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 1.11)

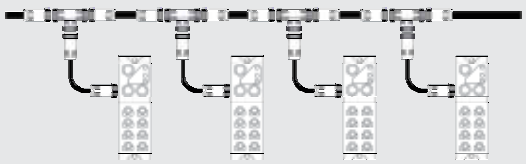
2. Distributed Modular I/O allows for up to four smart devices to be connected to one network address. With one address you can get up to 76 I/O points versus five network nodes in the traditional way. Also, IO-Link communicates point to point over standard sensor cordsets which costs less money and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



Balluff's Network Architecture Approach

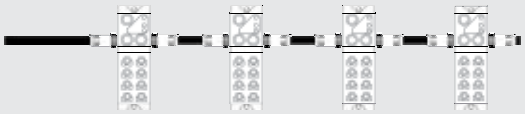
Your machine designs should not be hampered by inflexible network topology. Balluff's networking products include cables, tees, and hubs that allow you to mix and match elements of all topologies. Raw cable, single-ended cables, and field attachable connectors ensure installation flexibility.

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



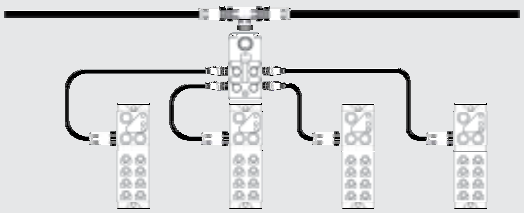
DeviceNet™ CC-Link

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



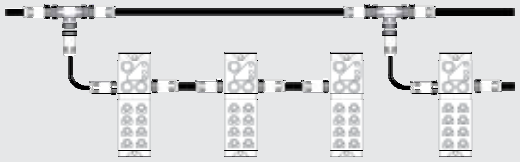
EtherNet/IP™ DeviceNet™ PROFIBUS PROFINET CC-Link

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



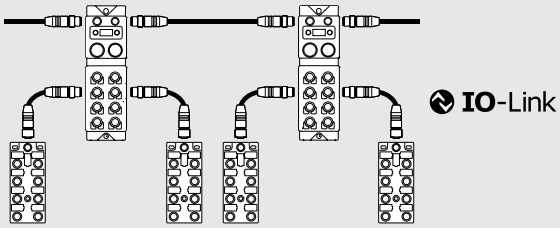
EtherNet/IP™ DeviceNet™ PROFINET IO-Link

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

EtherNet/IP™ DeviceNet™ CC-Link PROFIBUS PROFINET

Balluff Networking
Machine mount I/O product family

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

Type	Ports	Inputs (PNP)	Outputs	IO-Link	EtherNet/IP (with display)
					Page 1.11
Standard I/O Units					
Input	8	16	---	---	**BNI004M (DLR)**
Input (XXL)	16	32	---	---	**BNI0018**
Output	8	---	8	---	**BNI005J (DLR)**
Output	8	---	16	---	**BNI0016**
Input / Output	8	8	8	---	**BNI0017**
Input / Output (XXL)	16	16	16	---	**BNI0019**
Configurable (Shorty)	4	max. 8	max. 8	---	**BNI0044**
Configurable	8	max. 16	max. 16	---	**BNI004F (DLR)**
IO-Link Master Units (see section 2 for product options)					
Configurable	4	max. 4	max. 4	4	
Configurable	8	max. 12	max. 12	4	**BNI004A (DLR)**
Configurable	8	max. 8	max. 8	8	**BNI006A (DLR)***
Standard Transducer Interface Blocks					
Discrete Input	8	8x PNP, 4x P-111	---	---	
Analog Input (0-10V or 4-20mA)	8	4x Analog, 4x P-111	---	---	
Standard Ethernet Switch					
Unmanaged IP20	5	---	---	---	**BNI005E (DINrail)**
Unmanaged IP20	8	---	---	---	**BNI0067 (DINrail)**
Unmanaged IP67	9	---	---	---	**BNI000F (no display)**

*Consult factory for availability

Housing Styles

Standard 8-port


Slim 4-port

Shorty 4-port

DeviceNet	Profinet	Profibus	CC-Link (with display)
Page 1.21	Page 1.33	Page 1.39	Page 1.47
BNI0001	**BNI0053**	**BNI005C (display)**	**BNI002F (PNP), BNI0049 (NPN)**
BNI0002	**BNI005F**	**BNI0057 (display)**	**BNI002E**
		BNI002K (dials)	
BNI0004	**BNI005K**		**BNI002C**
BNI0003	**BNI0052**	**BNI0047 (display)**	**BNI002A**
		BNI003P (slim), BNI0030 (panel)	
BNI005A*	**BNI004U**	**BNI003K (dials), BNI005R (display)**	**BNI0040**
	BNI005H*		
		BNI001A	
		BNI002H	
	BNI005E (DINrail)		
	BNI0067 (DINrail)		
	BNI000F (no display)		

XXL 16-port

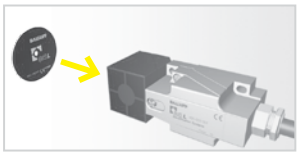
Panel Mount 4-port

Industrial Identification

www.balluff.com/rfid

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.

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.



100% Data Reliability
Reliable traceability of the production and quality data brings maximum visibility to your supply and production chain; thereby preventing quality fluctuations.

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

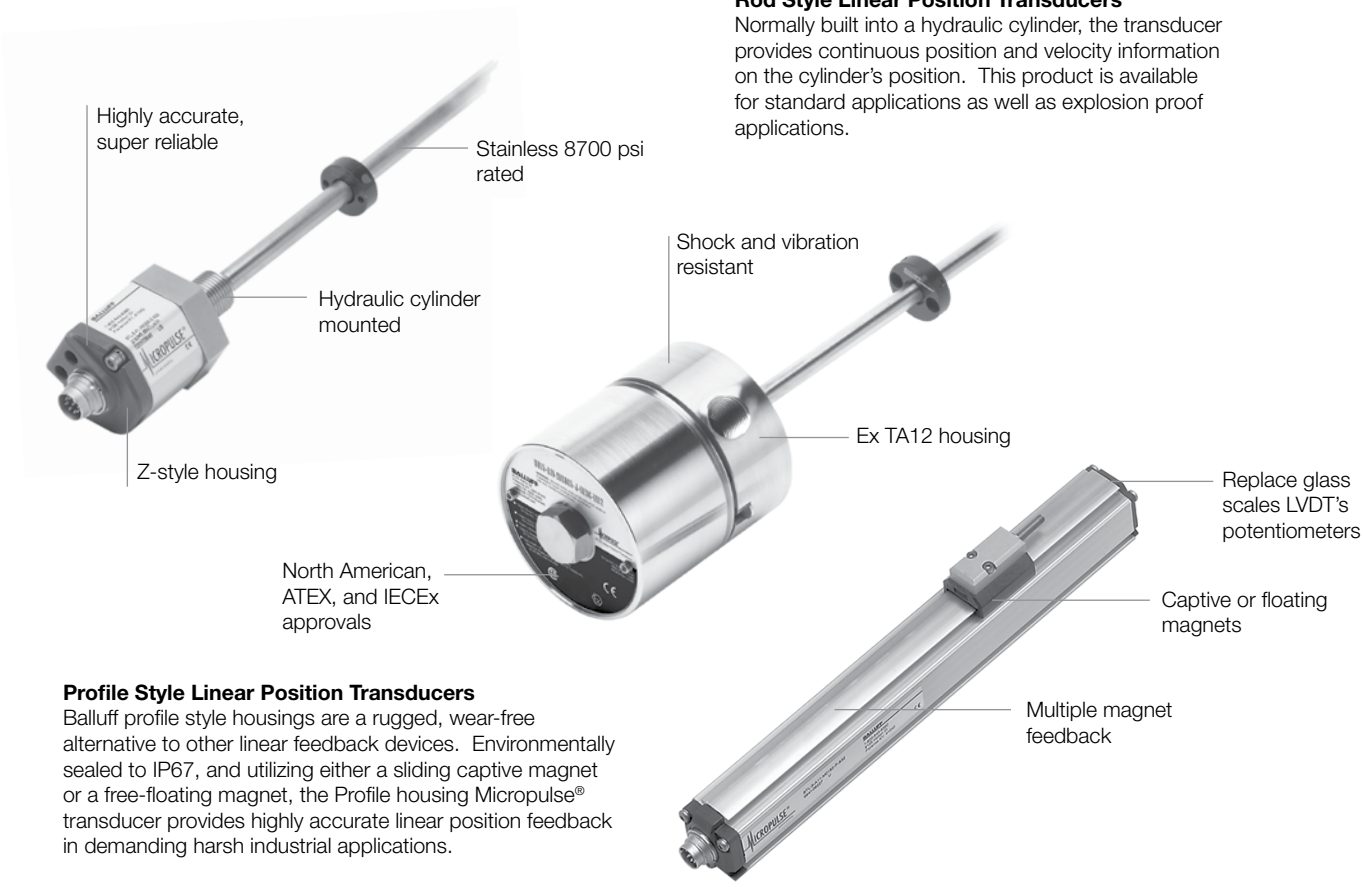
BIS M – Wide variety of options with fast data transfer and large read/write distance for flexible applications and ISO standardized

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

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.

Systems	Housings	EtherNet/IP	DeviceNet	
		Page 1.11	Page 1.21	
Industrial Identification RFID Systems				
BIS C System - Rugged and versatile	Plastic		■	
	Metal	■	■	
BIS L System - Economical logistics	Plastic		■	
	Metal	■	■	
BIS M System - Faster data and longest distances	Plastic		■	
	Metal	■	■	
BIS S System - Large quantities of data	Plastic		■	
	Metal	■	■	
Micropulse Linear Position Transducers				
Rod Style - Hydraulic cylinder position feedback	Rod-style (Standard)			
	Rod-style (Ex-proof)			
Profile Style - Linear position feedback	Profile housing		■	
Low Profile Style - Linear position feedback	PF housing			

Linear Position Transducers

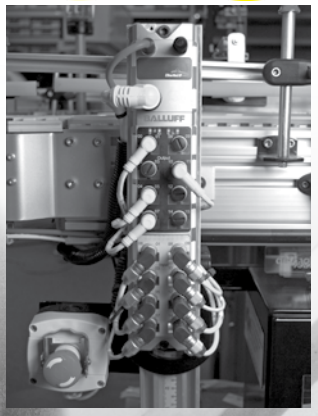


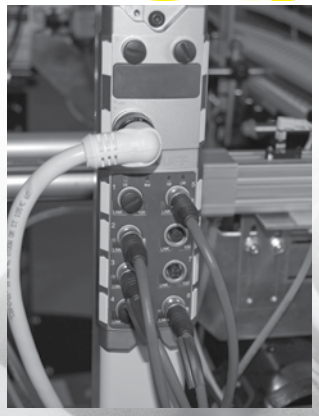
Rod Style Linear Position Transducers
Normally built into a hydraulic cylinder, the transducer provides continuous position and velocity information on the cylinder's position. This product is available for standard applications as well as explosion proof applications.

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.

	Profinet	Profibus	CC-Link	IO-Link	Other Networks
	Page 1.33	Page 1.39	Page 1.47	Page 2.1	See RFID Catalog
	■	■			InterBus
	■	■			TCP/IP
		■		■	InterBus
		■		■	TCP/IP
	■	■		■	InterBus
	■	■	■	■	TCP/IP
		■			
		■			TCP/IP
		■			CANopen
		■			CANopen
		■			CANopen
				■	

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
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.

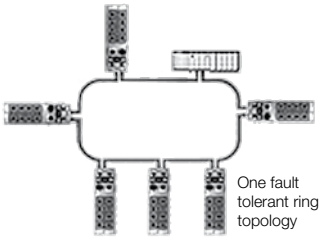
Balluff has developed a comprehensive line of EtherNet/IP products that include two versions of machine-mount I/O blocks, unmanaged switches, network cables and accessories. At the heart of the line are the I/O blocks. These blocks have a low initial cost per point and are designed to save money over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

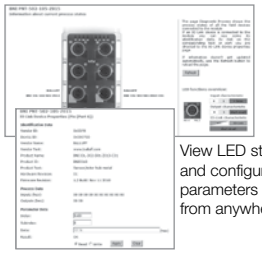
Webserver and DLR Capable

DeviceLevel Ring (DLR)



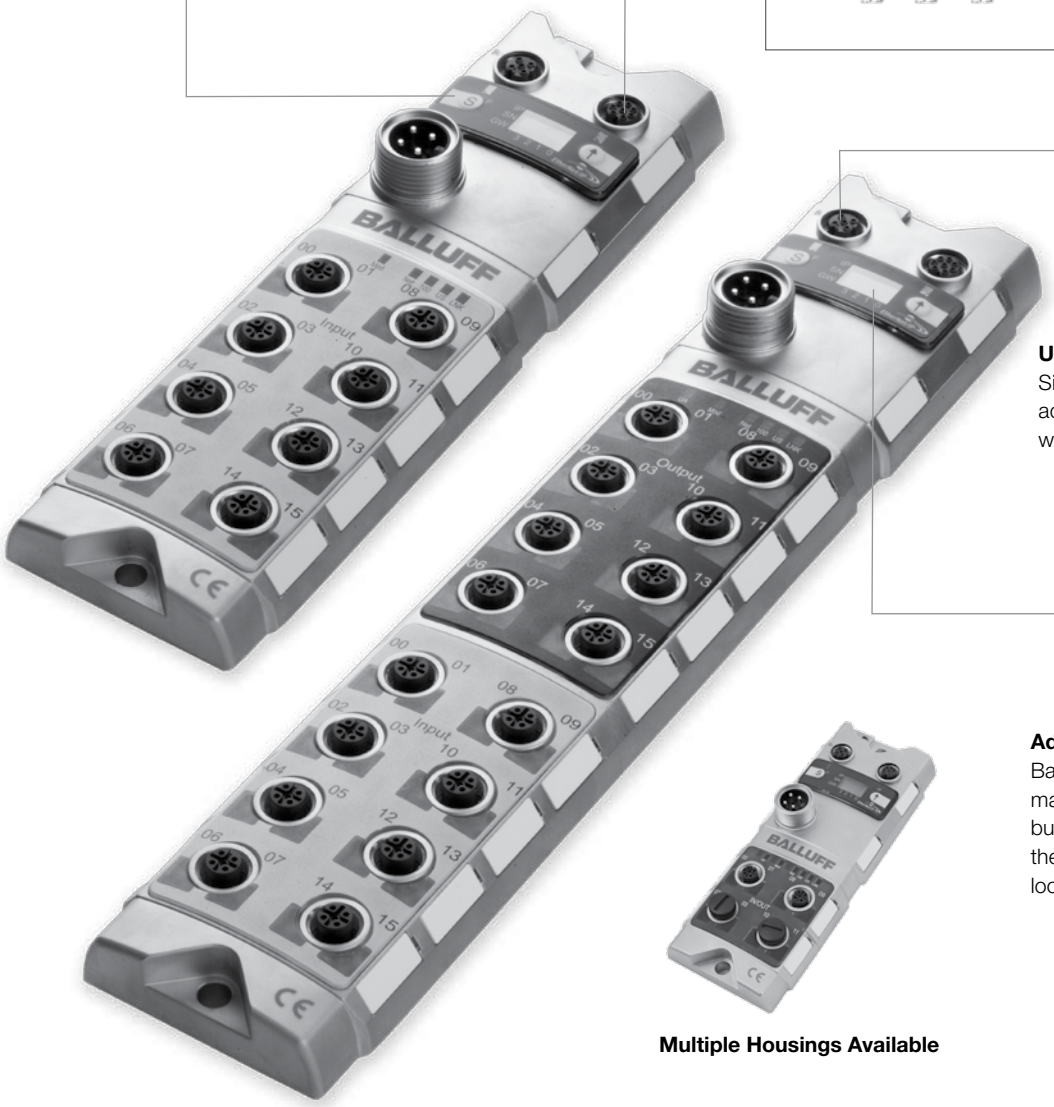
One fault tolerant ring topology

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.

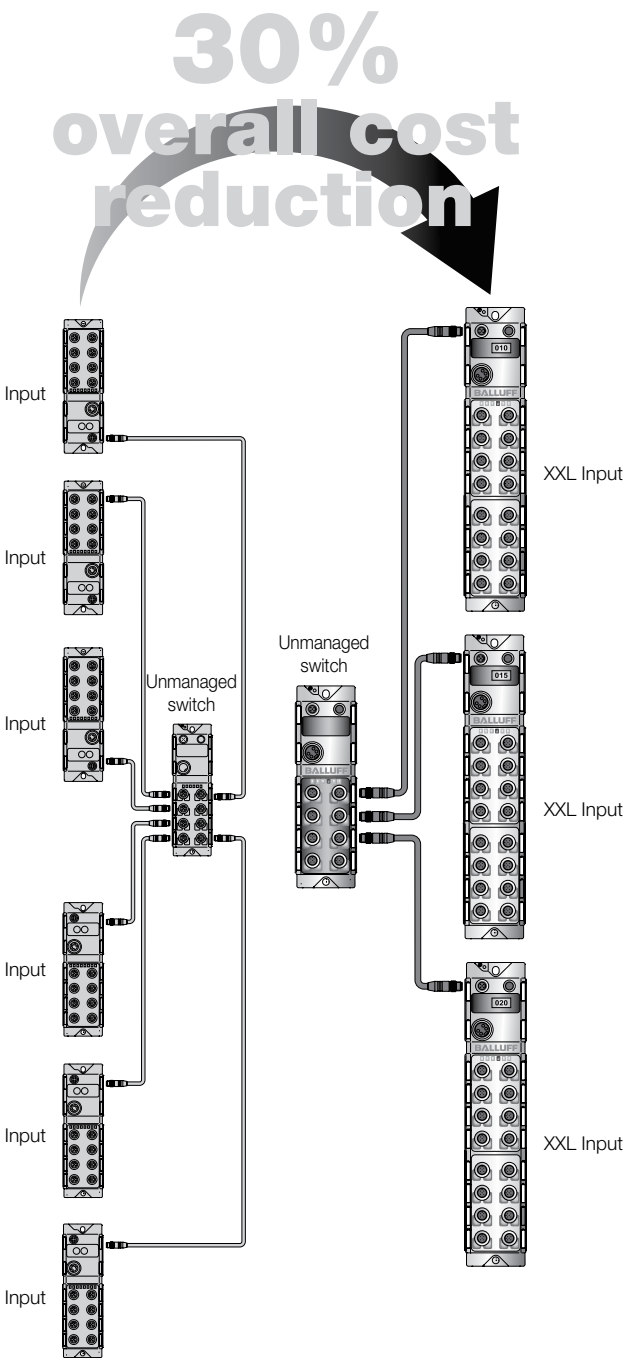
Addressable Display (100 series only)
Backlit display shows IP address, subnet mask, and gateway address. Push buttons allow the setting of any octet of the above addresses. The display can be locked out via the controller.

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.

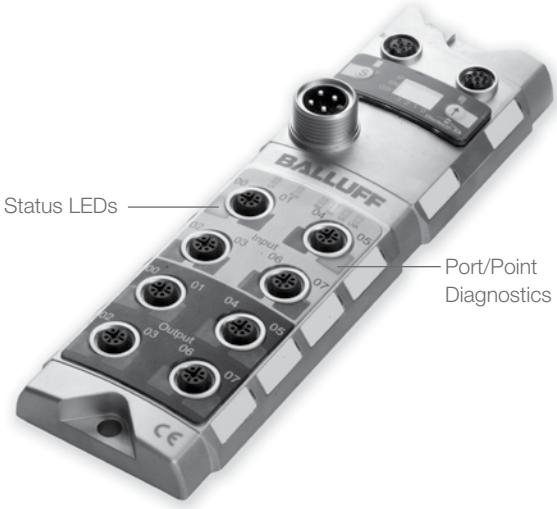
5. **Establish Procedures** – Define procedures early. How do I swap out a device? If the switch is dead, how do I replace it and reconfigure it? Can I use a longer cordset to replace a shorter bad one? All these questions will come up at some point, be proactive and have a procedure in place.

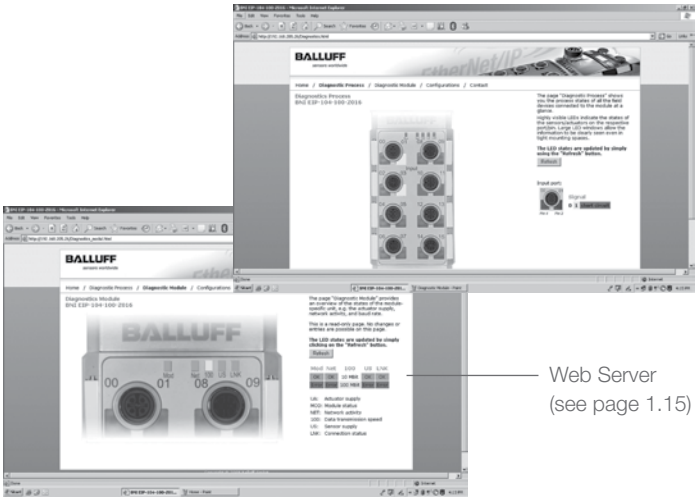
6. **Bandwidth and Packet Usage** – "Just add another device, it will be fine." Sometimes this statement starts a network down the wrong path making it unreliable. Know what a new device will do to your network traffic. Yes, EtherNet/IP is faster, yes it can pass more packets, but it does have its limits. 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.

Block Diagnostics

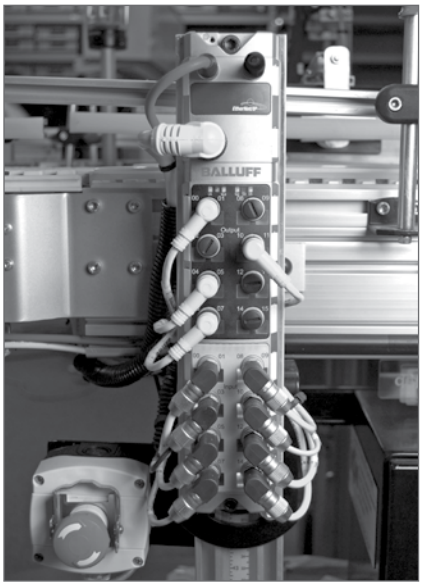
A device's diagnostic capabilities can be used as a key to quickly diagnosing and solving problems that have stopped a production process. Balluff's EtherNet/IP™ blocks come equipped to aid support staff in pinpointing problems in a variety of manners.

- Each I/O port boasts large LEDs to distinguish which port/point has a short circuit or overload condition
- Status LEDs are also viewable to determine the overall status of the block, communication speed, and auxiliary power status
- Each block reports short circuit and overload status back to the controller via the standard I/O mapping
- Built-in web pages allow users to view the status LEDs of the block and individual ports
- Customize LED reactions to different conditions to aid in finding the effected block using user-defined LEDs in the display or IPAP

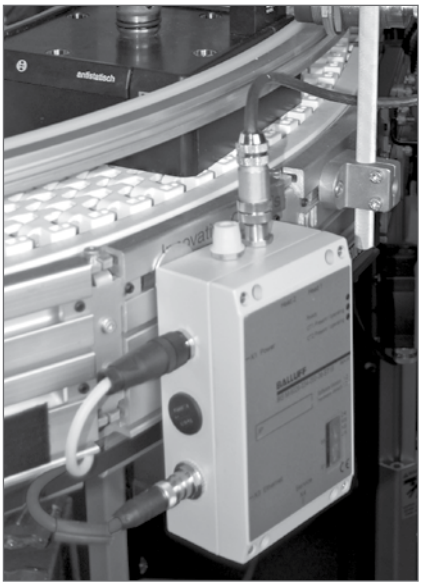




Applications



Machine Mount I/O
Your automation projects have sensors and actuators that require a large amount of I/O infrastructure. Balluff's XXL EtherNet/IP blocks allow you to have either 32 inputs or 16 inputs/16 outputs on one IP address. This reduces network costs and per sensor point costs.



Industrial RFID
With more than 25 years of experience in industrial RFID, Balluff can offer an Ethernet solution to meet your process automation needs. Ethernet protocols that Balluff supports are: EtherNet/IP™, Ethernet TCP/IP, Modbus TCP, and ProfiNet.

Addressing Methods

Below are the different methods for programming IP Address, SubNet Mask, and Gateway of the Balluff machine mount I/O blocks.

BOOTP/DHCP

Balluff's EtherNet/IP™ blocks can be set up using a standard DHCP server.

Push Button Display

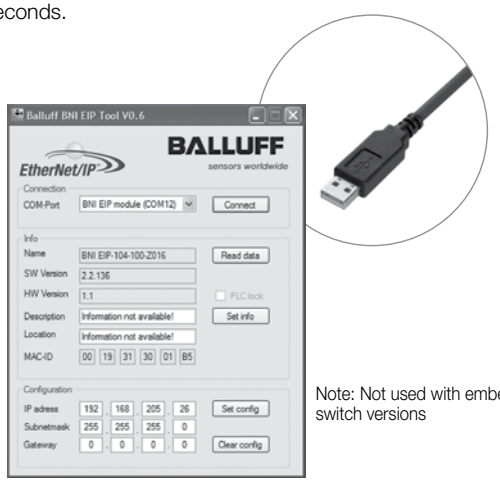
With the 100 series blocks, you can gain a significant advantage by programming all the octets of the block's addresses directly on the block iteself. This is the simplest means of programming because it does not require additional parts. User defined LEDs for trouble shooting and push button lockout are available from your controller.

Web Server

For those who prefer a web interface, Balluff EtherNet/IP™ blocks have a simple web server built in. This webpage lets you program the addresses of the block and view port or status information.

Block USB Programming

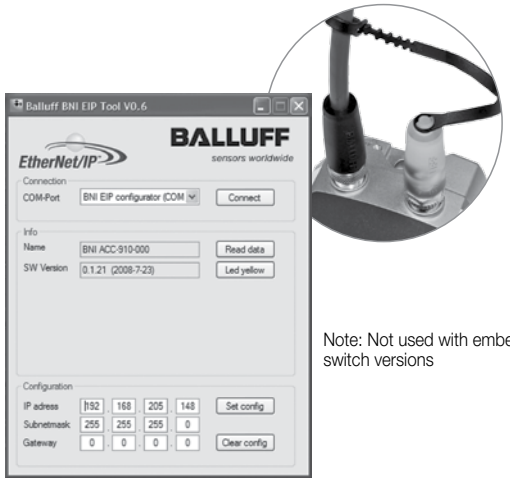
With the block programming cable and using the provided software, you can easily program the blocks' addresses in a matter of seconds.



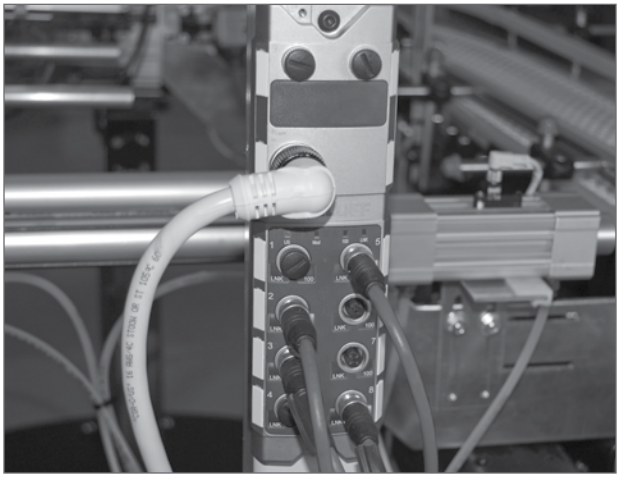
Note: Not used with embedded switch versions

IPAP Plug

Using the provided software, combined with the IPAP programming cable, the IPAP address plug can be easily programmed. By attaching the IPAP to a block, the address configuration is downloaded to the block on power-up.



Note: Not used with embedded switch versions



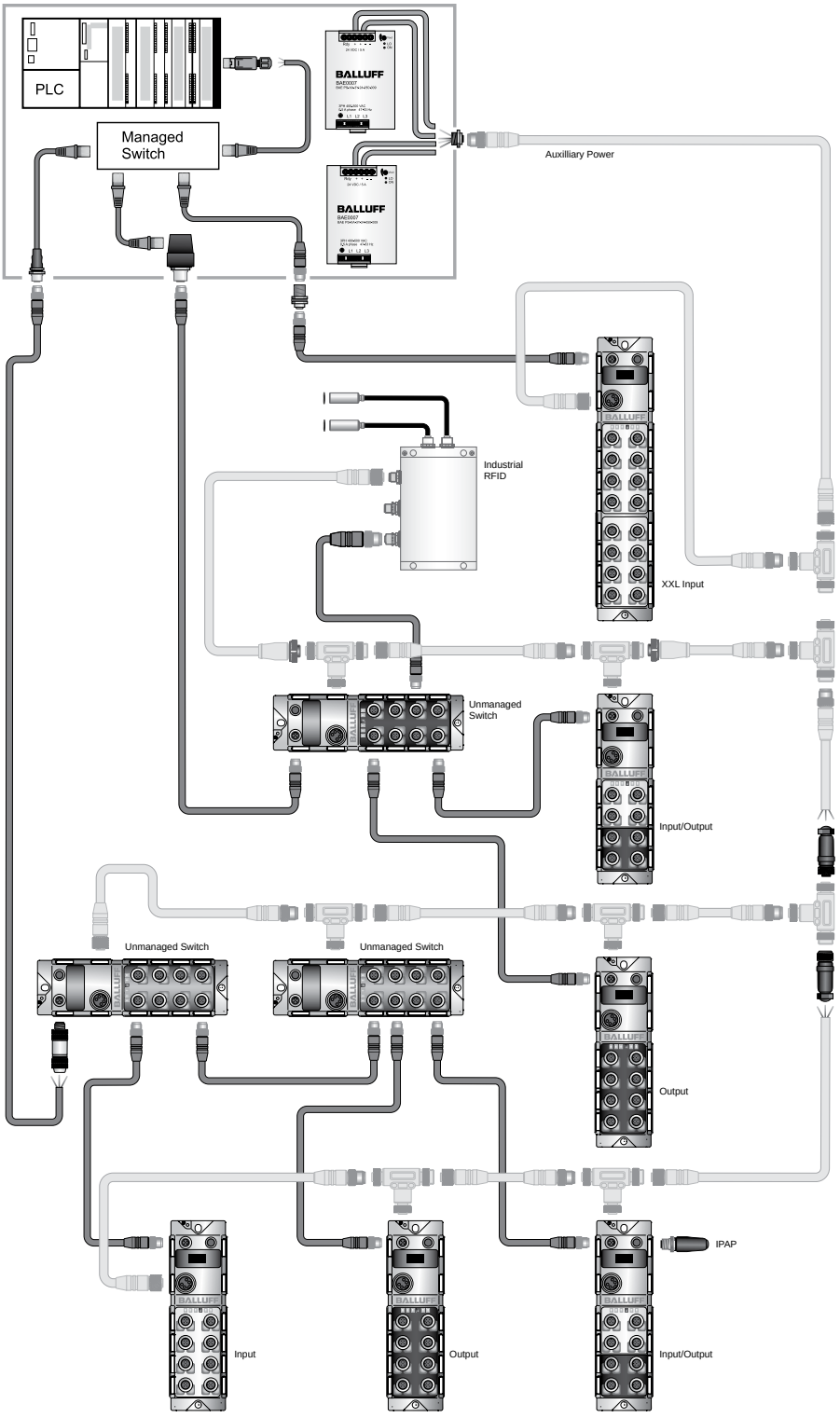
Ethernet Connectivity and Switches

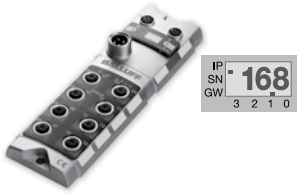
Balluff's rugged IP67 unmanaged Ethernet switch can be used on any Ethernet project. Use this unmanaged switch to network your Modbus TCP RFID processors or connect your Sharpshooter® vision sensors together. This 9 port switch can even be used with your EtherNet/IP™ discrete I/O blocks.

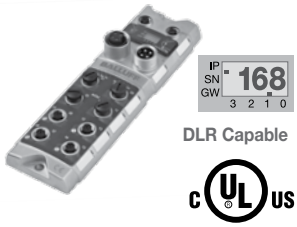
Seamless Communication Right Down to the Sensors

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.







DLR Capable

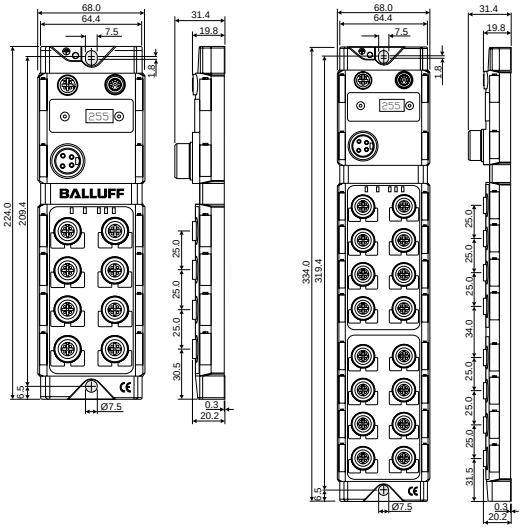
	Standard I/O Blocks	Standard I/O Blocks	XXL I/O Blocks
	With Service Port	With Embedded Switch	With Service Port
16 Input	**BNI0014**	**BNI004M**	
	BNI EIP-104-100-Z016	BNI EIP-104-105-Z015	
8 Output	**BNI0015**	**BNI005J**	
	BNI EIP-202-100-Z016	BNI EIP-202-105-Z015	
16 Output	**BNI0016**		
	BNI EIP-206-100-Z016		
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.
* Contact factory for availability

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 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	Solid	TPE	600V, CM	BCC M414-M414-6D-366-EM64N9-_ _ _*		
	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-VS64N9-_ _ _*		
		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/BCC03WW	M12-RJ45 Straight Bulkhead
BCC085H/BCC03WY	M12-RJ45 Right Angle Bulkhead
BCC08KW	M12 D-coded, Shield Break Plug

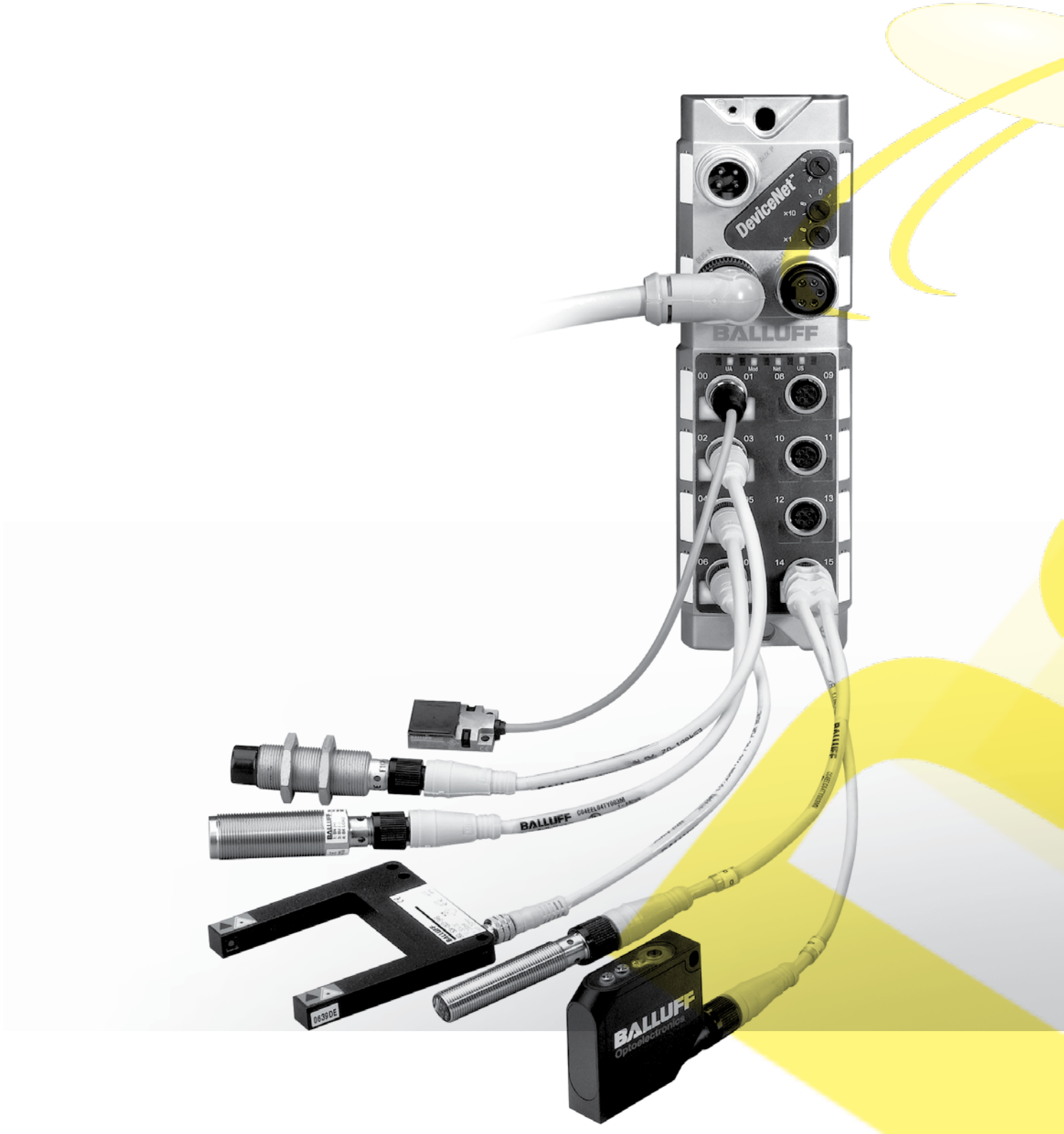
Field Attachables

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

	M12 Right to M12 Right	M12 Straight to RJ45	M12 Right to RJ45	RJ45 to RJ45	Bulk Cable (100m)
		BCC M414-E894-8G-695-EM64N9-___*			**BCC0CP9***
	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-673-VS64N9-___*		BCC E894-E894-90-339-VS64N9-___*	**BCC0AZ9**
		BCC M414-E894-8G-673-ES64N9-___		BCC E894-E894-90-339-ES64N9-___	**BCC0AUJ**

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

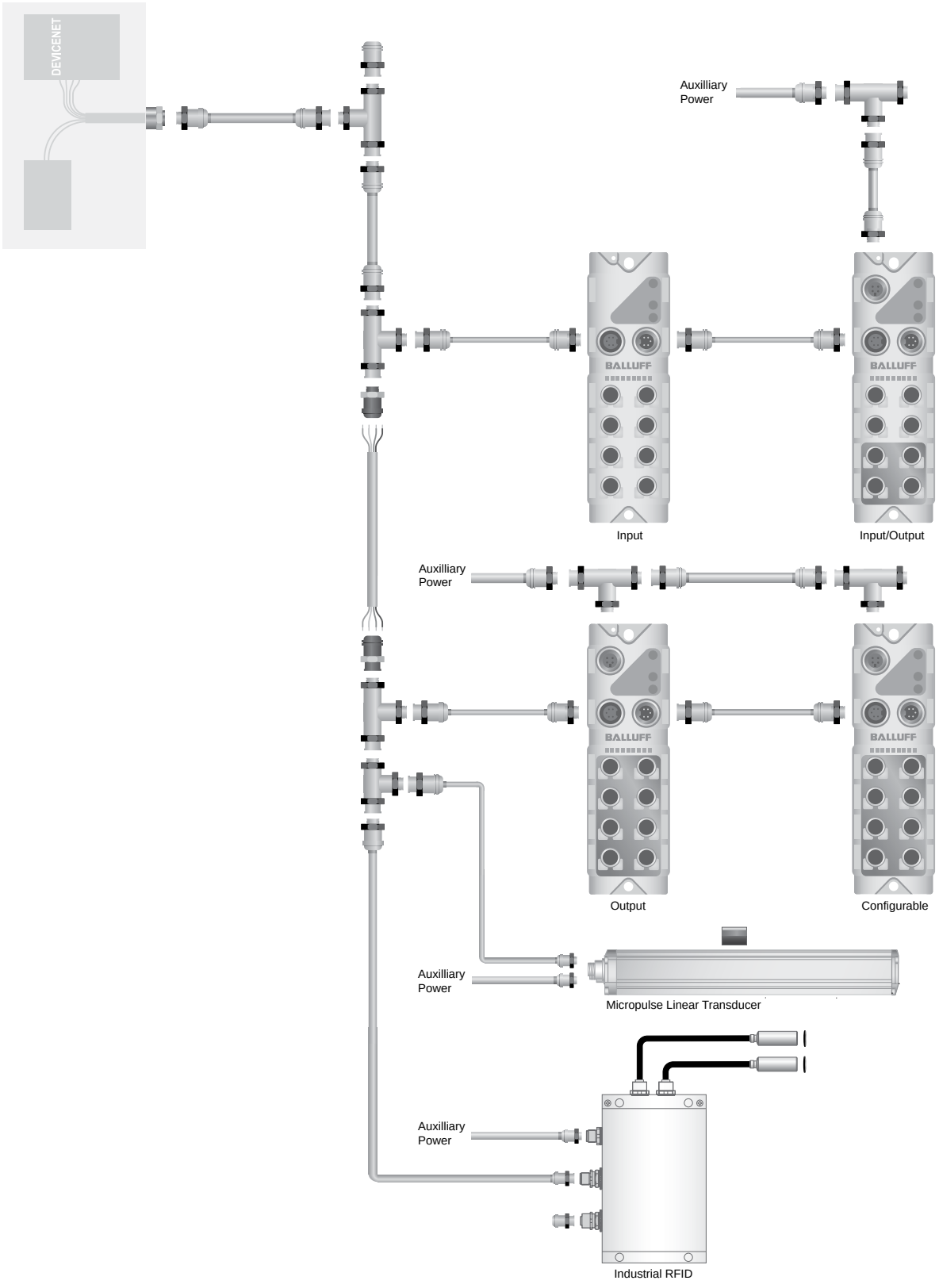
For a simple choice of outstanding network components, Balluff offers the entire spectrum of high-performance network technology. For applications in the USA, such as with Rockwell Automation and other controller manufacturers, you will find all modules for efficient DeviceNet installation at Balluff.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



DeviceNet
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.



The heart of Balluff's Network Component System

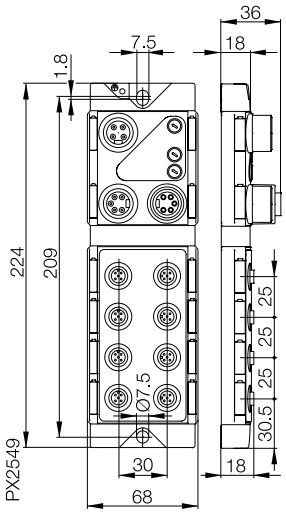
The old “home-run” wiring approach has proven too costly and inflexible for today's machine designers. Distributed I/O has become an essential part of OEM machine design and an accepted method for users to reduce their cost by eliminating long wire runs between field devices and the control system.

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

DeviceNet
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" 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

DeviceNet

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			BDN C-_ _ _-AC-EAD-01-_ _ _M	
7/8" Female Right Angle			BDN C-_ _ _-BC-EAD-01-_ _ _M	
7/8" Male Straight	BDN C-_ _ _-AC-EDA-01-_ _ _M	BDN C-_ _ _-BC-EDA-01-_ _ _M		
7/8" Male Right Angle	BDN C-_ _ _-AD-EDA-01-_ _ _M	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 = 2.0 M

M12 Thin DeviceNet Media

Head 1/Head 2	Single-Ended	M12 Male Straight	M12 Male Right Angle
Single-Ended		BDN C-_ _ _-CN-EDN-01-_ _ _M	BDN C-_ _ _-DN-EDN-01-_ _ _M
M12 Female Straight	BDN C-_ _ _-AN-EDN-01-_ _ _M	BDN C-_ _ _-AC-EDD-01-_ _ _M	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 = 2.0 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
M12 Male Straight	BDN C-D11-RC-EOA-01-_ _ _M
7/8" 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
010 = 1.0 m
020 = 2.0 m
050 = 5.0 m
100 = 10.0 m

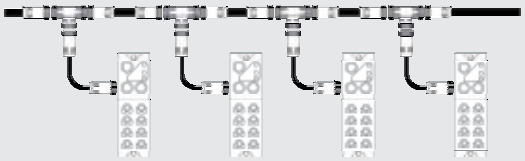
Raw Cable Data

		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

Trunk and Drop Topology

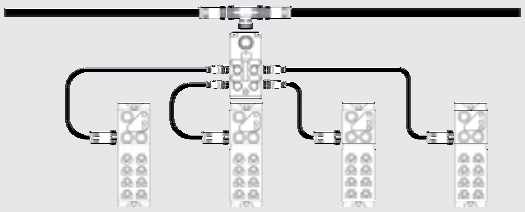
- Easiest to troubleshoot
- One device can be disconnected without disturbing the entire network
- Extra cable requirements lead to higher costs

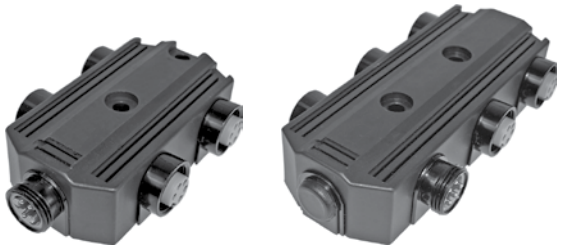


Description	Pass-Thru	Drop	Order Code
Standard Tee	7/8"	7/8"	**BCC07WP**
Standard Tee	7/8"	M12	**BCC07WZ**
Standard Tee	M12	M12	**BCC07WR**
Diagnostic Tee	7/8"	7/8"	**BCC07WT**
U-Style Drop	7/8"	7/8"	**BCC07Y6**
U-Style Drop	M12	M12	**BCC08CA**

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

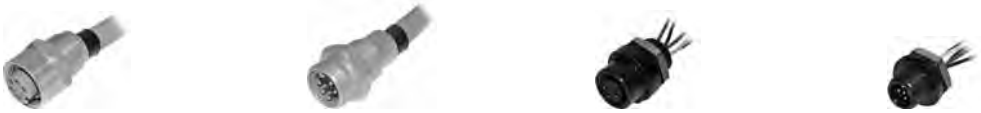
Size	Configuration	Description	Order Code
7/8"	Male to Male	Gender Changer	**BCC07Y2**
7/8"	Female to Female	Gender Changer	**BCC07Y3**
7/8"	Female to Male	Right Angle	**BCC07Y4**
7/8"	Female to Male	Inline Diagnostic	**BCC07WU**

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

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.

DeviceNet/CAN Analyzer

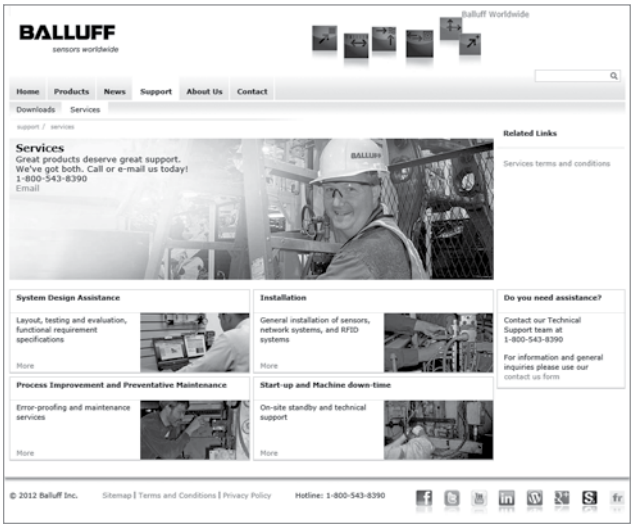
Part number	BNI ACC A03-01-01

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.

DeviceNet Network Analysis On-site Service

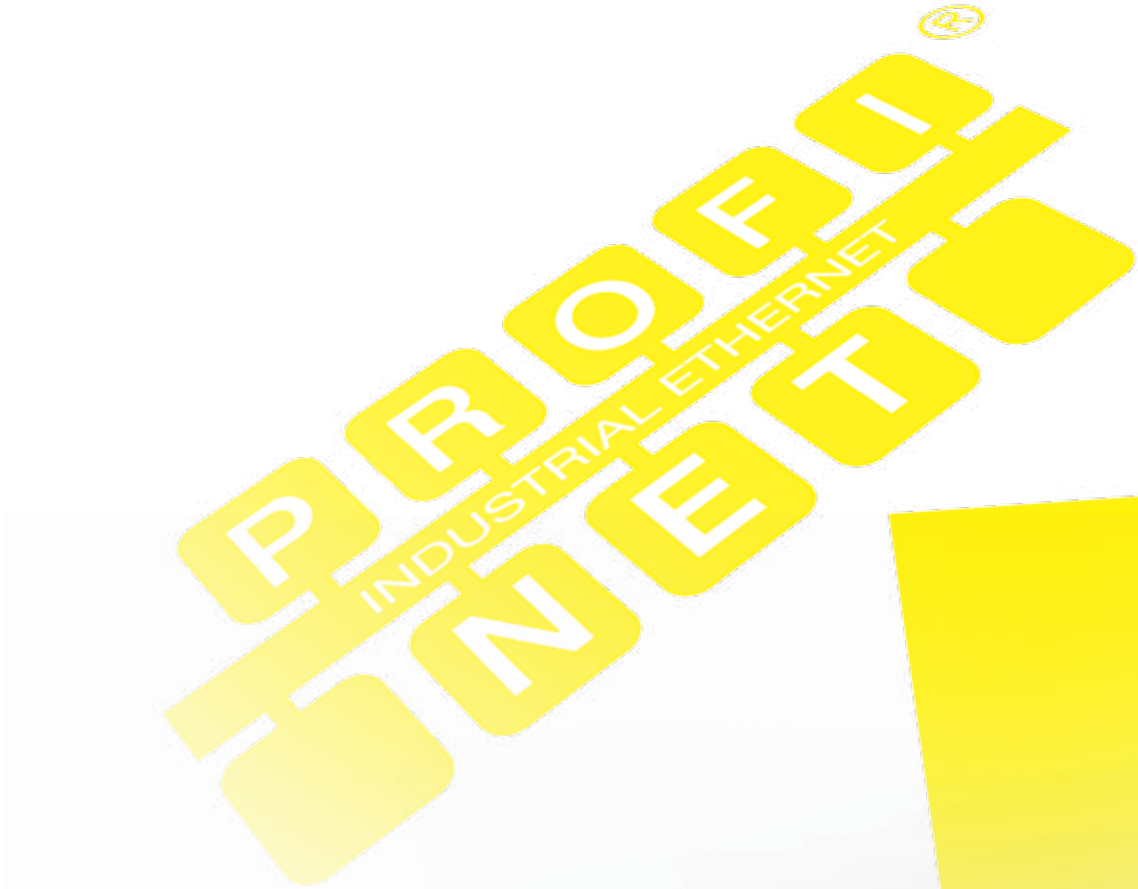
Have Balluff Technical Services come visit your facility and help you diagnose hiccups or issues on your DeviceNet network. We will review I/O network performance and validate the network health. This will be done by working with your maintenance crew to monitor data communications for a 24-hour period, analyze results, and provide a finalized report on overall network health with recommended improvements.

For more information, please visit www.balluff.us or call 1-800-543-8390.



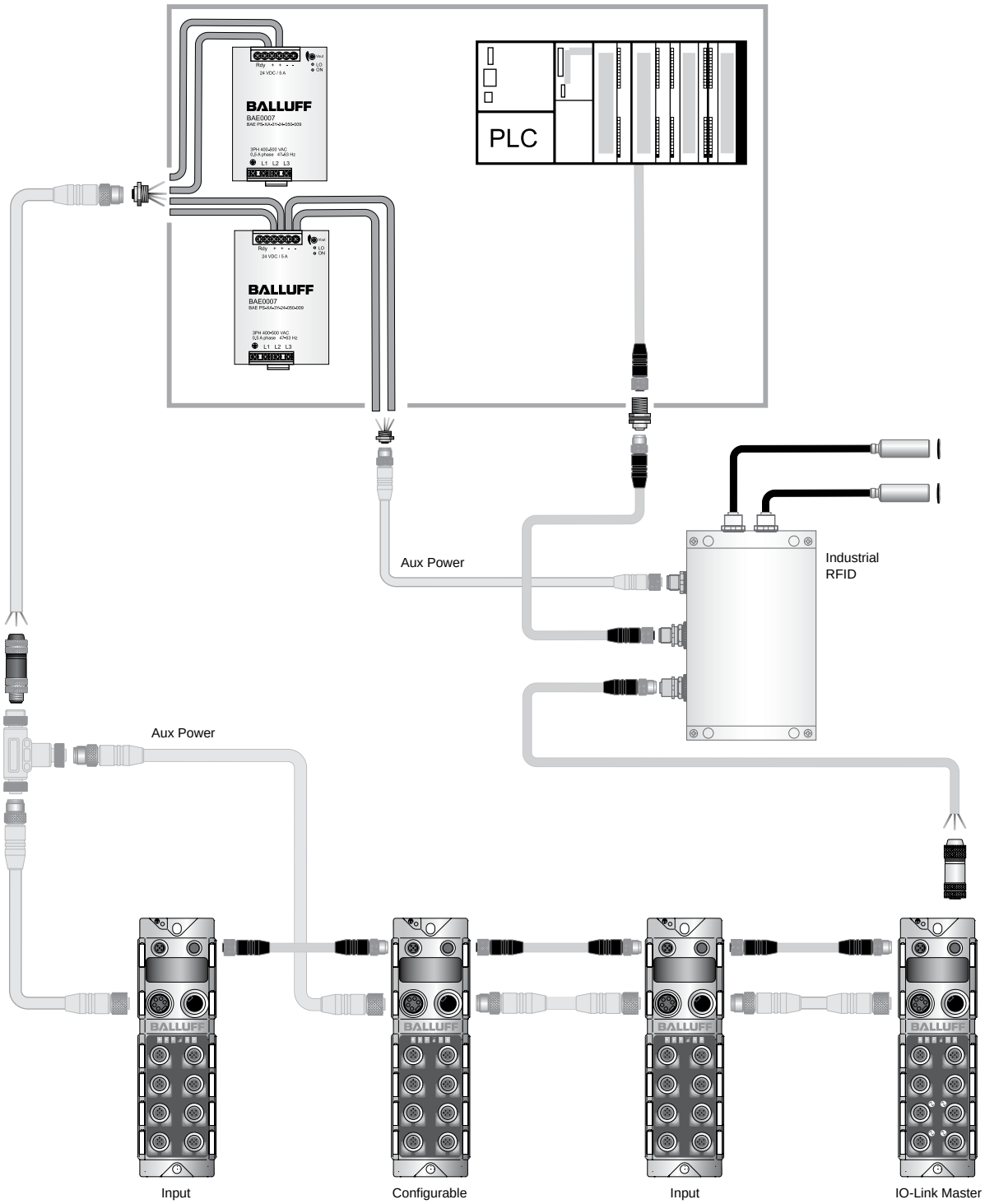
With Profinet, industrial automation has made a significant advancement. Profinet operates on an Ethernet basis and is considerably faster than Profibus. Other advantages: Profinet can be fully integrated from the control level to the drive, even in harsh environments. With Profinet, you also directly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



PROFINET
Contents

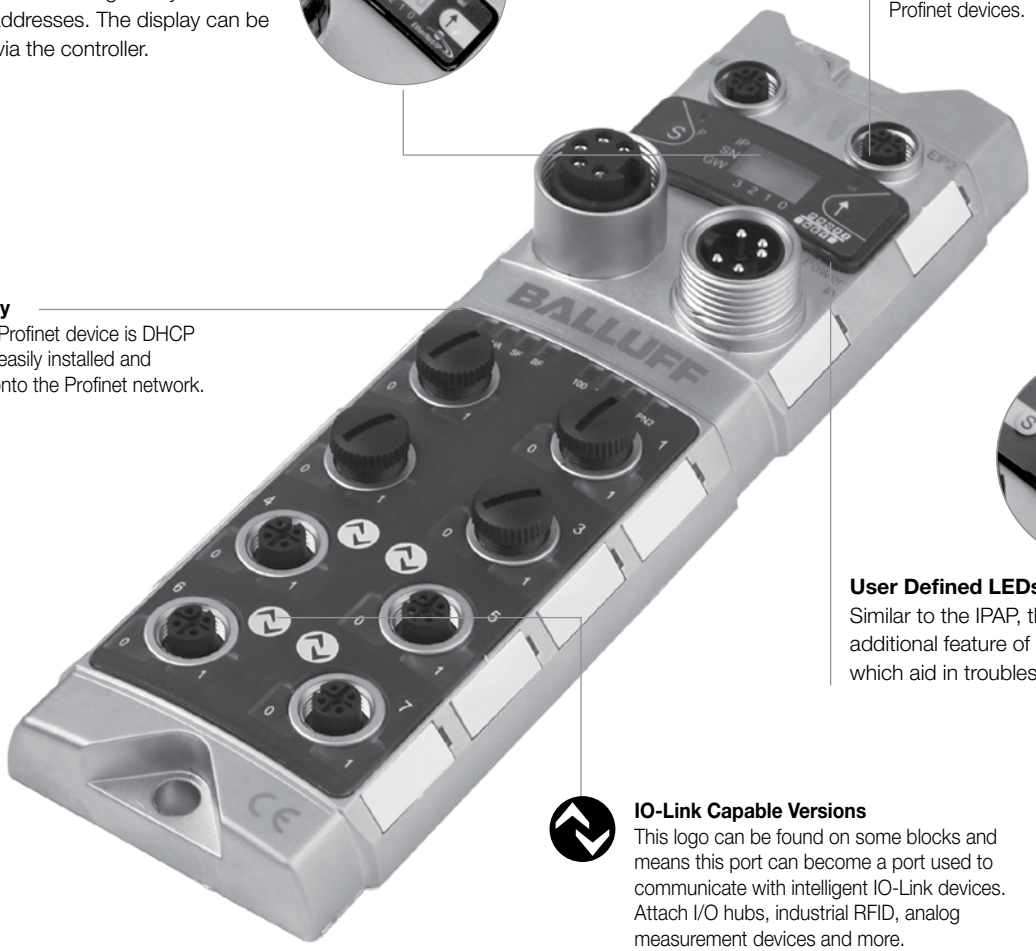
High-quality connectors and compatible accessories are required to create an efficient Profinet system. Balluff offers all the components you need for constructing and supporting a first-class Profinet network. From industrial RFID processors for plant floor data tracking to Profinet compliant network cables, Balluff offers many solutions for use on your industrial Profinet network.



There are many who rely on Profibus in their manufacturing processes and can now have that same dependability moving into the Ethernet realm with the Profinet protocol. Balluff offers a wide range of Profinet components for efficient and fast communication. IO-Link capable Profinet expansion blocks allow you to take full advantage of the many benefits of IO-Link such as its unique expandability and configurability of the IO-Link Devices.

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.

Integrated Switch
These industrial M12 connections allow for easy IP67 connections between daisy chained network I/O modules and other Profinet devices.

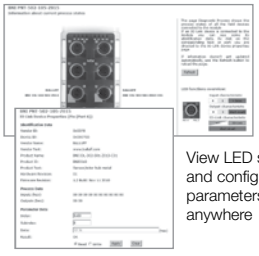


DHCP Ready
Every Balluff Profinet device is DHCP ready and is easily installed and established onto the Profinet network.

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.

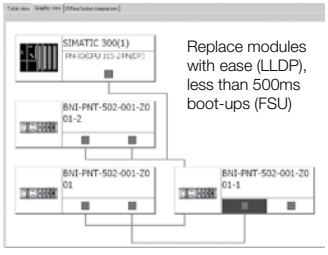
IO-Link Capable Versions
This logo can be found on some blocks and means this port can become a port used to communicate with intelligent IO-Link devices. Attach I/O hubs, industrial RFID, analog measurement devices and more.

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)

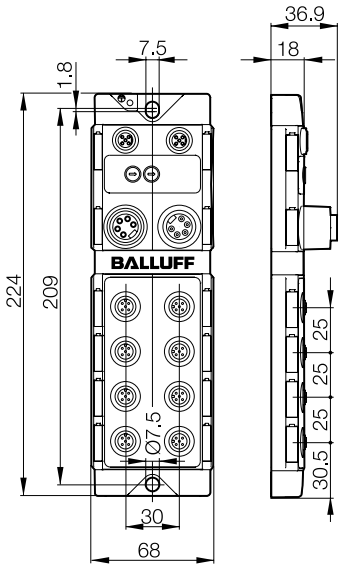
PROFINET
Machine mount I/O blocks

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

*Consult factory for availability

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-_ _ _**

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

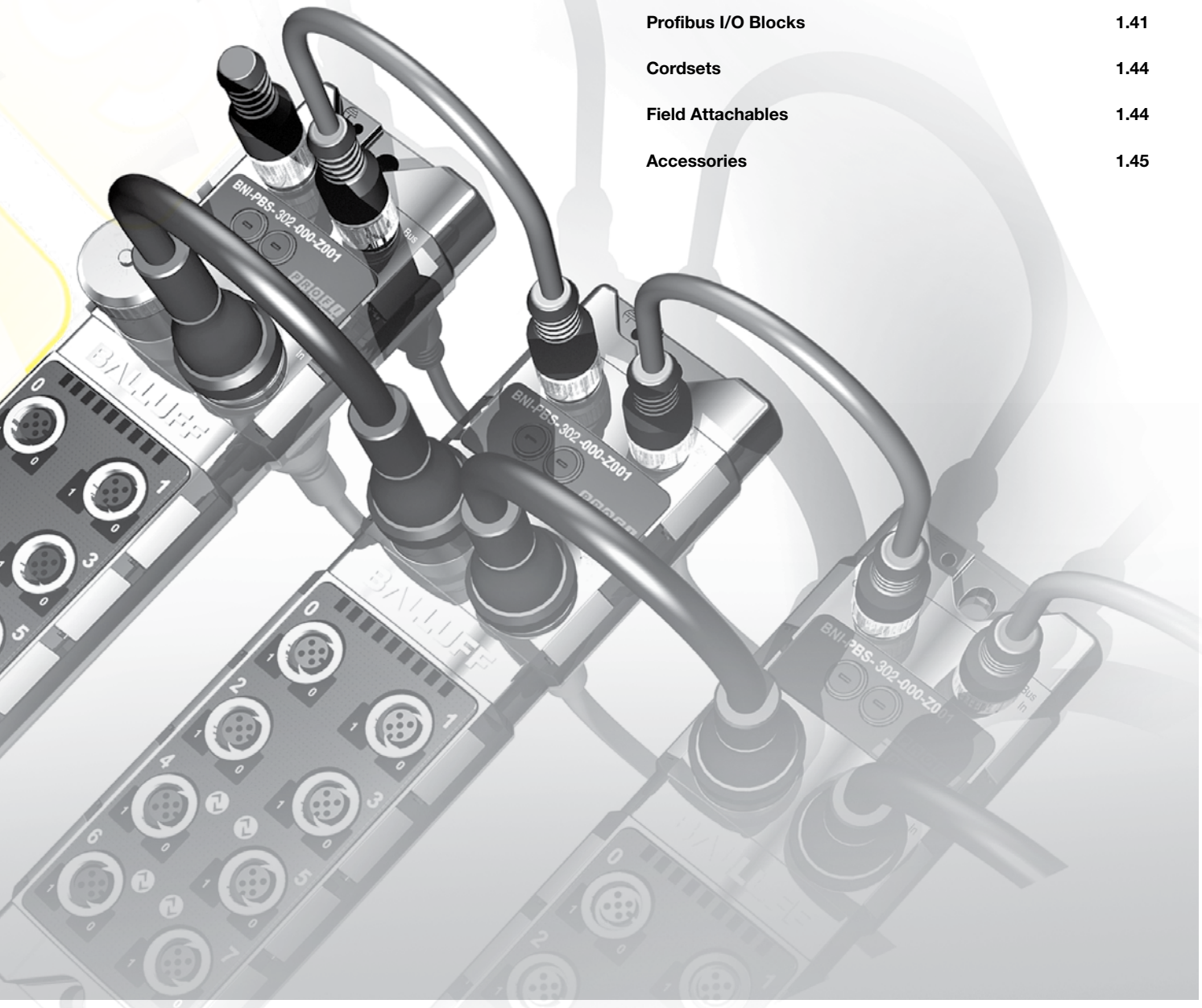
Description	Order Code
M12, D-coded, Straight Male	**BCC03WZ**
M12, D-coded, Right-Angle Male	**BCC03Y0**
M12, D-coded, Straight Female	**BCC03Y1**
M12, D-coded, Right-Angle Female	**BCC03Y2**
RJ45, Straight Male, 8-position, 4-wire	**BCC06FH**

Profinet Accessories

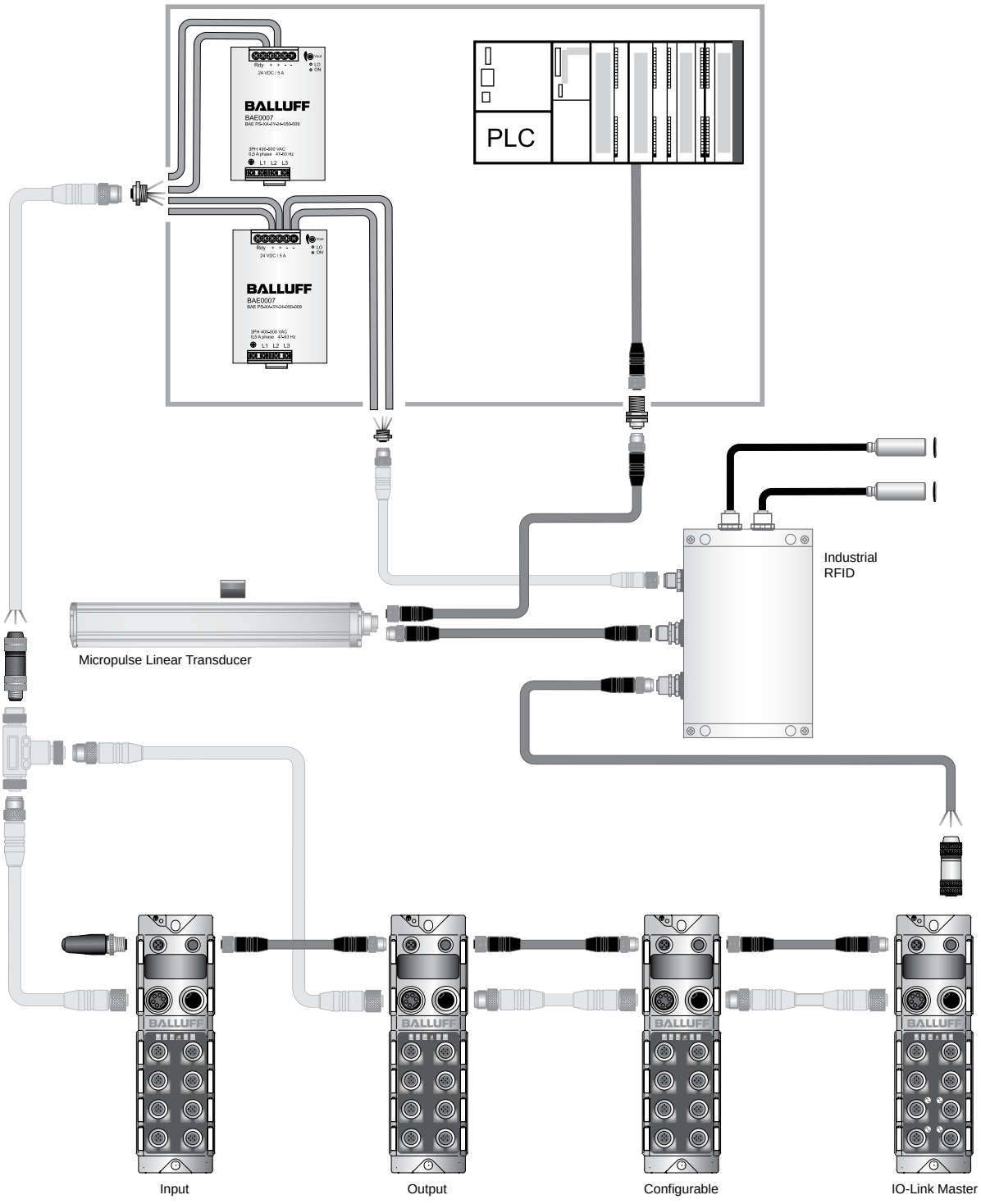
Description	Order Code
M12-RJ45 Receptacle, 2 m	**BCC03WP**
M12-M12 Female Bulkhead	**BCC06YP**
M12-RJ45 Straight Bulkhead	**BCC085F/BCC03WW**
M12-RJ45 Right Angle Bulkhead	**BCC085H/BCC03WY**
M12 D-coded, Shield Break Plug	**BCC08KW**
Bulk Cable, 100 m Starquad Ethernet	**BCC0AC6**

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.



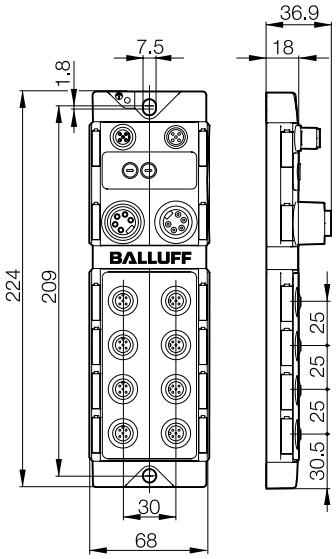
High-quality connectors and compatible accessories are required to create an efficient Profibus system. Balluff offers all the components you need for constructing and supporting a first-class Profibus network. From industrial RFID processors for plant floor data tracking to Micropulse® linear transducers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



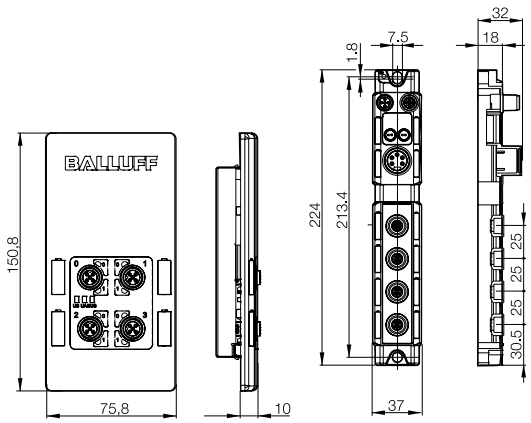
In use for 20 years, Profibus has reliably supported modern manufacturing in many applications. Balluff offers a wide range of Profibus components for efficient process communication with simple wiring, fast integration and unique expandability. IO-Link capable Profibus expansion blocks allow you to take full advantage of the many benefits of IO-Link.

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.



IO-Link Capable Versions
This logo can be found on some blocks and means this port can become a port used to communicate with intelligent IO-Link devices. Attach I/O hubs, industrial RFID, analog measurement devices and more.



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
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.

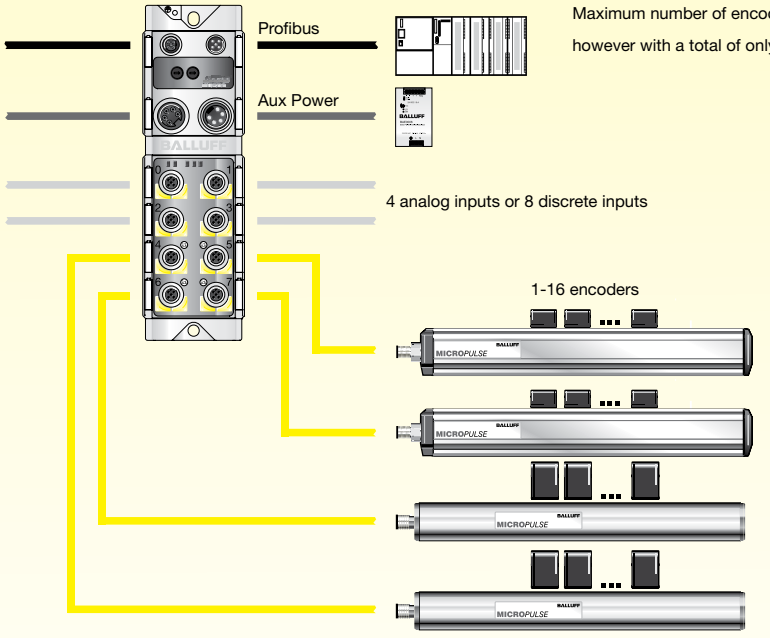
IO-Link Blocks

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		

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.

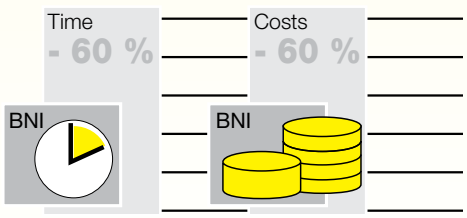
Profibus/ Micropulse Transducer Inferface Block

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



Maximum number of encoders per BTL is 16, however with a total of only 60 per module

Reduce your wiring costs by 60 %!



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

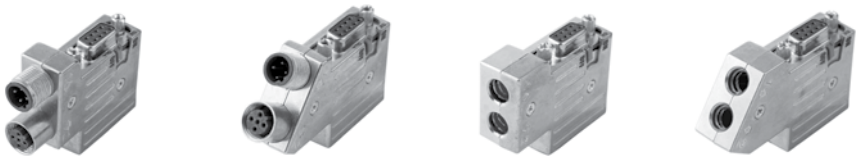
Double-Ended Lengths:
003 = 0.3 m
006 = 0.6 m
010 = 1.0 m
020 = 2 m
050 = 5 m
100 = 10 m
150 = 15 m
200 = 20 m

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

CC-Link

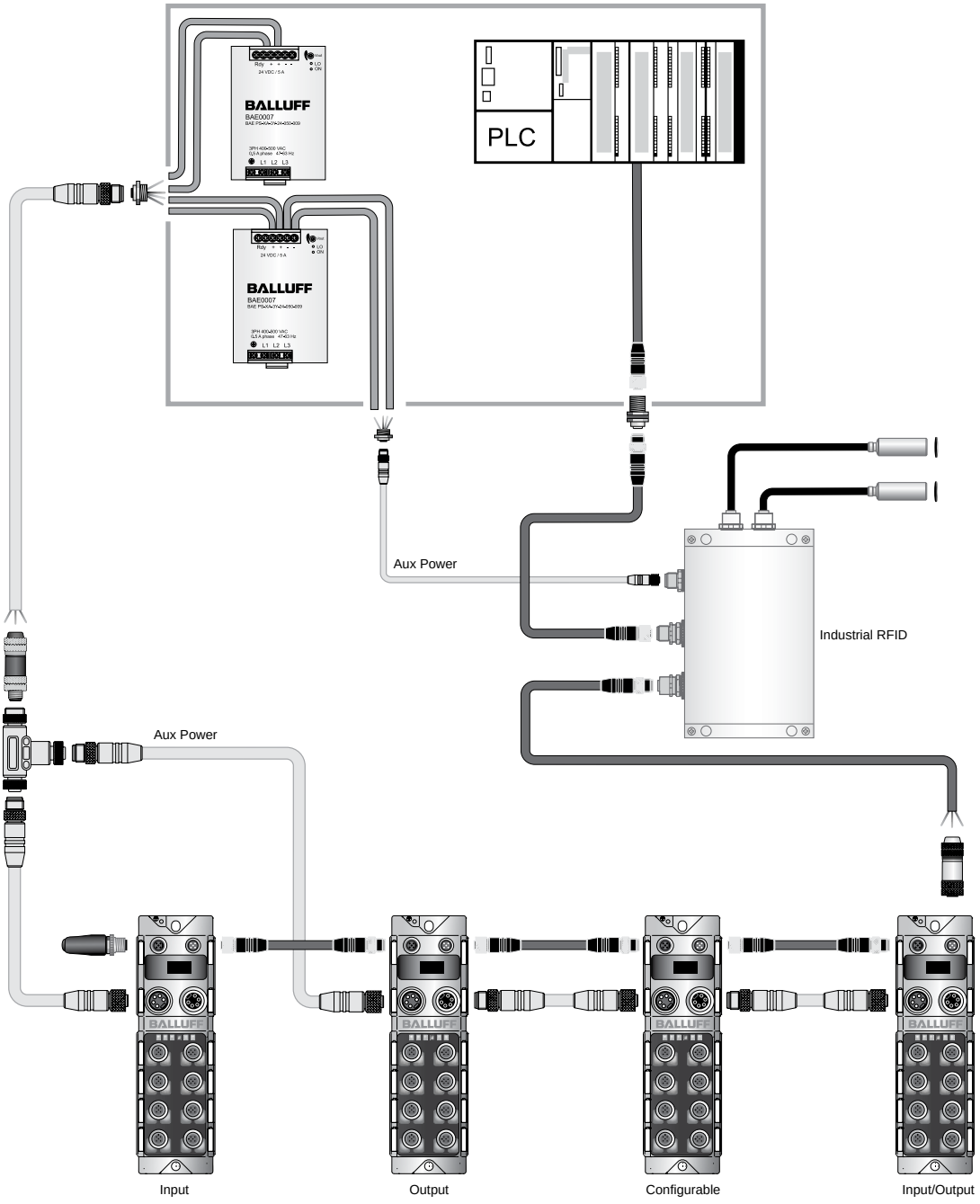
CC-Link is the most dominant and fastest growing fieldbus technology in Asia. The open network is supported by the global CC-Link partner association CLPA, which comprises more than 1,000 companies. CC-Link is a standardized fieldbus designed to integrate different automation components from a wide range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

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

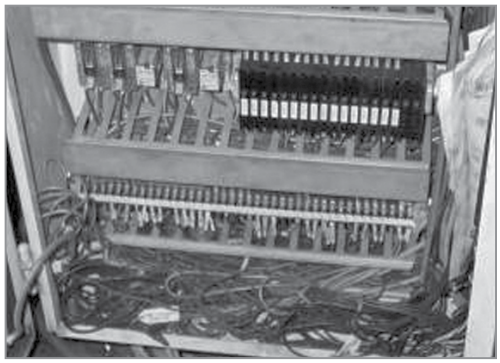
Every equipment designer goes through a phase of their design process where they need to decide how their I/O gets from their sensors and their valves to their controller. Some people use I/O cards on their PLC, or networks with IP20 solutions inside remote I/O cabinets.

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.

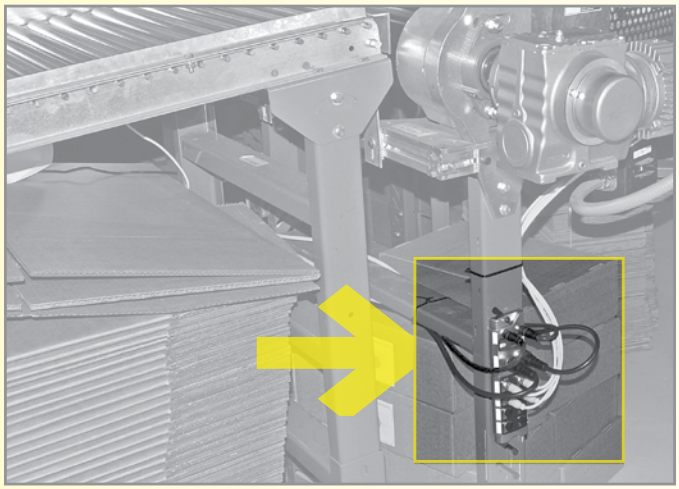
3. **Setup Time**
   If for some reason the machine needs to be torn down and shipped someplace else (which many machines do), many hours can be spent disconnecting the I/O only to be reassembled in the final destination.



Before

After

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.



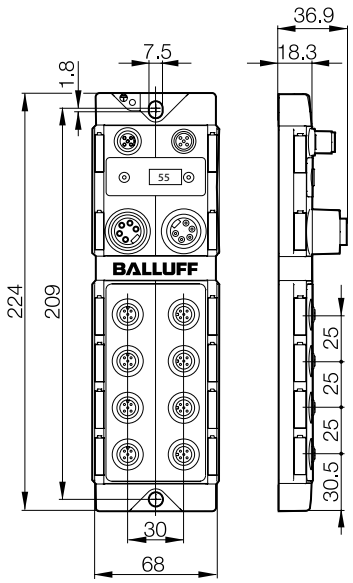
Inputs and Outputs without an Enclosure

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

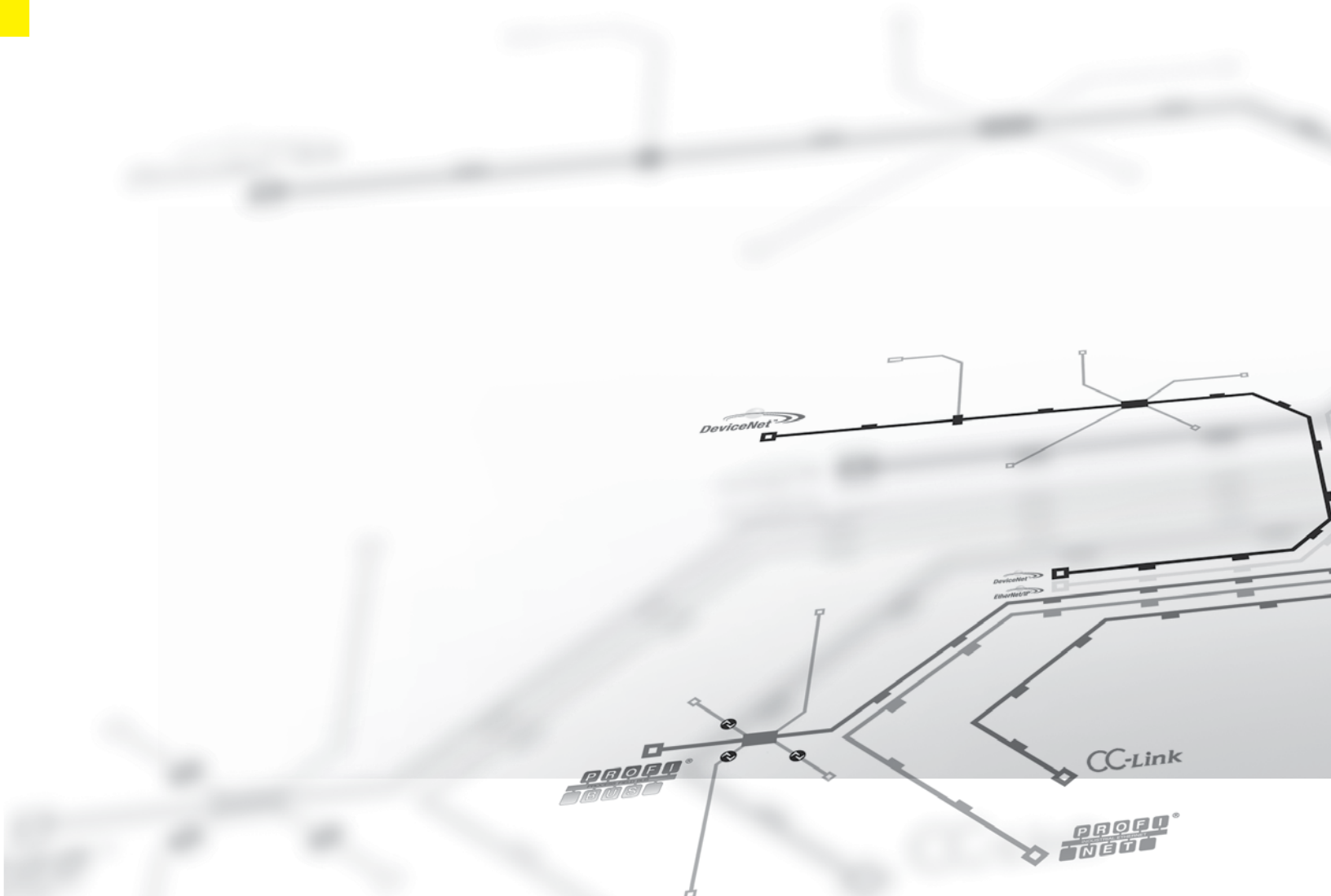
Head 1/Head 2	Single-Ended Female	M12 A-Coded Straight Male
Single-Ended Male	---	BCC M414-0000-2A-068-VS24N7-_ _ _
M12 A-Coded Straight Female	BCC M415-0000-1A-068-VS24N7-_ _ _	BCC M415-M414-3A-337-VS24N7-_ _ _

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**

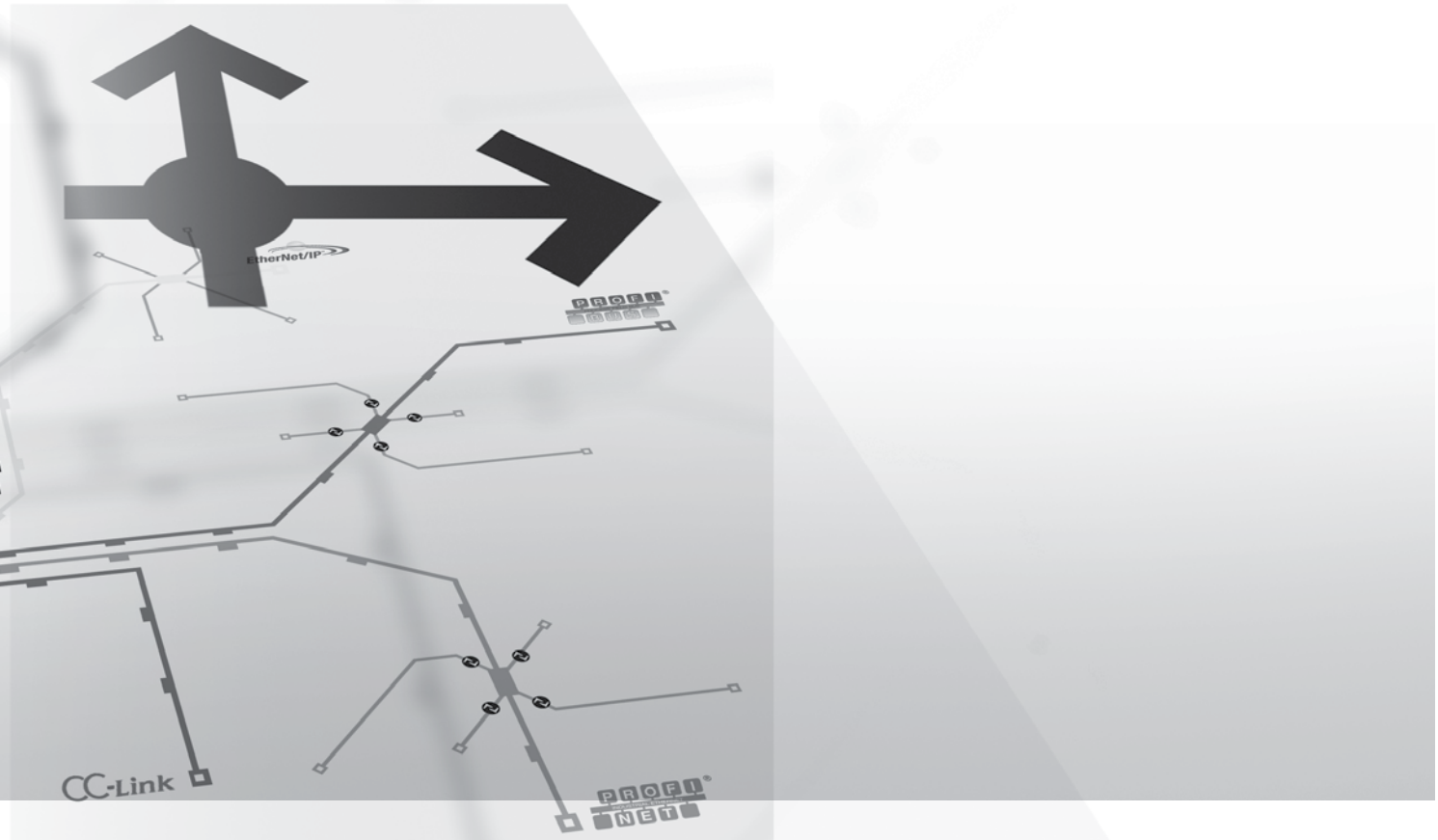
For 5-pole aux power cables and accessories, see pages 3.42-3.47


DeviceNet
DeviceNet
EtherNet/IP
CC-Link
PROFI BUS
PROFI NET

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.





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	

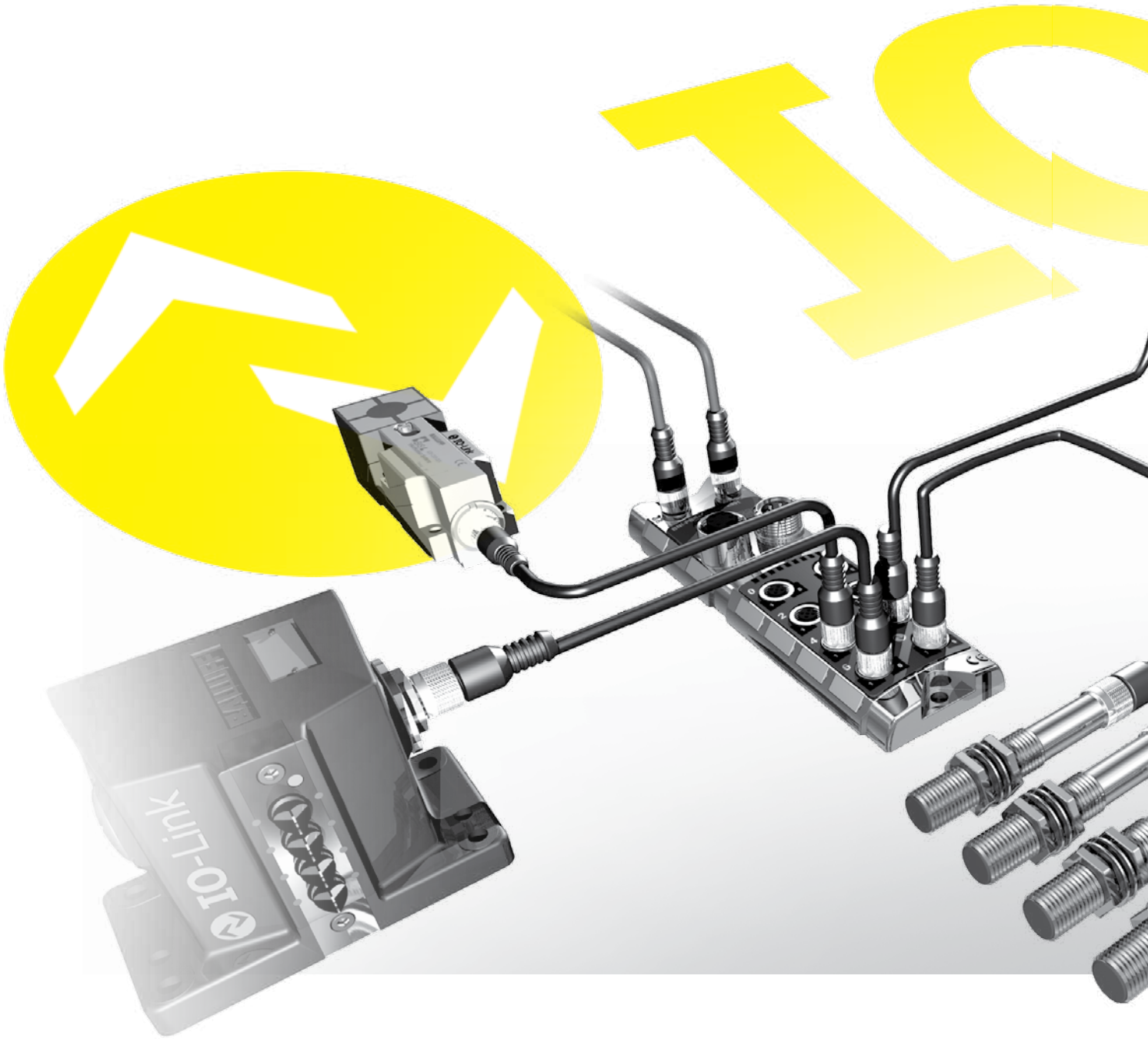
*Consult factory for availability

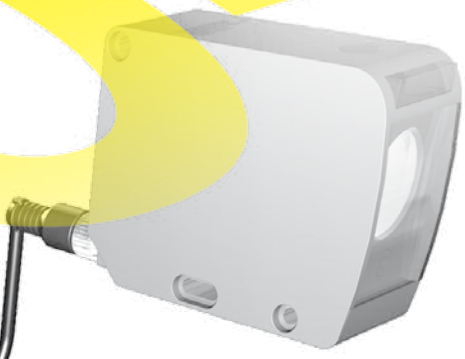
	BAM0114	BAM01LT	BAM012T	BAM012U
	BKS-12-CS-01	BAM CS-XA-006-M12-1	BKS-7/8-CS-00-A	BKS-7/8-CS-00-I
	M12x1	M12x1	7/8”-16UN	7/8”-16UN
	External	Internal	External	Internal
	CuZn	CuZn	CuZn	CuZn
	M12 Female Port	M12 Male Port	7/8” Female Port	7/8” Male Port

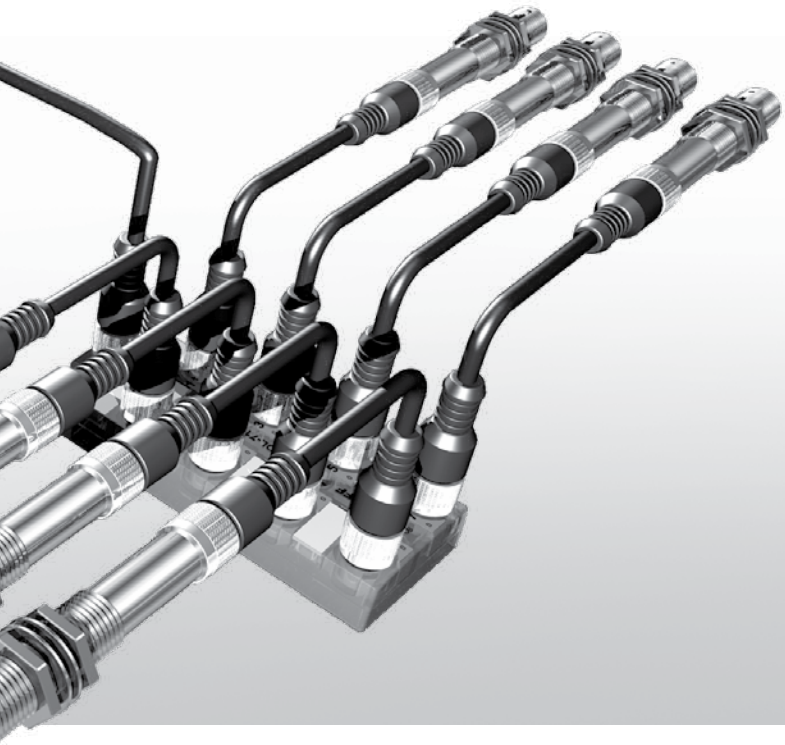
	BAM01H4	BAM01J0		BCC08HL
	BAM FK-NI-DNT-01-C	BAM FK-NI-PBS-01-C	BNI ACC-M01-001	BCC M415-M412-3A-RA012-000
	Dial Cover	Dial Cover	Mounting Plate	Non-polarized to Polarized
			68x224	M12
	7/8" Network Connections	M12 Network Connections	BNI Blocks	BNI Blocks
	BNI DNT…	BNI EIP… BNI PBS… BNI PNT… BNI CCL…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

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



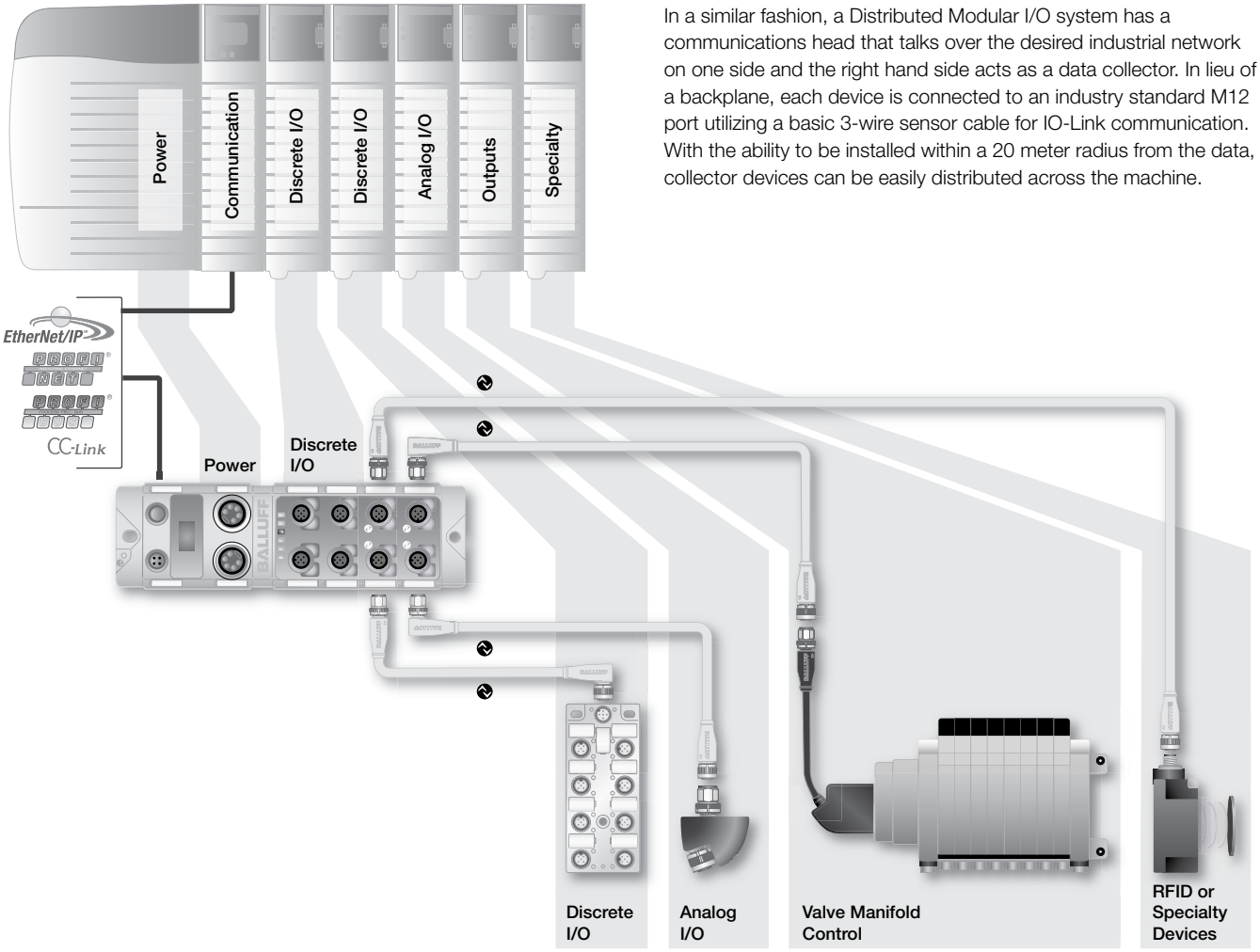




IO-Link
Distributed Modular I/O

IO-Link
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.



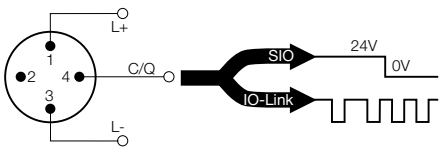
In a similar fashion, a Distributed Modular I/O system has a communications head that talks over the desired industrial network on one side and the right hand side acts as a data collector. In lieu of a backplane, each device is connected to an industry standard M12 port utilizing a basic 3-wire sensor cable for IO-Link communication. With the ability to be installed within a 20 meter radius from the data, collector devices can be easily distributed across the machine.

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.

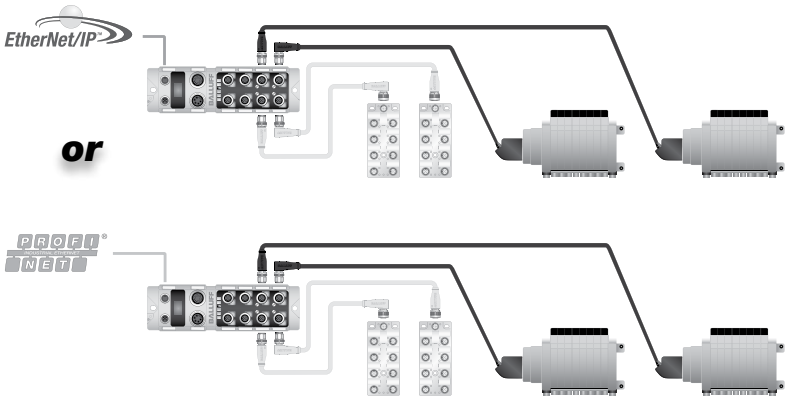
3 Wire or 4 Wire Sensor Cable

20 Meters maximum



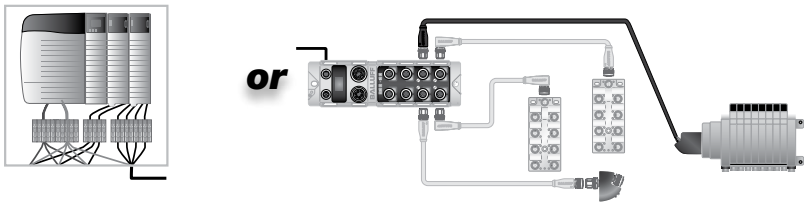
Simplify Controls Quotation Process

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.



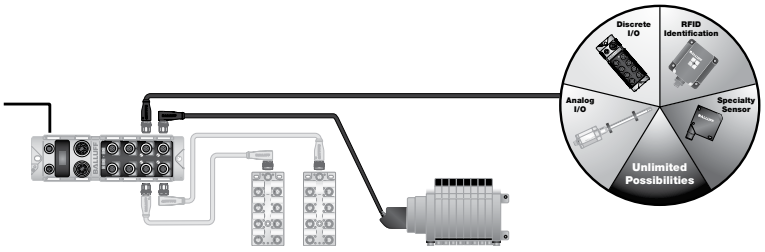
Reduce Total Cost per Point

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.



IO-Link

Types of Distributed Modular I/O devices

Discrete I/O

M8 ports
– Up to 16 inputs

M12 ports
– Up to 16 inputs
– 16 outputs
– 16 configurable

IP20 terminals
– Up to 16 configurable

Analog I/O

1 channel (14 bit)
– 0-10 V in/out
– 4-20mA in/out
– PT100 in

4 channels (10 bit)
– 0-10 V
– 4-20mA
– plus 8 inputs

Valve Manifold Control

25 pin D-sub

IP67 & Terminal

Specialty Devices and RFID

Measurement and position sensors

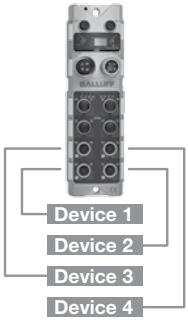
RFID
– Read/write
– Read only

Non-contact connectors
– 3 bytes to 11 bytes

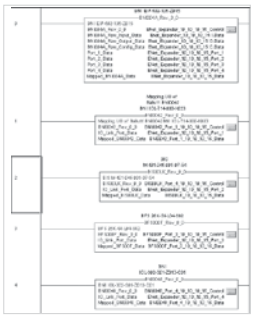
While hardware selection is important to the success of a project, if the hardware is not easily integrated into the engineering software, any benefits gained could be lost. However, Distributed Modular I/O is easily integrated into typical engineering software with an easy three step process. Below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

EtherNet/IP™

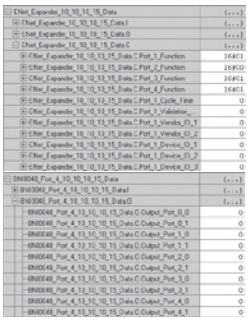
Step 1
Select hardware



Step 2
Import add on instructions (AOI)



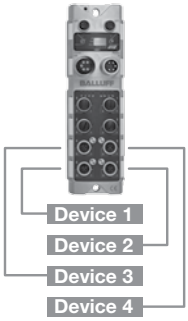
Step 3
Create user defined tags (UDTs)



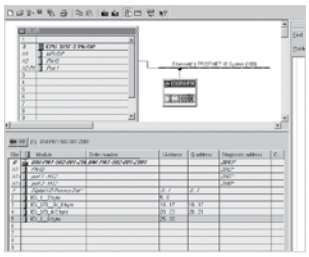
www.balluff.com/AOI

PROFINET INDUSTRIAL ETHERNET

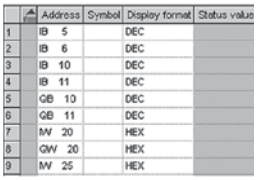
Step 1
Select hardware



Step 2
Configure Profinet expander and expansion devices from one screen using GSD and GSDML files



Step 3
Assign I/O to user defined address scheme



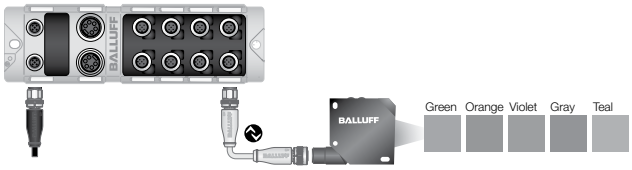
	Address	Symbol	Display format	Status value
1	IB 5		DEC	
2	IB 6		DEC	
3	IB 10		DEC	
4	IB 11		DEC	
5	QB 10		DEC	
6	QB 11		DEC	
7	MW 20		HEX	
8	QW 20		HEX	
9	MW 25		HEX	

Device parameterization and configuration

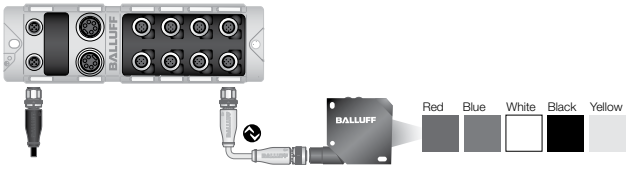
There are multiple advantages to device parameterization. The two major advantages are the ability to quickly swap out a failed device and the ability to reconfigure a device for a recipe or production change on the fly. The controller stores the necessary data for each setup and, when needed, it sends 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.

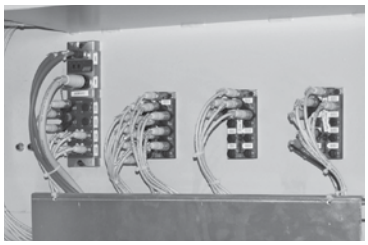


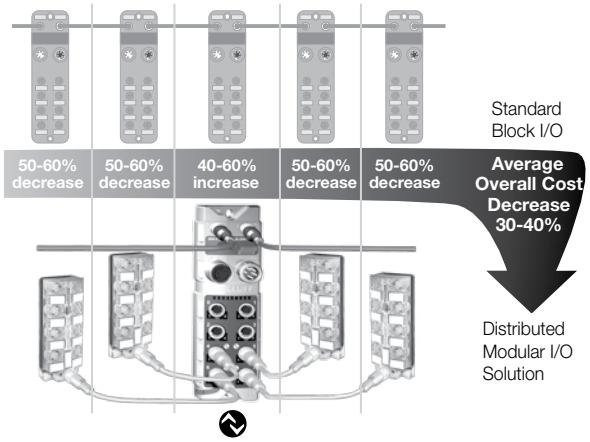
After the required parts are run off, a new project is begun with a different color set. In the past, a second color sensor would be required, or the operator would have to reprogram the current sensor for each new color. By using device parameterization, the controller tells the sensor its configuration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



Discrete I/O Savings

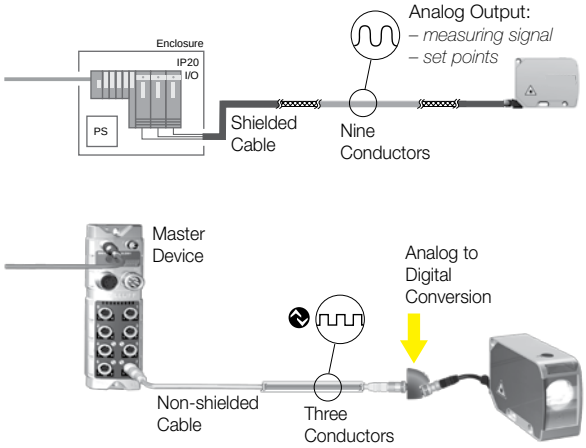
Machine builders looking to lower the cost per point for discrete I/O gain many advantages with Distributed Modular I/O. Reduced cable and device costs can save an OEM 15-60% over traditional I/O systems.





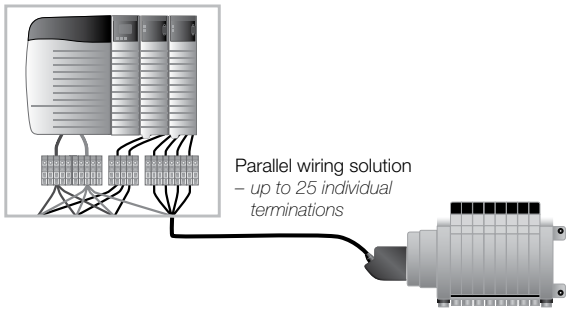
Analog I/O Savings

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.



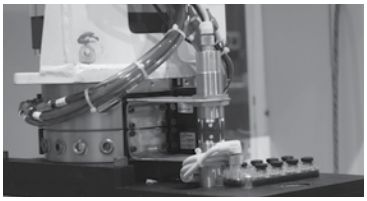
Valve Manifold Control

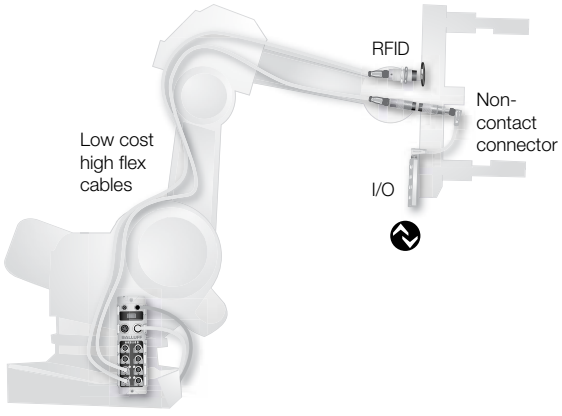
Every pneumatic action requires valve control. The typical parallel wiring of valve manifolds can be labor intensive and add dramatically to cabinet space and setup time.



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%.

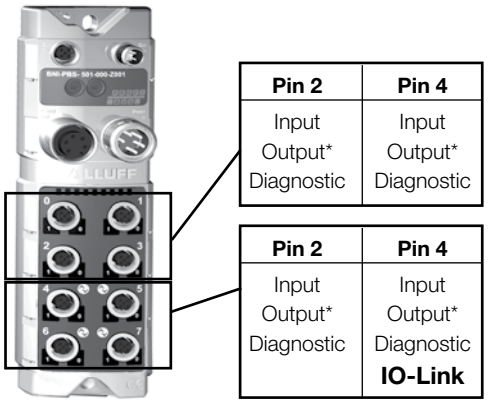




IO-Link

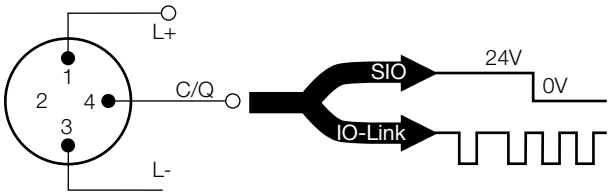
Flexible IO-Link Master Blocks

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.

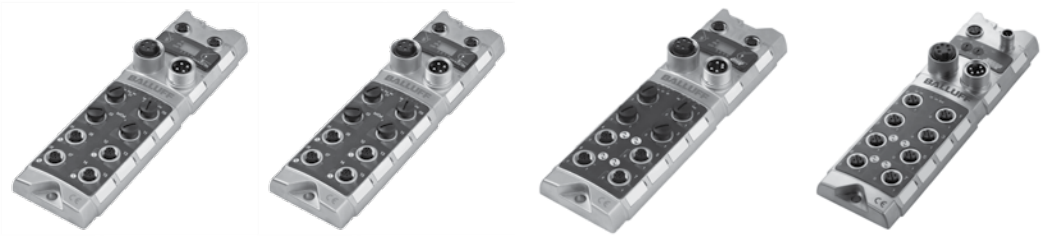


Pin 2	Pin 4
Input Output* Diagnostic	Input Output* Diagnostic

Pin 2	Pin 4
Input Output* Diagnostic	Input Output* Diagnostic **IO-Link**

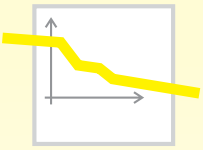


*Only available in configurable versions



Network Protocol	EtherNet/IP	DeviceNet	ProfiNet	Profibus	
Addressing	Display	Display	Display	Rotary Dials	
1 IO-Link / 4 RFID BIS VM or VL					
4 IO-Link / 4 Configurable					
4 IO-Link / 12 Configurable	**BNI004A**	**BNI005A***	**BNI004U**	**BNI003K**	
	BNI EIP-502-105-Z015	BNI DNT-502-100-Z001*	BNI PNT-502-105-Z015	BNI PBS-502-001-Z001	
8 IO-Link / 8 Configurable	**BNI006A***		**BNI005H***		
	BNI EIP-508-105-Z015		BNI PNT-508-105-Z015		

*Consult factory for availability

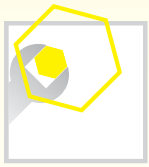


Reduce Costs

- 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

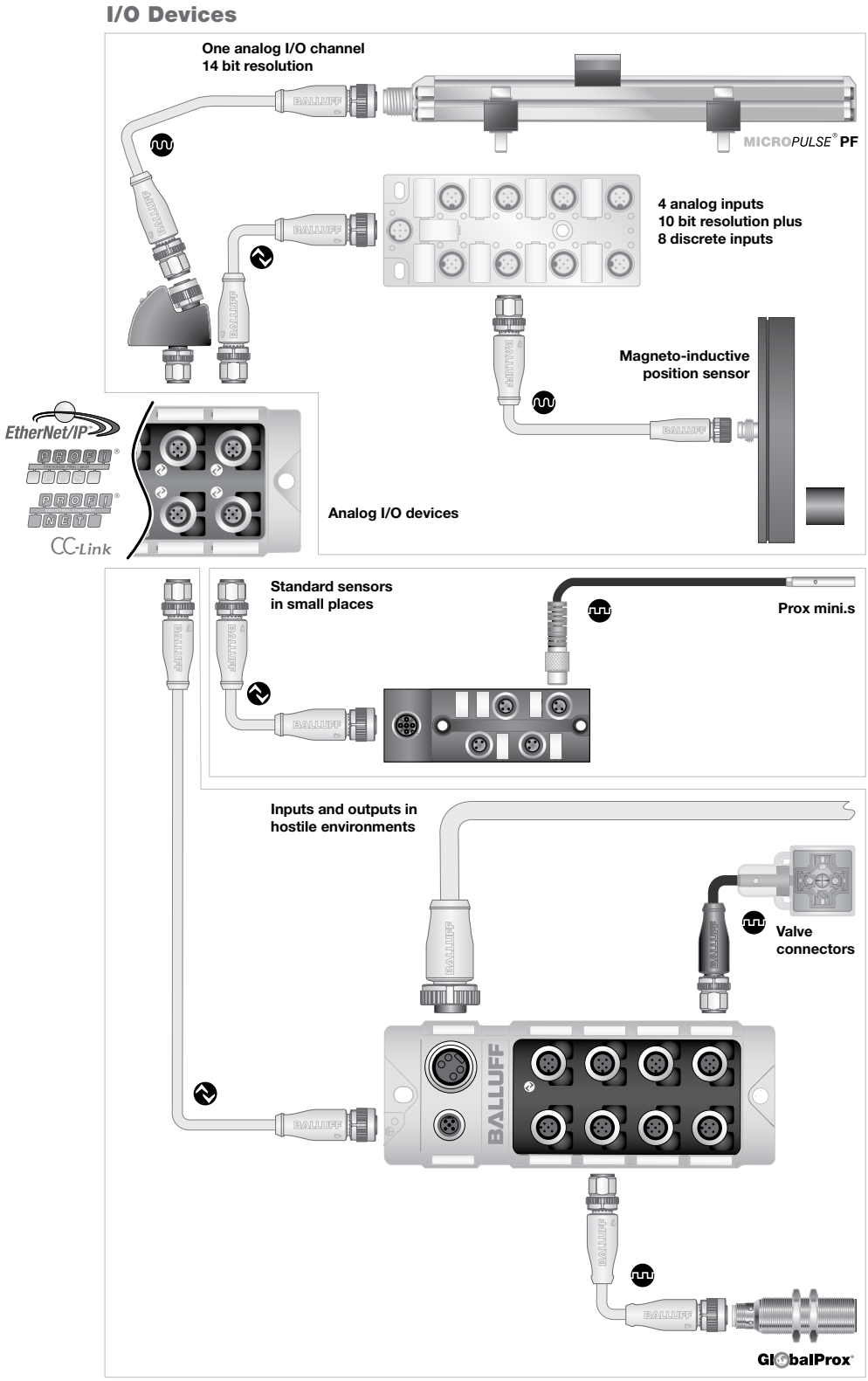
IO-Link

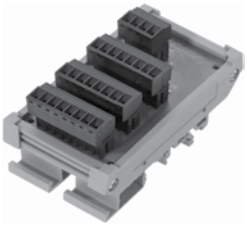
	Profibus	Profibus	Profibus	Profibus	CC-Link
	Display	Rotary Dials	Rotary Dials	Display	Display
				BIS00T3	
				BIS V-6102-019-C001	
		BNI003P	**BNI0030**		
		BNI PBS-507-001-Z011	BNI PBS-504-001-K008		
	BNI005R				**BNI0040**
	BNI PBS-502-101-Z001				BNI CCL-502-100-Z001

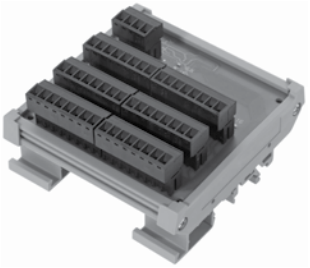
IO-Link Input/Output Devices

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







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

Connection Type	Spring Terminal	Spring Terminal
8 Configurable	**BNI004K**	
	BNI IOL-309-000-K024	
16 Configurable		**BNI004L**
		BNI IOL-310-000-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

IO-Link

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		**BNI0042**
			BNI IOL-714-000-K023
4-20 mA Analog (14 bit), 3-wire input	1		**BNI0041**
			BNI IOL-712-000-K023
PT100 Analog (14 bit), 3-wire input	1		**BNI004T**
			BNI IOL-716-000-K023
0-10 V Analog (14 bit), 3-wire output		1	**BNI004E**
			BNI IOL-724-000-K023
4-20 mA Analog (14 bit), 3-wire output		1	**BNI004C**
			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					–	
3-wire input	4 or 8 PNP	–	**BNI000P** (4 input)	**BNI000R** (8 input)		
			BNI IOL-101-000-K018	BNI IOL-102-000-K019		
3-wire input, w/diagnostics	4 or 8 PNP	–	**BNI001W** (4 input)	**BNI001Y** (8 input)		
			BNI IOL-101-S01-K018	BNI IOL-102-S01-K019		
4-wire input	8 or 16 PNP	–		**BNI0021** (16 input)	**BNI0005** (8 input)	
				BNI IOL-104-000-K021	BNI IOL-102-000-K006	
4-wire input w/diagnostics	16 PNP	–		**BNI0022** (16 input)		
				BNI IOL-104-S01-K021		
4-wire output	–	8				
4-wire output, w/diagnostics	–	8				
5-wire input	16x PNP (or NPN)	–			**BNI0006**	
					BNI IOL-104-000-K006	
5-wire input, w/diagnostics	16x PNP (or NPN)	–				
5-wire input, w/diagnostics, w/2 bytes ID data	16x PNP (or NPN)	–				
5-wire input, w/diagnostics, w/4 bytes ID data	16x PNP	–				
5-wire output	–	16				
5-wire output w/diagnostics	–	16				
5-wire configurable	max 16 PNP	max 16			**BNI005L**	
					BNI IOL-302-000-K006	
5-wire configurable, w/diagnostics	max 16 PNP	max 16				
5-wire configurable , w/diagnostics, w/2 bytes ID data	max 16 PNP	max 16				
0-10 V analog (10 bit) 5-wire input	4x VDC 8x PNP	–			**BNI0008**	
					BNI IOL-710-000-K006	
4-20 mA analog (10 bit) 5-wire input	4x mA 8x PNP	–			**BNI0007**	
					BNI IOL-709-000-K006	

*Consult factory for availability

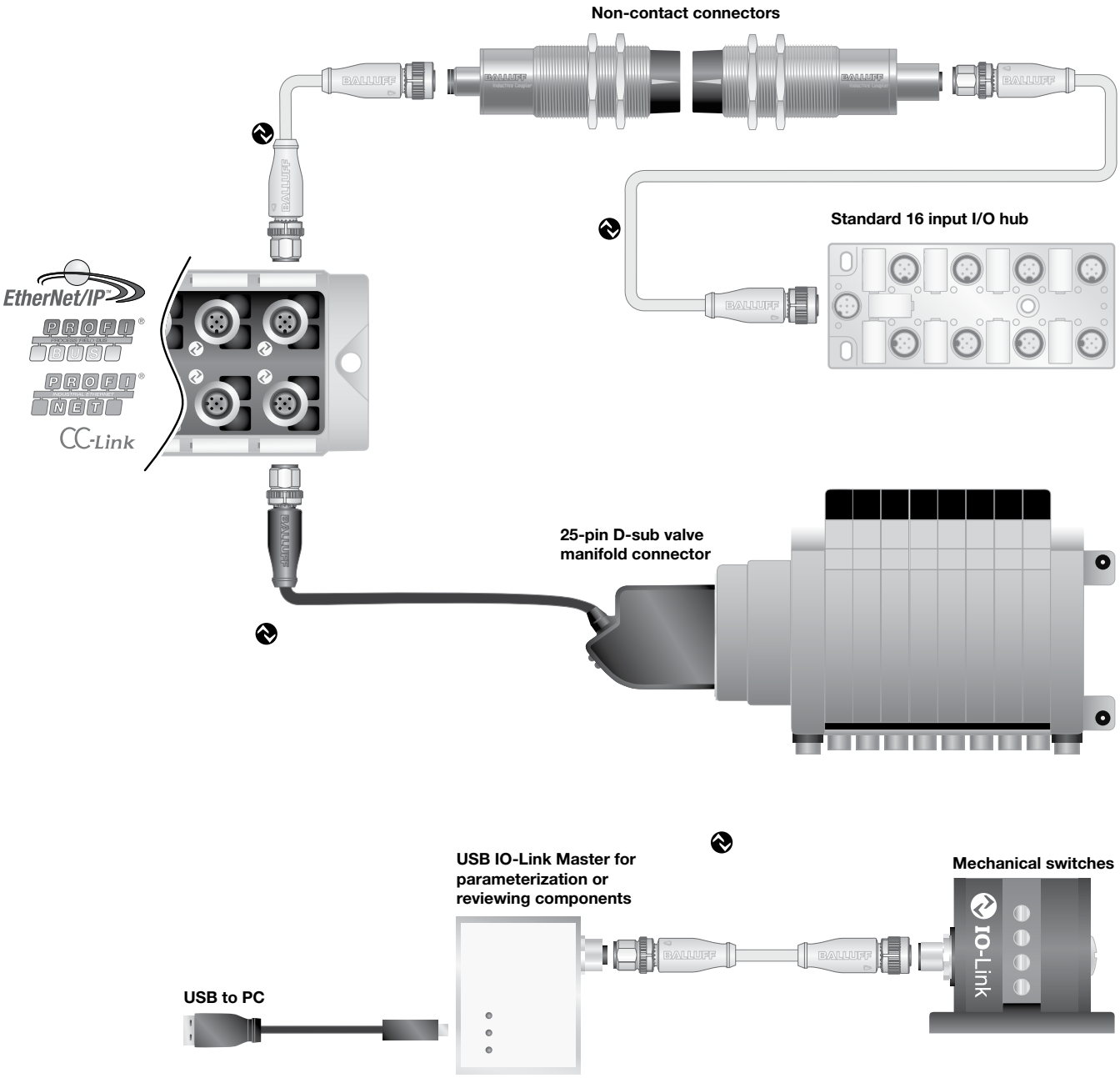
	M12 Metal		M12 Metal	M12 Metal	M12 Metal
	with Integrated Power		with 4-pole Auxilliary Power	with 5-pole Auxilliary Power	with Galvanic Isolation
	8		8	8	8
	0.5A / 1.4A		2A / 9A	2A / 9A	2A / 9A
	BNI0031 (8 input)				
	BNI IOL-102-000-Z012				
					BNI0033
					BNI IOL-252-000-Z013
					BNI003W
					BNI IOL-252-S01-Z013
	BNI0032	**BNI0063***			
	16x PNP	16x NPN			
	BNI0039	**BNI0062***			
	16x PNP	16x NPN			
	BNI003T	**BNI0061***			
	16x PNP	16x NPN			
	BNI005P				
	BNI IOL-104-S01-Z012-C02				
	BNI0043				**BNI0034**
	BNI IOL-205-000-Z012				BNI IOL-256-000-Z013
					BNI003Y
					BNI IOL-256-S01-Z013
	BNI003U		**BNI0050**	**BNI0035**	
	BNI IOL-302-000-Z012		BNI IOL-302-000-Z026	BNI IOL-302-000-Z013	
	BNI003C		**BNI0051**	**BNI003A**	
	BNI IOL-302-S01-Z012		BNI IOL-302-S01-Z026	BNI IOL-302-S01-Z013	
				BNI0048	
				BNI IOL-302-S01-Z013-C01	

IO-Link

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



Non-Contact Connectors

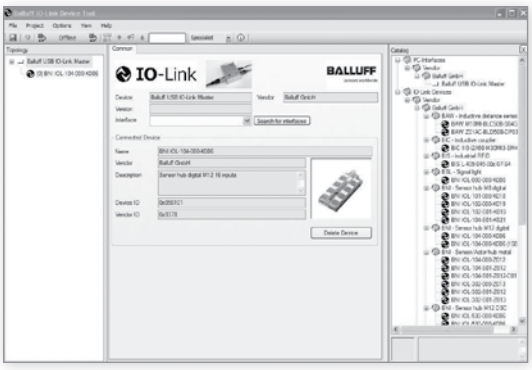
Base	**BIC005A**	**BIC000C**	**BIC0053**
	BIC 1I0-I2A50-Q40KFU-SM4A4A	BIC 1I0-I2A50-M30MI3-SM4A4A	BIC 1I0-IAA50-M30MI3-SM4A4A
Remote	**BIC005C**	**BIC000E**	**BIC0054**
	BIC 2I0-I2A50-Q40KFU-SM4A5A	BIC 2I0-I2A50-M30MI3-SM4A5A	BIC 2I0-IAA50-M30MI3-SM4A5A
Housing Type	40x40	M30	M30
Remote Side, Max Current	500 mA	500 mA	500 mA
Transmission Range	0...5 mm	0…5 mm	0...5 mm
Max Data Transmitted	3 bytes	3 bytes	10 bytes
Process Data	4 bytes	4 bytes	11 bytes

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

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

Ordering code BCC0CT6, 0.3 m

USB Master Features:
- Standard parameterization
- Troubleshooting by device
- PC backup of parameter data



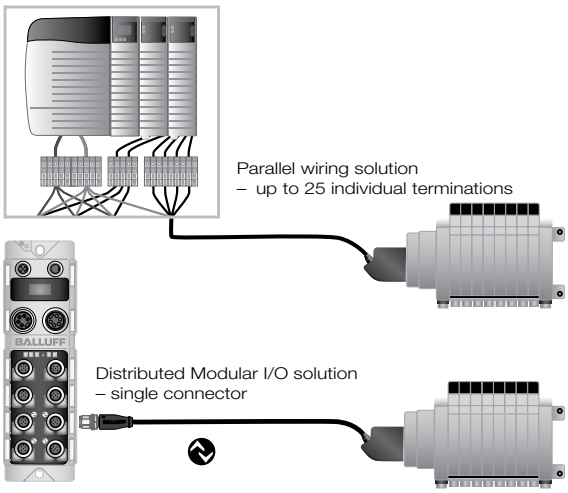
USB Master

USB Master	**BNI002U**
	BNI USB-901-000-A501
Number of IO-Link Ports	1
USB, Max Current	50 mA
External Power, Max Current	1.6 A
Software Included	Yes

IO-Link
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



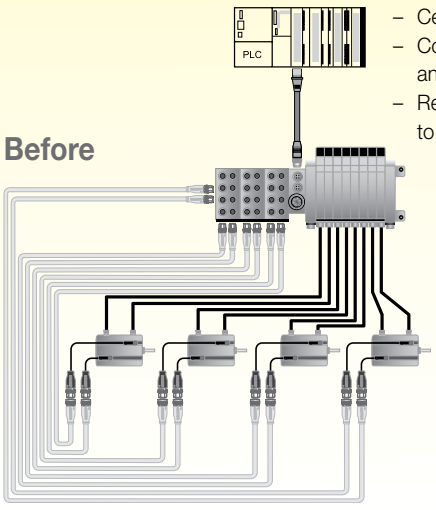
Valve Mainifold Control over EtherNet/IP

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

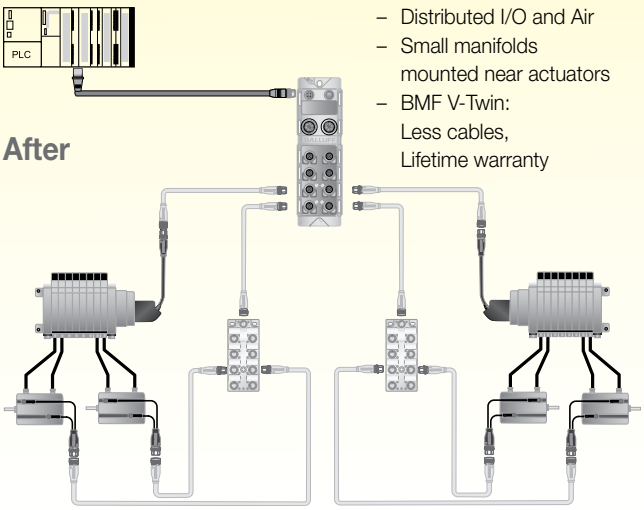
Pneumatic Systems Improvement – BMF V-Twin & Valve Manifold Control

Network Manifold with Reed Switches



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

BMV V-Twin & Valve Manifold Control



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

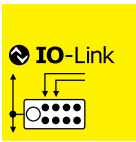
Part Overview

Part Number	BNI IOL-751-V_ _-K007	BNI IOL-770-V06-A027	BNI IOL-77_-000-_027*
Connection Type	D-Sub 25-pin	M26 26-pin IP54	flying leads
Max Active Current	1.1A	1.1A	1.1A
Output Type	24VDC outputs, OVDC commons	24VDC outputs, OVDC commons	24VDC supply, 24VDC outputs, OVDC commons
Diagnostics	basic device fault events and information	basic device fault events, point level open coil detection	basic device fault events and information
Inputs/Outputs	16 or 24 outputs	24 outputs	1=16 or 2=8* configurable
Housing Material	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
MAC Valve Manifolds					
MAConnect	D-sub 25pin	16	**BNI001L** BNI IOL-751-V02-K007		
Bosch Rexroth Valve Manifolds					
LS04, HFO2-LG, HFO3-LG, HFO4	D-sub 25pin	24	**BNI001K** BNI IOL-751-V01-K007		
Festo Valve Manifolds					
MPA, VUVB	D-sub 25pin	24	**BNI001K** BNI IOL-751-V01-K007	**BAM01RC** BAM PC-NI-009-4	For some models, cover plate
CPV	D-sub 25pin	8	**BNI001L** BNI IOL-751-V02-K007	**BAM01RC** BAM PC-NI-009-4	For some models, cover plate
SMC Valve Manifolds					
FD0 connector kit	D-sub 25pin	24	**BNI001M** BNI IOL-751-V03-K007		
MD0 connector kit	M26 26pin	24	**BNI004W** BNI IOL-770-V06-A027		
Numatics Valve Manifolds					
AKJ connector	D-sub 25pin	22	**BNI001M** BNI IOL-751-V03-K007	**BCC0CKE** BCC D43T-D43T-30-RA051-000	Adapter required for all models
AKF terminals	screw terminals	16	**BNI005M *** BNI IOL-771-000-K027		
AKR connector kit	M26 26pin	22	Contact Factory *		
Parker Valve Manifolds					
L2 End Plate Kit D-sub 25pin versions	D-sub 25pin	24	**BNI001M** BNI IOL-751-V03-K007		
Terminal Housing versions	screw terminals	16	**BNI005M *** BNI IOL-771-000-K027		
Norgren Valve Manifolds					
VS45	D-sub 25pin	24	**BNI001M** BNI IOL-751-V03-K007		
VS45	screw terminals	16	**BNI005M *** BNI IOL-771-000-K027		

*Consult factory for availability

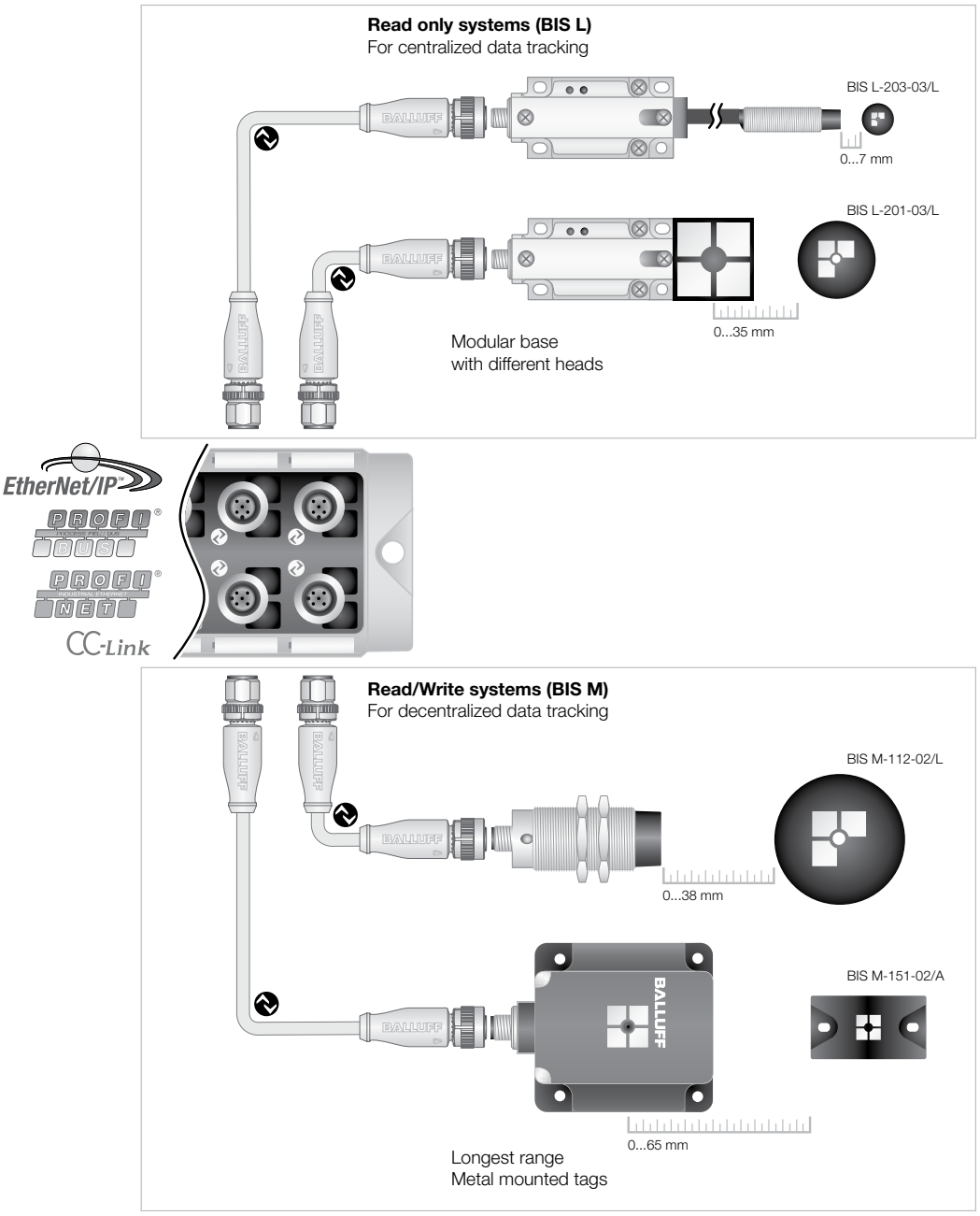


Data Tracking with Industrial RFID using IO-Link

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

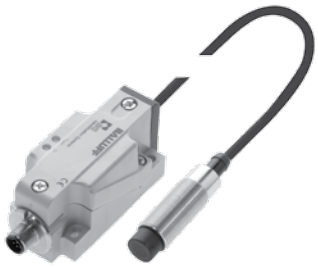
2. Choose the appropriate data carrier form factor.
3. Determine the head based on distance.
4. Determine your required memory capacity.

IO-Link

	Size	M12	M18	25x50	40x40
	IO-Link Processors Read only	BIS00E1	BIS00E0	BIS00E2	BIS00CZ
		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
Data Carriers	BIS0035	---	0...15 mm	0...15 mm	0...25 mm
	BIS L-100-05/L-RO				
	BIS0038	---	0...18 mm	0...18 mm	0...35 mm
	BIS L-101-05/L-RO				
	BIS003C	---	---	---	0...48 mm
	BIS L-102-05/L-RO				
	BIS003F	0...7 mm	0...10 mm	0...10 mm	0...16 mm
	BIS L-103-05/L-RO				
	BIS003R	---	0…15 mm	0…15 mm	0…25 mm
	BIS L-200-03/L				
	BIS003T	---	0…18 mm	0…18 mm	0…35 mm
	BIS L-201-03/L				
	BIS003U	---	---	---	0…48 mm
	BIS L-202-03/L				
	BIS003W	0…7 mm	0…10 mm	0… 10 mm	0…16 mm
	BISL-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 Read/Write Heads	BIS00LJ	BIS00LW	
			BIS M-400-045-002-07-S4	BIS M-402-045-002-07-S4	
	Standard Data Carriers	752 bytes	2000 bytes		
		BIS0048	BIS004A	0…5(6) mm	0…5 mm	
		BIS M-122-01/A	BIS M-122-02/A			
		BIS0040	BIS0042	0…6(9) mm	0…5 mm	
		BIS M-105-01/A	BIS M-105-02/A			
			BIS0044	0…15 mm	0…8 mm	
			BIS M-110-02/L			
		BIS003Y		0…15 mm		
		BIS M-101-01/L				
		BIS003Z		0…18 mm		
		BIS M-102-01/L				
			BIS0043	0…20 m		
			BIS M-108-02/L			
			BIS0045	0…20 mm		
			BIS M-111-02/L			
			BIS0046	0…28 mm		
			BIS M-112-02/L			
		BIS0047				
		BIS M-120-01/L				

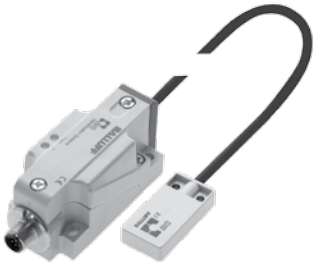
For reliable traceability: All data carriers have a 4-byte unique ID contained in the read/write memory. This number is read-only.
All IO-Link RFID processors require a shielded cable. See page 2.19 for suggested part numbers.

		Size	80x84
		IO-Link Processors Read/Write Heads	BIS00LM
			BIS M-451-045-001-07-S4
	Metal Mount DataCarriers	BIS004F	0…65 mm
		BIS M-150-02/A (vertical mount)	
		BIS004H	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.



	M30	25x50	80x84
	BIS00LH	**BIS00M1**	**BIS00LK**
	BIS M-400-045-001-07-S4	BIS M-402-045-004-07-S4	BIS M-401-045-001-07-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

IO-Link

Shielded Cable Options		
Size	M12 - M12	M12
Configuration	Female - Male	Female with Male Field Attachable
Jacket	Shielded PUR Black	Shielded PUR Black
Conductors	4x 0.34 mm²	4x 0.34 mm²
Available Lengths	1 m, 2 m, 2.5 m, 5 m	2 m, 5 m, 10 m, 20 m
Double-Ended Straight-Straight	**BCC M415-M414-3A-305-PS0434-_ _ _***	
Single-Ended Straight Female		**BCC M415-0000-1A-014-PS0434-_ _ _**
Single-Ended Right Angle Female		**BCC M425-0000-1A-014-PS0434-_ _ _**
Field Attachable Straight Male		**BCC M474-0000-2A-000-01X475-000**

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

IO-Link
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**

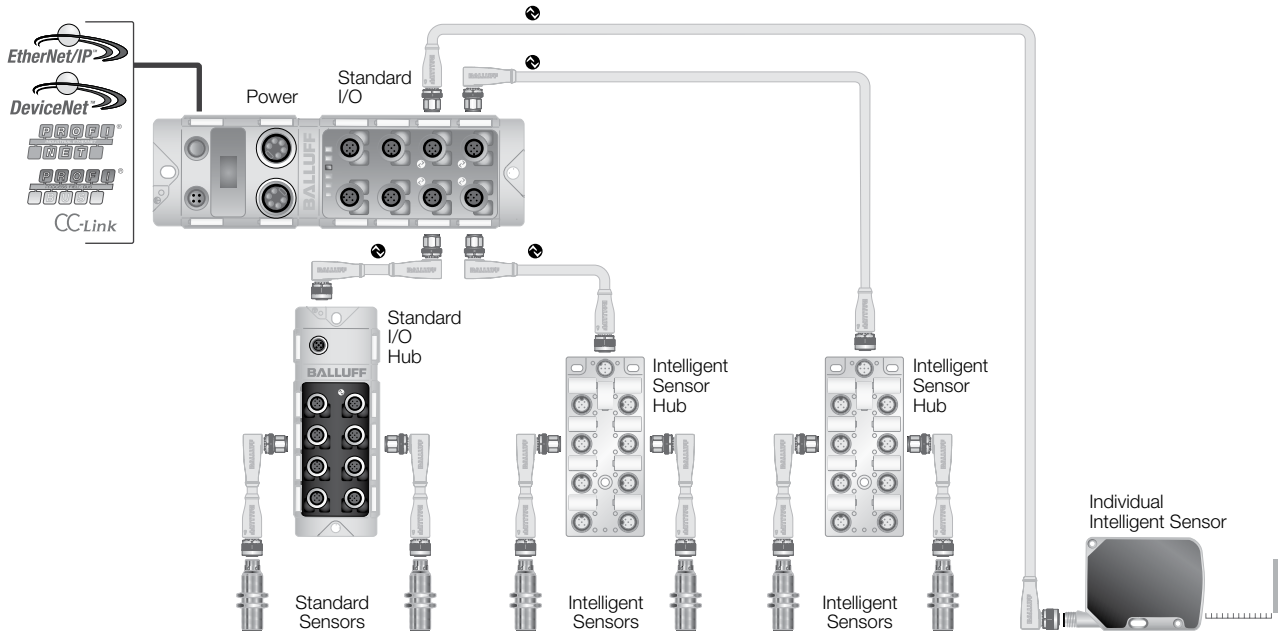
Applications of intelligent sensors

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.

Using Distributed Modular I/O technology and talking over the same backplane from slave to master device, multiple intelligent sensors can be connected to one IP address on an industrial network. Depending on the complexity of the information the sensor provides or requires, any combination of 1 to 32 intelligent sensors can be connected. Utilizing the open standard IO-Link, it is also possible to mix and match with any Distributed Modular I/O products available such as: discrete I/O, analog I/O, valve manifold control, RFID and third party intelligent sensors and devices.



	Standard Sensors	Level 1 Intelligent sensors	Level 2 Intelligent sensors	Level 3 IO-Link Intelligent sensors
Maximum sensors per IP address	16 per hub 12 per master 76 per IP address	8 per hub 0 per master 32 per IP address	8 per hub 0 per master 32 per IP address	4 per master 4 per IP address
Available functions	ON OFF	ON OFF; Constant Condition Monitoring	ON OFF; Constant Condition Monitoring; Preventative Diagnostics	Measure; Constant Condition Monitoring; ON OFF; Preventative Diagnostics; Automatic Configuration
Balluff brands	**Standard sensors**	DESINA **Sensors**	Dynamic Sensor Control **Sensors**	IO-Link **Sensors**

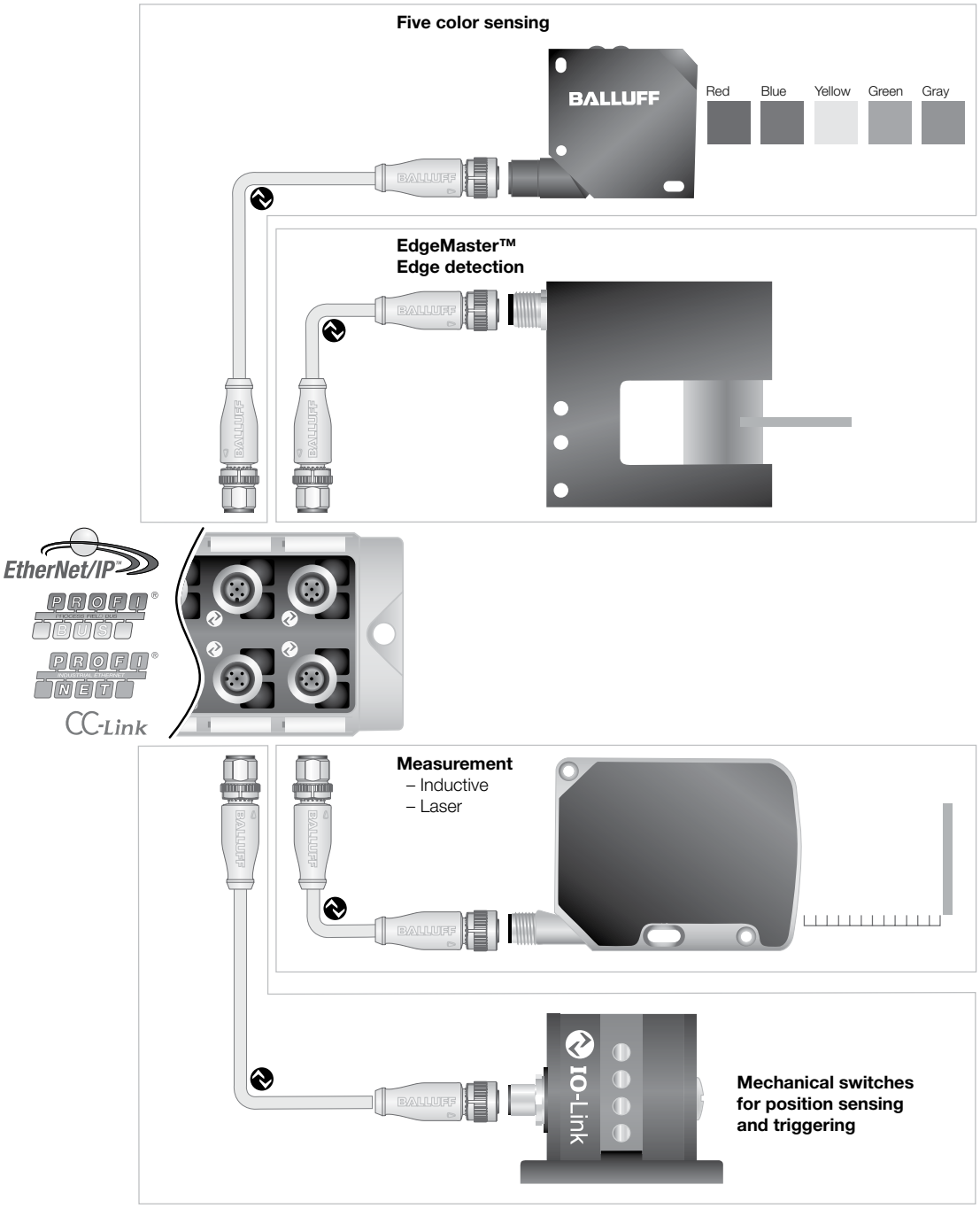
Intelligent Sensor Hub

Ordering Code	**BNI002Z**
Part number	BNI IOL-530-000-K006
Type	M12 plastic
Number of Intelligent Sensors	8 (Level 1 or Level 2)
Number of Ports	8

Level 3 Intelligent Sensors with IO-Link

As manufacturing needs to get more flexible, sensors and other devices installed in the process need to be flexible as well. Right now, most production lines require the operator to reprogram a sensor, or the engineer needs to design multiple sensors into the process. Intelligent sensors with IO-Link built into them can reduce this downtime and the errors that come with reprogramming. IO-Link sensors can have their parameters changed via the PLC to accommodate multiple recipes or configurations. Some examples of sensors with this capability are:

- Color sensors for detecting product colors for error proofing or JIT (just in time) production
- Measurement sensors for detecting the position of targets or measuring their size
- Precision Mechanical Switches have been in the Balluff product portfolio from the very beginning, use their upgraded functionality by connecting them via IO-Link
- Edge detection sensors allow for positioning on machines or in production



Capacitive Ø 20 mm

Ordering Code	BCS0001
Part number	BCS 20MG10-XPA1Y-8B-03*
Switching Type	PNP complementary
Rated Switching Distance s_n	10 mm
Size, Mounting	Ø 20 mm, flush
Operating Voltage U_B	10...30 V DC
Function Indicator	Yes
Degree of Protection per IEC 60529	IP 63
Approvals	CE
Housing Material	V2A, EP
Connection	3 m cable PUR, 3×0.25 mm²

ON
OFF

Constant
Condition
Monitoring

Inductive M12 Sensors

IO-Link

Ordering Code	BES02MC	BES02M5	BES02M8
Part number	BES 113-356-SA6-S4*	BES 113-3019-SA1-S4*	BES 113-356-SA31-S4*
Switching Type	PNP normally open	PNP normally closed	PNP normally open
Rated Switching Distance s_n	3.7 mm	3.7 mm	4 mm
Size, Mounting	M12×1, non-flush	M12×1, non-flush	M12×1, non-flush
Operating Voltage U_B	20...30 V DC	20...30 V DC	20...30 V DC
Function Indicator	No	No	No
Degree of Protection per IEC 60529	IP 67	IP 67	IP 67
Approvals	CE	CE	CE
Housing Material	Stainless steel	Stainless steel	Stainless steel
Connection	M12 connector	M12 connector	M12 connector

ON
OFF

Constant
Condition
Monitoring

*Can be used with the constant condition monitor which provides a status output.

Ordering code BAE006W
Part number BES 113-FD-1

Inductive M8 Sensors

Ordering Code	BES03EN	BES03EP	BES03EL
Part number	BES M08EI-PSY15B-S49G-D01	BES M08EH-PSY25F-S49G-D01	BES M08EI-PSY15B-S04G-D01
Switching Type	PNP normally open	PNP normally open	PNP normally open
Rated Switching Distance s_n	1.5 mm	2.5 mm	1.5 mm
Mounting Type	Flush	Non-flush	Flush
Operating Voltage U_B	18...30 V DC	18...30 V DC	18...30 V DC
Function Indicator	Yes	Yes	Yes
Degree of Protection per IEC 60529	IP 67	IP 67	IP 67
Approvals	CE, cULus	CE, cULus	CE, cULus
Housing Material	Stainless steel	Stainless steel	Stainless steel
Connection	M8, 3-pin	M8, 3-pin	M12, 3-pin

Inductive

M12, M18, M30 Sensors	M12	M12	M18
Ordering Code	**BES03ER**	**BES03ET**	**BES03EU**
Part number	BES M12MI-PSY20B-S04G-D01	BES M12MH-PSY40F-S04G-D01	BES M18MI-PSY50B-S04G-D01
Switching Type	PNP normally open	PNP normally open	PNP normally open
Rated Switching Distance s_n	2 mm	4 mm	5 mm
Mounting Type	Flush	Non-flush	Flush
Operating Voltage U_B	18...30 V DC	18...30 V DC	18...30 V DC
Function Indicator	Yes	Yes	Yes
Degree of Protection per IEC 60529	IP 67	IP 67	IP 67
Approvals	CE, cULus	CE, cULus	CE, cULus
Housing Material	CuZn coated	CuZn coated	CuZn coated
Connection	M12, 3-pin	M12, 3-pin	M12, 3-pin

ON
OFF
Constant
Condition
Monitoring
Preventative
Diagnostics

BGL Fork Sensors with Dynamic Sensor Control

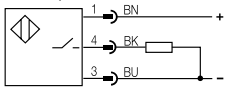
Ordering Code	BGL003N	BGL003P	BGL003R
Part number	BGL 30A-013-S49	BGL 50A-013-S49	BGL 80A-013-S49
Fork Sensor	1xPNP	1xPNP	1xPNP
Fork Opening	30 mm	50 mm	80 mm
Light Type	Infrared	Infrared	Infrared
Function Indicator	Yes	Yes	Yes
Repeat Accuracy	≤ 0.15 mm	≤ 0.15 mm	≤ 0.15 mm
Connection, Connectors	M8, 3-pin	M8, 3-pin	M8, 3-pin

ON
OFF
Constant
Condition
Monitoring
Preventative
Diagnostics

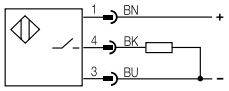
	BES03EM
	BES M08EH1-PSY25F-S04G-D01
	PNP normally open
	2.5 mm
	Non-flush
	18...30 V DC
	Yes
	IP 67
	CE, cULus
	Stainless steel
	M12, 3-pin

M18	M30	M30
BES03EW	**BES03EY**	**BES03EZ**
BES M18MG-PSY80F-S04G-D01	BES M30MI-PSY10B-S04G-D01	BES M30MF1-PSY15F-S04G-D01
PNP normally open	PNP normally open	PNP normally open
8 mm	10 mm	15 mm
Non-flush	Flush	Non-flush
18...30 V DC	18...30 V DC	18...30 V DC
Yes	Yes	Yes
IP 67	IP 67	IP 67
CE, cULus	CE, cULus	CE, cULus
CuZn coated	CuZn coated	CuZn coated
M12, 3-pin	M12, 3-pin	M12, 3-pin

M8, 3-pin



M12, 3-pin



IO-Link

Photoelectric Sensor BOS 18 M Teach-In with Dynamic Sensor Control

Ordering Code	BOS01CU	BOS01CT	BOS01CW	BOS01CY
Part number	BOS 18M-PUD-RD30-S4	BOS 18M-PUD-PR30-S4	BOS 18M-PUD-RE30-S4	BOS 18M-X-RS30-S4
Sensing Technology	Retro Reflective	Diffuse	Thrubeam Receiver	Thrubeam Emitter
Switching Type	PNP NC/NO selectable	PNP NC/NO selectable	PNP NC/NO selectable	PNP NC/NO selectable
Rated Switching Distance S_n	500 mm	5 mm	20 mm	20 mm
Size, Mounting	M18	M18	M18	M18
Operating Voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Function Indicator	Yes	Yes	Yes	Yes
Degree of Protection per IEC 60529	IP 67	IP 67	IP 67	IP 67
Housing Material	Nickel-plated brass	Nickel-plated brass	Nickel-plated brass	Nickel-plated brass
Connection	M12 connector	M12 connector	M12 connector	M12 connector

ON
OFF

Constant
Condition
Monitoring

Preventative
Diagnostics

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

Measure | Constant Condition Monitoring | Preventative Diagnostics

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 | ON OFF | Constant Condition Monitoring | Preventative Diagnostics | Automatic Configuration

Edge Detection

30 mm	Ordering Code	BGL0035
	Part Number	BGL 30C-007-S4
50 mm	**Ordering Code**	**BGL003F**
	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

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

Color Sensing

Ordering Code	BFS000F
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

ON OFF | Constant Condition Monitoring | Automatic Configuration

Linear Position Transducer

Ordering Code	
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

Measure | Constant Condition Monitoring | Preventative Diagnostics | Automatic Configuration

*Consult factory for availability

Ordering Instructions:

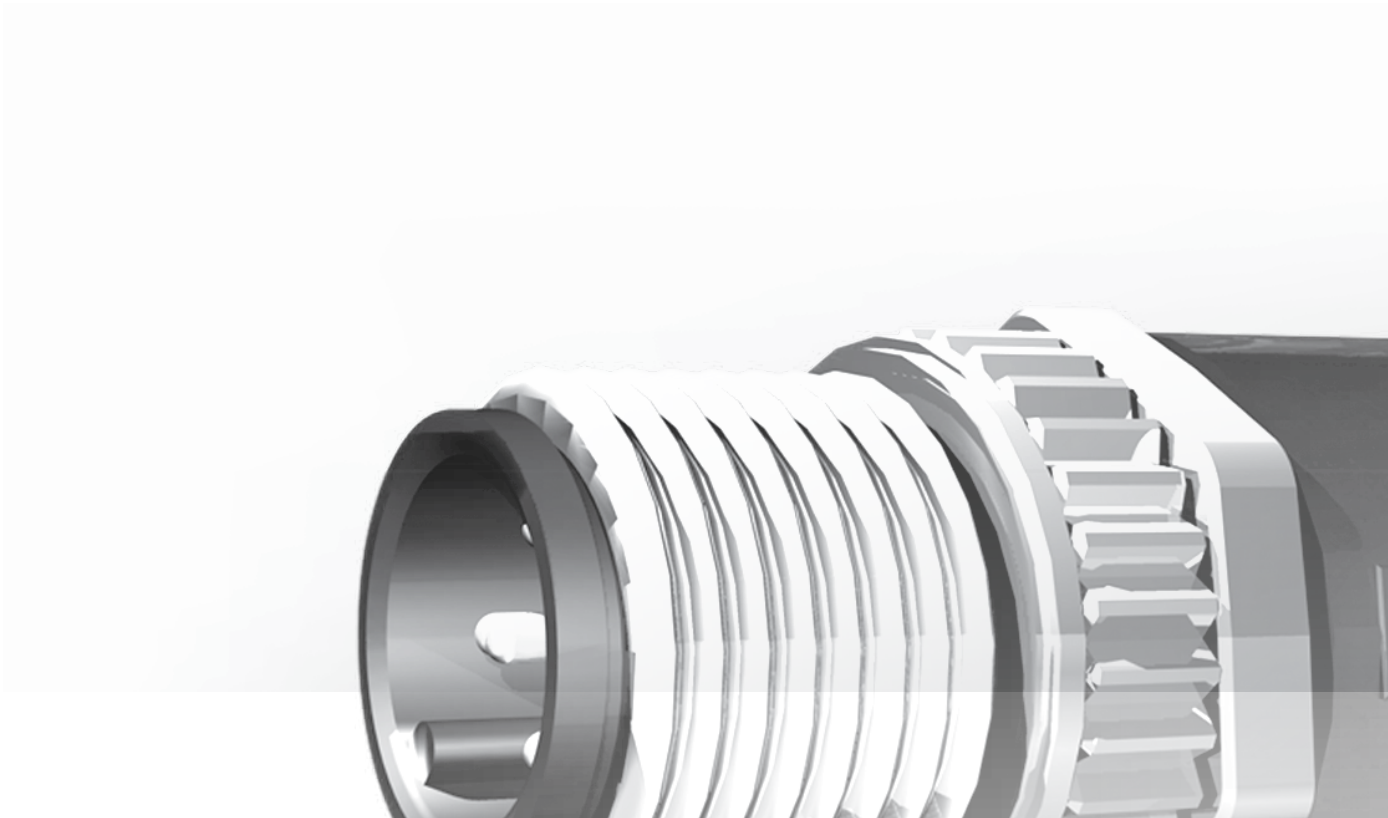
M_ _ _ _ = desired stroke length in mm (0051 to 4572)

IO-Link

Mechanical Switches

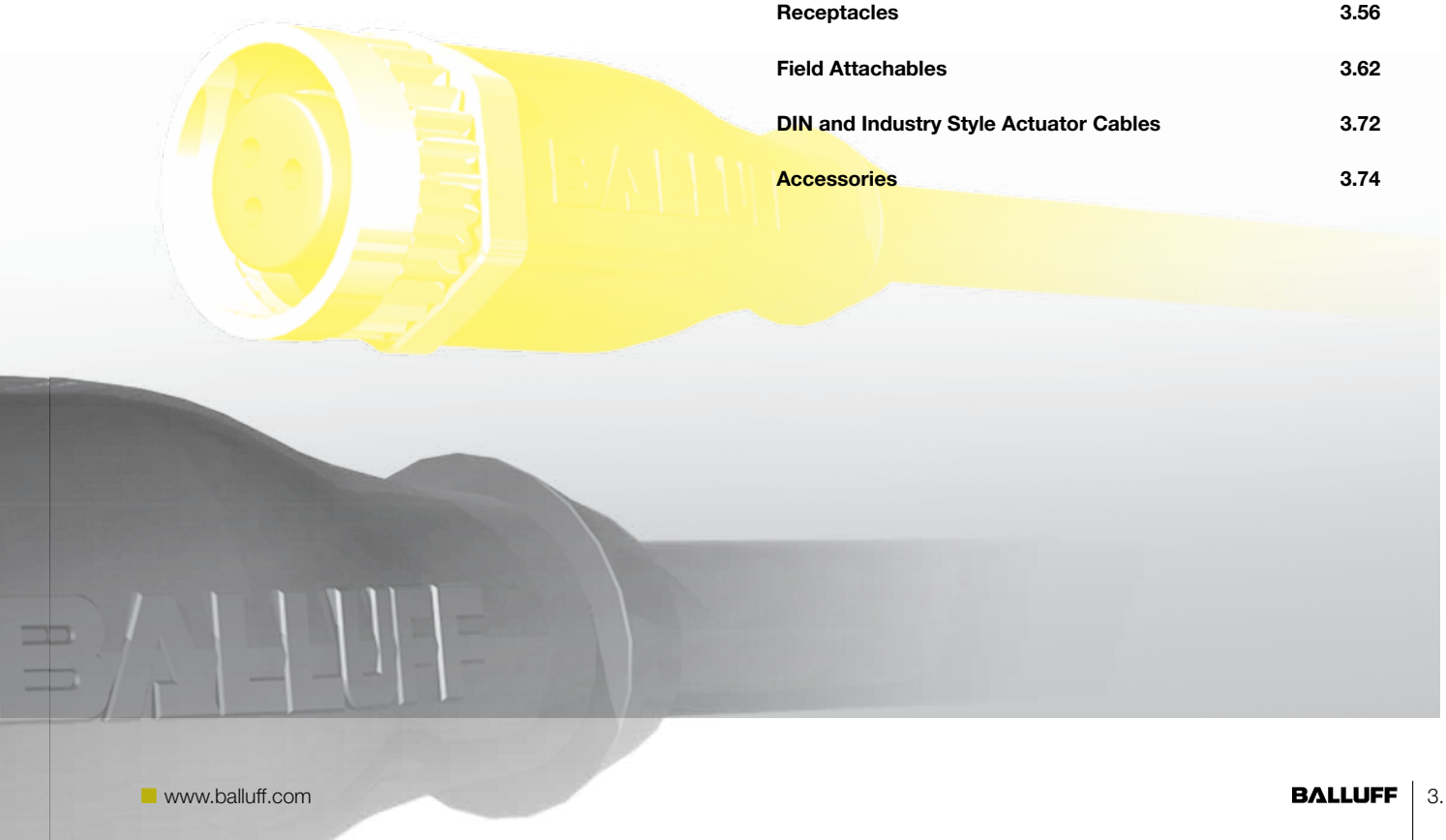
Part Number	BNS 819-...
Housing Series Available	40, 46, 61, 62, 100

ON OFF | Constant Condition Monitoring



Connectivity Solutions
Contents

Balluff's new line of passive connectivity products offers a full compliment of options to establish standard sensor and actuator solutions in the automation environment. These components provide a high level of reliability and confidence, enabling accurate and repeatable connection IP ratings during maintenance. Many combinations of solutions are available and are presented below to facilitate future connectivity designs.



Connectivity Solutions
Passive connectivity overview

Balluff's new line of sensor cordsets offers many benefits to the automation world. Balluff can globally offer cordsets that fit almost any standard sensor or actuator application. This offering includes features such as consistent and accurate IP ratings, a wide range of cable jackets, a full range of overmold configurations, and high quality rugged materials.

Hex Nut and Wrench
Maintain IP rating by applying the correct tightening torque every time

Alignment Mark
Arrow symbol aligns cordset with sensor keyways

Cable Materials
High grade, industry standard jacket materials

PVC
Standard automation and washdown

PUR
Abrasion and fluid resistant, halogen free

TPE
High-flex and weld slag resistant

TPU Overmold Strain Relief
Durable material that offers strain relief when required

Bright LEDs
LEDs shine bright even in difficult applications. Available with 2 or 3 LEDs

M8 and M12 Cordsets
Standard industrial connector sizes

Black PUR

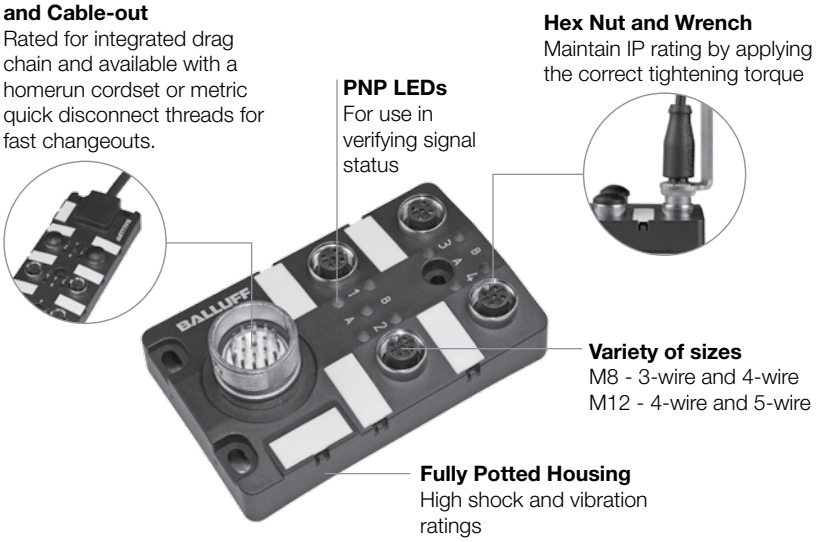
Gray PVC

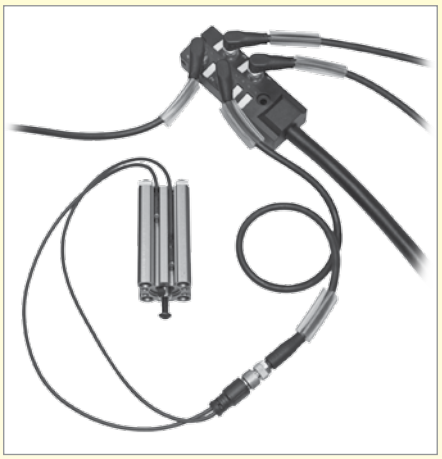
Yellow PVC, PUR, and TPE

PVC, PUR, and TPE with LEDs

Multiple Interface Blocks (MIB)

Balluff multiple interface blocks allow multiple sensors and actuator signals to be easily routed back to a control system. These fully potted blocks with metal threaded ports carry high shock and vibration ratings and are well-suited for many types of environments. The combination of Balluff's multiple interface blocks, cordsets and torque wrenches, provides a robust IP67 solution for a wet environment.

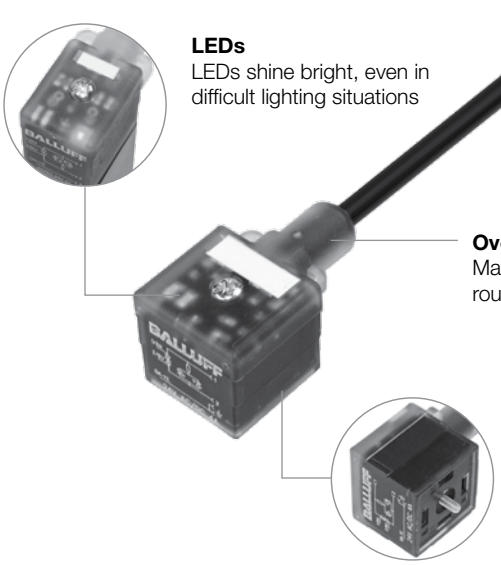


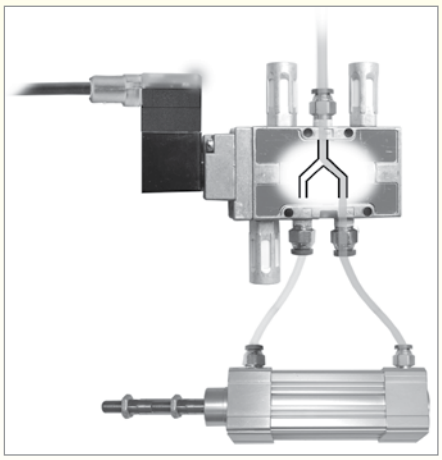


By incorporating passive technology, these blocks concentrate signals into one homerun cordset. The dual density connectors allow for two signals per port. A typical application would include a Balluff V-Twin™ magnetic field sensor used with pneumatic cylinders. The V-Twin provides two sensors with a single connector, which sends both signals through the single cordset back to the high density MIB. This solution reduces sensor and cabling costs without sacrificing reliability or quality.

Valve Connectors

From sensors to cordsets, Balluff offers an extensive line, which includes valve connctors. These valve connectors cover all standard DIN connections, while also offering drag chain rated cables, rugged housings, and an option of protective circuits. Balluff can essentially complete any valve connector solution.





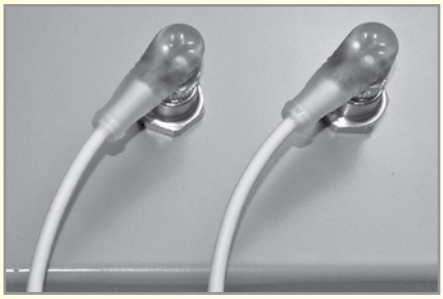
While DIN & Industry style connectors are used in many industrial automation applications, the most popular uses are with simple motors and solenoid valves. As with most solenoid valve applications a DIN or Industry style connector is required to switch the valve's position. Whether the application is clamping a part or moving an object, the Balluff valve connector can be used to pass the control signal to the valve. Integrated LEDs allow for easy recognition of solenoid position.

Connectivity Solutions
Passive connectivity applications

Welding and Rugged Environments

When working in rugged environments, it's important to choose a cordset that will stand up to the harshest situations - TPE is the cable jacket of choice. The use of LED cordsets is also beneficial for troubleshooting.

I/O Verification for Troubleshooting



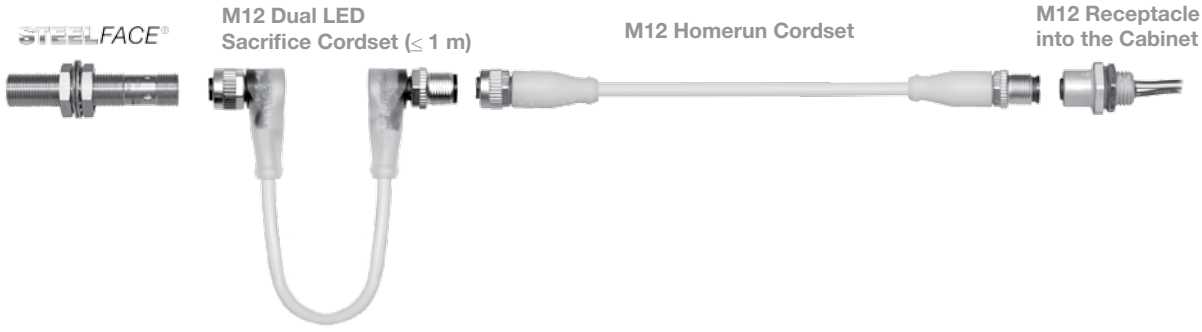
Selecting LEDs on the male ends of your cordsets allows for the sensor and output signals to be easily viewable and allows for simpler input or output indication for the operator.

Cordset Options and Solutions

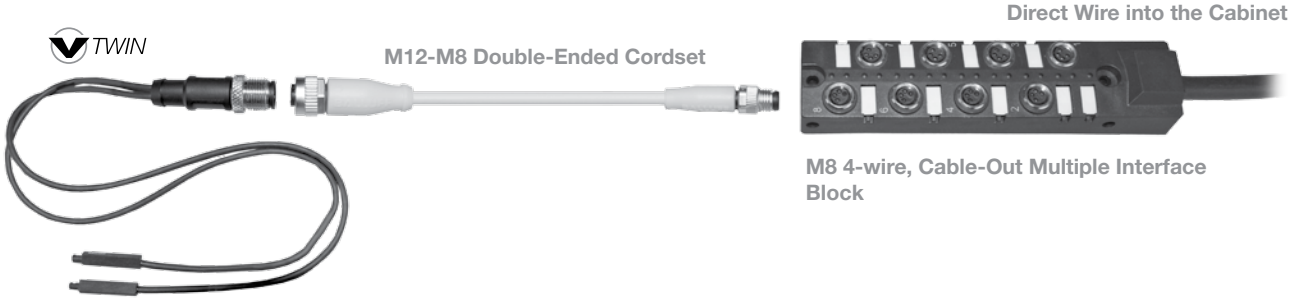
Balluff's new line of passive connectivity products offers a full compliment of options to establish standard sensor and actuator solutions in the automation environment. These components provide a high level of reliability and confidence, enabling accurate and repeatable connection IP ratings during maintenance. Many combinations of solutions are available and are presented below to facilitate future connectivity designs.

Basic Connectivity Solution: Used in simple, low sensor count applications

Sacrifice Cordset Solution: Used in extremely rugged applications to reduce cordset replacement downtime



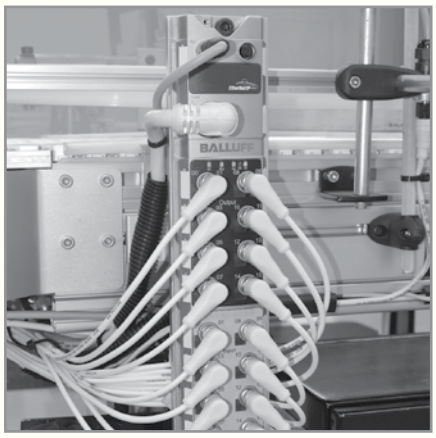
Distributed I/O Solution: Used when many sensors and actuators are installed in various clumps around the machine



Washdown and Wet Applications

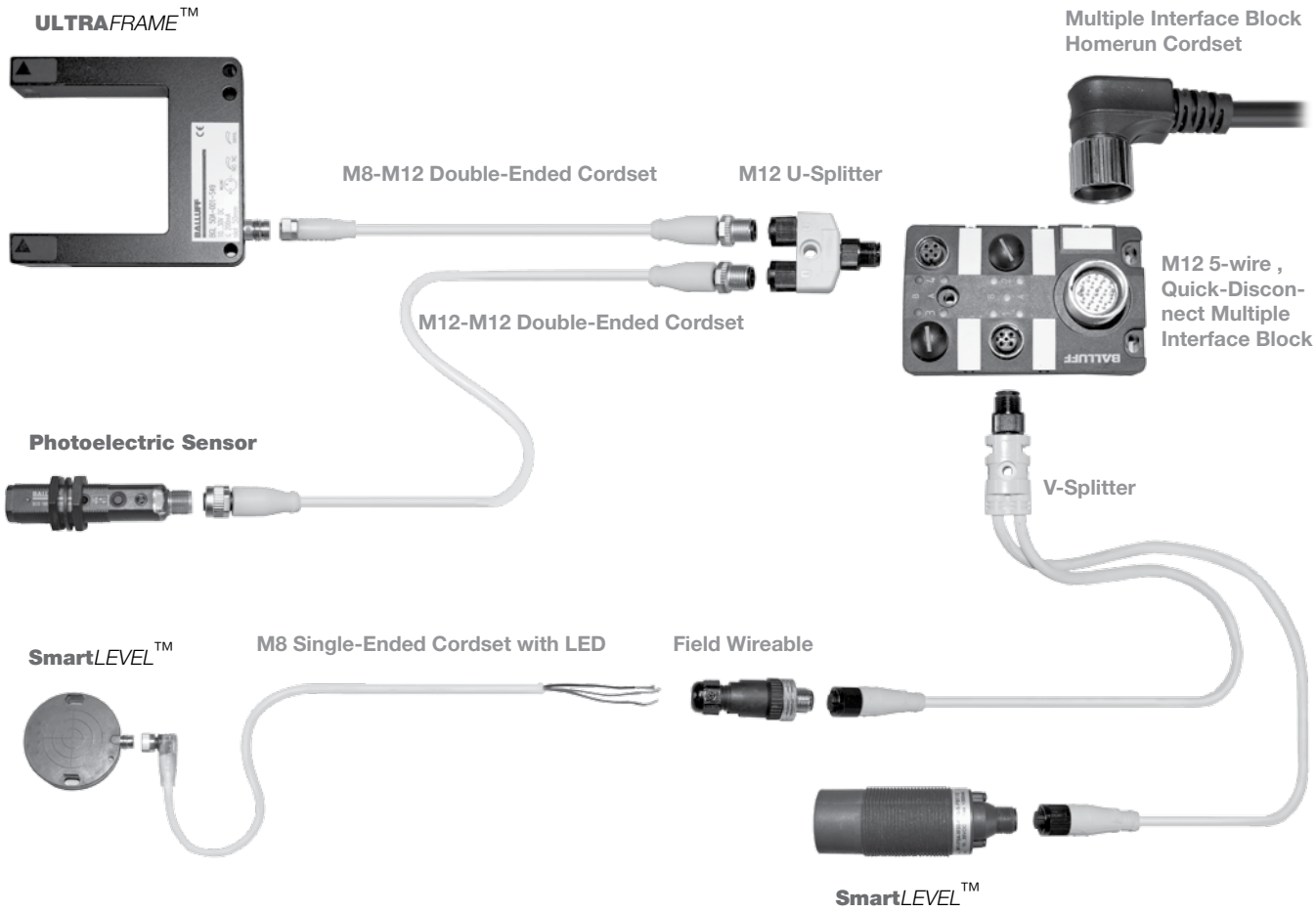
Fluids and sensor signals do not mix. By using a calibrated IP67 torque wrench on the hex nut of every cordset, you can ensure the IP67 rating of the multiple interface block with the cordset - and keep your signals dry.

Packaging and Assembly Automation



When quality is as important as speed in your application, select a PUR cordset, which provides flexibility as well as abrasion and fluid resistance. In a standard automation application, select a PVC cordset that is reliable and cost effective.

High Density Distributed I/O: Used when many sensor and actuator signals are needed for a production line or a highly automated machine



Connectivity Solutions
Overview quick selector



Sensor & Actuator Cables

Size	M5	M8	M12	
Configurations	Single-Ended & Double-Ended	Single-Ended, Double-Ended	Single-Ended, Double-Ended	
Conductors	3-wire, 4-wire	3-wire, 4-wire	3, 4, 4+PE, 5, 8, 12-wire	
LED Versions	No	Yes	Yes	
Shielded Versions	No	Yes	Yes	
Page #	3.20	3.21	3.24	



Mini Size Cables

Size	7/8"	1"	1 1/8"	
Configurations	Single-Ended, Double-Ended, Tees, Bulkheads, Converters	Single-Ended, Double-Ended	Single-Ended, Double-Ended	
Conductors	US Color Code: 3 & 4-wire DC Color Code: 4 & 5-wire	6, 7, 8-wire	9, 10, 12, 19-wire	
Color Codes Available	US AC, DC	---	---	
Shielded Versions	No	No	No	
Page #	3.42	3.48	3.49	


Junction Blocks (MIBs)

Size	M8	M12	M12, M16, M23	
Configurations	Quick Disconnect, Cable Out	Quick Disconnect, Cable Out, Terminal Blocks	Homerun Cables	
Conductors	4-port & 8-port, 3-wire & 4-wire	4-port & 8-port, 3+PE & 4+PE	8-wire, 12-wire, 19-wire	
LED Versions	Yes	Yes	No	
Shielded Versions	No	No	No	
Page #	3.50	3.52	3.55	

	M8 and M12 Specialty	Splitters	1/2" AC	DIN A, DIN B, IND B, DIN C, IND C
	High Temp, Coil Cable, Stainless, IP69K, ECOLAB, Global cable	M8 & M12, V & U Styles	Single-Ended, Double-Ended	Single-Ended, Pigtail, V-Splitter
	3-wire, 4-wire, 4+PE	3-wire, 3+PE	3, 4, 5, 6-wire	2+PE
	Yes	Yes	No	Yes
	No	No	Yes	Yes
	3.34	3.38	3.40	3.72

Receptacles

	M8	M12	1/2" AC, 7/8", 1", 1 1/8"	M23
	M8x0.5	1/4"-18NPT, 1/2"-14NPT, M16x1.5	1/4"-18NPT, 1/2"-14NPT, M16x1.5, M20x1.5	M20x1.5
	3-wire, 4-wire	3, 4, 4+PE, 5, 8-wire	3, 4, 5, 6-wire, 7, 8, 9, 10-wire 12, 19-wire	12-wire, 19-wire
	DC	DC	US AC, DC	---
	Metal	Metal	Metal	Metal
	3.56	3.57	3.58-3.61	3.56

Field Attachables

	M8	M12	1/2" AC, 7/8"	M23
	Piercon, Screw Terminal, Soldercup	Insulation Displacement, Screw Terminal, Spring Clamp	Screw Terminal	Solder Cup
	3-wire, 4-wire	3, 4, 5, 8, 12-wire	3, 4, 5-wire	12, 19-wire
	No	No	No	No
	No	Yes	No	No
	3.62	3.64	3.68-3.69	3.70

BCC M415 - M424 - 3A - 304 - VX44T2 - 020 - C008

Head 1 | Head 2 | Code | Wiring | Raw Cable | Length | Custom

Head 1 & Head 2 Configuration

Connector Size & Type:

M3	M8 Nano DC - Ni Plated Brass
M4	M12 Micro DC - Ni Plated Brass
S3	M8 Nano DC - Stainless 1.4404
S4	M12 Micro DC - Stainless 1.4404
0000	(Head 2) Single-Ended Cable

Connector Direction:

1	Straight Plastic Overmolded
2	Right Angle Plastic Overmolded

Number of Visible Connections:

5	M12 Female
no. poles	Any other configuration

Code Configuration

Gender Type:

1	Female Internal Threads
2	Male External Threads
3	Female Int - Male Ext
5	Female Int - Female Int
6	Male Ext - Male Ext

Connector Coding

A	M12 Sensor Cables (typical) (A-coded)
0	M8 Sensor Cables (typical) (No coding)
B	M12 Profibus Cables (B-coded)
D	M12 Ethernet Cables (D-coded) (Profinet, EtherNet/IP)
E	M8-M12 Double-Ended Cables
F	M12-M8 Double-Ended Cables

Wiring Configurations

See next page for configurations

Custom Configurations

Custom Values:

C002	Grey Overmold
C008	WeldRepel™ Applied
C013	GlobalLine, Black Overmold

Raw Cable Configuration

Jacket Material:

V	PVC
P	PUR
E	TPE

Special Designator:

X	Nothing
C	Coiled Cable
H	High Temperature
S	Shielded
W	Weld Resistant / High Shore
I	Economy (non-UL/CSA)
M	Solid Conductor, Unshielded

Jacket Color:

0	Black	**2**	Red (CC-Link)
3	Orange	**4**	Yellow (standard)
5	Green (Profinet)	**6**	Blue (EtherNet/IP)
7	Violet (Profibus)	**8**	Grey (standard/DeviceNet)

Number of Poles

#	3-pole thru 9-poles
A	10-pole
C	12-pole

Conductor Profile

T2	22 AWG	**W8**	18 AWG
25	0.25mm²	**34**	0.34mm²
50	0.50mm²	**N1**	Profibus
N2	Profinet	**N7**	CC-Link
N8	ethernet	**N9**	EtherNet/IP

Length Configuration

Cable Length:

003	0.3 meters
020	2.0 meters
100	10.0 meters

Special Lengths:

05/14	0.5m coiled, 1.4m stretch
2D5	2.5 decimeters (25cm)
10X	100 meters

Note: Part Number Matrix is designed for information purposes only. Not all configurations are possible. Consult factory for part number availability.

Standard Cordsets

Wiring	Poles	Shield	Head 1	Head 2
001	3-wire	---	N/O	---
002	3-wire	---	N/C	---
003	4-wire	---	Comp.	---
004	3-wire	---	N/O PNP LED	---
005	3-wire	---	N/C PNP LED	---
006	3-wire	---	N/O NPN LED	---
007	3-wire	---	N/C NPN LED	---
008	4-wire	---	N/O PNP LED	---
009	4-wire	---	N/O NPN LED (M12 Female Only)	---
010	4-wire	---	Comp. PNP LED	---
300	3-wire	---	N/O	N/O
302	3-wire	---	N/O PNP LED	N/O PNP LED
304	4-wire	---	Comp.	Comp.
306	4-wire	---	N/O PNP LED	N/O PNP LED
313	5-wire	---	Comp. and Gnd	---
602	3-wire	---	N/O PNP LED	N/O
603	3-wire	---	N/O NPN LED	N/O
606	4-wire	---	N/O PNP LED	Comp.
607	4-wire	---	N/O NPN LED	Comp.
650	4-wire	---	Comp. PNP LED	Comp.
651	4-wire	---	Comp. PNP LED	N/O PNP LED
Shielded Cordsets and High Conductor Counts				
014	4-wire	Nut	BN,WH,BU,BK	---
016	5-wire	Nut	BN,WH,BU,BK,GY	---
017	5-wire	---	BN,WH,BU,BK,GY	---
034	4-wire+PE	---	BN,WH,BU,BK,GNYE	---
036	3-wire	Nut	BN,BU,BK (N/O)	---
037	3-wire	Nut	BN,BU,BK (N/C)	---
039	5-wire	---	Comp. PNP LED	---
040	4-wire+PE	---	Comp. PNP LED	---
043	4-wire+PE	Nut	BN,WH,BU,BK,GNYE	---
044	8-wire	---	WH,GN,YE,GY,BN,PK,BU,RD	---
046	8-wire	Nut	WH,BN,GN,YE,GY,PK,BU,RD	---
049	12-wire	---	BN,BU,WH,GN,PK,YE,BK,GY,RD,VI,GYPK,RDBU	---
325	12-wire	---	BN,BU,WH,GN,PK,YE,BK,GY,RD,VI,GYPK,RDBU	---
Network Cordsets				
031	2-pole	Nut	Profibus	---
068	4-pole	Pin	CC-Link	---
329	2-pole	Nut	Profibus	Profibus
331	4-pole	Nut	Profinet	Profinet
337	4-pole	Pin	CC-Link	CC-Link
338	2x2pair	Nut	ethernet	ethernet

BCC M414 - M425 - M425 - U2010 - 003

Head 1 (Splitter) Head 2 (Head A) Head 3 (Head B) Splitter Code Length

Head 1 Configuration

Connector Size & Type:
M4 M12 Micro DC - Ni Plated Brass

Connector Direction:
1 Straight Plastic Overmolded

Number of Visible Connections:
3-pole thru 8-poles

Head 2 & Head 3 Configuration

Connector Size & Type:
M3 M8 Nano DC - Ni Plated Brass
M4 M12 Micro DC - Ni Plated Brass
0000 (Head 2, Head 3) Open Splitter

Connector Direction:
1 Straight Plastic Overmolded
2 Right Angle Plastic Overmolded

Number of Visible Connections:
5 M12 Female
no. poles Any other configuration

Splitter Code

Code	Type	Wiring	Head 1	Head 2	Head 3	Cable	Body
U0003	U Splitter	A00	M12 Male	M12 Female	M12 Female	---	BK PVC
U0014	U Splitter	A00	M12 Male	M8 3-pole Female	M8 3-pole Female	---	BK PVC
U2002	V Splitter	A00	M12 Male	M12 Female	M12 Female	YE TPE	YE TPU
U2009	V Splitter	A13	M12 Male	Leads	Leads	YE PVC	YE TPU
U2010	V Splitter	A00	M12 Male	M12 Female	M12 Female	YE PVC	YE TPU
U2011	V Splitter	A07	M12 Male	M12 Female	M12 Female	YE TPE	YE TPU
U2012	V Splitter	A00	M12 Male	M8 Female	M8 Female	YE PVC	YE TPU

Wiring Configuration

Wiring	Head 1	Head 2	Head 3	Logic	LED
A00	4-wire	3-wire N/O (H1=pin 4)	3-wire N/O (H1=pin 2)	Splitter	---
A07	4-wire	3-wire N/O (H1=pin 4)	3-wire N/O (H1=pin 2)	Splitter	(H2&H3) PNP
A13	4-wire	BN,BU,BK (H1=pin 4)	BN,BU,BK (H1=pin 2)	Splitter	---

Length Configuration

Cable Length:
003 0.3 meters
020 2.0 meters
100 10.0 meters

*Head 2 & Head 3 lengths are equal

Note: Part Number Matrix is designed for information purposes only. Not all configurations are possible. Consult factory for part number availability.

BCC A315 - A325 - 30 - 335 - VX45W6 - 020

Head 1 | Head 2 | Code | Wiring | Raw Cable | Length

Head 1 & Head 2 Configuration

Connector Size & Type:

A3	7/8" MINI Size I
A4	1" MINI Size II
A5	1 1/8" MINI Size III
0000	(Head 2) Single-Ended Cable

Connector Direction:

1	Straight Plastic Overmolded
2	Right Angle Plastic Overmolded

Number of Visible Connections:

#	3-pole thru 9-poles
A	10-pole
C	12-pole
L	19-pole

Code Configuration

Gender Type:

1	Female Internal Threads
2	Male External Threads
3	Female Int - Male Ext
7	Female Int - Male Int
C	Male Internal Threads
D	Female External Threads

Connector Coding:

0	All configurations (typical)

Wiring Configurations

Single-Ended	Double-Ended	Poles
003	304	4-wire DC
063	335	5-wire DC
071	345	3-wire AC
072	346	4-wire AC
085	357	6-wire
086	358	7-wire
087	359	8-wire
088	360	9-wire
089	355	10-wire
090	362	12-wire
091	363	19-wire
030	330	DeviceNet

Raw Cable Configuration

Jacket Material:

V	PVC
P	PUR
E	TPE

Special Designator:

X	nothing
S	Shielded

Jacket Color:

0	Black
4	Yellow (standard)
8	Grey

Number of Poles:

#	1-pole thru 9-poles
A	10-pole
C	12-pole
L	19-pole

Conductor Profile:

W6	16 AWG
W8	18 AWG
A5	1.50mm2
N4	DeviceNet Thick*
N5	DeviceNet Mid*
N6	DeviceNet Thin*

*For DeviceNet a jacket material of PUR is flex rated

Length Configuration

Cable Length:

003	0.3 meters
020	2.0 meters
100	10.0 meters

Note: Part Number Matrix is designed for information purposes only. Not all configurations are possible. Consult factory for part number availability.

BCC M434 - 0000 - 2A - 000 - 55X450 - 000

Connector (Place Holder) Code (Place Holder) Configuration (Place Holder)

Field Attachable Connector

Connector Size & Type:

M3	M8 Nano DC
M4	M12 Micro DC
S3	M8 Nano DC - Stainless
S4	M12 Micro DC - Stainless
A2	1/2" Micro AC
A3	7/8" MINI Size I

Connector Direction:

3	Straight Plastic Field Attachable
4	Right Angle Plastic Field Attachable
7	Straight Metal Field Attachable
8	Right Angle Metal Field Attachable

Number of Visible Connections:

5	M12 Female
no. poles	Any other configuration

Code Configuration

Gender Type:

1	Female Internal Threads
2	Male External Threads

Connector Coding

A	M12 Sensor Connectors (typical)
0	M8 & 7/8" (typical)
B	M12 Profibus Connectors
D	M12 Ethernet Connectors (Profinet, EtherNet/IP)

Configuration Breakdown

Cable Gland Minimum Diameter

1	min Ø 2.5mm	**2**	min Ø 3.0mm
3	min Ø 3.5mm	**4**	min Ø 4.0mm
5	min Ø 6.0mm	**6**	min Ø 8.0mm
7	min Ø 10mm	**8**	min Ø 12mm
9	min Ø 14mm	**0**	min Ø 5.0mm
A	min Ø 2.1mm or 4.0mm		

Connection Technology

1	Screw Terminals
2	Piercon Terminals
3	Insulation Displacement Terminals
4	Solder Cup Terminals
5	Spring Type Terminals

Cable Type

X	no cable

Number of Poles

#	1-pole thru 9-poles
A	10-pole
C	12-pole

Maximum Conductor Profile

25	0.25mm2	**34**	0.34mm2
50	0.50mm2	**75**	0.75mm2
A5	1.50mm2		

Note: Part Number Matrix is designed for information purposes only. Not all configurations are possible. Consult factory for part number availability.

BCC 0000 - 0000 - 00 - 001 - EX43T2 - 10X

(Place Holder) (Place Holder) (Place Holder) Wiring Raw Cable Length

Wiring Configuration

Wiring	Poles	Shield	Color Code
001	3-wire DC	---	BN,BU,BK
003	4-wire DC	---	BN,WH,BU,BK
030	5-wire	Yes	DeviceNet
063	5-wire DC	---	BN,WH,BU,BK,GNYE
071	3-wire AC	---	WH,BK,GN
072	4-wire AC	---	BK,WH,RD,GN
102	2x2 Twisted Pair	---	OR, WH/OR, GN, WH/GN
168	2x2 Twisted Pair	Yes	OR, WH/OR, GN, WH/GN
000	---	---	Contact Technical Support

Length Configuration

Cable Length:

500	50 meters
10X	100 meters (standard)
25X	250 meters

Raw Cable Configuration

Jacket Material:

V	PVC
P	PUR
E	TPE

Special Designator:

X	nothing
S	Shielded
M	Solid Conductor, Unshielded

Jacket Color:

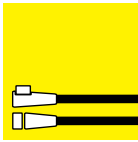
0	Black	**2**	Red (CC-Link)
4	Yellow (standard)	**5**	Green (Profinet)
7	Violet (Profibus)	**6**	Teal (Ethernet)
8	Grey (standard/DeviceNet)		

Number of Poles

#	2-pole thru 5-poles

Conductor Profile

T2	22 AWG	**W6**	16 AWG
34	0.34mm^2	**A5**	1.50mm2
N1	Profibus	**N2**	Profinet
N4	DeviceNet Thick	**N5**	DeviceNet Mid
N6	DeviceNet Thin	**N7**	CC-Link
		N9	EtherNet/IP



Note: Part Number Matrix is designed for information purposes only. Not all configurations are possible. Consult factory for part number availability.

BCC VA04 - M413 - 3E - 665 - VX8350 - 006

Head 1 | Head 2 | Code | Wiring | Raw Cable | Length

Head 1 Configuration

Connector Size & Type:

VA0	Type A - DIN (18mm) - 0°
VB0	Type B - DIN (10mm) - 0°
VB2	Type B - DIN (10mm) - 180°
VB4	Type B - IND (11mm) - 0°
VB6	Type B - IND (11mm) - 180°
VC0	Type C - DIN (8mm) - 0°
VC4	Type C - IND (9.4mm) - 0°

Number of Visible Connections:

4	A & C Types
3	B Type

Head 2 Configuration

Connector Size & Type:

M4	M12 Micro DC - Ni Plated Brass
0000	(Head 2) Single-Ended Cable

Connector Direction:

1	Straight Plastic Overmolded
2	Right Angle Plastic Overmolded

Number of Visible Connections:

#	3-pole thru 5-poles

Code Configuration

Gender Type:

1	Female
3	Female - Male

Connector Coding

0	Single-Ended Cables (typical)
E	Double-Ended Cables (with M12)

Wiring Configuration

Wiring	Poles	Bridged	H1/H2 LED
053	3	Yes	Diode & PNP LED/---
054	3	Yes	No/---
055	3	---	Diode & PNP LED/---
056	3	---	No/---
664	3	Yes	Diode & PNP LED/No
665	3	Yes	No/No
666	3	---	Diode & PNP LED/No
667	3	---	No/No

Raw Cable Configuration

Jacket Material:

V	PVC
P	PUR

Special Designator:

X	nothing

Jacket Color:

0	Black
8	Grey

Number of Poles

#	3-pole thru 5-poles

Conductor Profile

50	0.50mm2

Length Configuration

Cable Length:

003	0.3 meters
020	2.0 meters
100	10.0 meters

Note: Part Number Matrix is designed for information purposes only. Not all configurations are possible. Consult factory for part number availability.

Balluff's new line of sensor cordsets offers many benefits to the automation world. Balluff can globally offer cordsets that fit almost any standard sensor or actuator application. This offering includes features such as consistant and accurate IP ratings, a wide range of cable jackets, a full range of overmold configurations, and high quality rugged materials.

Select your cordset in 4 easy steps:

1. Pick your connector types (single/double, right angle/straight)
2. Pick your electrical information and LEDs
3. Pick your jacket material and color
4. Pick your cordset length

Complete Part Number Example:

BCC M415-0000-1A-008-VX44T2-050

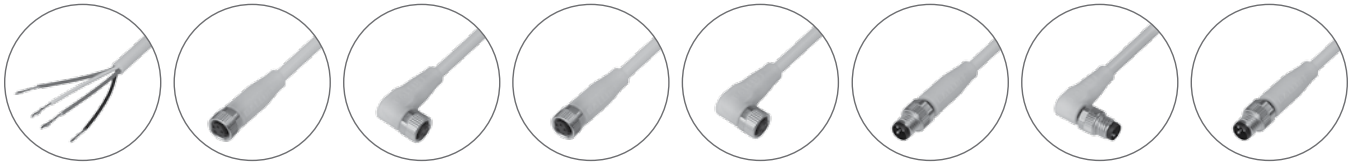
- M12 single ended, straight female (M415-0000-1A)
- 4-wire, 2x PNP LED (008)
- Yellow PVC, 4-wire (VX44T2)
- 5 m cable (050)

Step 1

BCC_ _ _ _-_ _ _ _-_ _ -_ _ _-_ _ _ _ _ _-_ _ _

Cordset Connector Selection
Single-ended and double-ended cordsets can be made using the chart below. Available in industry standard M8 and M12 sizes, these cordsets come in a variety of head combinations; single-ended, straight to straight, right angle to straight, and right angle to right angle. To select your cordset, start by selecting the female connector that will match your sensor. Next, follow the row across until you find the required end that will go back to your controller, homerun cordset, MIB, etc.

		Male (controller, homerun cable, MIB end) →				
Female (sensor end)	**Connector Types**	**Single Ended Female**	**3-wire M8 Straight Male**	**3-wire M8 Right Angle Male**	**4-wire M8 Straight Male**	
	Single-Ended Male		M313-0000-20	M323-0000-20	M314-0000-20	
	M8 Straight Female 3-wire	M313-0000-10	M313-M313-30	M313-M323-30		
	M8 Right Angle Female 3-wire	M323-0000-10	M323-M313-30	M323-M323-30		
	M8 Straight Female 4-wire	M314-0000-10			M314-M314-30	
	M8 Right Angle Female 4-wire	M324-0000-10			M324-M314-30	
	M12 Straight Female	M415-0000-1A	M415-M313-3F	M415--M323-3F	M415-M314-3F	
	M12 Right Angle Female	M425-0000-1A	M425-M313-3F	M425-M323-3F	M425-M314-3F	



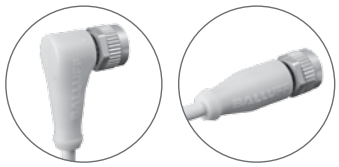
Single Ended | M8 Female 3-wire | M8 Female 3-wire | M8 Female 4-wire | M8 Female 4-wire | M8 Male 3-wire | M8 Male 3-wire | M8 Male 4-wire

Step 2

BCC_ _ _ _-_ _ _ _-_ _ -_ _ _-_ _ _ _ _ _-_ _ _

Cordset Wiring and LEDs
Both 3- and 4-wire cordsets are available in single- and double-ended cordsets, as well as two and three LEDs. To select your cordset, start with Step 1 on previous page. Then decide if you need 3- or 4-wire and whether or not you want an LED in the overmolded head.

Single Ended Cordsets			
Head 1 and 2	**3-wire N/O**	**3-wire N/C**	**4-wire**
No LED	001	002	003
2x PNP LED	004	005	008
3x PNP LED**			010
2x NPN LED	006	007	009



No LED

Double Ended Cordsets			
Head 1	**Head 2**	**3-wire N/O**	**4-wire**
No LED	**No LED**	300	304
2x PNP LED	**No LED**	602	606
3x PNP LED**	**No LED**		650
2x NPN LED	**No LED**	603	607
2x PNP LED	**2x PNP LED***	302	306
2x NPN LED	**2x NPN LED***	303	307
3x PNP LED**	**2x PNP LED***		651

2x LED 3x LED

2x = 1 power LED and 1 signal LED
3x = 1 power LED and 2 signal LEDs

*M12 right angle male only
**M12 right angle female only

	Male (controller, homerun cable, MIB end)				
	4-wire M8 Right Angle Male	**3-wire M12 Straight Male**	**3-wire M12 Right Angle Male**	**4-wire M12 Straight Male**	**4-wire M12 Right Angle Male**
	M324-0000-20	M413-0000-2A	M423-0000-2A	M414-0000-2A	M424-0000-2A
		M313-M413-3E	M313-M423-3E		
		M323-M413-3E	M323-M423-3E		
	M314-M324-30			M314-M414-3E	M314-M424-3E
	M324-M324-30			M324-M414-3E	M324-M424-3E
	M415-M324-3F	M415-M413-3A	M415-M423-3A	M415-M414-3A	M415-M424-3A
	M425-M324-3F	M425-M413-3A	M425-M423-3A	M425-M414-3A	M425-M424-3A

M8 Male 4-wire | M12 Female | M12 Female | M12 Male 3-wire | M12 Male 3-wire | M12 Male 4-wire | M12 Male 4-wire

Step 3

BCC_ _ _ _-_ _ _ _-_ _ -_ _ _-_ _ _ _ _ _-_ _ _

Raw Cable Type
To select your raw cable, first decide on the correct jacket for the application and then on a jacket color.
- PVC: For standard automation applications
- PUR: For abrasion and extreme fluid resistance
- TPE: For High-flex and for use in heavy duty environments

Jacket Color and Material				
Material	**Color**	**Conductor**	**3-wire**	**4-wire**
PVC	Yellow	22 AWG	VX43T2	VX44T2
PVC	Gray	0.34 mm²	VX8334	VX8434
PUR	Yellow	22 AWG	PX43T2	PX44T2
PUR	Black	0.34 mm²	PX0334	PX0434
TPE	Yellow	22 AWG	EX43T2	EX44T2

Step 4

BCC_ _ _ _-_ _ _ _-_ _ -_ _ _-_ _ _ _ _ _-_ _ _

Cordset Length
Select from our standard cordset lengths below. Contact the factory for custom cordset length selections.

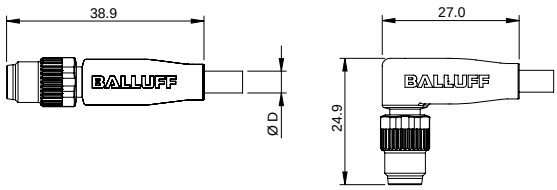
Double Length Options	
Length	**Ordering Information**
0.3 m	003
0.6 m	006
1 m	010
1.5 m	015
2 m	020
3 m	030
5 m	050

Single Length Options	
Length	**Ordering Information**
2 m	020
5 m	050
10 m	100

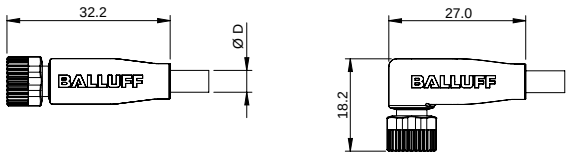
Need help finding a cross?
Need help selecting a part?

Visit us online: www.balluff.us
Call or email our technical support group at:
1-800-543-8390
technical.support@balluff.com

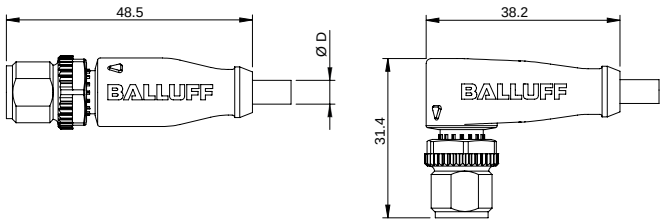
M8 connectors, male straight and right-angle



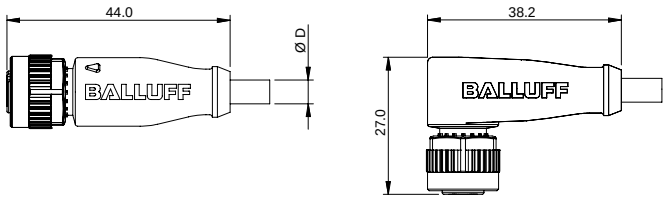
M8 connectors, female straight and right-angle



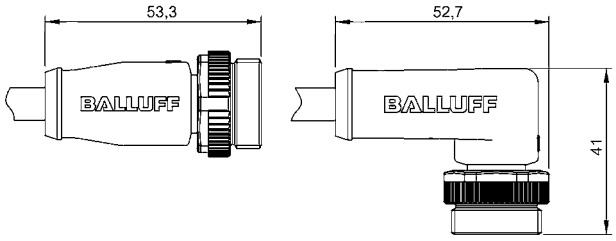
M12 connectors, male straight and right-angle



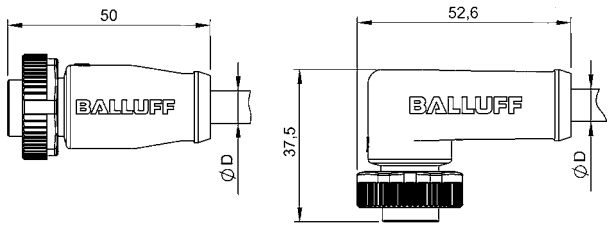
M12 connectors, female straight and right-angle



7/8“ connectors, male straight and right-angle



7/8" connectors, female straight and right-angle



Note: For face views and wiring diagrams see the technical reference section (t).

Bulk Cable Specifications

Jacket Material	**PVC**		**PUR**		**TPE**	
Application	General Automation		Cut & Fluid Resistant, Halogen Free		High Flex, Weld Slag Resistant	
Jacket Color	Yellow		Yellow		Yellow	
Conductor Gauge	22AWG		22AWG		22AWG	
Ambient temp (moving)	-5…105°C		-25…80°C		-40…105°C	
Ambient temp. (fixed)	-40…105°C		-50…80°C		-50…105°C	
Bending Cycles	> 2 Million		> 2 Million		> 10 Million	
Bulk Cable (100 m)	**BCC0AE7**	**BCC0AE8**	**BCC0AE9**	**BCC0AEA**	**BCC0AEC**	**BCC0AEE**
Number of Conductors	3	4	3	4	3	4
Cable Diameter (mm)	4.7 ± 0.15	5.0 ± 0.15	4.3 ± 0.20	4.7 ± 0.20	5.3 ± 0.13	5.3 ± 0.13

M5 Single-Ended

Type	M5 Female	M5 Female
Configuration	Straight	Right Angle
Voltage Rating	30 VAC/VDC	30 VAC/VDC
Amperage	1 A	1 A
3-wire, non-LED	**BKS-B 25-1-PU-03**	**BKS-B 26-1-PU-03**
4-wire, non-LED	**BKS-B 25-3-PU-03**	**BKS-B 26-3-PU-03**

M5-M8 Double-Ended

Type	M5 Female - M8 Male	M5 Female - M8 Male
Configuration	Straight - Straight	Right Angle - Straight
Voltage Rating	30 VAC/VDC	30 VAC/VDC
Amperage	1 A	1 A
3-wire, non-LED	**BKS-B 25-1/GS49-PU-01**	**BKS-B 26-1/GS49-PU-01**

For list of order codes and available lengths, see the index in section t.

M8 Single-Ended Female

Type	M8 Female	M8 Female
Configuration	Straight	Right Angle
Voltage Rating	60 VAC/VDC (3wire), 30 VAC/VDC (4wire)	60 VAC/VDC (3wire), 30 VAC/VDC (4wire), 10-30 VDC (LED)
Amperage	4 A	4 A
3-wire, non-LED	**BCC M313-0000-10-001-_X43T2-_ _ _**	**BCC M323-0000-10-001-_X43T2-_ _ _**
3-wire, non-LED, shielded	**BCC M313-0000-10-036-_S_334-_ _ _**	**BCC M323-0000-10-036-_ S_334-_ _ _**
3-wire, PNP-LED, N/O signal		**BCC M323-0000-10-004-_X43T2-_ _ _**
3-wire, NPN-LED, N/O signal		**BCC M323-0000-10-006-_X43T2-_ _ _**
4-wire, non-LED	**BCC M314-0000-10-003-_X44T2-_ _ _**	**BCC M324-0000-10-003-_X44T2-_ _ _**
4-wire, non-LED, shielded	**BCC M314-0000-10-014-_S_434-_ _ _**	**BCC M324-0000-10-014-_S_434-_ _ _**

Standard Cable Jackets:
V = PVC (VS0 = shielded)
P = PUR (PS0 = shielded)
E = TPE (no shielded version)

Standard Lengths Available:
020 = 2 m
050 = 5 m
100 = 10 m

M8 Single-Ended Male

Type	M8 Male	M8 Male
Configuration	Straight	Right Angle
Voltage Rating	60 VAC/VDC (3wire), 30 VAC/VDC (4wire)	60 VAC/VDC (3wire), 30 VAC/VDC (4wire)
Amperage	4 A	4 A
3-wire, non-LED	**BCC M313-0000-20-001-_X43T2-_ _ _**	**BCC M323-0000-20-001-_X43T2-_ _ _**
4-wire, non-LED	**BCC M314-0000-20-003-_X44T2-_ _ _**	**BCC M324-0000-20-003-_X44T2-_ _ _**

Standard Cable Jackets:
V = PVC
P = PUR
E = TPE

Standard Lengths Available:
020 = 2 m
050 = 5 m
100 = 10 m

For list of order codes and available lengths, see the index in section t.

M8-M8 Double-Ended

Type	M8 Female - M8 Male	M8 Female - M8 Male	
Configuration	Straight - Straight	Right Angle - Straight	
Voltage Rating	60 VAC/VDC (3wire), 30 VAC/VDC (4wire)	60 VAC/VDC (3wire), 30 VAC/VDC (4wire), 10-30 VDC (LED)	
Amperage	4 A	4 A	
3-wire, non-LED	**BCC M313-M313-30-300-_X43T2-_ _ _**	**BCC M323-M313-30-300-_X43T2-_ _ _**	
3-wire, PNP-LED, N/O, Head 1		**BCC M323-M313-30-602-_X43T2-_ _ _**	
3-wire, NPN-LED, N/O, Head 1		**BCC M323-M313-30-603-_X43T2-_ _ _**	
4-wire, non-LED	**BCC M314-M314-30-304-_X44T2-_ _ _**	**BCC M324-M314-30-304-_X44T2-_ _ _**	

M8-M12 Double-Ended

Type	M8 Female - M12 Male	M8 Female - M12 Male	
Configuration	Straight - Straight	Right Angle - Straight	
Voltage Rating	60 VAC/VDC (3wire), 30 VAC/VDC (4wire)	60 VAC/VDC (3wire), 30 VAC/VDC (4wire), 10-30 VDC (LED)	
Amperage	4 A	4 A	
3-wire, non-LED	**BCC M313-M413-3E-300-_X43T2-_ _ _**	**BCC M323-M413-3E-300-_X43T2-_ _ _**	
3-wire, PNP-LED, N/O, Head 1		**BCC M323-M413-3E-602-_X43T2-_ _ _**	
3-wire, NPN-LED, N/O, Head 1		**BCC M323-M413-3E-603-_X43T2-_ _ _**	
4-wire, non-LED	**BCC M314-M414-3E-304-_X44T2-_ _ _**	**BCC M324-M414-3E-304-_X44T2-_ _ _**	

For list of order codes and available lengths, see the index in section t.

	M8 Female - M8 Male	M8 Female - M8 Male
	Straight - Right Angle	Right Angle - Right Angle
	60 VAC/VDC (3wire), 30 VAC/VDC (4wire)	60 VAC/VDC (3wire), 30 VAC/VDC (4wire), 10-30 VDC (LED)
	4 A	4 A
	BCC M313-M323-30-300-_X43T2-_ _ _	**BCC M323-M323-30-300-_X43T2-_ _ _**
		BCC M323-M323-30-602-_X43T2-_ _ _
		BCC M323-M323-30-603-_X43T2-_ _ _
	BCC M314-M324-30-304-_X44T2-_ _ _	**BCC M324-M324-30-304-_X44T2-_ _ _**

Standard Cable Jackets:
V = PVC
P = PUR
E = TPE

Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m
010 = 1.0 m
015 = 1.5 m
020 = 2 m
030 = 3 m
050 = 5 m

	M8 Female - M12 Male	M8 Female - M12 Male
	Straight - Right Angle	Right Angle - Right Angle
	60 VAC/VDC (3wire), 30 VAC/VDC (4wire)	60 VAC/VDC (3wire), 30 VAC/VDC (4wire), 10-30 VDC (LED)
	4 A	4 A
	BCC M313-M423-3E-300-_X43T2-_ _ _	**BCC M323-M423-3E-300-_X43T2-_ _ _**
		BCC M323-M423-3E-602-_X43T2-_ _ _
		BCC M323-M423-3E-603-_X43T2-_ _ _
	BCC M314-M424-3E-304-_X44T2-_ _ _	**BCC M324-M424-3E-304-_X44T2-_ _ _**

Standard Cable Jackets:
V = PVC
P = PUR
E = TPE

Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m
010 = 1.0 m
015 = 1.5 m
020 = 2 m
030 = 3 m
050 = 5 m

For list of order codes and available lengths, see the index in section t.

M12 Single-Ended

Type	M12 Female	M12 Female	
Configuration	Straight	Right Angle	
Voltage Rating	250 VAC/VDC (3&4wire), 36 VDC (LED)	250 VAC/VDC (3&4wire), 36 VDC (LED)	
Amperage	4 A	4 A	
3-wire, non-LED, N/O signal	**BCC M415-0000-1A-001-_X43T2-_ _ _**	**BCC M425-0000-1A-001-_X43T2-_ _ _**	
3-wire, non-LED, N/C signal	**BCC M415-0000-1A-002-_X43T2-_ _ _**	**BCC M425-0000-1A-002-_X43T2-_ _ _**	
3-wire, PNP-LED, N/O signal	**BCC M415-0000-1A-004-_X43T2-_ _ _**	**BCC M425-0000-1A-004-_X43T2-_ _ _**	
3-wire, PNP-LED, N/C signal	**BCC M415-0000-1A-005-_X43T2-_ _ _**	**BCC M425-0000-1A-005-_X43T2-_ _ _**	
3-wire, NPN-LED, N/O signal	**BCC M415-0000-1A-006-_X43T2-_ _ _**	**BCC M425-0000-1A-006-_X43T2-_ _ _**	
3-wire, NPN-LED, N/C signal	**BCC M415-0000-1A-007-_X43T2-_ _ _**	**BCC M425-0000-1A-007-_X43T2-_ _ _**	
4-wire, non-LED, N/O and N/C signal	**BCC M415-0000-1A-003-_X44T2-_ _ _**	**BCC M425-0000-1A-003-_X44T2-_ _ _**	
4-wire, PNP-LED, N/O signal	**BCC M415-0000-1A-008-_X44T2-_ _ _**	**BCC M425-0000-1A-008-_X44T2-_ _ _**	
4-wire, PNP-LED, N/O and N/C signal		**BCC M425-0000-1A-010-_X44T2-_ _ _**	
4-wire, NPN-LED, N/O signal	**BCC M415-0000-1A-009-_X44T2-_ _ _**	**BCC M425-0000-1A-009-_X44T2-_ _ _**	

Standard Cable Jackets:
V = PVC
P = PUR
E = TPE

Standard Lengths Available:
020 = 2 m
050 = 5 m
100 = 10 m

For list of order codes and available lengths, see the index in section t.

	M12 Male	M12 Male
	Straight	Right Angle
	250 VAC/VDC (3&4wire), 36 VDC (LED)	250 VAC/VDC (3&4wire), 36 VDC (LED)
	4 A	4 A
	BCC M413-0000-2A-001-_X43T2-_ _ _	**BCC M423-0000-2A-001-_X43T2-_ _ _**
	BCC M413-0000-2A-002-_X43T2-_ _ _	**BCC M423-0000-2A-002-_X43T2-_ _ _**
		BCC M423-0000-2A-004-_X43T2-_ _ _
		BCC M423-0000-2A-005-_X43T2-_ _ _
	BCC M414-0000-2A-003-_X44T2-_ _ _	**BCC M424-0000-2A-003-_X44T2-_ _ _**
		BCC M424-0000-2A-008-_X44T2-_ _ _

For list of order codes and available lengths, see the index in section t.

M12-M12 Double-Ended

Type	M12 Female - M12 Male
Configuration	Straight - Straight
Voltage Rating	250 VAC / VDC (non-LED), 10-30 VDC (LED)
Amperage	4 A

	Female LED	Male LED	
3-wire, non-LED	---	---	**BCC M415-M413-3A-300-_X43T2-_ _ _**
3-wire, PNP-LED, Head 1	N/O	---	**BCC M415-M413-3A-602-_X43T2-_ _ _**
3-wire, PNP-LED, Head 1&2	N/O	N/O	
3-wire, NPN-LED, Head 1	N/O	---	**BCC M415-M413-3A-603-_X43T2-_ _ _**
4-wire, non-LED	---	---	**BCC M415-M414-3A-304-_X44T2-_ _ _**
4-wire, PNP-LED, Head 1	N/O	---	**BCC M415-M414-3A-606-_X44T2-_ _ _**
4-wire, PNP-LED, Head 1	N/O and N/C	---	
4-wire, PNP-LED, Head 1 & 2	N/O	N/O	
4-wire, PNP-LED, Head 1 & 2	N/O and N/C	N/O	
4-wire, NPN-LED, Head 1	N/O	---	**BCC M415-M414-3A-607-_X44T2-_ _ _**

Standard Cable Jackets:
V = PVC
P = PUR
E = TPE

Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m
010 = 1.0 m
015 = 1.5 m
020 = 2 m
030 = 3 m
050 = 5 m

For list of order codes and available lengths, see the index in section t.

	M12 Female - M12 Male	M12 Female - M12 Male	M12 Female - M12 Male
	Right Angle - Straight	Straight - Right Angle	Right Angle - Right Angle
	250 VAC / VDC (non-LED), 10-30 VDC (LED)	250 VAC / VDC (non-LED), 10-30 VDC (LED)	250 VAC / VDC (non-LED), 10-30 VDC (LED)
	4 A	4 A	4 A
	BCC M425-M413-3A-300-_X43T2-_ _ _	**BCC M415-M423-3A-300-_X43T2-_ _ _**	**BCC M425-M423-3A-300-_X43T2-_ _ _**
	BCC M425-M413-3A-602-_X43T2-_ _ _	**BCC M415-M423-3A-602-_X43T2-_ _ _**	**BCC M425-M423-3A-602-_X43T2-_ _ _**
		BCC M415-M423-3A-302-_X43T2-_ _ _	**BCC M425-M423-3A-302-_X43T2-_ _ _**
	BCC M425-M413-3A-603-_X43T2-_ _ _	**BCC M415-M423-3A-603-_X43T2-_ _ _**	**BCC M425-M423-3A-603-_X43T2-_ _ _**
	BCC M425-M414-3A-304-_X44T2-_ _ _	**BCC M415-M424-3A-304-_X44T2-_ _ _**	**BCC M425-M424-3A-304-_X44T2-_ _ _**
	BCC M425-M414-3A-606-_X44T2-_ _ _	**BCC M415-M424-3A-606-_X44T2-_ _ _**	**BCC M425-M424-3A-606-_X44T2-_ _ _**
	BCC M425-M414-3A-650-_X44T2-_ _ _		**BCC M425-M424-3A-650-_X44T2-_ _ _**
		BCC M415-M424-3A-306-_X44T2-_ _ _	**BCC M425-M424-3A-306-_X44T2-_ _ _**
	BCC M425-M414-3A-651-_X44T2-_ _ _		**BCC M425-M424-3A-651-_X44T2-_ _ _**
	BCC M425-M414-3A-607-_X44T2-_ _ _	**BCC M415-M424-3A-607-_X44T2-_ _ _**	**BCC M425-M424-3A-607-_X44T2-_ _ _**

For list of order codes and available lengths, see the index in section t.

M12-M8 Double-Ended

Type	M12 Female - M8 Male
Configuration	Straight - Straight
Voltage Rating	60 VAC/VDC (3wire) 30 VAC/VDC (4wire) 10-30 VDC (LED)
Amperage	4 A

	Female LED	Male LED	
3-wire, non-LED	---	---	**BCC M415-M313-3F-300-_X43T2-_ _ _**
3-wire, PNP-LED, Head 1	N/O	---	**BCC M415-M313-3F-602-_X43T2-_ _ _**
3-wire, NPN-LED, Head 1	N/O	---	**BCC M415-M313-3F-603-_X43T2-_ _ _**
4-wire, non-LED	---	---	**BCC M415-M314-3F-304-_X44T2-_ _ _**
4-wire, PNP-LED, Head 1	N/O	---	**BCC M415-M314-3F-606-_X44T2-_ _ _**
4-wire, PNP-LED, Head 1	N/O and N/C	---	
4-wire, NPN-LED, Head 1	N/O	---	**BCC M415-M314-3F-607-_X44T2-_ _ _**

Standard Cable Jackets:
V = PVC
P = PUR
E = TPE

Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m
010 = 1.0 m
015 = 1.5 m
020 = 2 m
030 = 3 m
050 = 5 m

For list of order codes and available lengths, see the index in section t.

	M12 Female - M8 Male	M12 Female - M8 Male	M12 Female - M8 Male
	Right Angle - Straight	Straight - Right Angle	Right Angle - Right Angle
	60 VAC/VDC (3wire) 30 VAC/VDC (4wire) 10-30 VDC (LED)	60 VAC/VDC (3wire) 30 VAC/VDC (4wire) 10-30 VDC (LED)	60 VAC/VDC (3wire) 30 VAC/VDC (4wire) 10-30 VDC (LED)
	4 A	4 A	4 A
	BCC M425-M313-3F-300-_X43T2-_ _ _	**BCC M415-M323-3F-300-_X43T2-_ _ _**	**BCC M425-M323-3F-300-_X43T2-_ _ _**
	BCC M425-M313-3F-602-_X43T2-_ _ _	**BCC M415-M323-3F-602-_X43T2-_ _ _**	**BCC M425-M323-3F-602-_X43T2-_ _ _**
	BCC M425-M313-3F-603-_X43T2-_ _ _	**BCC M415-M323-3F-603-_X43T2-_ _ _**	**BCC M425-M323-3F-603-_X43T2-_ _ _**
	BCC M425-M314-3F-304-_X44T2-_ _ _	**BCC M415-M324-3F-304-_X44T2-_ _ _**	**BCC M425-M324-3F-304-_X44T2-_ _ _**
	BCC M425-M314-3F-606-_X44T2-_ _ _	**BCC M415-M324-3F-606-_X44T2-_ _ _**	**BCC M425-M324-3F-606-_X44T2-_ _ _**
	BCC M425-M314-3F-650-_X44T2-_ _ _		**BCC M425-M324-3F-650-_X44T2-_ _ _**
	BCC M425-M314-3F-607-_X44T2-_ _ _	**BCC M415-M324-3F-607-_X44T2-_ _ _**	**BCC M425-M324-3F-607-_X44T2-_ _ _**

For list of order codes and available lengths, see the index in section t.

Single-Ended

Type	M12 Female	M12 Female	
Configuration	Straight	Right Angle	
Voltage Rating	(4p+PE, 5p = 125 V), (8p = 60 V), (12p = 30 V)	(4p+PE, 5p = 125 V), (8p = 60 V), (12p = 30 V)	
Amperage	(4p+PE, 5p = 4 A), (8p = 2 A), (12p = 1 A)	(4p+PE, 5p = 4 A), (8p = 2 A), (12p = 1 A)	
Conductor Cross-Section	(5p = 0.34 mm²), (8p, 12p = 0.25 mm²)	(5p = 0.34 mm²), (8p, 12p = 0.25 mm²)	
4-wire+PE, non-LED	**BCC M415-0000-1A-034-PX0534-_ _ _**	**BCC M425-0000-1A-034-PX0534-_ _ _**	
4-wire+PE, PNP-LED, N/O & N/C signals		**BCC M425-0000-1A-040-PX0534-_ _ _**	
5-wire, non-LED	**BCC M415-0000-1A-017-PX0534-_ _ _**	**BCC M425-0000-1A-017-PX0534-_ _ _**	
5-wire, PNP-LED, N/O & N/C signals		**BCC M425-0000-1A-039-PX0534-_ _ _**	
8-wire, non-LED	**BCC M418-0000-1A-044-PX0825-_ _ _**	**BCC M428-0000-1A-044-PX0825-_ _ _**	
12-wire, non-LED	**BCC M41C-0000-1A-049-_X_C25-_ _ _**	**BCC M42C-0000-1A-049-_X_C25-_ _ _**	

Double-Ended

Type	M12 Female - M12 Male	M12 Female - M12 Male	
Configuration	Straight - Straight	Right Angle - Straight	
Voltage Rating	4p+PE & 5p = 125V, 8p=60V, 12p = 30V	125V	
Amperage	4p+PE & 5p = 4A, 8p=2A, 12p = 1A	4A	
Conductor Cross-Section	4p+PE & 5p = 0.34 mm², 8p & 12p = 0.25 mm². Yellow = 22 AWG	0.34 mm²	
Cable Jacket Material	Black PUR, Yellow TPE, Yellow PVC	Black PUR	
4-wire+PE, non-LED	**BCC M415-M415-3A-313-PX0534-_ _ _**	**BCC M425-M415-3A-313-PX0534-_ _ _**	
4-wire+PE, PNP-N/O & N/C signals		**BCC M425-M415-3A-661-PX0534-_ _ _**	
5-wire, non-LED	**BCC M415-M415-3A-312-_ _ _ _ _ _-_ _ _**	**BCC M425-M415-3A-312-PX0534-_ _ _**	
5-wire, PNP-N/O & N/C signals		**BCC M425-M415-3A-660-PX0534-_ _ _**	
8-wire, non-LED	**BCC M418-M418-3A-342-PX0825-_ _ _**		
12-wire, non-LED	**BCC M41C-M41C-3A-325-PX0C25-_ _ _**		

For list of order codes and available lengths, see the index in section t.

	M12 Male	M12 Male
	Straight	Right Angle
	(4p+PE, 5p = 125 V), (8p = 60 V), (12p = 30 V)	(4p+PE, 5p = 125 V), (8p = 60 V), (12p = 30 V)
	(4p+PE, 5p = 4 A), (8p = 2 A), (12p = 1 A)	(4p+PE, 5p = 4 A), (8p = 2 A), (12p = 1 A)
	(5p = 0.34 mm²), (8p, 12p = 0.25 mm²)	(5p = 0.34 mm²), (8p, 12p = 0.25 mm²)
	BCC M415-0000-2A-034-PX0534-_ _ _	
	BCC M415-0000-2A-017-PX0534-_ _ _	
	BCC M418-0000-2A-044-_X_825-_ _ _	**BCC M428-0000-2A-044-_X_825-_ _ _**
	BCC M41C-0000-2A-049-_X_C25-_ _ _	**BCC M42C-0000-2A-049-_X_C25-_ _ _**

Standard Cable Jackets:
VX8= PVC (grey, 8)
PX0 = PUR (black, 0)

Standard Lengths Available:
020 = 2 m
050 = 5 m
100 = 100 m

	M12 Female - M12 Male	M12 Female - M12 Male
	Straight - Straight	Right Angle - Straight
	125V	125V
	4A	4A
	0.34 mm²	0.34 mm²
	Orange High Shore PUR, Weld Resistant*	Orange High Shore PUR, Weld Resistant*
	BCC M415-M415-3A-313-PW3534-006	**BCC M425-M415-3A-313-PW3534-006**
	BCC M425-M415-3A-661-PW3534-006	

Jacket Materials:
Yellow PVC = VX45T2
Black PUR = PX0534
Yellow TPE = EX45T2

Available Lengths:
003 = 0.3 m
006 = 0.6 m
010 = 1.0 m
015 = 1.5 m
020 = 2.0 m
030 = 3.0 m
050 = 5.0 m
100 = 10.0 m

*Also available in single-ended versions. See page 3.37.

For list of order codes and available lengths, see the index in section t.

Single-Ended

Type	M12 Female	M12 Female	
Configuration	Straight	Right Angle	
Voltage Rating	(3p, 4p = 250 V), (4p+PE, 5p = 125 V), (8p = 60 V)	(3p, 4p = 250 V), (4p+PE, 5p = 125 V), (8p = 60 V)	
Amperage	(3p, 4p = 4 A), (5p = 4 A), (8p = 2 A)	(3p, 4p = 4 A), (5p = 4 A), (8p = 2 A)	
Conductor Cross-Section	(3p, 4p, 5p = 0.34 mm²), (8p = 0.25 mm²)	(3p, 4p, 5p = 0.34 mm²), (8p = 0.25 mm²)	
3-wire, non-LED, N/O signal, shielded	**BCC M415-0000-1A-036-_S_334-_ _ _**	**BCC M425-0000-1A-036-_S_334-_ _ _**	
3-wire, non-LED, N/C signal, shielded	**BCC M415-0000-1A-037-_S_334-_ _ _**	**BCC M425-0000-1A-037-_S_334-_ _ _**	
4-wire, non-LED, shielded	**BCC M415-0000-1A-014-_S_434-_ _ _**	**BCC M425-0000-1A-014-_S_434-_ _ _**	
4-wire+PE, non-LED, shielded	**BCC M415-0000-1A-043-PS0534-_ _ _**	**BCC M425-0000-1A-043-PS0534-_ _ _**	
5-wire, non-LED, shielded	**BCC M415-0000-1A-016-PS0525-_ _ _**		
8-wire, non-LED, shielded	**BCC M418-0000-1A-046-PS0825-_ _ _**	**BCC M428-0000-1A-046-PS0825-_ _ _**	

Double-Ended

Type	M12 Female - M12 Male
Configuration	Straight - Straight
Voltage Rating	4p = 250V, 8p = 60V
Amperage	4p = 4A, 8p = 2A
Conductor Cross-Section	4p = 0.34 mm², 8p = 0.25 mm²
4-wire, non-LED, shielded	**BCC M415-M414-3A-305-PS0434-_ _ _**
8-wire, non-LED, shielded	**BCC M418-M418-3A-351-PS0825-003**

Available Lengths:
010 = 1.0 m
020 = 2.0 m
025 = 2.5 m
050 = 5.0 m
100 = 10.0 m
200 = 20.0 m

For list of order codes and available lengths, see the index in section t.

	M12 Male	M12 Male
	Straight	Right Angle
	250 V	250 V
	4 A	4 A
	(3p, 4p, 5p = 0.34 mm²)	(3p, 4p = 0.34 mm²), (8p = 0.25 mm²)
	BCC M413-0000-2A-036-_S_334-_ _ _	**BCC M423-0000-2A-036-_S_334-_ _ _**
	BCC M413-0000-2A-037-_S_334-_ _ _	**BCC M423-0000-2A-037-_S_334-_ _ _**
	BCC M414-0000-2A-014-_S_434-_ _ _	**BCC M424-0000-2A-014-_S_434-_ _ _**
	BCC M415-0000-2A-043-PS0534-_ _ _	**BCC M425-0000-2A-043-PS0534-_ _ _**

Standard Cable Jackets:
VS8 = PVC (grey, 8)
PS0 = PUR (black, 0)

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 100 meters

For list of order codes and available lengths, see the index in section t.

Connectivity Solutions

M8 and M12 specialty cables
IP69K, ECOLAB, stainless

Single-Ended

Type	ECOLAB, H2O2 Reistant, Stainless IP68	IP69K Rated, 1.4404 Stainless	
Configuration	Stainless Nut, Grey Overmold & PUR Cable	Stainless Nut, Black Overmold	
Voltage Rating	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12 non-LED), 36 V (M12 LED)	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12)	
Amperage	4 A	4 A	
M8 Versions			
M8 Female, 3-wire, Straight	**BCC S313-0000-10-001-PX8334-100-C002**		
M8 Female, 3-wire, Right Angle	**BCC S323-0000-10-001-PX8334-100-C002**		
M8 Female, 3-wire, Right Angle, N/O PNP-LED	**BCC S323-0000-10-004-PX8334-030-C002**	**BCC S323-0000-10-004-PX0334-_ _ _**	
M8 Female, 4-wire, Straight	**BCC S314-0000-10-003-PX8434-100-C002**		
M8 Female, 4-wire, Right Angle	**BCC S324-0000-10-003-PX8434-100-C002**		
M12 Versions			
M12 Female, 3-wire, Straight			
M12 Femaile, 3-wire, Right Angle			
M12 Female, 3-wire, Right Angle, PNP-LED, N/O	**BCC S425-0000-1A-004-PX8334-030-C002**	**BCC S425-0000-1A-004-PX0334-_ _ _**	
M12 Female, 4-wire, Straight	**BCC S415-0000-1A-003-PX8434-_ _ _-C002**	**BCC S415-0000-1A-003-VX8434-_ _ _**	
M12 Female, 4-wire, Straight, N/O PNP-LED			
M12 Female, 4-wire, Right Angle	**BCC S425-0000-1A-003-PX8434-_ _ _-C002**	**BCC S425-0000-1A-003-VX8434-_ _ _**	
M12 Female, 4-wire, Right Angle, N/O PNP-LED	**BCC S425-0000-1A-008-PX8434-100-C002**	**BCC S425-0000-1A-008-PX0434-_ _ _**	
M12 Female, 5-wire, Straight	**BCC S415-0000-1A-017-PX8534-_ _ _-C002**		
M12 Female, 5-wire, Straight, Braided Shield	**BCC S415-0000-1A-017-PS8525-_ _ _-C002**		
M12 Female, 5-wire, Right Angle	**BCC S425-0000-1A-017-PX8534-_ _ _-C002**		
M12 Female, 5-wire, Right Angle, Braided Shield	**BCC S425-0000-1A-017-PS8525-100-C002**		
M12 Female, 8-wire, Straight, Braided Shield	**BCC S418-0000-1A-069-PS8825-_ _ _-C002**		

Standard Lengths Available:
100 = 10 meters
200 = 20 meters
250 = 25 meters

Standard Lengths Available:

LED	Non-LED
030 = 3 meters	100 = 10.0 meters
050 = 5 meters	150 = 15.0 meters
100 = 10 meters	200 = 20.0 meters

Double-Ended

Type	1.4404 Stainless, IP69K Rated	1.4404 Stainless, IP69K Rated	
Configuration	Stainless Nut, Yellow Overmold & PVC Cable	Stainless Nut, Yellow Overmold & PVC Cable	
Voltage Rating	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12 non-LED), 36 V (M12 LED)	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12 non-LED), 36 V (M12 LED)	
Amperage	4 A	4 A	
M12 Female - M12 Male, 4-wire	**BCC S415-S414-3A-304-VX44T2-_ _ _**	**BCC S425-S414-3A-304-VX44T2-_ _ _**	
M12 Female - M12 Male, 4-wire, N/O PNP-LED	**BCC S415-S414-3A-606-VX44T2-_ _ _**	**BCC S425-S414-3A-606-VX44T2-_ _ _**	

For list of order codes and available lengths, see the index in section t.

	1.4404 Stainless, IP69K Rated	High Temperature
	Stainless Nut, Yellow Overmold & PVC Cable	-25°C...120°C
	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12 non-LED), 36 V (M12 LED)	125 VAC / 150 VDC
	4 A	4 A
	BCC S313-0000-10-001-VX43T2-_ _ _ (IP67)	**BCC M313-0000-10-001-PH0334-050**
	BCC S323-0000-10-001-VX43T2-_ _ _	
	BCC S314-0000-10-003-VX44T2-_ _ _ (IP67)	
	BCC S324-0000-10-003-VX44T2-_ _ _	
		BCC M415-0000-1A-001-PH0334-_ _ _
		BCC M425-0000-1A-001-PH0334-_ _ _
	BCC S425-0000-1A-004-VX43T2-_ _ _	
	BCC S415-0000-1A-003-VX44T2-_ _ _	**BCC M415-0000-1A-003-PH434-_ _ _**
	BCC S415-0000-1A-008-VX44T2-_ _ _	
	BCC S425-0000-1A-003-VX44T2-_ _ _	**BCC M425-0000-1A-003-PH434-_ _ _**
	BCC S425-0000-1A-008-VX44T2-_ _ _	

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 10 meters

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 10 meters

	1.4404 Stainless, IP69K Rated	1.4404 Stainless, IP69K Rated
	Stainless Nut, Yellow Overmold & PVC Cable	Stainless Nut, Yellow Overmold & PVC Cable
	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12 non-LED), 36 V (M12 LED)	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12 non-LED), 36 V (M12 LED)
	4 A	4 A
	BCC S415-S424-3A-304-VX44T2-_ _ _	**BCC S425-S424-3A-304-VX44T2-_ _ _**
	BCC S415-S424-3A-606-VX44T2-_ _ _	**BCC S425-S424-3A-606-VX44T2-_ _ _**

For list of order codes and available lengths, see the index in section t.

M8 and M12 Specialty

Type	Global Cables	Economy Line	
Unique Specification	Black Overmold, Yellow PVC Cable	non-UL / non-CSA, Black PVC	
Voltage Rating	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12)	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12)	
Amperage	4 A	4 A	
M8 Versions			
M8 Female Straight, 3-wire	**BCC M313-0000-10-001-VX43T2-_ _ _-C013**	**BCC M313-0000-10-001-VI0325-_ _ _**	
M8 Female Right Angle, 3-wire	**BCC M323-0000-10-001-VX43T2-_ _ _-C013**	**BCC M323-0000-10-001-VI0325-_ _ _**	
M8 Female Right Angle, 3-wire, PNP-LED, N/O			
M8 Female Straight, 4-wire	**BCC M314-0000-10-003-VX44T2-_ _ _-C013**	**BCC M314-0000-10-003-VI0425-_ _ _**	
M8 Female Right Angle, 4-wire	**BCC M324-0000-10-003-VX44T2-_ _ _-C013**	**BCC M324-0000-10-003-VI0425-_ _ _**	
M12 Versions			
M12 Female Straight, 3-wire			
M12 Female Right Angle, 3-wire	**BCC M415-0000-1A-003-VX44T2-_ _ _-C013**	**BCC M415-0000-1A-003-VI0425-_ _ _**	
M12 Female Right Angle, 3-wire, PNP-LED, N/O			
M12 Female Straight, 4-wire	**BCC M425-0000-1A-003-VX44T2-_ _ _-C013**	**BCC M425-0000-1A-003-VI0425-_ _ _**	
M12 Female Right Angle, 4-wire			
M12 Female Straight, 4-wire+PE			
M12 Female Right Angle, 4-wire+PE, PNP-LED, N/O&N/C			
	Standard Lengths Available: 020 = 2 meters 050 = 5 meters 100 = 10 meters	Standard Lengths Available: 050 = 5 meters 100 = 10 meters	

For list of order codes and available lengths, see the index in section t.

	Weld Resistant, High Shore PUR*	Short Coil Cable	Long Coil Cable
	UL-AWM Style 20549, Orange cable	0.5m / 1.4m (coiled/stretched)	1.2m / 3.7m (coiled/stretched)
	250 VAC / VDC (3&4-wire), 60 VDC (5-wire), 30 VDC (LED)	250 VAC / VDC	250 VAC / VDC,
	4 A	4 A	4 A
	BCC M323-0000-10-004-PW3334-030		
	BCC M425-0000-1A-001-PW3334-_ _ _		
	BCC M425-0000-1A-004-PW3334-_ _ _		
	BCC M415-0000-1A-003-PW3434-_ _ _	**BCC M415-0000-1A-003-PC44T2-05/14**	**BCC M415-0000-1A-003-PC44T2-12/37**
		BCC M425-0000-1A-003-PC44T2-05/14	**BCC M425-0000-1A-003-PC44T2-12/37**
	BCC M415-0000-1A-034-PW3534-_ _ _		
	BCC M425-0000-1A-040-PW3534-_ _ _		

*Also available in double-ended versions, see page 3.31

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 10 meters

For list of order codes and available lengths, see the index in section t.

M8 Splitters

Type		M8 Female (x2) - M12 Male	M8 Female (x2) - M12 Male	
Configuration		Straight - Straight	Right Angle - Straight	
Voltage Rating		60 VAC / 75 VDC	60 VAC / 75 VDC	
Amperage		4 A	4 A	
Wiring	**Jacket Mat.**			
3-wire, non-LED	**PVC**	**BCC M414-M313-M313-U2012-_ _ _**	**BCC M414-M323-M323-U2012-_ _ _**	
3-wire, non-LED	**PUR (black)**			
3-wire, OR Logic	**PUR (black)**			

M12 Splitters

Type		Flying Leads (x2) - M12 Male	M12 Female (x2) - M12 Male	
Configuration		Open - Straight	Straight - Straight	
Voltage Rating		250 VAC/ VDC	250 VAC / VDC	
Amperage		4 A	4 A	
Wiring	**Jacket Mat.**			
3-wire, non-LED, N/O	**PVC**	**BCC M414-0000-0000-U2009-_ _ _**	**BCC M414-M415-M415-U2010-_ _ _**	
3-wire, non-LED, N/O	**TPE**		**BCC M414-M415-M415-U2002-_ _ _**	
3-wire, PNP-LED, N/O	**TPE**		**BCC M414-M415-M415-U2011-_ _ _**	
3-wire+PE, non-LED, N/O	**PVC (black)**			
3-wire, AND Logic	**TPE**		**C04 EEC-04-TY-002M-V-F039**	
4-wire+PE, OR Logic	**PVC (black)**			
4-wire, N/C or N/O, non-LED	**PUR (black)**		**BCC M414-M415-M415-U2018-002**	

For list of order codes and available lengths, see the index in section t.

	M8 Female (x2) - M8 Male	M8 Female (x2) - M12 Male
	Straigt - Straight	U-style
	30 VAC / 30 VDC	60 VAC / 60 VDC
	4 A	4 A
		BCC M415-M313-M313-U0014-000
	BCC M314-M313-M313-U2024-_ _ _	
	BCC M313-M313-M313-U2017-003	

Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m
010 = 1.0 m
020 = 2 m
050 = 5 m

	M12 Female (x2) - M12 Male	M12 Female (x2) - M12 Male
	Right Angle - Straight	U-style
	250 VAC / VDC	250 VAC / VDC
	4 A	4 A
	BCC M414-M425-M425-U2010-_ _ _	
	BCC M414-M425-M425-U2002-_ _ _	
	BCC M414-M425-M425-U2011-_ _ _	
		BCC M415-M415-M415-U0003-000
		BCC M415-M415-M415-U0016-000

Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m
010 = 1.0 m
020 = 2 m
050 = 5 m

Flying Lead Standard Lengths:
020 = 2 m
050 = 5 m

For list of order codes and available lengths, see the index in section t.

Connectivity Solutions

1/2" dual keyway single-ended
1/2" dual keyway double-ended

1/2” Dual Keyway Single-Ended

Type	1/2" Dual Keyway Female	1/2" Dual Keyway Female
Configuration	Straight	Right Angle
Voltage Rating	250 VAC / VDC	250 VAC / VDC
Amperage	4 A	4 A
3-wire, 22AWG	**C21 AE3-00-_Y-_ _ _F**	**C21 BE3-00-_Y-_ _ _F**
3-wire, 22 AWG, Stainless Steel Nut	**C21 AS3-00-_Y-_ _ _F**	**C21 BS3-00-_Y-_ _ _F**
3-wire, 18AWG	**C21 AE3-00-VY-_ _ _F-8**	**C21 BE3-00-VY-_ _ _F-8**
4-wire, 18AWG	**C21 AE4-00-VY-_ _ _F-8**	**C21 BE4-00-VY-_ _ _F-8**
4-wire, 22 AWG, Braided Shield	**C21 AE4-00-VY-_ _ _FB**	**C21 BE4-00-VY-_ _ _FB**
5-wire, 22 AWG, Braided Shield	**C21 AE5-00-VY-_ _ _FB**	
6-wire, 22 AWG, Braided Shield	**C21 AE6-00-VY-_ _ _FB**	**C21 BE6-00-VY-_ _ _FB**

Standard Cable Jackets:
V = PVC
T = TPE

Single-Ended Std Lengths:
060F = 6 feet
120F = 12 feet
150F = 15 feet
300F = 30 feet

1/2” Dual Keyway Double-Ended

1/2"AC Female - 7/8" Male	1/2" AC Female - 1/2" AC Male	1/2" AC Female - 1/2" AC Male
Straight - Straight	Straight - Straight	Right Angle - Straight
250 VAC / VDC	250 VAC / VDC	250 VAC / VDC
4 A	4 A	4 A
3-wire, 22AWG	**C21 EE3-21-TY-_ _ _F**	**C21 GE3-21-TY-_ _ _F**

Double-Ended Std Lengths:
010F = 1 foot
030F = 3 feet
060F = 6 feet
120F = 12 feet

For list of order codes and available lengths, see the index in section t.

1/2” AC - 7/8” Double-Ended		
1/2"AC Female - 7/8" Male	1/2"AC Female - 7/8" Male	1/2"AC Female - 7/8" Male
Straight - Straight	Straight - Straight	Right Angle - Straight
250 VAC / VDC	250 VAC / VDC	250 VAC / VDC
4 A	4 A	4 A
3-wire, 18AWG	**C21 EE3-05-_Y-_ _ _M**	**C21 GE3-05-_Y-_ _ _M**

Standard Cable Jackets:
V = PVC
T = TPE

Single-Ended Std Lengths:
002 = 0.2 m
006 = 0.6 m

	1/2" AC Female - 1/2" AC Male	1/2" AC Female - 1/2" AC Male
	Straight - Right Angle	Right Angle - Right Angle
	250 VAC / VDC	250 VAC / VDC / VDC
	4 A	4 A
	C21 FE3-21-TY-_ _ _F	**C21 HE3-21-TY-_ _ _F**

For list of order codes and available lengths, see the index in section t.

7/8" Single-Ended

Type	7/8" Female (Int Threads)	7/8" Female (Int Threads)	
Configuration	Straight	Right Angle	
Voltage Rating	300 V AC/DC	300 V AC/DC	
Amperage	12 A (3-wire)/9 A (4- and 5-wire)	12 A (3-wire)/9 A (4- and 5-wire)	
Conductor Cross-Section	16 AWG	16 AWG	
3-wire US-Color Code	**BCC A313-0000-10-071-VX43W6-_ _ _**	**BCC A323-0000-10-071-VX43W6-_ _ _**	
4-wire US-Color Code	**BCC A314-0000-10-072-VX44W6-_ _ _**	**BCC A324-0000-10-072-VX44W6-_ _ _**	
4-wire DC-Color Code	**BCC A314-0000-10-003-_X44W6-_ _ _**	**BCC A324-0000-10-003-_X44W6-_ _ _**	
5-wire DC-Color Code	**BCC A315-0000-10-063-VX45W6-_ _ _**	**BCC A325-0000-10-063-VX45W6-_ _ _**	

Standard Cable Jackets:
V = PVC
E = TPE

Standard Lengths Available:
20 = 2 meters
050 = 5 meters
100 = 10 meters
150 = 15 meters
200 = 20 meters

Bulk Cables

Bulk Cable	**BCC0AEF**	**BCC0AEH**	**BCC0AEJ**	**BCC0APC**	
Jacket Material	PVC	PVC	PVC	TPE	
Length	100 m	100 m	100 m	100 m	
Number of Conductors	3	4	4	4	
Conductor Color Code	US AC	US AC	DC	DC	
Jacket Color	Yellow	Yellow	Yellow	Yellow	
Conductor Gauge	16 AWG	16 AWG	16 AWG	16 AWG	
Cordsets Used	7/8"	7/8"	7/8"	7/8"	
Temperature Rating	-40…105°C	-40…105°C	-40…105°C	-40…105°C	
Cable Diameter (mm)	10.24 ± 0.20 mm	10.67 ± 0.25 mm	10.67 ± 0.25 mm	10.67 ± 0.25 mm	

For list of order codes and available lengths, see the index in section t.

	7/8" Male (Ext Threads)	7/8" Male (Ext Threads)
	Straight	Right Angle
	300 V AC/DC	300 V AC/DC
	12 A (3-wire)/9 A (4- and 5-wire)	12 A (3-wire)/9 A (4- and 5-wire)
	16 AWG	16 AWG
	BCC A313-0000-20-071-VX43W6-_ _ _	**BCC A323-0000-20-071-VX43W6-_ _ _**
	BCC A314-0000-20-072-VX44W6-_ _ _	**BCC A324-0000-20-072-VX44W6-_ _ _**
	BCC A314-0000-20-003-_X44W6-_ _ _	**BCC A324-0000-20-003-_X44W6-_ _ _**
	BCC A315-0000-20-063-VX45W6-_ _ _	**BCC A325-0000-20-063-VX45W6-_ _ _**

	BCC0AEK	**---**	**---**	**---**
	PVC	PVC	PVC	PUR
	100 m			
	5	6, 7, 8	9, 10, 12	19
	DC	US AC	US AC	---
	Yellow	Yellow	Yellow	Black
	16 AWG	18 AWG	18 AWG	3x 18 AWG, 16 x 22 AWG
	7/8"	1"	1 1/8"	1 1/8"
	-40…105°C	-40…105°C	-40…105°C	-40…80°C
	12.57 ± 0.25 mm	---	---	---

For list of order codes and available lengths, see the index in section t.

7/8" Double-Ended - Internal Threads to External Threads

Type	7/8" Female (Int) to 7/8" Male (Ext)	7/8" Female (Int) to 7/8" Male (Ext)	
Configuration	Straight - Straight	Right Angle - Straight	
Voltage Rating	300 V AC/DC	300 V AC/DC	
Amperage	12 A (3-wire)/9 A (4- and 5-wire)	12 A (3-wire)/9 A (4- and 5-wire)	
Conductor Cross-Section	16 AWG	16 AWG	
3-wire US-Color Code	**BCC A313-A313-30-345-VX43W6-_ _ _**	**BCC A323-A313-30-345-VX43W6-_ _ _**	
4-wire US-Color Code	**BCC A314-A314-30-346-VX44W6-_ _ _**	**BCC A324-A314-30-346-VX44W6-_ _ _**	
4-wire DC-Color Code	**BCC A314-A314-30-304-_X44W6-_ _ _**	**BCC A324-A314-30-304-_X44W6-_ _ _**	
5-wire DC-Color Code*	**BCC A315-A315-30-335-VX45W6-_ _ _**	**BCC A325-A315-30-335-VX45W6-_ _ _**	

7/8" Double-Ended - Internal Threads to Internal Threads

Type	7/8" Female (Int) to 7/8" Male (Int)	7/8" Female (Int) to 7/8" Male (Int)	
Configuration	Straight - Straight	Right Angle - Straight	
Voltage Rating	300 V AC/DC	300 V AC/DC	
Amperage	12 A	12 A	
Conductor Cross-Section	16 AWG	16 AWG	
3-wire US-Color Code	**BCC A313-A313-70-345-VX43W6-_ _ _**	**BCC A323-A313-70-345-VX43W6-_ _ _**	

For list of order codes and available lengths, see the index in section t.

	7/8" Female (Int) to 7/8" Male (Ext)	7/8" Female (Int) to 7/8" Male (Ext)
	Straight - Right Angle	Right Angle - Right Angle
	300 V AC/DC	300 V AC/DC
	12 A (3-wire)/9 A (4- and 5-wire)	12 A (3-wire)/9 A (4- and 5-wire)
	16 AWG	16 AWG
	BCC A313-A323-30-345-VX43W6-_ _ _	**BCC A323-A323-30-345-VX43W6-_ _ _**
	BCC A314-A324-30-346-VX44W6-_ _ _	**BCC A324-A324-30-346-VX44W6-_ _ _**
	BCC A314-A324-30-304-_X44W6-_ _ _	**BCC A324-A324-30-304-_X44W6-_ _ _**
	BCC A315-A325-30-335-VX45W6-_ _ _	**BCC A325-A325-30-335-VX45W6-_ _ _**

Standard Cable Jackets:
V = PVC yellow
E = TPE yellow
PX0_A5 = PUR black

Standard Lengths Available:
006 = 0.6 meters
020 = 2 meters
050 = 5 meters
100 = 10 meters
150 = 15 meters
200 = 20 meters

	7/8" Female (Int) to 7/8" Male (Int)	7/8" Female (Int) to 7/8" Male (Int)
	Straight - Right Angle	Right Angle - Right Angle
	300 V AC/DC	300 V AC/DC
	12 A	12 A
	16 AWG	16 AWG
	BCC A313-A323-70-345-VX43W6-_ _ _	**BCC A323-A323-70-345-VX43W6-_ _ _**

Standard Lengths Available:
006 = 0.6 meters
020 = 2 meters
050 = 5 meters
100 = 10 meters
150 = 15 meters
200 = 20 meters

For list of order codes and available lengths, see the index in section t.

7/8" Double-Ended - Internal Threads to External Threads

Type	7/8" Tee Black	7/8" Tee Yellow	7/8" 90° Elbow	
Configuration	Female - Male Thru, Female Drop	Female - Male Thru, Female Drop	Female - Male	
Voltage Rating	300 VAC/VDC	300 VAC/VDC	600 VAC/VDC	
Amperage	(4p = 8 A), (5p = 8 A/4 A drop)	8 A	8 A	
3-wire	**BCC0AA5**			
	BCC A313-A313-A313-T0021-000			
4-wire	**BCC0AA6**	**BCC071Y**	**BCC07Y1**	
	BCC A314-A314-A314-T0022-000	BCC A314-A314-A314-T0001-000	BDN G-P-DEA-01	
5-wire	**BCC0AA7**			
	BCC A315-A315-A315-T0023-000			

For list of order codes and available lengths, see the index in section t.

	7/8" Bulkhead	7/8" to M12 Converter	M12 to 7/8" Converter
	Female - Male	Female - Male	Female - Male
	600 VAC/VDC	300 V	300 V
	(3p = 13 A), (4p = 10 A), (5p = 8 A)	4 A	4 A
	BCC0A7M	**BCC0A7E**	**BCC0A7J**
	BCC A353-A353-30-RN036-000	BCC A313-M413-3E-RA031-000	BCC M415-A313-3F-RA023-000
	BCC0723	**BCC0A7F**	**BCC0A7K**
	BCC A354-A354-30-RN011-000	BCC A314-M414-3E-RA032-000	BCC M415-A314-3F-RA034-000
	BCC0A7N	**BCC0A7H**	**BCC0A7L**
	BCC A355-A355-30-RN037-000	BCC A315-M415-3E-RA033-000	BCC M415-A315-3F-RA035-000

For list of order codes and available lengths, see the index in section t.

Connectivity Solutions

1" single-ended mini cordset

1" double-ended mini cordset

1" Single-Ended Female

Type	1" Female (Int Threads)	1" Female (Int Threads)
Configuration	Straight	Right Angle
Voltage Rating	300 VAC/VDC	300 VAC/VDC
Amperage	(6p = 5.5 A), (7p = 5 A), (8p = 5A)	(6p = 5.5 A), (7p = 5 A), (8p = 5A)
Conductor Cross-Section	18 AWG	18 AWG
6-wire	**BCC A416-0000-10-085-VX46W8-_ _ _**	**BCC A426-0000-10-085-VX46W8-_ _ _**
7-wire	**BCC A417-0000-10-086-VX47W8-_ _ _**	**BCC A427-0000-10-086-VX47W8-_ _ _**
8-wire	**BCC A418-0000-10-087-VX48W8-_ _ _**	**BCC A428-0000-10-087-VX48W8-_ _ _**

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 10 meters

1" Single-Ended Male & Double-Ended

Type	1" Male (Int Threads)	1" Female (Int) - 1" Male (Int)
Configuration	Straight	Straight - Straight
Voltage Rating	300 VAC/VDC	300 VAC/VDC
Amperage	(6p = 5.5 A), (7p = 5 A), (8p = 5A)	(6p = 5.5 A), (7p = 5 A), (8p = 5A)
Conductor Cross-Section	18 AWG	18 AWG
6-wire	**BCC A416-0000-C0-085-VX46W8-_ _ _**	**BCC A416-A416-70-352-VX46W8-_ _ _**
7-wire	**BCC A417-0000-C0-086-VX47W8-_ _ _**	**BCC A417-A417-70-358-VX47W8-_ _ _**
8-wire	**BCC A418-0000-C0-087-VX48W8-_ _ _**	**BCC A418-A418-70-359-VX48W8-_ _ _**

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 10 meters

For list of order codes and available lengths, see the index in section t.

1 1/8" Single-Ended Female

Type	1 1/8" Female (Int Threads)	1 1/8" Female (Int Threads)
Configuration	Straight	Right Angle
Voltage Rating	300 VAC/VDC	300 VAC/VDC
Amperage	(9p, 10p, 12p = 4 A), (19p = 3x8 A, 16 x 3 A)	4 A
Conductor Cross-Section	18 AWG	18 AWG
9-wire	**BCC A519-0000-10-088-VX49W8-_ _ _**	**BCC A529-0000-10-088-VX49W8-_ _ _**
10-wire	**BCC A51A-0000-10-089-VX4AW8-_ _ _**	**BCC A52A-0000-10-089-VX4AW8-_ _ _**
12-wire	**BCC A51C-0000-10-090-VX4CW8-_ _ _**	**BCC A52C-0000-10-090-VX4CW8-_ _ _**
19-wire	**BCC A51L-0000-10-091-PX0LW8-_ _ _**	

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 10 meters

1 1/8" Single-Ended Male & Double-Ended

Type	1 1/8" Male (Int Threads)	1 1/8" Female (Int) - 1 1/8" Male (Int)
Configuration	Straight	Straight - Straight
Voltage Rating	300 VAC/VDC	300 VAC/VDC
Amperage	(9p, 10p, 12p = 4 A), (19p = 3x8 A, 16 x 3 A)	(9p, 10p, 12p = 4 A), (19p = 3x8 A, 16 x 3 A)
Conductor Cross-Section	18 AWG	18 AWG
9-wire	**BCC A519-0000-C0-088-VX49W8-_ _ _**	**BCC A519-A519-70-360-VX49W8-_ _ _**
10-wire	**BCC A51A-0000-C0-089-VX4AW8-_ _ _**	**BCC A51A-A51A-70-355-VX4AW8-_ _ _**
12-wire	**BCC A51C-0000-C0-090-VX4CW8-_ _ _**	**BCC A51C-A51C-70-362-VX4CW8-_ _ _**
19-wire	**BCC A51L-0000-C0-091-PX0LW8-_ _ _**	**BCC A51L-A51L-70-363-PX0LW8-_ _ _**

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 10 meters

For list of order codes and available lengths, see the index in section t.

M8 Junction Blocks (MIBs) - Quick Disconnect

Type	M12 Quick Disconnect	M12 Quick Disconnect
Configuration	4 port	8 port
Voltage Rating	10...30 VDC	10...30 VDC
Current Rating / Block	6 A	6 A
Current Rating / Contact	2 A	2 A
Suggested Homerun Cable	BCC M4_8-0000-1A-044-PX0825-_ _ _	BCC M4_C-0000-1A-049-PX0C25-_ _ _
3-wire, PNP-LED	**BPI 4M303P-2K-00-SM48T**	**BPI 8M303P-2K-00-SM4CT**

M8 Junction Blocks (MIBs) - Cable Out

Type	Cable Out	Cable Out
Configuration	4 port	8 port
Voltage Rating	10...30 VDC	10...30 VDC
Current Rating / Block	6 A	6 A
Current Rating / Contact	2 A	2 A
3-wire, PNP-LED	**BPI 4M303P-2K-00-KPX60-_ _ _**	**BPI 8M303P-2K-00-KPXA0-_ _ _**
4-wire, PNP-LED	**BPI 4M304P-2K-00-KPXA0-_ _ _**	**BPI 8M304P-2K-00-KPXK0-_ _ _**

Standard Lengths Available:
030 = 3 meters
050 = 5 meters
100 = 10 meters
150 = 15 meters

M16 Junction Blocks (MIBs) - Quick Disconnect

Type	M16 Quick Disconnect	M16 Quick Disconnect
Configuration	4 port	8 port
Voltage Rating	10...30 VDC	10...30 VDC
Current Rating / Block	6 A	6 A
Current Rating / Contact	2 A	2 A
Suggested Homerun Cable	CM 16-_N8-00-PB-_ _ _M	CM 16-_N8-00-PB-_ _ _M
3-wire, non-LED	**C49 T4F-16**	**C49 T8F-16**
3-wire, PNP-LED	**C49 T4E-16**	**C49 T8E-16**

M16 Junction Blocks (MIBs) - Cable Out

Type	Cable Out	Cable Out
Configuration	4 port	8 port
Voltage Rating	10...30 VDC	10...30 VDC
Current Rating / Block	6 A	6 A
Current Rating / Contact	2 A	2 A
3-wire, non-LED	**C49 T4C-00-PB-050M**	
3-wire, PNP-LED	**C49 T4E-00-PB-_ _ _M**	**C49 T8E-00-PB-_ _ _M**

Standard Lengths Available:
050 = 5 meters
100 = 10 meters

M12 Junction Blocks (MIBs) - Quick Disconnect

Type	M23 Quick Disconnect	M23 Quick Disconnect
Configuration	4 port	8 port
Voltage Rating	10...30 VDC	10...30 VDC
Current Rating / Block	6 A	12 A
Current Rating / Contact	2 A	2 A
Suggested Homerun Cable (3-wire)	BCC M6_C-0000-10-065-PX0BP4-_ _ _	BCC M6_C-0000-10-065-PX0BP4-_ _ _
Suggested Homerun Cable (4-wire)	BCC M6_L-0000-10-022-PX0LP4-_ _ _	BCC M6_L-0000-10-022-PX0LP4-_ _ _
3-wire+PE, PNP-LED	**BPI 4M4A4P-2K-00-SM6CT**	**BPI 8M4A4P-2K-00-SM6CT**
4-wire+PE, PNP-LED	**BPI 4M4A5P-2K-00-SM6LT**	**BPI 8M4A5P-2K-00-SM6LT**

M12 Junction Blocks (MIBs) - Cable Out

Type	Cable Out	Cable Out
Configuration	4 port	8 port
Voltage Rating	10...30 VDC	10...30 VDC
Current Rating / Block	6 A	12 A
Current Rating / Contact	2 A	2 A
3-wire+PE, PNP-LED	**BPI 4M4A4P-2K-00-KPX70-_ _ _**	**BPI 8M4A4P-2K-00-KPXB0-_ _ _**
4-wire+PE, PNP-LED	**BPI 4M4A5P-2K-00-KPXB0-_ _ _**	**BPI 8M4A5P-2K-00-KPXL0-_ _ _**

Standard Lengths Available
030 = 3 meters
050 = 5 meters
100 = 10 meters
150 = 15 meters

M12 Junction Blocks (MIBs) - Quick Disconnect

Type	M23 Quick Disconnect	M23 Quick Disconnect
Configuration	4 port	8 port
Voltage Rating	10...30 VDC	10...30 VDC
Current Rating / Block	6 A	12 A
Current Rating / Contact	2 A	2 A
Suggested Homerun Cable (3-wire)	BCC M6_C-0000-10-065-PX0BP4-_ _ _	BCC M6_C-0000-10-065-PX0BP4-_ _ _
Suggested Homerun Cable (4-wire)	BCC M6_L-0000-10-022-PX0LP4-_ _ _	BCC M6_L-0000-10-022-PX0LP4-_ _ _
3-wire+PE, non-LED	**C04 T4L-23**	**C04 T8L-23**
3-wire+PE, PNP-LED	**C04 T4M-23**	**C04 T8M-23**
3-wire+PE, NPN-LED	**C04 T4N-23**	**C04 T8N-23**
4-wire+PE, non-LED	**C04 T4Q-23**	**C04 T8Q-23**
4-wire+PE, PNP-LED	**C04 T4R-23**	**C04 T8R-23**
4-wire+PE, NPN-LED	**C04 T4S-23**	**C04 T8S-23**

M12 Junction Blocks (MIBs) - Cable Out

Type	Cable Out	Cable Out
Configuration	4 port	8 port
Voltage Rating	10…30 VDC	10…30 VDC
Amperage	4A per Port, 12 A per Block	4A per Port, 12 A per Block
3-wire+PE, non-LED	**C04 T4L-00-PB-_ _ _M**	**C04 T8L-00-PB-_ _ _M**
3-wire+PE, PNP-LED	**C04 T4M-00-PB-_ _ _M**	**C04 T8M-00-PB-_ _ _M**
3-wire+PE, NPN-LED	**C04 T4N-00-PB-_ _ _M**	**C04 T8N-00-PB-_ _ _M**
4-wire+PE, non-LED	**C04 T4Q-00-PB-_ _ _M**	**C04 T8Q-00-PB-_ _ _M**
4-wire+PE, PNP-LED	**C04 T4R-00-PB-_ _ _M**	**C04 T8R-00-PB-_ _ _M**
4-wire+PE, NPN-LED	**C04 T4S-00-PB-_ _ _M**	**C04 T8S-00-PB-_ _ _M**

Standard Lengths Available:
050 = 5 meters
100 = 10 meters

M12 Terminal Junction Blocks (MIBs)

Type	Spring Terminals	Spring Terminals
Configuration	4 port	8 port
Voltage Rating	48 VDC	48 VDC
Amperage	3A per Port, 8A per Block	3A per Port, 8A per Block
Cable Diameter	5...13 mm	5...13 mm
3-wire+PE, non-LED	**BPI 4M4A40-2K-MC-HHF7**	**BPI 8M4A40-2K-MC-HHFB**
4-wire+PE, non-LED	**BPI 4M4A50-2K-MC-HHFB**	**BPI 8M4A50-2K-MC-HHFL**
4-wire+PE, PNP-LED	**BPI 4M4A5P-2K-MC-HHFB**	**BPI 8M4A5P-2K-MC-HHFL**
4-wire+PE, NPN-LED	**BPI 4M4A5N-2K-MC-HHFB**	**BPI 8M4A5N-2K-MC-HHFL**

M12 Terminal Junction Blocks (MIBs)

Type	Screw Terminals	Screw Terminals
Configuration	4 port	8 port
Voltage Rating	18...30 VDC	18...30 VDC
Amperage	2A per Port, 8A per Block	2A per Port, 8A per Block
4-wire+PE, PNP-LED	**BPI 4M4A5P-2K-00-TPSG**	**BPI 8M4A5P-2K-00-TPSN**

M8 Blocks - M12 Homerun Cables

Type	M12 Female	M12 Female
Configuration	Straight	Right Angle
Voltage Rating	(8p = 60 V), (12p = 30 V)	(8p = 60 V), (12p = 30 V)
Amperage	(8p = 2 A), (12p = 1A)	(8p = 2 A), (12p = 1A)
8-wire	**BCC M418-0000-1A-044-PX0825-_ _ _**	**BCC M428-0000-1A-044-PX0825-_ _ _**
12-wire	**BCC M41C-0000-1A-049-PX0C25-_ _ _**	**BCC M42C-0000-1A-049-PX0C25-_ _ _**

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 10 meters

M8 Blocks - M16 Homerun Cables

Type	M16 Female	M16 Female
Configuration	Straight	Right Angle
Voltage Rating	300 VAC / VDC	300 VAC / VDC
Amperage	6 A	6 A
12-pin	**CM 16-AN8-00-PB-050M**	**CM 16-BN8-00-PB-_ _ _M**

Standard Lengths Available:
050 = 5 meters
100 = 10 meters
200 = 20 meters

M12 Blocks - M23 Homerun Cables

Type	M23 Female	M23 Female
Configuration	Straight	Right Angle
Voltage Rating	(12p = 250 VAC/VDC), (19p = 125 VAC/VDC)	(12p = 250 VAC/VDC), (19p = 125 VAC/VDC)
Amperage	(12p = 8 A), (19p = 3x8 A)	(12p = 8 A), (19p = 3x8 A)
12-wire	**BCC M61C-0000-10-065-PX0BP4-_ _ _**	**BCC M62C-0000-10-065-PX0BP4-_ _ _**
19-wire	**BCC M61L-0000-10-022-PX0LP4-_ _ _**	**BCC M62L-0000-10-022-PX0LP4-_ _ _**

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 10 meters

M8 Receptacles

Type		M8 Female	M8 Male
Configuration		Straight	Straight
Wire Gauge		24 AWG	24 AWG
Connector Thread Type		Internal	External
No. Conductors	**Mounting**	**Order Code/Part Number***	
3-wire	M8 x 0.5	**BCC0CTL**	**BCC0CTN**
		BCC M353-0000-10-RM067-006	BCC M353-0000-20-RM067-006
4-wire	M8 x 0.5	**BCC0CTF**	**BCC0CTJ**
		BCC M354-0000-10-RM068-006	BCC M354-0000-20-RM068-006

* 2 meter available, replace 006 with 020

M23 Receptacles

Type		M23 Female	M23 Male
Configuration		Straight	Straight
Wire Gauge		22 AWG	22 AWG
Connector Thread Type		External	External
No. Conductors	**Mounting**	**Order Code/Part Number***	
12-wire	M20	**BCC0CTU**	**BCC0CTR**
		BCC M65C-0000-D0-RM078-006	BCC M65C-0000-20-RM078-006
19-wire	M20	**BCC0CU0**	**BCC0CTY**
		BCC M65L-0000-D0-RM079-006	BCC M65L-0000-20-RM079-006

* 2 meter available, replace 006 with 020

M12 A-coded Receptacles

Type	M12 Female	M12 Male
Configuration	Straight	Straight
Wire Gauge	22 AWG (8-wire 24AWG)	22 AWG (8-wire 24AWG)
Connector Thread Type	Internal	External

No. Conductors	Mounting	Nut Coating	Order Code/Part Number*	
3-wire	1/4"-18 NPT	Nickel Brass	**BCC0CW9**	**BCC0CWF**
			BCC M453-0000-1A-RN052-006	BCC M453-0000-2A-RN052-006
	1/2"-14 NPT	Aluminum	**BCC0CWC**	**BCC0CWJ**
			BCC M453-0000-1A-RN058-006	BCC M453-0000-2A-RN058-006
	M16	Nickel Brass	**BCC0CY7**	**BCC0CY9**
			BCC M453-0000-1A-RM069-006	BCC M453-0000-2A-RM069-006
4-wire	1/4"-18 NPT	Nickel Brass	**BCC0CWL**	**BCC0CZ2**
			BCC M454-0000-1A-RN053-006	BCC M454-0000-2A-RN053-006
		Stainless Steel	**BCC0CUE**	**BCC0CUK**
			BCC S454-0000-1A-RN053-006	BCC S454-0000-2A-RN053-006
	1/2"-14 NPT	Aluminum	**BCC0CZ0**	**BCC0CZ4**
			BCC M454-0000-1A-RN060-006	BCC M454-0000-2A-RN060-006
		Stainless Steel	**BCC0CUH**	**BCC0CUM**
			BCC S454-0000-1A-RN060-006	BCC S454-0000-2A-RN060-006
	M16	Nickel Brass	**BCC0CWN**	**BCC0CWR**
			BCC M454-0000-1A-RM070-006	BCC M454-0000-2A-RM070-006
4-wire+PE	1/2"-14 NPT	Aluminum	**BCC0CYL**	**BCC0CYU**
			BCC M455-0000-1A-RN064-006	BCC M455-0000-2A-RN064-006
	M16	Nickel Brass	**BCC0CWY**	**BCC0CY1**
			BCC M455-0000-1A-RM072-006	BCC M455-0000-2A-RM072-006
5-wire	1/4"-18 NPT	Nickel Brass	**BCC0CZ6**	**BCC0CYN**
			BCC M455-0000-1A-RN054-006	BCC M455-0000-2A-RN054-006
	1/2"-14 NPT	Aluminum	**BCC0CZ8**	**BCC0CYR**
			BCC M455-0000-1A-RN063-006	BCC M455-0000-2A-RN063-006
	M16	Nickel Brass	**BCC0CWU**	**BCC0CY0**
			BCC M455-0000-1A-RM071-006	BCC M455-0000-2A-RM071-006
8-wire	1/4"-18 NPT	Nickel Brass	**BCC0CYY**	**BCC0CYC**
			BCC M458-0000-1A-RN056-006	BCC M458-0000-2A-RN056-006
	1/2"-14 NPT	Aluminum	**BCC0CYF**	**BCC0CYJ**
			BCC M458-0000-1A-RN066-006	BCC M458-0000-2A-RN066-006
	M16	Nickel Brass	**BCC0CY3**	**BCC0CY5**
			BCC M458-0000-1A-RM073-006	BCC M458-0000-2A-RM073-006

* 2 meter available, replace 006 with 020

1/2” Dual Keyway Receptacles

Type	1/2" AC Female	1/2" AC Male
Configuration	Straight Dual Keyway	Straight Dual Keyway
Connector Thread Type	Internal	External
Metric Thread - Wire Gauge	22 AWG	22 AWG
NPT Thread - Wire Gauge	22 AWG	22 AWG

No. Conductors	Mounting	Order Code/Part Number	
3-wire	M16		**BCC01A8**
			R21 CA-03-K-22B-010F
	1/4"-18 NPT	**BCC02A0**	**BCC01AC**
		R21 AA-03-A-22B-010F	R21 CN-03-A-22B-010F
	1/2"-14 NPT		**BCC02A4**
			R21 CA-03-B-22B-010F
4-wire	1/4"-18 NPT	**BCC02A1**	**BCC01AE**
		R21 AA-04-A-22B-010F	R21 CN-04-A-22B-010F
	1/2"-14 NPT		**BCC02A5**
			R21 CA-04-B-22B-010F
5-wire	1/4"-18 NPT	**BCC02A2**	**BCC01AF**
		R21 AA-05-A-22B-010F	R21 CN-05-A-22B-010F
	1/2"-14 NPT		**BCC02A6**
			R21 CA-05-B-22B-010F
6-wire	1/4"-18 NPT	**BCC02A3**	**BCC01AH**
		R21 AA-06-A-22B-010F	R21 CN-06-A-22B-010F
	1/2"-14 NPT		**BCC02A7**
			R21 CA-06-B-22B-010F



7/8" Receptacles

Type		7/8" Female	7/8" Female	7/8" Male
Configuration		Straight	Straight	Straight
Wire Gauge		16 AWG	16 AWG	16 AWG
Connector Thread Type		Internal	External	External

No. Conductors	Mounting	Color Code	Order Code/Part Number*		
3-wire	1/2"-14 NPT	AC		**BCC0CU2**	**BCC0CU4**
				BCC A353-0000-10-RN057-006	BCC A353-0000-20-RN057-006
	M20	AC		**BCC0CUP**	**BCC0CUT**
				BCC A353-0000-10-RM074-006	BCC A353-0000-20-RM074-006
4-wire	1/2"-14 NPT	AC		**BCC0CU6**	**BCC0CU9**
				BCC A354-0000-10-RN059-006	BCC A354-0000-20-RN059-006
		DC	**BCC071Z**		**BCC0721**
			BCC A354-0000-10-RN010-003		BCC A354-0000-20-RN010-003
	M20	AC		**BCC0CUZ**	**BCC0CW3**
				BCC A354-0000-10-RM075-006	BCC A354-0000-20-RM075-006
		DC	**BCC0CW1**		**BCC0CW4**
			BCC A354-0000-10-RM076-006		BCC A354-0000-20-RM076-006
5-wire	1/2"-14 NPT	DC	**BCC098M**		**BCC098P**
			BCC A355-0000-10-RN022-006		BCC A355-0000-20-RN022-006
	M20	DC		**BCC0CW5**	**BCC0CW7**
				BCC A355-0000-10-RM077-006	BCC A355-0000-20-RM077-006

* 2 meter available, replace 006 with 020

1" Receptacles

Type		1" Female	1" Male
Configuration		Straight	Straight
Connector Thread Type		External	External
Cable Color Code		US	US
Wire Gauge		18 AWG	18 AWG
Mounting		1/2"-14 NPT	1/2"-14 NPT

No. Conductors	Lead Length	Order Code/Part Number	
6-wire	0.6 m	**BCC0A66**	**BCC0A68**
		BCC A456-0000-D0-RN024-006	BCC A456-0000-20-RN024-006
	2.0 m	BCC0A67	BCC0A69
		BCC A456-0000-D0-RN024-020	BCC A456-0000-20-RN024-020
7-wire	0.6 m	**BCC0A6A**	**BCC0A6E**
		BCC A457-0000-D0-RN025-006	BCC A457-0000-20-RN025-006
	2.0 m	**BCC0A6C**	**BCC0A6F**
		BCC A457-0000-D0-RN025-020	BCC A457-0000-20-RN025-020
8-wire	0.6 m	**BCC0A6H**	**BCC0A6K**
		BCC A458-0000-D0-RN026-006	BCC A458-0000-20-RN026-006
	2.0 m	**BCC0A6J**	**BCC0A6L**
		BCC A458-0000-D0-RN026-020	BCC A458-0000-20-RN026-020

1 1/8" Receptacles

Type	1 1/8" Female	1 1/8" Male
Configuration	Straight	Straight
Connector Thread Type	External	External
Cable Color Code	US	US
Wire Gauge (9-12 wire)	18 AWG	18 AWG
Wire Gauge (19-wire)	3x 18 AWG, 16x 22 AWG	3x 18 AWG, 16x 22 AWG
Mounting	1/2"-14 NPT	1/2"-14 NPT

No. Conductors	Lead Length	Order Code/Part Number	
9-wire	0.6 m	**BCC0A6M**	**BCC0A6P**
		BCC A559-0000-D0-RN027-006	BCC A559-0000-20-RN027-006
	2.0 m	**BCC0A6N**	**BCC0A6R**
		BCC A559-0000-D0-RN027-020	BCC A559-0000-20-RN027-020
10-wire	0.6 m	**BCC0A6T**	**BCC0A6W**
		BCC A55A-0000-D0-RN028-006	BCC A55A-0000-20-RN028-006
	2.0 m	**BCC0A6U**	**BCC0A6Y**
		BCC A55A-0000-D0-RN028-020	BCC A55A-0000-20-RN028-020
12-wire	0.6 m	**BCC0A6Z**	**BCC0A71**
		BCC A55C-0000-D0-RN029-006	BCC A55C-0000-20-RN029-006
	2.0 m	**BCC0A70**	**BCC0A72**
		BCC A55C-0000-D0-RN029-020	BCC A55C-0000-20-RN029-020
19-wire	0.6 m	**BCC0A73**	**BCC0A75**
		BCC A55L-0000-D0-RN030-006	BCC A55L-0000-20-RN030-006
	2.0 m	**BCC0A74**	**BCC0A76**
		BCC A55L-0000-D0-RN030-020	BCC A55L-0000-20-RN030-020

M8 Female Field Attachables

Type	M8 Female	M8 Female	
Configuration	Straight	Straight	
Housing	Plastic/Metal	Plastic	
Connection	Piercon Terminals	Screw Terminals	
Conductor Maximum	0.14...0.38 mm² (26...22 AWG)	0.14...0.50 mm² (26...20 AWG)	

No. of Conductors	Cable Ø Range	Order Code/Part Number		
3-wire	**3...5 mm**	**BCC09EU**		
		BCC M333-0000-10-000-22X334-000		
	3.5...5 mm		**BCC06Z1**	
			BCC M333-0000-10-000-31X350-000	
4-wire	**3...5 mm**	**BCC09EY**		
		BCC M334-0000-10-000-22X434-000		
	3.5...5 mm		**BCC06Z5**	
			BCC M334-0000-10-000-31X450-000	

M8 Male Field Attachables

Type	M8 Male	M8 Male	
Configuration	Straight	Straight	
Housing	Plastic/Metal	Plastic	
Connection	Piercon Terminals	Screw Terminals	
Conductor Maximum	0.14...0.38 mm² (26...22 AWG)	0.14...0.50 mm² (26...20 AWG)	

No. of Conductors	Cable Ø Range	Order Code/Part Number		
3-wire	**3...5 mm**	**BCC09EW**		
		BCC M333-0000-20-000-22X334-000		
	3.5...5 mm		**BCC06Z3**	
			BCC M333-0000-20-000-31X350-000	
4-wire	**3...5 mm**	**BCC09EZ**		
		BCC M334-0000-20-000-22X434-000		
	3.5...5 mm		**BCC06Z7**	
			BCC M334-0000-20-000-31X450-000	

	M8 Female	M8 Female
	Straight	Right Angle
	Plastic/Metal	Plastic
	Solder Cup	Solder Cup
	0.14...0.38 mm² (26...22 AWG)	0.14...0.38 mm² (26...22 AWG)
	BCC06YW	**BCC06YY**
	BCC M333-0000-10-000-34X325-000	BCC M343-0000-10-000-34X325-000

Standard Cable Information

Jacket	Wires	Conductors	Diameter
Yellow PVC	3	22 AWG	4.7 ± 0.15 mm
Yellow PVC	4	22 AWG	5.0 ± 0.15 mm
Grey PVC	3	0.34 mm²	4.5 ± 0.15 mm
Grey PVC	4	0.34 mm²	4.8 ± 0.15 mm
Yellow PUR	3	22 AWG	4.3 ± 0.20 mm
Yellow PUR	4	22 AWG	4.7 ± 0.20 mm
Black PUR	3	0.34 mm²	4.3 ± 0.20 mm
Black PUR	4	0.34 mm²	4.7 ± 0.20 mm
Yellow TPE	3	22 AWG	5.3 ± 0.13 mm
Yellow TPE	4	22 AWG	5.3 ± 0.13 mm

	M8 Male	M8 Male
	Straight	Right Angle
	Plastic/Metal	Plastic
	Solder Cup	Solder Cup
	0.14...0.38 mm² (26...22 AWG)	0.14...0.38 mm² (26...22 AWG)
	BCC06YZ	**BCC06Z0**
	BCC M333-0000-20-000-34X325-000	BCC M343-0000-20-000-34X325-000

Standard Cable Information

Jacket	Wires	Conductors	Diameter
Yellow PVC	3	22 AWG	4.7 ± 0.15 mm
Yellow PVC	4	22 AWG	5.0 ± 0.15 mm
Grey PVC	3	0.34 mm²	4.5 ± 0.15 mm
Grey PVC	4	0.34 mm²	4.8 ± 0.15 mm
Yellow PUR	3	22 AWG	4.3 ± 0.20 mm
Yellow PUR	4	22 AWG	4.7 ± 0.20 mm
Black PUR	3	0.34 mm²	4.3 ± 0.20 mm
Black PUR	4	0.34 mm²	4.7 ± 0.20 mm
Yellow TPE	3	22 AWG	5.3 ± 0.13 mm
Yellow TPE	4	22 AWG	5.3 ± 0.13 mm



M12 Female Field Attachables

Type	M12 Female	M12 Female	M12 Female	
Configuration	Straight	Straight	Straight	
Housing	Plastic	Plastic	Plastic	
Connection	Screw Terminals	Insulation Displacement	Spring Clamp	
Conductor Range	0.14...0.75 mm² (26...18 AWG)	0.14...0.34 mm² (26...22 AWG)	0.14...0.50 mm² (26...20 AWG)	

No. of Conductors	Allowable Cable Ø	Order Code/Part Number			
4-wire	**4...6 mm**	**BCC06Z9**	**BCC06ZY**		
		BCC M435-0000-1A-000-41X475-000	BCC M435-0000-1A-000-43X434-000		
	5...8 mm				
	6...8 mm	**BCC06F6**		**BCC06Y6**	
		BCC M435-0000-1A-000-51X475-000		BCC M435-0000-1A-000-55X450-000	
5-wire	**2.1...3 mm or 4...5 mm**	**BCC09JP**			
		BCC M435-0000-1A-000-A1X575-000			
	4...6 mm	**BCC06ZF**			
		BCC M435-0000-1A-000-41X575-000			
	5...8 mm				
	6...8 mm	**BCC06W9**			
		BCC M435-0000-1A-000-51X575-000			
8-wire	**4...6 mm (shielded)**		**BCC04MC**		
			BCC M478-0000-1A-000-43X834-000		
	6...8 mm (0.14...0.50 mm²)	**BCC0A03**			
		BCC M438-0000-1A-000-51X850-000			
12-wire	**6...8 mm (0.14...0.25 mm²)**			**BCC0A05* (solder cup)**	
				BCC M43C-0000-1A-000-54XC25-000	

*Consult factory for availability.

Standard Cable Information

Jacket	Wires	Conductors	Diameter
Yellow PVC	3	22 AWG	4.7 ± 0.15 mm
Yellow PVC	4	22 AWG	5.0 ± 0.15 mm
Grey PVC	3	0.34 mm²	4.5 ± 0.15 mm
Grey PVC	4	0.34 mm²	4.8 ± 0.15 mm
Yellow PUR	3	22 AWG	4.3 ± 0.20 mm
Yellow PUR	4	22 AWG	4.7 ± 0.20 mm

Jacket	Wires	Conductors	Diameter
Black PUR	3	0.34 mm²	4.3 ± 0.20 mm
Black PUR	4	0.34 mm²	4.7 ± 0.20 mm
Yellow TPE	3	22 AWG	5.3 ± 0.13 mm
Yellow TPE	4	22 AWG	5.3 ± 0.13 mm




	M12 Female	M12 Female	M12 Female	M12 Female
	Right Angle	Straight	Straight	Right Angle
	Plastic	Metal (shielded)	Stainless Steel	Stainless Steel
	Screw Terminals	Screw Terminals	Screw Terminals	Screw Terminals
	0.14...0.75 mm² (26...18 AWG)	0.14...0.75 mm² (26...18 AWG)	0.14...0.75 mm² (26...18 AWG)	0.14...0.75 mm² (26...18 AWG)
	BCC06ZA			
	BCC M445-0000-1A-000-41X475-000			
		BCC06ZM		
		BCC M475-0000-1A-000-01X475-000		
	BCC06Y8			
	BCC M445-0000-1A-000-51X475-000			
	BCC06ZH		**BCC097P**	**BCC097T**
	BCC M445-0000-1A-000-41X575-000		BCC S435-0000-1A-000-41X575-000	BCC S445-0000-1A-000-41X575-000
		BCC06ZN		
		BCC M475-0000-1A-000-01X575-000		
	BCC06ZJ		**BCC097R**	**BCC097U**
	BCC M445-0000-1A-000-51X575-000		BCC S435-0000-1A-000-51X575-000	BCC S445-0000-1A-000-51X575-000
	BCC04ME (IDC)			
	BCC M488-0000-1A-000-43X834-000			



M12 Male Field Attachables

Type		M12 Male	M12 Male	M12 Male	
Configuration		Straight	Straight	Straight	
Housing		Plastic	Plastic	Plastic	
Connection		Screw Terminals	Insulation Displacement	Spring Clamp	
Conductor Maximum		0.14...0.75 mm² (26...18 AWG)	0.14...0.34 mm² (26...22 AWG)	0.14...0.50 mm² (26...20 AWG)	
No. of Conductors	**Allowable Cable Ø**	**Order Code/Part Number**			
4-wire	**4...6 mm**	**BCC06M4**	**BCC08C0**		
		BCC M434-0000-2A-000-41X475-000	BCC M434-0000-2A-000-43X434-000		
	5...8 mm				
	6...8 mm	**BCC06F7**		**BCC06Y5**	
		BCC M434-0000-2A-000-51X475-000		BCC M434-0000-2A-000-55X450-000	
5-wire	**2.1...3 mm or 4...5 mm**	**BCC09JW**			
		BCC M435-0000-2A-000-A1X575-000			
	4...6 mm	**BCC06YA**			
		BCC M435-0000-2A-000-41X575-000			
	5...8 mm				
	6...8 mm	**BCC06EY**			
		BCC M435-0000-2A-000-51X575-000			
8-wire	**4...6 mm**	**BCC01KR**			
		C04 CNT-9			
	6...8 mm	**BCC0A04**			
	(0.14...0.50 mm²)	BCC M438-0000-2A-000-51X850-000			
12-wire	**6...8 mm**			**BCC0A06* (solder cup)**	
	(0.14...0.25 mm²)			BCC M43C-0000-2A-000-54XC25-000	

*Consult factory for availability.

Standard Cable Information

Jacket	Wires	Conductors	Diameter
Yellow PVC	3	22 AWG	4.7 ± 0.15 mm
Yellow PVC	4	22 AWG	5.0 ± 0.15 mm
Grey PVC	3	0.34 mm²	4.5 ± 0.15 mm
Grey PVC	4	0.34 mm²	4.8 ± 0.15 mm
Yellow PUR	3	22 AWG	4.3 ± 0.20 mm
Yellow PUR	4	22 AWG	4.7 ± 0.20 mm

Jacket	Wires	Conductors	Diameter
Black PUR	3	0.34 mm²	4.3 ± 0.20 mm
Black PUR	4	0.34 mm²	4.7 ± 0.20 mm
Yellow TPE	3	22 AWG	5.3 ± 0.13 mm
Yellow TPE	4	22 AWG	5.3 ± 0.13 mm




	M12 Male	M12 Male	M12 Male	M12 Male
	Right Angle	Straight	Straight	Right Angle
	Plastic	Metal (shielded)	Stainless Steel	Stainless Steel
	Screw Terminals	Screw Terminals	Screw Terminals	Screw Terminals
	0.14...0.75 mm² (26...18 AWG)	0.14...0.75 mm² (26...18 AWG)	0.14...0.75 mm² (26...18 AWG)	0.14...0.75 mm² (26...18 AWG)
	BCC06ZC			
	BCC M444-0000-2A-000-41X475-000			
		BCC0869		
		BCC M474-0000-2A-000-01X475-000		
	BCC06ZE			
	BCC M444-0000-2A-000-51X475-000			
	BCC06ZK		**BCC097K**	**BCC097M**
	BCC M445-0000-2A-000-41X575-000		BCC S435-0000-2A-000-41X575-000	BCC S445-0000-2A-000-41X575-000
		BCC086A		
		BCC M475-0000-2A-000-01X575-000		
	BCC06ZL		**BCC097L**	**BCC097N**
	BCC M445-0000-2A-000-51X575-000		BCC S435-0000-2A-000-51X575-000	BCC S445-0000-2A-000-51X575-000

1/2" Field Attachables

Type	1/2" Female		1/2" Male	
Configuration	Straight		Right Angle	
Housing	Plastic		Plastic	
Connection	Screw Terminals		Screw Terminals	
Cable Gland	PG7		PG7	

No. of Conductors	Order Code/Part Number			
Female	**BCC01ZL**	**BCC08AU**	**BCC0206**	**BCC08AW**
	C21 AN3-7	BCC A233-0000-10-000-41X3W8-000	C21 BN3-7	BCC A243-0000-10-000-41X3W8-000
Male	**BCC080J**	**BCC08AY**	**BCC020E**	**BCC08AZ**
	C21 CN3-7	BCC A233-0000-20-000-41X3W8-000	C21 DN3-7	BCC A243-0000-20-000-41X3W8-000

7/8" Field Attachables

Type	7/8" Female	7/8" Male
Configuration	Straight	Straight
Housing	Plastic	Plastic
Connection	Screw Terminals	Screw Terminals
Conductor Maximum	0.14...1.50 mm² (26...16 AWG)	0.14...1.50 mm² (26...16 AWG)

No. of Conductors	Allowable Cable Ø	Order Code/Part Number	
3-wire	**8...10 mm**	**BCC0AT9**	**BCC0ATC**
		BCC A333-0000-10-000-61X3A5-000	BCC A333-0000-20-000-61X3A5-000
	10...12 mm	**BCC0ATA**	**BCC0ATE**
		BCC A333-0000-10-000-71X3A5-000	BCC A333-0000-20-000-71X3A5-000
4-wire	**6...8 mm**	**BCC0706**	**BCC0709**
		BCC A334-0000-10-000-51X4A5-000	BCC A334-0000-20-000-51X4A5-000
	8...10 mm	**BCC0707**	**BCC070A**
		BCC A334-0000-10-000-61X4A5-000	BCC A334-0000-20-000-61X4A5-000
	10...12 mm	**BCC0708**	**BCC070C**
		BCC A334-0000-10-000-71X4A5-000	BCC A334-0000-20-000-71X4A5-000
5-wire	**6...8 mm**	**BCC070E**	**BCC070J**
		BCC A335-0000-10-000-51X5A5-000	BCC A335-0000-20-000-51X5A5-000
	8...10 mm	**BCC070F**	**BCC070K**
		BCC A335-0000-10-000-61X5A5-000	BCC A335-0000-20-000-61X5A5-000
	10...12 mm	**BCC070H**	**BCC070L**
		BCC A335-0000-10-000-71X5A5-000	BCC A335-0000-20-000-71X5A5-000
	12...14 mm	**BCC0ATH**	**BCC0ATF**
		BCC A335-0000-10-000-81X5A5-000	BCC A335-0000-20-000-81X5A5-000

Jacket Material	**PVC**	**PVC**	**PVC**	**PVC**
Number of Conductors	3	4	4	5
Conductor Color Code	US AC	US AC	DC	DC
Jacket Color	Yellow	Yellow	Yellow	Yellow
Conductor Gauge	16 AWG	16 AWG	16 AWG	16 AWG
Cordsets Used	7/8"	7/8"	7/8"	7/8"
Temperature Rating	-40…105°C	-40…105°C	-40…105°C	-40…105°C
Cable Diameter (mm)	10.24 ± 0.20 mm	10.67 ± 0.25 mm	10.67 ± 0.25 mm	12.57 ± 0.25 mm

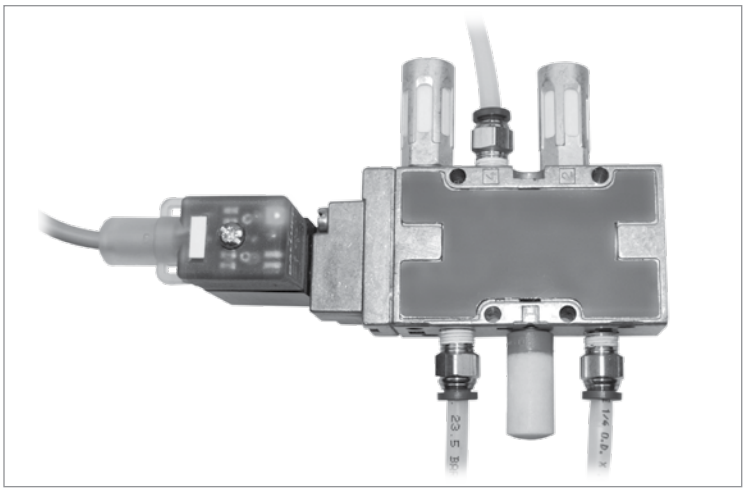
M23 Field Attachables

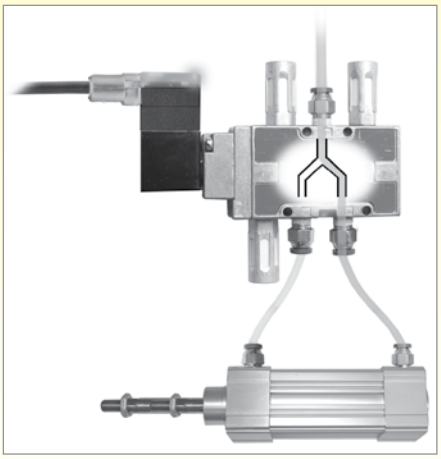
Type		M23 Female	M23 Female	
Configuration		Straight	Right Angle	
Housing		Metal	Metal	
Connection		Solder Connections	Solder Connections	
Conductor Range		0.14...1.00 mm² (26...18 AWG)	0.14...1.00 mm² (26...18 AWG)	
No. of Conductors	**Cable Min. Ø**	**Order Code/Part Number**		
12-wire	**6...9 mm**	**BCC08JH**	**BCC08JF**	
		BCC M67C-0000-10-000-54XCA0-000	BCC M68C-0000-10-000-54XCA0-000	
19-wire	**6...9 mm**	**BCC02HY**	**BCC02J0**	
		CM 23-AN-19-13	CM 23-BN-19-13	

	M23 Male (Internal Threads)	M23 Male (External Threads)
	Straight	Straight
	Metal	Metal
	Solder Connections	Solder Connections
	0.14...1.00 mm² (26...18 AWG)	0.14...1.00 mm² (26...18 AWG)
	BCC02J3	**BCC02J1**
	CM 23-EN-19-13	CM 23-CN-19-13

Connectivity Solutions
DIN A style actuator cables

From sensors to cordsets, Balluff offers an extensive line, which includes valve connectors. These valve connectors cover all standard DIN connections per EN175301, while also offering drag chain rated cables, rugged housings, and an option of protective circuits. Balluff can essentially complete any valve connector solution.





While DIN & Industry style connectors are used in many industrial automation applications, the most popular uses are with simple motors and solenoid valves. As with most solenoid valve applications a DIN or Industry style connector is required to switch the valve's position. Whether the application is clamping a part or moving an object, the Balluff valve connector can be used to pass the control signal to the valve. Integrated LEDs allow for easy recognition of solenoid position.

DIN A

Type		DIN A Female	DIN A Female - M12 Male	DIN A Female - M12 Male
Configuration		Right Angle	Right Angle - Straight	Right Angle - Right Angle
Straight Wired - Voltage Rating		230 VAC/VDC	230 VAC/VDC	230 VAC/VDC
Suppressor Diode - Voltage Rating		24 VAC/VDC	24 VAC/VDC	24 VAC/VDC
Current Rating		4.0 A	4.0 A	4.0 A
0°	DIN A 18 mm - Straight Wired	**BCC VA04-0000-10-054-_X_350-_ _ _**	**BCC VA04-M413-3E-665-_X_350-_ _ _**	**BCC VA04-M423-665-_X_350-_ _ _**
	DIN A 18 mm - PNP & Suppressor Diode	**BCC VA04-0000-10-053-_X_350-_ _ _**	**BCC VA04-M413-3E-664-_X_350-_ _ _**	**BCC VA04-M423-664-_X_350-_ _ _**

Standard Cable Jacket:
VX8 = PVC (grey, 8)
PX0 = PUR (black, 0)

Single-Ended Lengths:
020 = 2 m
050 = 5 m
100 = 10 m

Double-Ended Lengths:
003 = 030 m
006 = 0.6 m
010 = 1.0 m
015 = 1.5 m
020 = 2 m
030 = 3 m
050 = 5 m



DIN B and IND B

Type		B Style Female	B Style Female - M12 Male	B Style Female - M12 Male
Configuration		Right Angle	Right Angle - Straight	Right Angle - Right Angle
Straight Wired - Voltage Rating		230 VAC/VDC	230 VAC/VDC	230 VAC/VDC
Suppressor Diode - Voltage Rating		24 VAC/VDC	24 VAC/VDC	24 VAC/VDC
Current Rating		4.0 A	4.0 A	4.0 A
0°	DIN B 10mm - Straight Wired	**BCC VB03-0000-10-056-_X_350-_ _ _**	**BCC VB03-M413-3E-667-_X_350-_ _ _**	**BCC VB03-M423-3E-667-_X_350-_ _ _**
0°	DIN B 10mm - PNP & Suppressor Diode	**BCC VB03-0000-10-055-_X_350-_ _ _**	**BCC VB03-M413-3E-666-_X_350-_ _ _**	**BCC VB03-M423-3E-666-_X_350-_ _ _**
180°	DIN B 10mm - Straight Wired	**BCC VB23-0000-10-056-_X_350-_ _ _**	**BCC VB23-M413-3E-667-_X_350-_ _ _**	**BCC VB23-M423-3E-667-_X_350-_ _ _**
180°	DIN B 10mm - PNP & Suppressor Diode	**BCC VB23-0000-10-055-_X_350-_ _ _**	**BCC VB23-M413-3E-666-_X_350-_ _ _**	**BCC VB23-M423-3E-666-_X_350-_ _ _**
0°	IND B 11mm - Straight Wired	**BCC VB43-0000-10-056-_X_350-_ _ _**	**BCC VB43-M413-3E-667-_X_350-_ _ _**	**BCC VB43-M423-3E-667-_X_350-_ _ _**
0°	IND B 11mm - PNP & Suppressor Diode	**BCC VB43-0000-10-055-_X_350-_ _ _**	**BCC VB43-M413-3E-666-_X_350-_ _ _**	**BCC VB43-M423-3E-666-_X_350-_ _ _**
180°	IND B 11mm - Straight Wired	**BCC VB63-0000-10-056-_X_350-_ _ _**	**BCC VB63-M413-3E-667-_X_350-_ _ _**	**BCC VB63-M423-3E-667-_X_350-_ _ _**
180°	IND B 11mm - PNP & Suppressor Diode	**BCC VB63-0000-10-055-_X_350-_ _ _**	**BCC VB63-M413-3E-666-_X_350-_ _ _**	**BCC VB63-M423-3E-666-_X_350-_ _ _**

For face views and wiring diagrams, visit the technical reference section t.



DIN C and IND C

Type		C-Style Female	C-Style Female - M12 Male	C-Style Female - M12 Male
Configuration		Right Angle	Right Angle - Straight	Right Angle - Right Angle
Straight Wired - Voltage Rating		230 VAC/VDC	230 VAC/VDC	230 VAC/VDC
Suppressor Diode - Voltage Rating		24 VAC/VDC	24 VAC/VDC	24 VAC/VDC
Current Rating		4.0 A	4.0 A	4.0 A
0°	DIN C 8 mm - Straight Wired	**BCC VC04-0000-10-054-_X_350-_ _ _**	**BCC VC04-M413-3E-665-_X_350-_ _ _**	**BCC VC04-M423-3E-665-_X_350-_ _ _**
0°	DIN C 8 mm - PNP & Suppressor Diode	**BCC VC04-0000-10-053-_X_350-_ _ _**	**BCC VC04-M413-3E-664-_X_350-_ _ _**	**BCC VC04-M423-3E-664-_X_350-_ _ _**
0°	IND C 9.4 mm - Straight Wired	**BCC VC44-0000-10-054-_X_350-_ _ _**	**BCC VC44-M413-3E-665-_X_350-_ _ _**	**BCC VC44-M423-3E-665-_X_350-_ _ _**
0°	IND C 9.4 mm - PNP & Suppressor Diode	**BCC VC44-0000-10-053-_X_350-_ _ _**	**BCC VC44-M413-3E-664-_X_350-_ _ _**	**BCC VC44-M423-3E-664-_X_350-_ _ _**




Size	M8x1	M12x1	M12x1	M12x1
Threads	External	External	External	External
Material	Plastic	Plastic	Plastic	CuZn
Use	M8 Female Port	M12 Female Port	M12 Female Port	M12 Female Port
Order Code	**BAM01C1**	**BAM01C2**	**BAM0115**	**BAM0114**
Part Number	BAM CS-XA-001-M8-C	BAM CS-XA-002-M12-A	BKS-12-CS-02	BKS-12-CS-01




Size	M12x1	7/8"-16UN	7/8"-16UN	M23
Threads	Internal	External	Internal	Internal
Material	Anodized Al	CuZn	CuZn	CuZn
Use	M12 Male Port	7/8" Female Port	7/8" Male Port	M23 Male Port
Order Code	**BAM01LT**	**BAM012T**	**BAM012U**	**BAM012P**
Part Number	BAM CS-XA-006-M12-1	BKS-7/8-CS-00-A	BKS-7/8-CS-00-I	BKS-23-CS-00

Type	Internal thread adapters	
Use With	Internal Male - Internal Female	
Compatibility	BCC A3..., BCCA4..., BCC A5...	
7/8"	**Order Code**	**BAM01LP**
	Part Number	BAM AD-XA-009-7U8-1
1"	**Order Code**	**BAM01LM**
	Part Number	BAM AD-XA-009-1U0-1
1 1/8"	**Order Code**	**BAM01LN**
	Part Number	BAM AD-XA-009-9U8-1

Type	Block Labels
Size	17x9
Use With	M12 Plastic Hubs
Compatibility	BPI...M4...
Order Code	**BAM01JU**
Part Number	BAM IA-XA-004-4X6-Y

IP67 Torque Wrenches

By using a calibrated IP67 torque wrench on the hex nut with every cordset, you can ensure the IP67 rating at the sensor or at the MIB, which will protect your sensor signals even in the wettest environments.

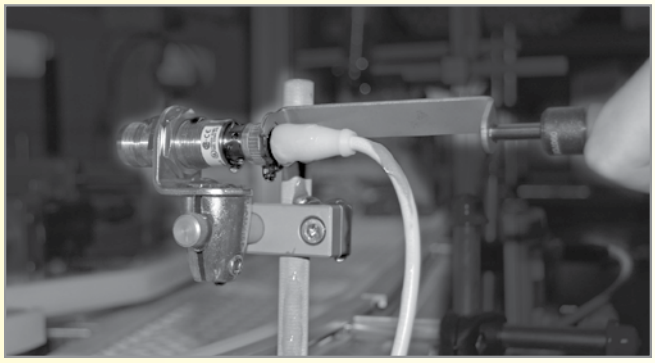
Description	Order Code	Part Number
M8, 0.4 Nm torque rating	**BAM00ZL**	BAM TO-CC-001-M3-0,4/8,0
M12, 0.6 Nm torque rating	**BAM00ZM**	BAM TO-CC-001-M4-0,6/12,0
7/8", 1.5 Nm torque rating	**BAM00ZN**	BAM TO-CC-001-A3-1,5/24,0

M23 Assembly wrench

M23 connectors are easy to assemble due to their size. After the components are assembled, the top and bottom section must be secured to one another to guarantee the high degree of protection.

Description	Ordering code
	Part number
Assembly wrench for 12 and 19-pin M23 connectors	**FHW003F**
	RC-Z2099

Possible Wet/Oily Environment



In this scenario there is a connection between cordsets, with the final connection to a sensor. This scenario is characteristic of homerun cables, patch cables, and adapter cables. The connection between cordsets can sometimes lie in an unexpected, oily or wet environment at the bottom of a work cell. By using a combination of a new Balluff cordset with hexagonal coupling nut and a properly calibrated torque wrench, the sensor connection is IP67 guaranteed. By ratcheting when the connection is properly sealed, it does not allow over-torque, which can be just as bad as too little torque.

Connectivity Solutions
Control accessories for analog inputs

Balluff signal adapters are crucial for quick, versatile modifications, retrofits and enhancements of a sensor's functionality. Several available models provide quick change options that will convert PNP/NPN outputs, add delay timing and counting functions, or monitor frequency of machine speeds and motion. Applications with very high switching frequency can be slowed down using signal stretching devices or analog inputs can be converted to discrete setpoints without the use of a controller or logic. Sensor controller relay boxes are great for simple applications where a controller is overkill. All of these solutions are suitable as stand-alone solutions in areas lacking external controllers. They are also ideal for applications where a solution must be retrofit without changing the controller.

IP67 Inline - Analog Signal Discrete Setpoint Controller

Rated Operational Voltage	24 VDC
Rated Operational Current	300mA
Number of Discrete Outputs	3
Number of Analog Outputs	1
Hysteresis	500mV
Remote Teach	Yes

Input Type	Wiring	Order Code
0...10VDC	**PNP, N/O**	**BAE0070**
	NPN, N/O	**BAE006Z**

Analog Signal Digital Panel Display

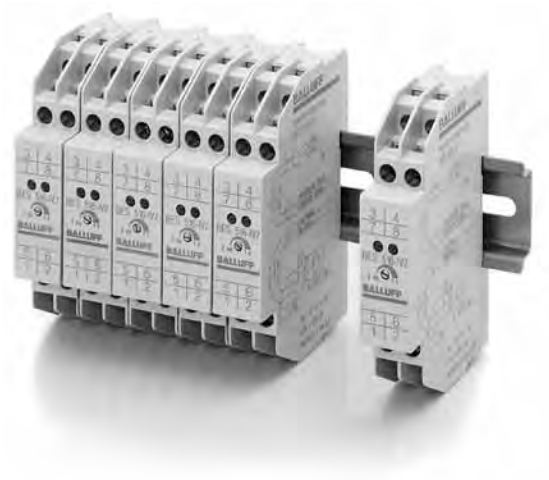
Input Signal	0...10 VDC, 4...20 mA
Supply Voltage	24 VDC
Resolution	16-bit A/D
Analog Output	16-bit, 100% adjustable
Display	6-digit (5-digit analog out)

Discrete Outputs	Scalable Analog Outputs	Order Code
---	**---**	**BAE004R**
4x PNP	**---**	**BAE004T**
2x PNP	**2x**	**BAE004U**
Clear IP65 NEMA 4X Cover		**BAM0130**

IP67 Inline - Signal Conditioning

Rated Operational Voltage	10…30 VDC
Maximum Load Current	400 mA
Timer Maximum Delay	65.535 s
Counter Maximum Count	65535
Frequency Minimum Frequency	0.15 Hz
Frequency Maximum Frequency	1000 Hz
Remote Teach	Yes

Type	Wiring	Order Code
Timer	PNP	**BAE002M**
	NPN	**BAE002N**
Counter	PNP	**BAE002E**
	NPN	**BAE002F**
Signal Inverter	PNP to NPN	**BAE002H**
	NPN to PNP	**BAE002J**
Frequency (under speed)	PNP	**BAE002K**
	NPN	**BAE002L**



IP20 DIN-rail mount - Signal Stretching Device

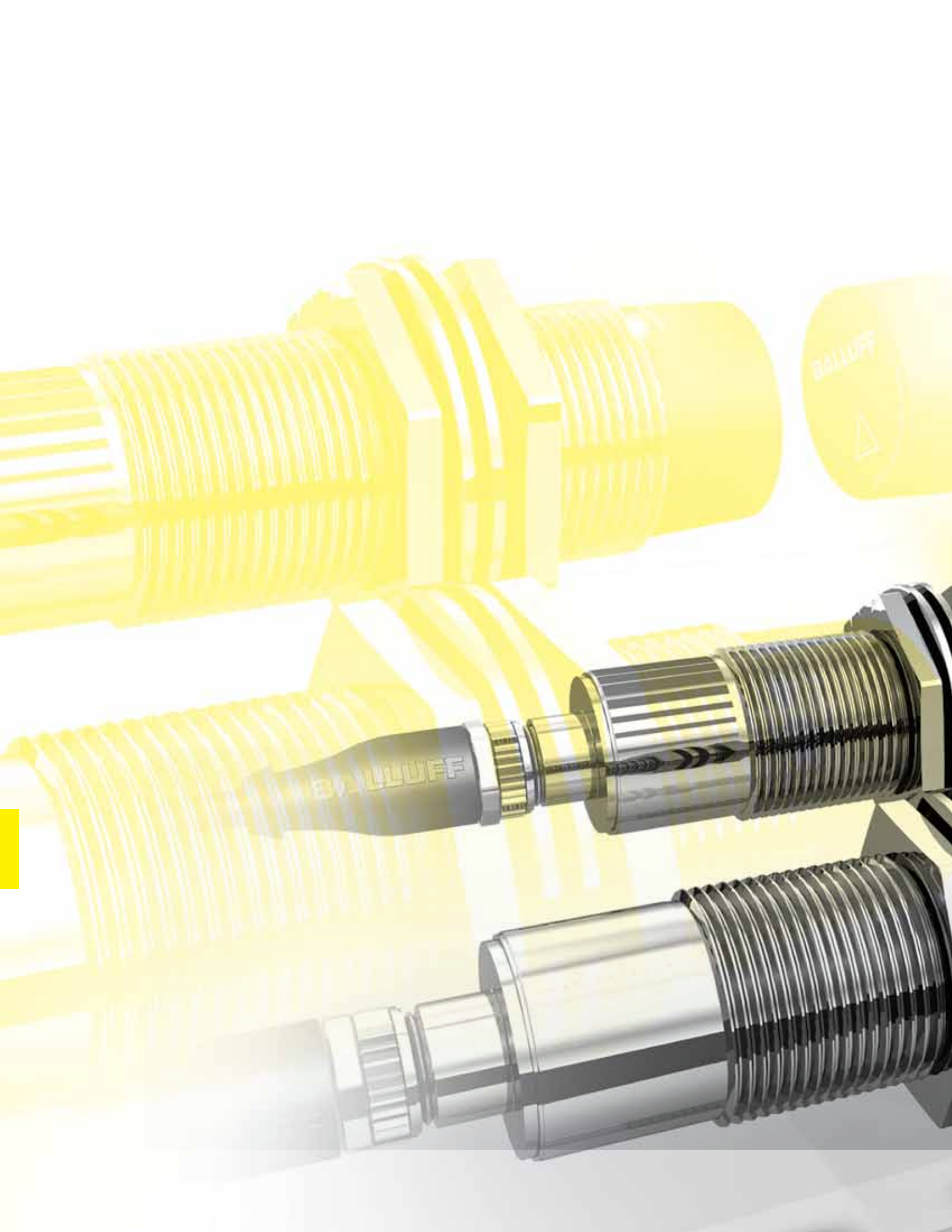
Rated Operational Voltage	10…30 VDC
Rated Operational Current	130 mA
Pulse Length Adjustable	2ms…1s
Minimum Input Pulse	1.5ms

Wiring	Order Code
PNP/NPN, Complementary	**BAE0073**

IP20 DIN-rail mount - Sensor Relay Controller

Supply Input Voltage	115 VAC, 60Hz
Sensor Output Voltage	24 VDC
Sensor Output Current Max	100mA DC
Number of Sensor Inputs & Relays	2
Relay Ratings	6A at 120 VAC or 24 VDC
Relay Life	100,000 Operations

Wiring	Order Code
PNP/NPN	**BAE0023**
PNP	**BAE0027**


BALLUFF

Non-Contact Connectors
Contents

Balluff non-contact connectors are extremely suitable for the quick connection and disconnection of modules. New requirements can be implemented within a very short period and with maximum flexibility.

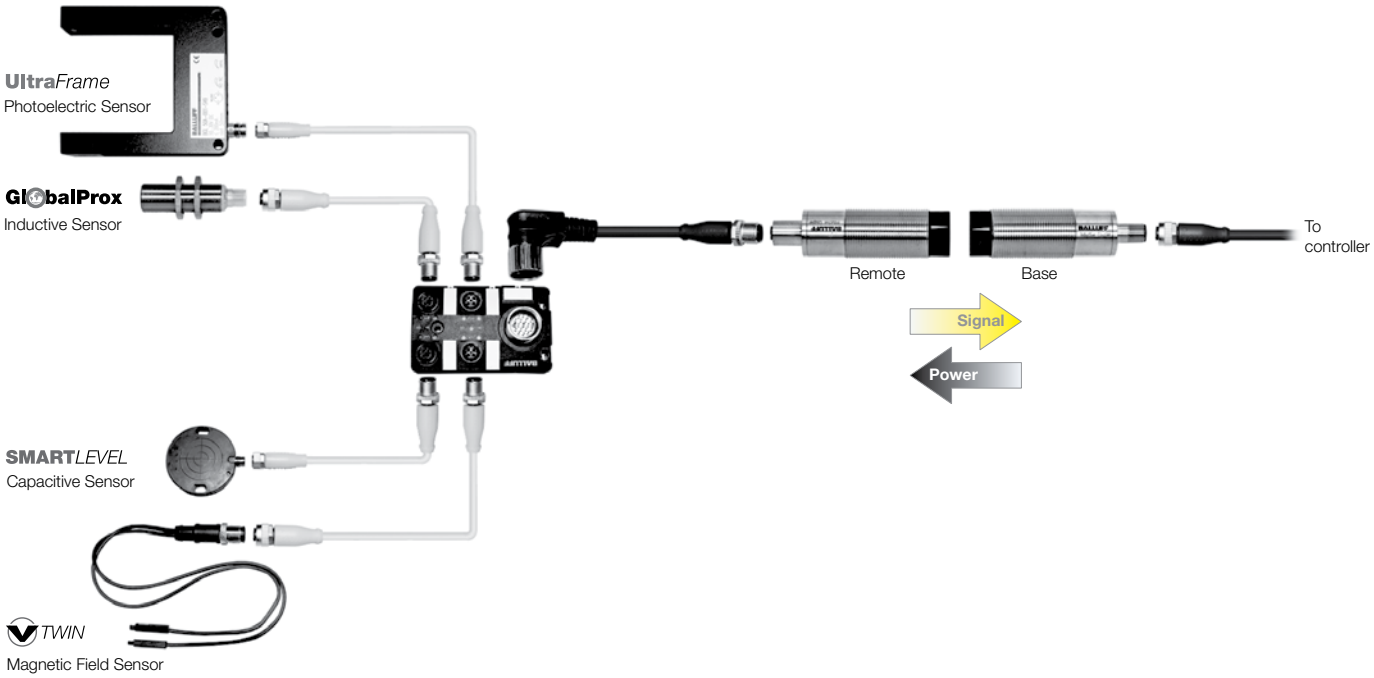
Non-contact connectors are installed via plug-and-play, making retrofitting extremely simple. Even maintenance is much easier. Cable breaks and mechanical wear are a thing of the past. Units are easy to disconnect, safe and powerful. Power and signals are transferred reliably over an air gap.

Non-Contact Connectors

Non-contact connectors technology overview

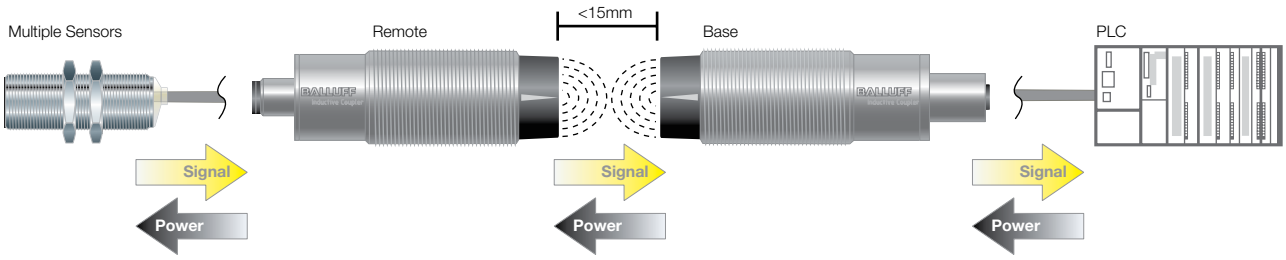
Reliable Connections for Your Hard-to-Solve Cable Applications

In machines and equipment, there are many instances where using a wired and cabled connection just doesn't work effectively. More and more, sensors and other feedback devices need to be mounted on a moving part and hardwired connections are not a viable option. Whether it is a rotating table, moving pallet, punches & presses, or a robot's end of arm tooling, connections need to be made. Balluff offers a tried and true non-contact connection solution for these hard to solve applications. By using these simple non-contact connectors in your application, the equipment can be more flexible and provide reliable sensor data across a difficult connection location.



How Non-Contact Connectors Work

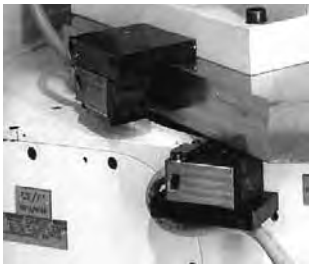
Think of this only as a mechanical connector without pins or the requirement of physical contact. When connected, power goes out to the devices and signals come back from the devices. Depending on the specific product of interest, different information can be passed. Power only, discrete inputs and outputs can be sent across the connectors as well as analog voltage inputs. Each base head is mounted on the controller side of the application and as many remote heads as needed are mounted on the sensors/actuators side of the application.



Inductive Coupling

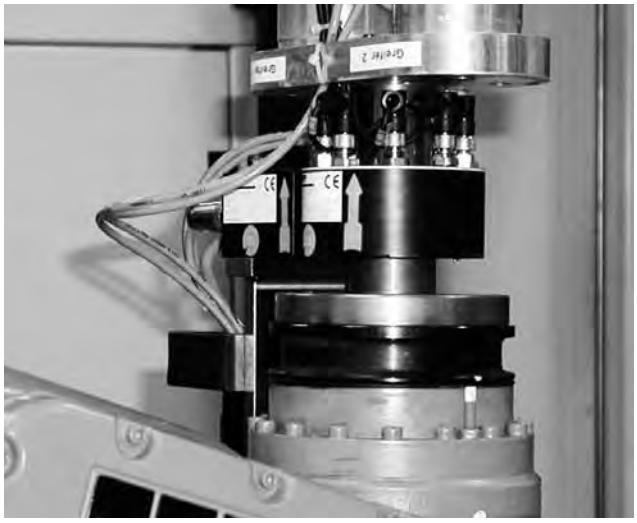
Non-Contact Connector Applications

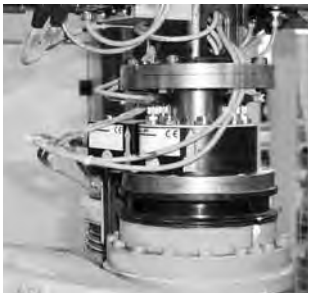
There are basically two ways to apply these connectors to your applications: axial movement connections and radial movement connections. In axial movement applications, the connector is mounted in a common location for all of the equipment so that when the two connectors move together they connect. This can be seen in pallet handling, robot end of arm tooling, and presses. In radial movement connections, the connector is mounted directly along the axis of rotation and the connection is constantly made throughout the rotation because the connector is along the axis. This can be seen in stirring, rotating tables, and some robot end-of-arm tooling applications.



Monitoring clamping jaws in the working area of a 2-spindle machining center

Clamping jaws can also be monitored during machining using non-contact connectors. Information from eight sensors on each of two rotary tables on the swing table is sent to the control. Power for the sensor function is also provided inductively. The separable inductive coupling of power and signals also guarantees greater flexibility in machining centers.





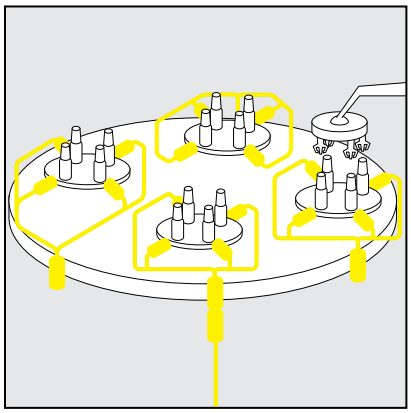
Robots are indispensable for the precision loading and unloading of parts in machining centers

The high movement speed of the gripper often leads to problems with the sensor cabling. Federal Mogul Friedberg GmbH has taken on the problem and installed a radial power remote system at the interface between the gripper and robot arm. The energy for powering the sensors and the position information is coupled inductively. This concept ensures reliable transmission, whether stationary or in motion.

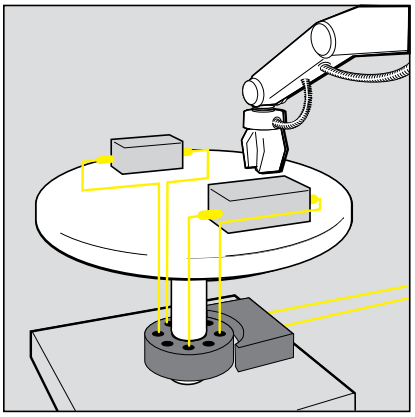
Slip Rings

Slip Ring Advantages:
- Cost effective with a low number of I/O signals

Slip Ring Disadvantages:
- Physical mechanical connection
- High costs of maintenance and repair
- High number of I/O becomes difficult



Rotating Work Table – Work Stations
In this solution to slip rings, each work station would have a base connector and each fixture would have a remote connector. This allows for 360° rotation. The one disadvantage to this solution is the sensors are not powered up when rotating the tooling.

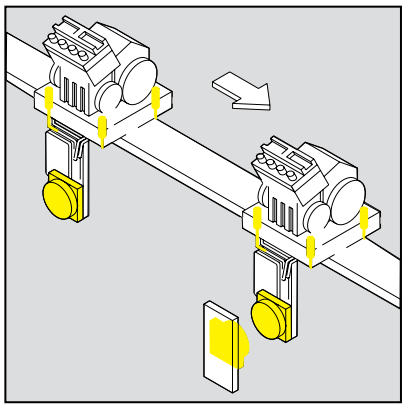


Rotating Work Table – Continuous Connections
The non-contact connector is positioned on the axis of rotation either axial (not pictured) or radial. This still allows for 360° rotation. This solution is most similar to the slip ring technology but sometimes the application does not allow mounting along the axis of rotation.

Pin and Plug Connectors

Pin and Plug Advantages:
- Lowest cost solution

Pin and Plug Disadvantages:
- Physical mechanical connection
- Mechanical pins are prone to damage from user interaction and repeated use
- Connectors are damaged when forgotten and not disconnected before change-out



Pallets or Changeable Tooling
Sensors are used to ensure components are present in the fixture or pallet before processes are performed. Many times connectors need to be made and disconnected regularly as pallets move down a process. With non-contact connectors the sensors are powered automatically as the pallet moves into position at the workstation and the signals are transmitted to the controller.

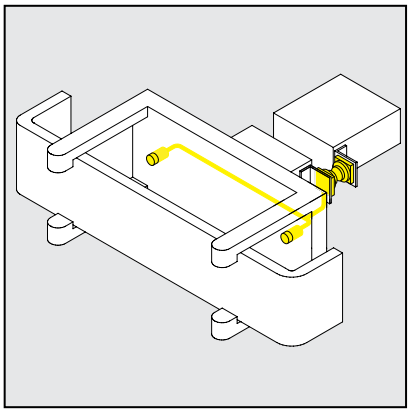
Robotic End Effector Quick Changers

Quick Changer Advantages:

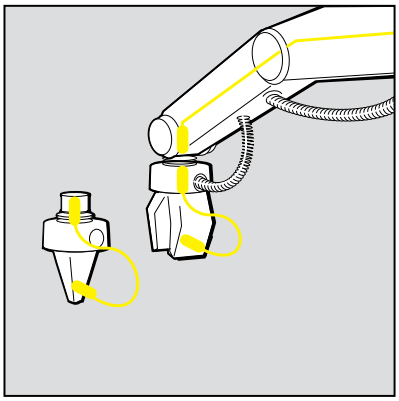
- Integrated pneumatic connections
- Can be complementary to Balluff non-contact connectors

Quick Changer Disadvantages:

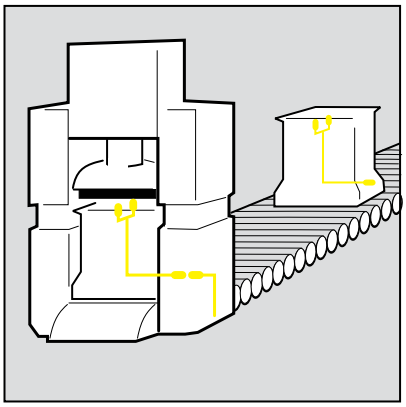
- Mechanical spring pin connectors wear with continuous change-out or can chatter in a signal
- Communication startup connection time can be slow



Changeable End Effectors
More and more one robot is used to perform multiple functions to increase its utilization. This is one of the most popular applications for non-contact connectors. Sensor data is transmitted from the tool back to the controller without having to make or break a physical connection and increases throughput of the robot.



360° Rotation End Effectors
When the end-effectors need to freely rotate on the end of the robot, the connection needs to be mounted on the axis of rotation either axial or radial (not pictured). Sometimes this application does not allow mounting along the axis of rotation on the axis but a radial version might still work.



Metalforming Die Changes
As die tools are more integrated with in-die sensors and automation, connections to the controller become important. If an operator forgets to disconnect the die from the controller the sensors and cables in the tool can be damaged when changing out the tooling.

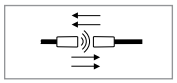
Non-Contact Connectors
Family overview/selector

Movement	Number of Signals	Remote Voltage	Remote Current	Gap Distance	
Power Only					
Axial	0	24 VDC	200 mA	0…5 mm	
	0	24 VDC	500 mA	0…5 mm	
Discrete Input Only					
Axial	1	12 VDC	30 mA	0…4 mm	
				0…8 mm	
	4	12 VDC	30 mA	0.5…3 mm	
	8	12 VDC	100 mA	2…15 mm	
		12 VDC	150 mA	2…5 mm	
		12 VDC	200 mA	3…8 mm	
	8	24 VDC	300 mA	4…12 mm	
		24 VDC	500 mA	0…5 mm	
Radial	8	24 VDC	160 mA	0…2 mm	
Discrete Input/Output					
Axial	4 In / 4 Out	24 VDC	300 mA	3…11 mm	
Analog Input Only					
Axial	1x 0…10 V	18 VDC	10 mA	0…2.5 mm	
Axial	1x PT100 Thermocouple			1...4 mm	
Radial	4x 0…10 V	24 VDC	180 mA	0…2 mm	
IO-Link Input Only (see IO-Link section 2)					
Axial	2 bytes (M30)	24 VDC	500 mA	0...5 A	
	2 bytes (Q40)	24 VDC	500 mA	0...5 A	
	11 bytes (M30)	24 VDC	500 mA	0...5 A	

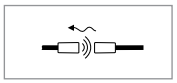
Power Only
Only power transmitting units
for actuators, load units or an energy supply.

Discrete Input Only
Means signal transmission in one direction. Two or three-wire sensors are connected depending on the version. The power is supplied by the remote sensor. 1, 4 or 8 digital signals are transmitted depending on the system. Special systems for analog signals or PT100 temperature sensors are also available.

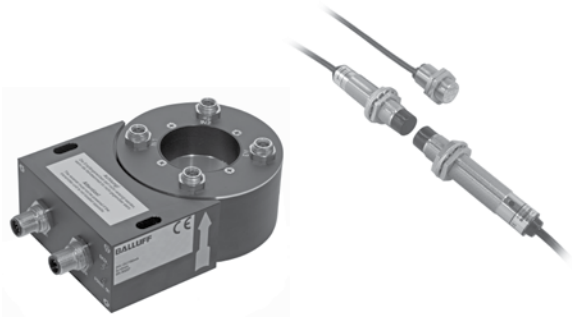
	Base (Stationary)		Remote (Moving)	
	PNP	NPN	PNP	NPN
	BIC0051		BIC0052	
	BIC0007		BIC0008	
	BIC0029	BIC002C	BIC002K	BIC002L
	BIC002E		BIC0044	
	BIC0015		BIC001N	
	BIC001J		BIC001Y	
	BIC0048		BIC0045	
	See page 4.12		See page 4.12	
	BIC0028		BIC0023	
	BIC0009		BIC000A	
	BIC003N		BIC003P	
	BIC003C		BIC0039	
	BIC0046		BIC0043	
	BIC0047		See page 4.16	
	BIC0049		BIC004A	
	BIC000C		BIC000E	
	BIC005A		BIC005C	
	BIC0053		BIC0054	



Discrete Input/Ouput
For the transmission of signals in two directions. Four sensors and four independent control signals are processed on the moving side. Power and signals are coupled inductively.



Analog Input Only
Special systems for the transmission of 1 or 4 analog inputs of the 0...10 VDC type.



Non-Contact Connectors

Power only 200 mA, 500 mA

Power Only		
Type	Power Only	Power Only
Max Remote Current	200 mA	500 mA
Working Range	0…5 mm	0…5 mm
Base	**BIC0051**	**BIC0007**
	BIC 1P0-P2A20-M30ME-SM4A4A	BIC 1P0-P2A50-M30MI3-SM4A4A
Remote	**BIC0052**	**BIC0008**
	BIC 2P0-P2A20-M30ME1-SM4A5A	BIC 2P0-P2A50-M30MI3-SM4A5A
Number of Signals	0	0
Housing Size	M30	M30
Remote Supply Voltage	24 VDC ± 5%	24 VDC ± 5%
Base Current Consumption	≤ 500 mA	≤ 1 A
Base Supply Voltage	24 VDC ± 10%	24 VDC ± 10%
Connector Type	M12 4wire	M12 4wire

Non-Contact Connectors

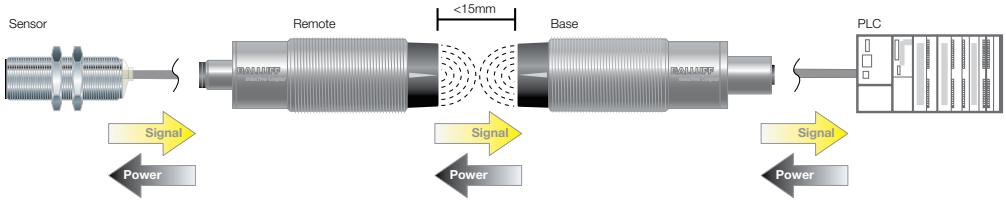
Discrete input only, 1 signal

Single Input Only

Type	Input Only	Input Only
Number of Signals	1	1
Transmission Distance	0…4 mm	1…8 mm
PNP Input Base	**BIC0029**	**BIC002E**
	BIC 1I0-P2A02-M18MI-BPX03-050	BIC 1I0-P2A02-M30MI-BPX03-050
PNP Input Remote	**BIC002K**	**BIC0044**
	BIC 2I0-P2A02-M18ME-BPX03-020	BIC 2I0-P2A05-M30MF-BPX03-030
NPN Input Base	**BIC002C***	
	BIC 1I0-N2A02-M18MI-BPX03-020	
NPN Input Remote	**BIC002L***	
	BIC 2I0-N2A02-M18ME-BPX03-010	
Max. Remote Current	≤ 30 mA	≤ 30 mA
Remote Supply Voltage	12 VDC ± 1.5 VDC	12 VDC ± 1.5 VDC
Housing Size	M18	M30
Base Current Consumption	≤ 150 mA	≤ 150 mA
Base Supply Voltage	24 VDC ± 5%	24 VDC ± 5%
Connector Type	PUR 3-wire	PUR 3-wire

*Consult factory for availability

How Non-Contact Connectors Work



Inductive Coupling

Non-Contact Connectors

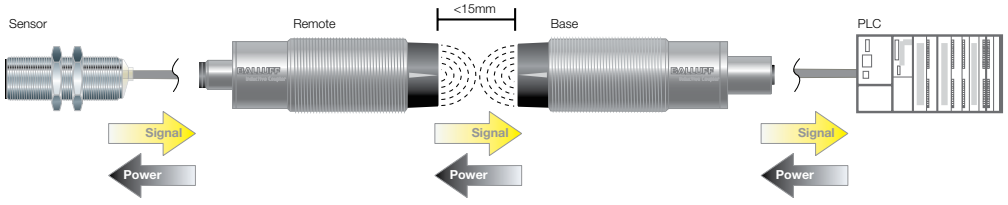
Discrete input only, 4 signals

4 Input Only

Type	Input Only
Number of Signals	4
Transmission Distance	0.5…3 mm
PNP Input Base	**BIC0015**
	BIC 1I2-P2A02-M18MN2-EPX07-050
PNP Remote	**BIC001N**
	BIC 2I2-P2A02-M18MF2-EPX07-050
Max Remote Current	≤ 30 mA
Remote Supply Voltage	12 ± 1.5 VDC
Housing Size	M18
Base Current Consumption	≤ 700 mA
Base Supply Voltage	24 VDC ± 5%
Connector Type	PUR 7-wire

*Consult factory for availability

How Non-Contact Connectors Work



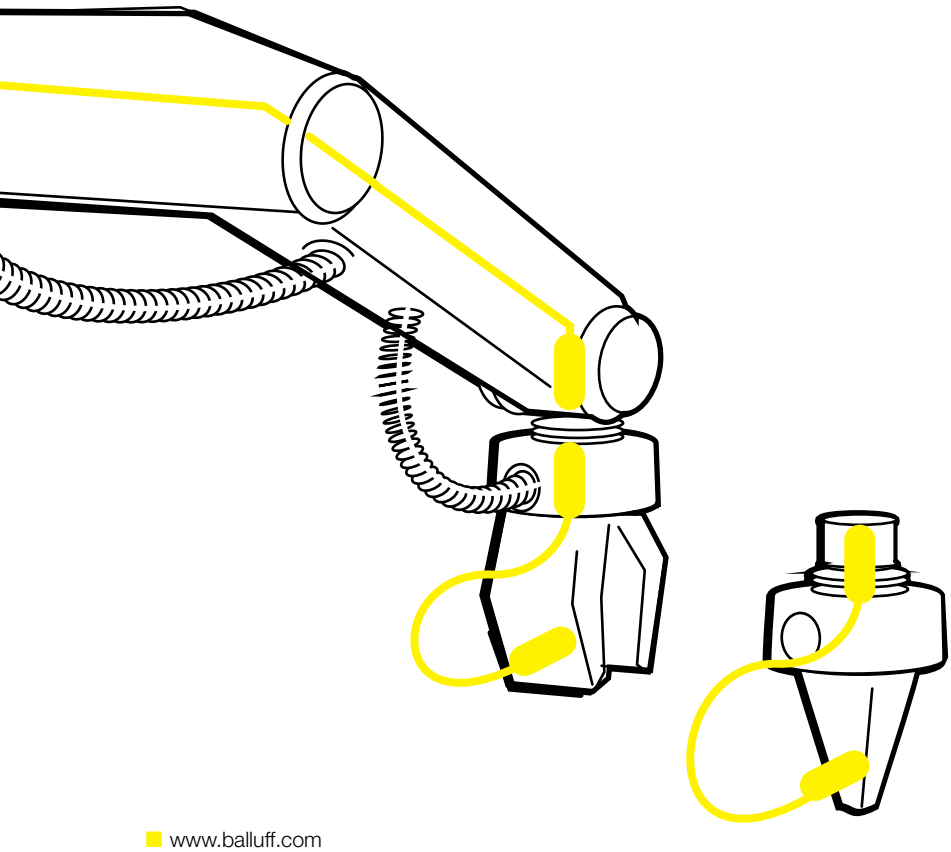
Inductive Coupling

Non-Contact Connectors

Discrete input only, 8 signals

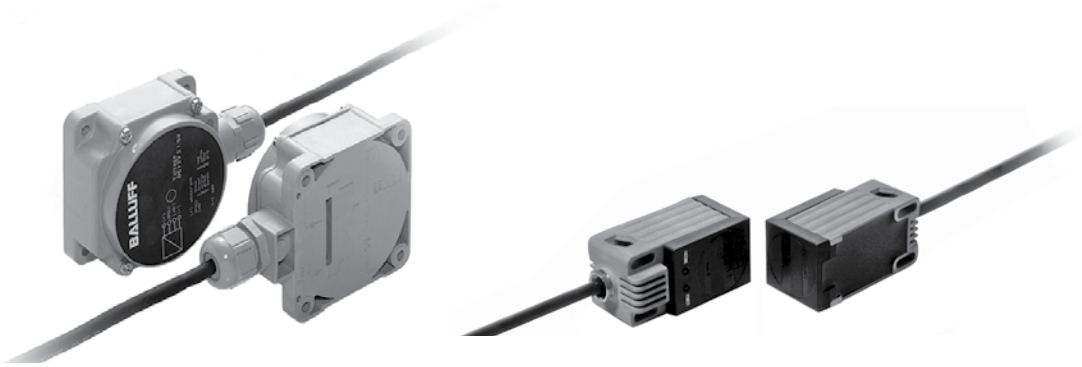
8 Input Only - Tubular Housing

Type	Input Only	Input Only
Number of Signals	8	8
Transmission Distance	2…5 mm	0…5 mm
PNP Input Base	**BIC0048**	**BIC0009**
	BIC 1I3-P2A15-M30MM3-BPX0B-050	BIC 1I3-P2A50-M30MI3-SM4ACA
PNP Remote	**BIC0045**	**BIC000A**
	BIC 2I3-P2A15-M30MI2-BPX0B-050	BIC 2I3-P2A50-M30MI3-SM4ACA
Max. Remote Current	≤ 150 mA	≤ 500 mA
Housing Size	M30	M30
Remote Supply Voltage	12 ± 1.5 VDC	24 VDC ± 5%
Base Current Consumption	≤ 1A	≤ 1A
Base Supply Voltage	24 VDC ± 10%	24 VDC ± 10%
Connector Type	PUR 11-wire	M12 12-pin



Non-Contact Connectors

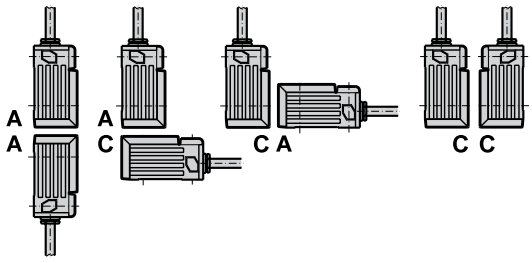
Discrete input only, 8 signals



8 Input Only - Block & Radial Housings

Type	Input Only	Input Only	
Number of Signals	8	8	
Transmission Distance	2…15 mm	3…8 mm	
PNP Input Base	**BIC001J**	**See Chart Below***	
	BIC 1I3-P2A05-Q80KA-GPX0C-050	BIC 1I3-P2A20-Q40A_-GPX0B-050	
PNP Remote	**BIC001Y**	**See Chart Below***	
	BIC 2I3-P2A05-Q80KA-GPX0C-050	BIC 2I3-P2A20-Q40A_-GPX0B-050	
Max Remote Current	≤ 100 mA	≤ 200 mA	
Remote Supply Voltage	12 ± 1.5 VDC	12 ± 1.5 VDC	
Housing Size	80x80	40x40	
Base Current Consumption	≤ 950 mA	≤ 1.2 A	
Base Supply Voltage	24 VDC ± 5%	24 VDC ± 10%	
Connector Type	PUR 12-wire	PUR 11-wire	

*Consult factory for availability

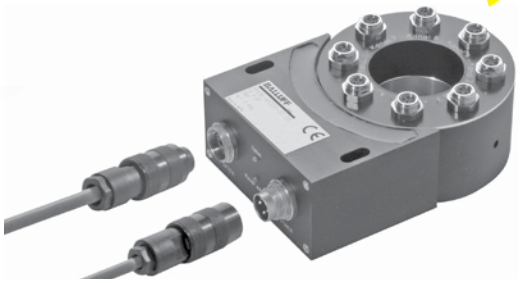


	A	C
Base	**BIC0026***	**BIC0027***
Remote	**BIC0021***	**BIC0022***

Non-Contact Connectors

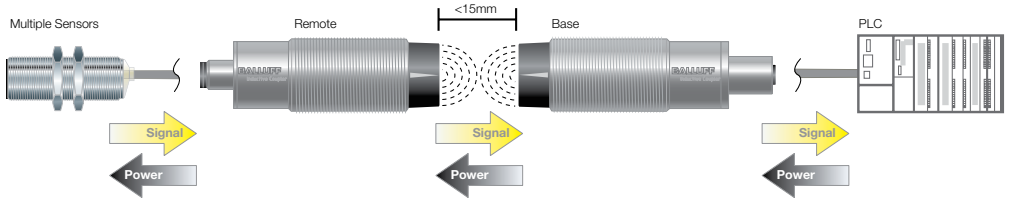
Discrete input only, 8 signals

Top Seller



	Input Only	Input Only
	8	8
	4…12 mm	0…2 mm
	BIC0028	**BIC003N**
	BIC 1I3-P2A30-Q90AA-GPX0B-050	BIC 1I3-P2A16-R01K01-C03
	BIC0023	**BIC003P**
	BIC 2I3-P2A30-Q90AA-GPX0B-050	BIC 2I3-P2A16-R01K01-SM3A30
	≤ 300 mA	≤ 160 mA
	24 ± 1.5 VDC	24 VDC
	90x90	Radial Mount (Ø45mm shaft)
	≤ 1.2 A	≤ 700 mA
	24 VDC ± 5%	24 VDC ± 5%
	PUR 11-wire	Sensors - M8 Female 3-pin, Power - M16 Female 3-pin, Signals - M16 Male - 12-pin (cables not included)

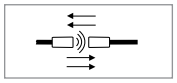
How Non-Contact Connectors Work



Inductive Coupling

Non-Contact Connectors

Discrete input/output

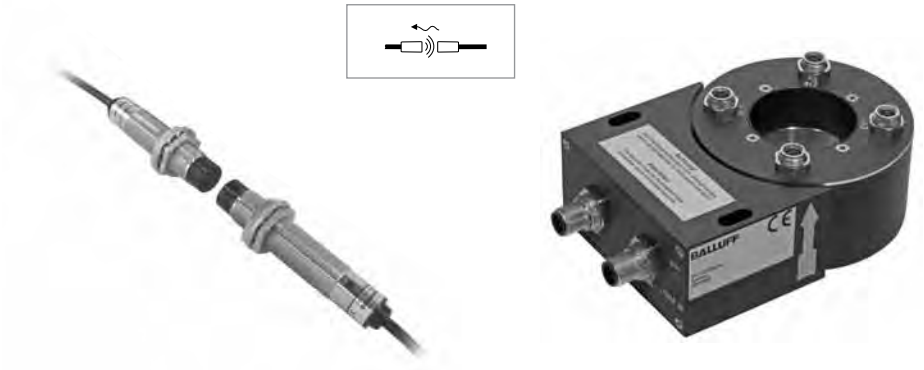


Discrete Input/Output

Type	Input/Output
Number of Signals	4 In / 4 Out
Transmission Distance	3…11 mm
Base	**BIC003C**
	BIC 1B2-P2A30-Q90AQ-GPX0B-050
Remote	**BIC0039**
	BIC 2B2-P2A30-Q90AQ-GPX0B-050
Max. Remote Current	300 mA
Input Type	PNP
Housing Size	M30
Remote Supply Voltage	24 VDC ± 5%
Base Current Consumption	≤ 1500 mA
Base Supply Voltage	24 VDC ± 10%
Connector Type	11-wire

Non-Contact Connectors

Analog input only
1x 0...10 V, 4x 0...10 V



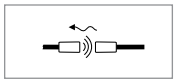
Analog

Type	Analog Voltage Input	Analog Voltage Input
Input Type	0…10 VDC	0…10 VDC
Number of Signals	1	4
Transmission Distance	0…2.5 mm	0…2 mm
Base	**BIC0046***	**BIC0049***
	BIC 1I0-V1003-M18MN2-BPX03-050	BIC 1I2-V1A18-R01K01-C01
Remote	**BIC0043***	**BIC004A***
	BIC 2I0-V1A01-M18MI2-BPX03-050	BIC 2I2-V1A18-R01K01-SM3A30
Remote Max Current	≤ 10 mA	≤ 180 mA
Remote Supply Voltage	18 ± 1.5 VDC	24 VDC
Housing Size	M18	Radial Mount (Ø45mm shaft)
Base Max Current Consumption	≤ 150 mA	≤ 800 mA
Base Supply Voltage	24 VDC ± 5%	24 VDC ± 5%
Connector Type	PUR 3-wire	Sensors - M8 Female 3-pin Power - M12 Female 4-pin Signals - M12 Female - 8-pin (cables not inlcuded)

*Consult factory for availability

Non-Contact Connectors

PT100 thermocouples



Remote sensor – non-contact transmission of temperature values
The thermal remote sensors are compatible with PT100 thermocouples for sensing temperature on moving components while they are being processed. The thermocouple detects the temperature of the object and changes its resistance value, which is processed by the transmitter. The digitized information is passed to the output sensor. The latter converts the digital values into an analog signal (4...20 mA) and transmits it to the external controller.

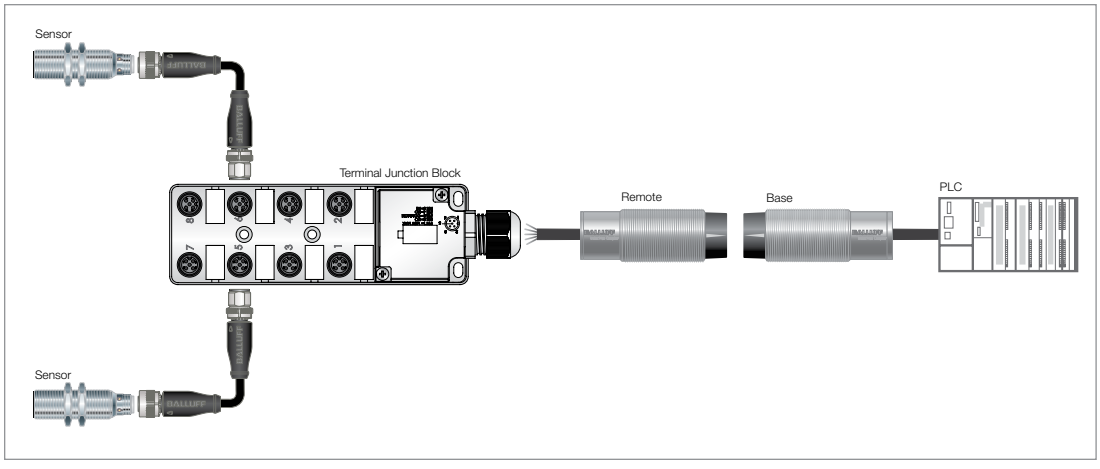
Size		M18×1	M18×1
Working range		1...4 mm	
Mounting		Not flush	Not flush
Base	**Ordering code**		**BIC0047**
	Part number		BIC 1I0-C1A02-M18MN2-PBX03-050
Remote	**Ordering code**	**BIC0041**	
0...+100° C	Part number	BIC 2I0-R1002-M18MF2-BPX03-050	
Remote	**Ordering code**	**BIC004C**	
0...+300° C	Part number	BIC 2I0-R3002-M18MF2-BPX03-050	
Power supply U_B incl. ripple			24 V DC ±5 %
Rated operating current I_e			≤ 200 mA
No-load supply current I_0 max.			≤ 150 mA
Output signal			4...20 mA
Connection type		5 m PUR cable	5 m PUR cable
No. of wires × cross-section		3×0.3 mm²	3×0.3 mm²

Mounting Brackets for Tubular Housings*	
M18 Plastic Mount	**BAM00F2**
	BES 18,0-BS-1
M30 Plastic Mount	**BAM00HN**
	BES 30,0-BS-1

*See sensor catalog for alternate mounting options

Terminal Junction Blocks for Cable Out Remote Side BICs*	
4x M12 ports, 8 signals, plastic	**BPI006H**
	BPI 4M4A50-2K-MC-HHFB
8x M12 ports, 8 signals, plastic	**BPI006K**
	BPI 8M4A40-2K-MC-HHFB

*For variations and details, see page 3.54



Double-Ended Cables for BICs and BPIs with Quick Disconnect Connectors

M12 Straight-M12 Straight, 12pole, 0.6m	**BCC088E**
	BCC M41C-M41C-3A-325-PX0C25-006
M12 Straight-M12 Straight, 12pole, 1m	**BCC088F**
	BCC M41C-M41C-3A-325-PX0C25-010
M12 Straight-M12 Straight, 12pole, 2m	**BCC088H**
	BCC M41C-M41C-3A-325-PX0C25-020

Single-Ended Cable for BICs with Quick Disconnect Connectors

M12 Female Straight, 12pole	**BCC M41C-0000-1A-049-_X_C25-_ _ _**
M12 Female Right Angle, 12pole	**BCC M42C-0000-1A-049-_X_C25-_ _ _**
M12 Male Straight, 12pole	**BCC M41C-0000-2A-049-_X_C25-_ _ _**
M12 Male Right Angle, 12pole	**BCC M42C-0000-2A-049-_X_C25-_ _ _**

Standard Cable Jackets:
V = PVC (grey, 8)
P = PUR (black, 0)

Standard Lengths Available:
020 = 2 meters
050 = 5 meters
100 = 100 meters

Cables for Radial BICs

M12, Female, 4wire, 5m	**BCC05FE**
	BCC M415-0000-1A-003-PX44T2-050
M12, Female, 8-wire, shielded, 5m	**BCC00YF**
	BKS-S115-PU-05
M16, Female, 3-wire, 5m	**BCC014K**
	BKS-S 96-PU-05
M16, Male, 12-wire, 5m	**BCC014M**
	BKS-S 97-PU-05


BALLUFF
BAE0009
BALLUFF
BAE00ET
BAE PS-XA-1W-24-999-604
Output
24 V / 8 A
Stress Level
Lifetime
Load Level
HEARTBEAT™
Input
100 - 240 VAC
1.6 - 3.5 A
BALLUFF
BAE00EN
BAE PS-XA-1W-24-038-601
Output
24 V / 3.8 A
Stress Level
Lifetime
Load Level
HEARTBEAT™
Input
100 - 240 VAC
0.7 - 1.6 A

Power Supply
Contents

Industrial automation is becoming more demanding than ever, and the complexity of tasks is forever increasing. Efficient operation of equipment and machines demands reliable power sources. Balluff power supplies: the powerful solution for fault-free operation of your system.

Take advantage of the special benefits of Balluff power supplies:

– Full product line – choose just what you need
– Short circuit and overload protection in industrial environments
– High availability of all devices
– Unlimited, precise power for increased demands
– Long life for reliable operation
– Worldwide approvals for use anywhere

A Power Supply You Can Trust

Intelligent power supplies with HeartBeat technology give reliable feedback on the real time and long term status of the supply. Built with the roughest applications in mind, these power supplies provide many great advantages:

- Highly energy efficient (>93% efficiency)
- Electrically durable (power boost 150% for 4 seconds)
- Long lasting (minimum service life of 15 years)
- Vibration and shock resistant
- IP67 - Outside the cabinet rated

HEARTBEAT™

Load level
Reversible in short term

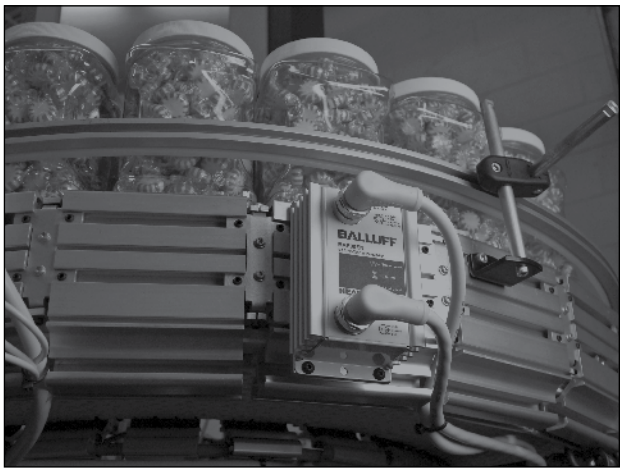
Load level indicates the current load on the device. The display indicates the load without delay.

Stress level
Reversible in medium term

Stress level indicates the physical and thermal loads. A change in the load status delays the "pulse" of the device slightly.

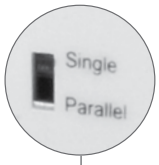
Lifetime
Irreversible in long term

Lifetime indicates the remaining useful life of the device and is based on the combination of all loads.



Network Auxiliary Power
This fully potted power supply can be installed virtually anywhere in an industrial manufacturing environment and provide efficient and reliable power. Easy to see indicators communicate the status of the power supply for simple preventative maintenance plan. With greater than 93% efficiency you can improve plant performance and decrease waste power consumption.

Power Supply
Reliable control power



Parallel/Single mode
When more power is needed, multiple units can be connected in parallel mode (most models)

Ready output
Informs control system that power supply is operational (most models)

Adjustable output
Adjust voltage output to compensate for losses in wiring and distributed components

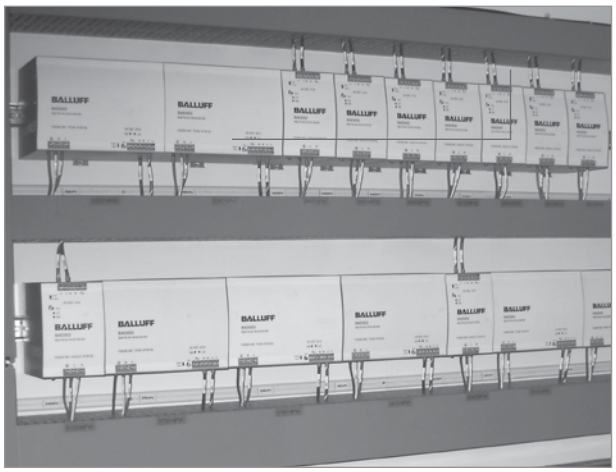
Rugged DIN rail mount

CE, UL/cUL, & TUV approvals

Status indication
LED for DC power ON and DC power LO indication (most models)

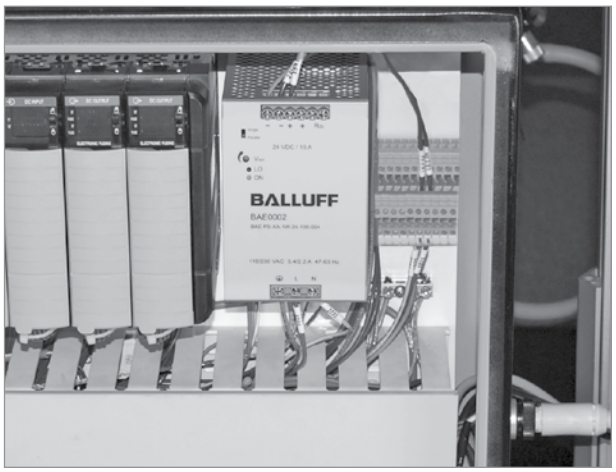
IP20-rated metal housing (most models)

Finger-safe terminals
No additional guarding is necessary



Control and Network Power
These power supplies were designed by Balluff with control products in mind, so you can be sure they will integrate perfectly with your control suite.

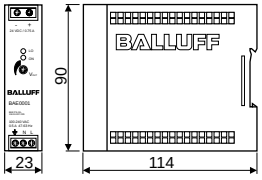
The PS Series of ultra reliable power supplies come in a wide range of 24 V DC models with single or 3-phase inputs. With current ranges from 0.75 A (18 W) to 40 A (960 W), there is a size for most applications. But if more power is needed, connect multiple power supplies together (parallel mode) for additive current capacity.



Seamless Installation
Reliable power has never been this easy to install. It starts with convenient DIN mounting with Balluff's heavy-duty, built-in mounting system. Screw terminals are oriented to allow AC power to enter from the bottom and DC power to exit from the top. Finger-safe terminals require no additional guarding.

Power Supply
IP20 standard
Single-phase
12 V, 24 V output

Output values		**1.5 A @ 12 V DC** **0.75 A @ 24 V DC**	
Output wattage		18 W	
Input voltage		100...240 V AC	
12 VDC	**Ordering code**	**BAE0036**	
	Part number	BAE PS-XA-1W-12-015-001	
24 VDC	**Ordering code**	**BAE0001**	
	Part number	BAE PS-XA-1W-24-007-001	
Ripple and noise		50 mV	
Short Circuit Protection		Yes	
Switching frequency		> 100 kHz	
Ambient temperature		-25 °C to +71 °C	
Degree of protection per IEC 60529		IP 20	
Cooling		Air free convection	
Housing material		Plastic	
Approvals		CE, UL/cUL, TUV, Class 2	

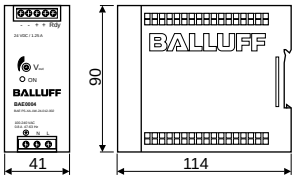


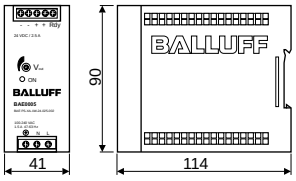
Siemens S7-300 rail adapter

Ordering code	**BAM01FH**
Part number	BAM AD-XA-006-50-3

Power Supply
IP20 standard
Single-phase
12 V, 24 V output

	2.5 A @ 12 V DC **1.25 A @ 24 V DC**	**5.0 A @ 12 V DC** **2.5 A @ 24 V DC**
	30 W	60 W
	100...240 V AC	100...240 V AC
	BAE0039	**BAE003E**
	BAE PS-XA-1W-12-025-002	BAE PS-XA-1W-12-050-002
	BAE0004	**BAE0005**
	BAE PS-XA-1W-24-012-002	BAE PS-XA-1W-24-025-002
	50 mV	50 mV
	Yes	Yes
	> 100 kHz	> 100 kHz
	-25 °C to +71°C	-25 °C to +71°C
	IP 20	IP 20
	Air free convection	Air free convection
	Plastic	Plastic
	CE, UL/cUL, TUV, Class 2	CE, UL/cUL, TUV, Class 2

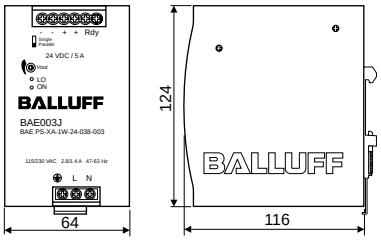


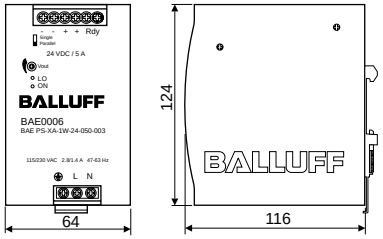


Power Supply

IP20 standard
Single-phase
12 V, 24 V, 48 V output

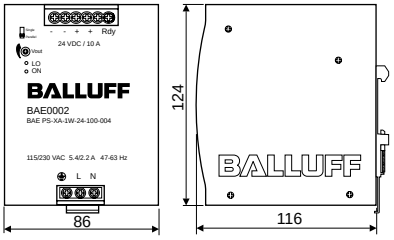
Output values		3.8 A @ 24 V DC (SELV)	10 A @12 V DC 5 A @ 24 V DC 2.5 A @ 48 V DC
Output wattage		91.20 W	120 W
Input voltage		115/230 V AC (Auto-Select)	115/230 V AC (auto select)
12 V	**Ordering code**		**BAE003H**
	Part number		BAE PS-XA-1W-12-100-003
24 V	**Ordering code**	**BAE003J**	**BAE0006**
	Part number	BAE PS-XA-1W-24-038-003	BAE PS-XA-1W-24-050-003
48 V	**Ordering code**		**BAE003K**
	Part number		BAE PS-XA-1W-48-025-003
Ripple and noise		50 mV	50 mV
Short Circuit Protection		Yes	Yes
Switching frequency		> 55 kHz (typically)	> 80 kHz
Ambient temperature		–25...+71 °C	-25 °C to +71 °C
Degree of protection per IEC 60529		IP 20	IP 20
Cooling		Air free convection	Air free convection
Housing material		Metal	Metal
Approvals		CE, UL/cUL, TUV, Class 2, ODVA certified	CE, UL/cUL, TUV

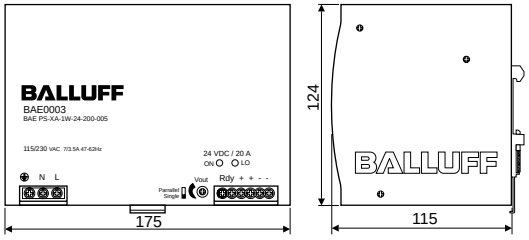




Power Supply
IP20 standard
Single-phase
24 V, 48 V output

	10 A @ 24 V DC **5 A @ 48 V DC**	**20 A @ 24 V DC** **10 A @ 48 V DC**
	240 W	480 W
	115/230 V AC (auto select)	115/230 V AC (auto select)
	BAE0002	**BAE0003**
	BAE PS-XA-1W-24-100-004	BAE PS-XA-1W-24-200-005
	BAE003L	**BAE003M**
	BAE PS-XA-1W-48-050-004	BAE PS-XA-1W-48-100-005
	100 mV	100 mV
	Yes	Yes
	> 80 kHz	> 100 kHz
	-25 °C to +71 °C	-25 °C to +71 °C
	IP 20	IP 20
	Air free convection	Air free convection
	Metal	Metal
	CE, UL/cUL, TUV	CE, UL/cUL, TUV

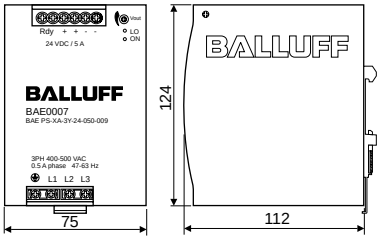


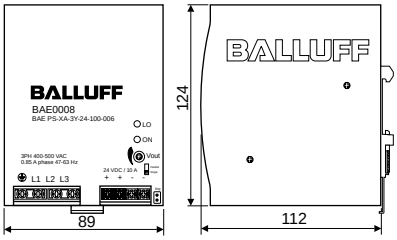


Power Supply

IP20 standard
Three-phase
24 V output

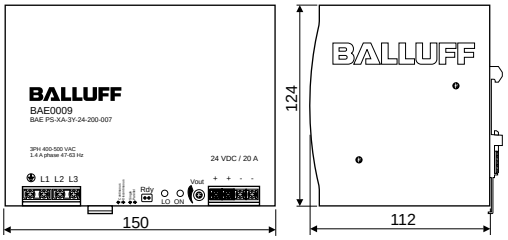
Output values	**5 A @ 24 V DC**	**10 A @ 24 V DC**	
Output wattage	120 W	240 W	
Input voltage	3x 340...575 V AC	3x 340...575 V AC	
Ordering code	**BAE0007**	**BAE0008**	
Part number	BAE PS-XA-3Y-24-050-009	BAE PS-XA-3Y-24-100-006	
Ripple and noise	100 mV	100 mV	
Short Circuit Protection	Yes	Yes	
Switching frequency	> 100 kHz	> 100 kHz	
Ambient temperature	-25 °C to +71 °C	-25 °C to +71 °C	
Degree of protection per IEC 60529	IP 20	IP 20	
Cooling	Air free convection	Air free convection	
Housing material	Metal	Metal	
Approvals	CE, UL/cUL, TUV	CE, UL/cUL, TUV	

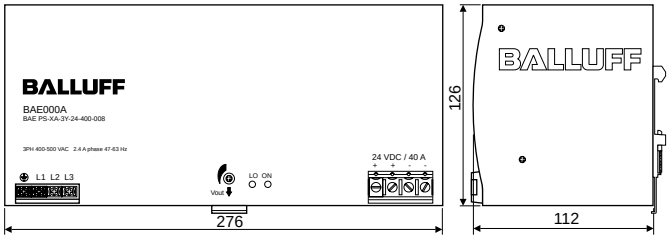




Power Supply
IP20 standard
Three-phase
24 V output

	20 A @ 24 V DC	**40 A @ 24 V DC**
	480 W	960 W
	3x 340...575 V AC	3x340...575 V AC
	BAE0009	**BAE003R**
	BAE PS-XA-3Y-24-200-007	BAE PS-XA-3Y-24-400-010
	100 mV	80 mV
	Yes	Yes
	> 100 kHz	> 100 kHz
	-25 °C to +71 °C	-25 °C to +71 °C
	IP 20	IP 20
	Air free convection	Air free convection
	Metal	Metal
	CE, UL/cUL, TUV	CE, UL/cUL, TUV





Power Supply
Intelligent power supplies

Inside the Cabinet Intelligent Power Supplies

Output values	**5 A @ 24 VDC (SELV)**	**10 A @ 24 VDC (SELV)**
Input voltage type	Single-Phase	Single-Phase
Output wattage	120 W	120 W
Input voltage	110...240 VAC	110...240 VAC
Ordering code	**BAE00EK**	**BAE00EU**
Part number	BAE PS-XA-1W-24-050-013	BAE PS-XA-1W-24-100-014
Efficiency	> 93 %	> 93 %
MTBF	> 800,000 hrs	> 800,000 hrs
Indicators	DC OK, Lifetime Alarm	DC OK, Lifetime Alarm
Operating temperature	–25...+70 °C	–25...+70 °C
Degree if protection per IEC 60529	IP 20	IP 20
Power boost	150% 4sec	150% 4sec
Mounting	DIN rail	DIN rail

*Consult factory for availability

Machine Mount IP67 Intelligent Power Supplies

Degree of protection per IEC 60529		**IP 67**	**IP 67**
Output current		3.8 A	8 A
Output power		100 W	200 W
Output voltage		24 V DC (SELV)	24 V DC (SELV)
Input voltage		100...240 V AC Single phase	100...240 V AC Single phase
Isolated output (4-pin), DeviceNet Aux, SELV & GND	**Ordering code**	**BAE00EN**	
	Part number	BAE PS-XA-1W-24-038-601	
Isolated output (4-pin), EtherNet IP Aux, SELV	**Ordering code**	**BAE00FW**	**BAE00ET**
	Part number	BAE PS-XA-1W-24-038-607	BAE PS-XA-1W-24-080-604
Grounded output (4-pin) EtherNet IP Aux, PELV	**Ordering code**	**BAE00EP**	**BAE00FY**
	Part number	BAE PS-XA-1W-24-038-602	BAE PS-XA-1W-24-080-606
Isolated output (5-pin), PROFI & CC-Link Aux, SELV & GND	**Ordering code**	**BAE00ER**	**BAE00FL**
	Part number	BAE PS-XA-1W-24-038-603	BAE PS-XA-1W-24-080-605
Efficiency		High efficiency > 93 %	
MTBF		> 800,000 h	
Input		3-pin (male)	
Output		4-pin (female), 2 circuits	
		5-pin (female) for DN Network Power	
Operating temperature		–25...+70 °C	
Storage temperature range		–40...+80 °C	
Mounting		Panel, wall and field mounting	
Housing material		Metal, fully enclosed	
Service life		Almost 15 years	
Warranty		2 years	


DeviceNet
DeviceNet
EtherNet/IP
CC-Link
PROFI BUS
PROFI NET

Technical Reference
Contents

While connectivity products are not the most technical product in the Balluff offering, there is useful information to have on hand. This section is not meant to be comprehensive, but to provide useful reference information and drawings. Most Balluff products come with some variety of manual or user's guide to help answer many of the more detailed questions you may have. Please contact Balluff's technical support group if you are having trouble finding the information you are looking for.

Technical Support

Online: www.balluff.com

E-mail: technical.support@balluff.com

Phone: 1-800-543-8390

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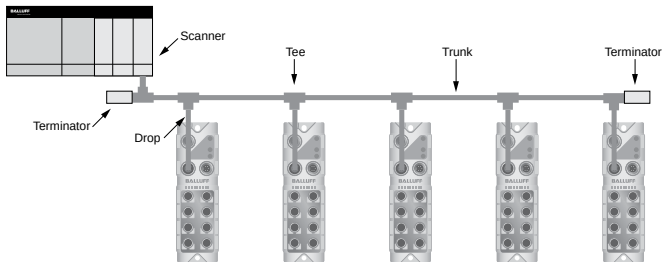
Technical Reference
DeviceNet network design quick tips

Basic Building Blocks

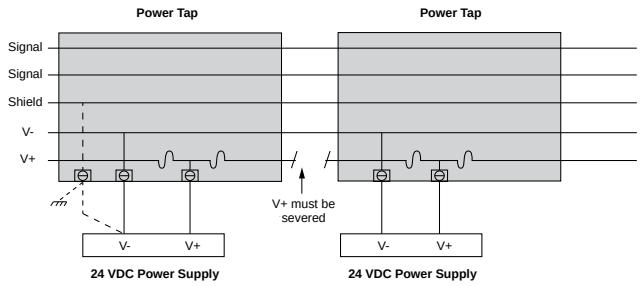
- Cables
  - Truck (usually thick media)
  - Drop (usually thin media)
- Connectors
  - Tee (7/8“ or M12)
  - Terminators: 121 Ohm, 1/4 watt resistors
- 24 V Class II Power Supplies, one ground
- DeviceNet Scanner Card in PLC



Information about Nodes

- 64 total nodes on a network
- Node 0: Typically scanner module on PLC
- Node 63: Typically for "new devices" default

Adding Power to the Network

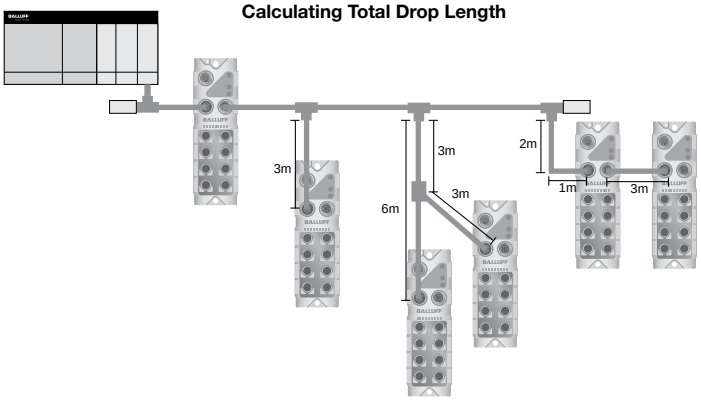


Limitations on Network Size

- Baud rates
- Cable type
- Cable length
- Total drop length 6 m from trunk to device

Cable Type/Speed	125 kbs	250 kbs	500 kbs
Thick	500 m	250 m	100 m
Mid	300 m	250 m	100 m
Thin	100 m	100 m	100 m
Max total drop length	156 m	78 m	39 m

Calculating Total Drop Length



Additional Notes and References

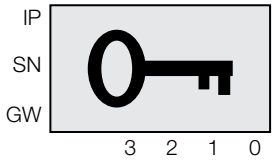
- DeviceNet is a category 2 network and you will need to adhere to the following spacing guidelines from publication 1770-4.1 (Industrial Automation Wiring and Grounding Guidelines)
- ODVA DeviceNet webpage: www.odva.org/default.aspx?tabid=66
- Balluff DeviceNet webpage: www.balluff.com/devicenet

EtherNet/IP Display User Defined Features

User Defined LEDs
With green and red LEDs, the display of the block can be used to visually indicate errors or provide maintenance troubleshooting assistance.

PING
When using the tried and true method of pinging an IP address, the Balluff block will display "PING" to distinguish itself as the target block.

Push Button Lockout
Using the controller as the interface, the push buttons can be locked out for tamper proofing.



EtherNet/IP Grounding Considerations

European Method
In a standard European grounding situation, use a common point grounding method where all devices are tied to a single grounding point as shown in figure 1. This insures all devices stay at the same ground potential. Use supplied ground strap when mounting on painted surface.

If a single-point ground system is not implemented, there is a possibility of varying earth ground potentials. If this happens, it will cause current to flow through the shield in the Ethernet network cable. This can induce excessive noise into the network cable causing communication interruption. There are two possible solutions to this issue shown in the figures below.

North American Method
In most North American grounding situations, each local machine is tied to its own grounding when using fully shielded cables. This situation is addressed in the ODVA publication PUB00148RO, "EtherNet/IP Media Planning and Installation Manual".

ODVA recommends the shield be connected to the ground at the switch and not connected at the network device. This setup is illustrated in figure 2.

Shield break plugs can be found in the accessory tables for EtherNet/IP networks in section 1.

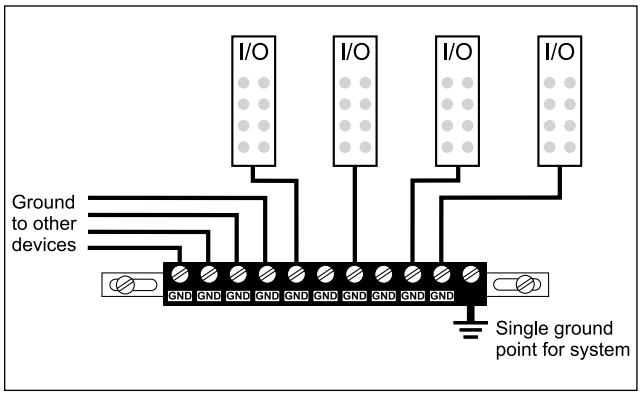


Figure 1

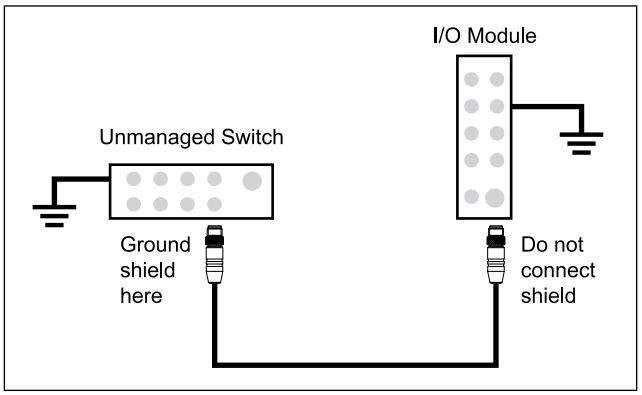


Figure 2

t

Technical Reference

Block bit maps

EtherNet/IP Input-Only 16 point

		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Byte 1/Byte 0	I-15	I-14	I-13	I-12	I-11	I-10	I-9	I-8	I-7	I-6	I-5	I-4	I-3	I-2	I-1	I-0
	Byte 3/Byte 2	S-15	S-14	S-13	S-12	S-11	S-10	S-9	S-8	S-7	S-6	S-5	S-4	S-3	S-2	S-1	S-0
	Byte 4															SP	
OUT	Byte 1/Byte 0	Display (100 Series Only) - See page t.5								IPAP - See page t.5							

EtherNet/IP Output-Only 8 point

		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Byte 1/Byte 0	OL-7	OL-6	OL-5	OL-4	OL-3	OL-2	OL-1	OL-0	HS-7	HS-6	HS-5	HS-4	HS-3	HS-2	HS-1	HS-0
	Byte 2																AP
OUT	Byte 1/Byte 0	R-7	R-6	R-5	R-4	R-3	R-2	R-1	R-0	O-7	O-6	O-5	O-4	O-3	O-2	O-1	O-0
	Byte 3/Byte 2	Display (100 Series Only) - See page t.5								IPAP - See page t.5							

EtherNet/IP Output-Only 16 point

		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Byte 1/Byte 0	HS-15	HS-14	HS-13	HS-12	HS-11	HS-10	HS-9	HS-8	HS-7	HS-6	HS-5	HS-4	HS-3	HS-2	HS-1	HS-0
	Byte 3/Byte 2	OL-15	OL-14	OL-13	OL-12	OL-11	OL-10	OL-9	OL-8	OL-7	OL-6	OL-5	OL-4	OL-3	OL-2	OL-1	OL-0
	Byte 4																AP
OUT	Byte 1/Byte 0	O-15	O-14	O-13	O-12	O-11	O-10	O-9	O-8	O-7	O-6	O-5	O-4	O-3	O-2	O-1	O-0
	Byte 3/Byte 2	R-15	R-14	R-13	R-12	R-11	R-10	R-9	R-8	R-7	R-6	R-5	R-4	R-3	R-2	R-1	R-0
	Byte 5/Byte 4	Display (100 Series Only) - See page t.5								IPAP - See page t.5							

EtherNet/IP 8 Input/8 Output

		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Byte 1/Byte 0	S-7	S-6	S-5	S-4	S-3	S-2	S-1	S-0	I-7	I-6	I-5	I-4	I-3	I-2	I-1	I-0
	Byte 3/Byte 2	OL-7	OL-6	OL-5	OL-4	OL-3	OL-2	OL-1	OL-0	HS-7	HS-6	HS-5	HS-4	HS-3	HS-2	HS-1	HS-0
	Byte 4															SP	AP
OUT	Byte 1/Byte 0	R-7	R-6	R-5	R-4	R-3	R-2	R-1	R-0	O-7	O-6	O-5	O-4	O-3	O-2	O-1	O-0
	Byte 3/Byte 2	Display (100 Series Only) - See page t.5								IPAP - See page t.5							

EtherNet/IP Input-Only 32 point

		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Byte 1/Byte 0	I-15	I-14	I-13	I-12	I-11	I-10	I-9	I-8	I-7	I-6	I-5	I-4	I-3	I-2	I-1	I-0
	Byte 3/Byte 2	I-31	I-30	I-29	I-28	I-27	I-26	I-25	I-24	I-23	I-22	I-21	I-20	I-19	I-18	I-17	I-16
	Byte 5/Byte 4	S-15	S-14	S-13	S-12	S-11	S-10	S-9	S-8	S-7	S-6	S-5	S-4	S-3	S-2	S-1	S-0
	Byte 7/Byte 6	S-31	S-30	S-29	S-28	S-27	S-26	S-25	S-24	S-23	S-22	S-21	S-20	S-19	S-18	S-17	S-16
	Byte 8															SP	
OUT	Byte 1/Byte 0	Display (100 Series Only) - See page 15								IPAP - See page t.5							

EtherNet/IP 16 Input/16 Output

		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Byte 1/Byte 0	I-15	I-14	I-13	I-12	I-11	I-10	I-9	I-8	I-7	I-6	I-5	I-4	I-3	I-2	I-1	I-0
	Byte 3/Byte 2	S-15	S-14	S-13	S-12	S-11	S-10	S-9	S-8	S-7	S-6	S-5	S-4	S-3	S-2	S-1	S-0
	Byte 5/Byte 4	HS-15	HS-14	HS-13	HS-12	HS-11	HS-10	HS-9	HS-8	HS-7	HS-6	HS-5	HS-4	HS-3	HS-2	HS-1	HS-0
	Byte 7/Byte 6	OL-15	OL-14	OL-13	OL-12	OL-11	OL-10	OL-9	OL-8	OL-7	OL-6	OL-5	OL-4	OL-3	OL-2	OL-1	OL-0
	Byte 8															SP	AP
OUT	Byte 1/Byte 0	O-15	O-14	O-13	O-12	O-11	O-10	O-9	O-8	O-7	O-6	O-5	O-4	O-3	O-2	O-1	O-0
	Byte 3/Byte 2	R-15	R-14	R-13	R-12	R-11	R-10	R-9	R-8	R-7	R-6	R-5	R-4	R-3	R-2	R-1	R-0
	Byte 5/Byte 4	Display (100 Series Only) - See page 15								IPAP - See page t.5							

EtherNet/IP™ Configurable 16 point

		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Byte 1/Byte 0	I-15	I-14	I-13	I-12	I-11	I-10	I-9	I-8	I-7	I-6	I-5	I-4	I-3	I-2	I-1	I-0
		HS-15	HS-14	HS-13	HS-12	HS-11	HS-10	HS-9	HS-8	HS-7	HS-6	HS-5	HS-4	HS-3	HS-2	HS-1	HS-0
	Byte 3/Byte 2	S-15	S-14	S-13	S-12	S-11	S-10	S-9	S-8	S-7	S-6	S-5	S-4	S-3	S-2	S-1	S-0
	Byte 5/Byte 4	OL-15	OL-14	OL-13	OL-12	OL-11	OL-10	OL-9	OL-8	OL-7	OL-6	OL-5	OL-4	OL-3	OL-2	OL-1	OL-0
	Byte 6															SP	AP
OUT	Byte 1/Byte 0	O-15	O-14	O-13	O-12	O-11	O-10	O-9	O-8	O-7	O-6	O-5	O-4	O-3	O-2	O-1	O-0
	Byte 3/Byte 2	R-15	R-14	R-13	R-12	R-11	R-10	R-9	R-8	R-7	R-6	R-5	R-4	R-3	R-2	R-1	R-0
	Byte 5/Byte 4	Display (100 Series Only) - See page t.5								IPAP - See page t.5							

DeviceNet™ Input Only 16 Point

		Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Word 0	I-15	I-14	I-13	I-12	I-11	I-10	I-9	I-8	I-7	I-6	I-5	I-4	I-3	I-2	I-1	I-0
	Word 1	S-15	S-14	S-13	S-12	S-11	S-10	S-9	S-8	S-7	S-6	S-5	S-4	S-3	S-2	S-1	S-0

DeviceNet™ Output Only 8 Point

		Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Word 0	OL-7	OL-6	OL-5	OL-4	OL-3	OL-2	OL-1	OL-0	HS-7	HS-6	HS-5	HS-4	HS-3	HS-2	HS-1	HS-0
	Word 1																AP
OUT	Word 0	R-7	R-6	R-5	R-4	R-3	R-2	R-1	R-0	O-7	O-6	O-5	O-4	O-3	O-2	O-1	O-0

DeviceNet™ Configurable 16 point

		Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Word 0	I-15	I-14	I-13	I-12	I-11	I-10	I-9	I-8	I-7	I-6	I-5	I-4	I-3	I-2	I-1	I-0
	Word 1	S-15	S-14	S-13	S-12	S-11	S-10	S-9	S-8	S-7	S-6	S-5	S-4	S-3	S-2	S-1	S-0
	Word 2	OL-15	OL-14	OL-13	OL-12	OL-11	OL-10	OL-9	OL-8	OL-7	OL-6	OL-5	OL-4	OL-3	OL-2	OL-1	OL-0
	Word 3															SP	AP
OUT	Word 0	O-15	O-14	O-13	O-12	O-11	O-10	O-9	O-8	O-7	O-6	O-5	O-4	O-3	O-2	O-1	O-0
	Word 1	R-15	R-14	R-13	R-12	R-11	R-10	R-9	R-8	R-7	R-6	R-5	R-4	R-3	R-2	R-1	R-0

DeviceNet™ 8 Input/8 Output

		Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN	Word 0	S-7	S-6	S-5	S-4	S-3	S-2	S-1	S-0	I-7	I-6	I-5	I-4	I-3	I-2	I-1	I-0
	Word 1	OL-7	OL-6	OL-5	OL-4	OL-3	OL-2	OL-1	OL-0	HS-7	HS-6	HS-5	HS-4	HS-3	HS-2	HS-1	HS-0
	Word 2															SP	AP
OUT	Word 0	R-7	R-6	R-5	R-4	R-3	R-2	R-1	R-0	O-7	O-6	O-5	O-4	O-3	O-2	O-1	O-0

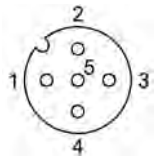
Block Bit Map Key

Bit Map - Legend	
I	Input
O	Output
R	Overload Reset
S	Input Short Circuit
OL	Output Overload Status
HS	Output Handshake
AP	Actuator Power Status
SP	Sensor/Network Power Status

IPAP Output Control Byte	
Bit 0	Red LED on
Bit 1	Red LED flash
Bit 2	Yellow LED on
Bit 3	Yellow LED flash
Bit 4	
Bit 5	
Bit 6	
Bit 7	

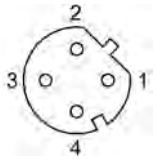
Display Output Control Byte (100 series only)	
Bit 0	Red LED on
Bit 1	Green LED on
Bit 2	Display Lock
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

Block Pinouts



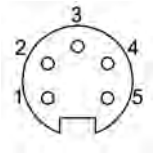
M12 I/O Port

PIN	Dual Input Port	Single Output Port	Dual Output Port	Configurable Port
1	+ 24 V	N.C.	N.C.	+ 24 V
2	Input 2	N.C.	Output 2	Input 2 or Output 2
3	0 V	0 V	0 V	0 V
4	Input 1	Output 1	Output 1	Input 1 or Output 1
5	FE	FE	FE	FE



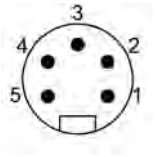
EtherNet/IP / Profinet Network Port Female

PIN	Function	Description
1	TX +	Transmit Data +
2	RX +	Receive Data +
3	TX -	Transmit Data -
4	RX -	Receive Data -



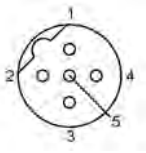
DeviceNet Network Port Female

PIN	Function	Description
1	Shield	Shield
2	+ 24 V	DeviceNet + 24 V
3	0 V	DeviceNet 0 V
4	CAN High	CAN Signal High
5	CAN Low	CAN Signal Low



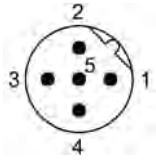
DeviceNet Network Port Male

PIN	Function	Description
1	Shield	Shield
2	+ 24 V	DeviceNet + 24 V
3	0 V	DeviceNet 0 V
4	CAN High	CAN Signal High
5	CAN Low	CAN Signal Low



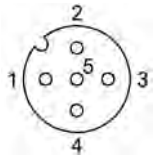
Profibus Network Port Female

PIN	Function	Description
1	VP	+ 5 V DC
2	RxD/TxD-N (A-Line Green)	A Signal
3	DGND	Ground
4	RxD/TxD-P (B-Line Red)	B Signal
5	N.C.	Not Connected
Coupling Nut	Shield	Shield



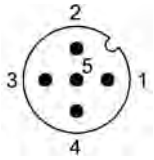
Profibus Network Port Male

PIN	Function	Description
1	VP	+ 5 V DC
2	RxD/TxD-N (A-Line Green)	A Signal
3	DGND	Ground
4	RxD/TxD-P (B-Line Red)	B Signal
5	N.C.	Not Connected
Coupling Nut	Shield	Shield



CC-Link Network Port Female

PIN	Function	Description
1	SLD	Shield
2	DB	B Line (White)
3	DG	Ground (Yellow)
4	DA	A Line (Blue)

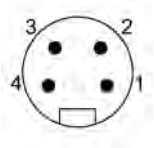


CC-Link Network Port Male

PIN	Function	Description
1	SLD	Shield
2	DB	B Line (White)
3	DG	Ground (Yellow)
4	DA	A Line (Blue)

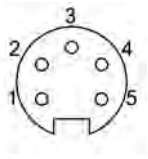
EtherNet/IP Aux Power Port Male

PIN	Function	Description
1	+ 24 V	Actuator Supply
2	+ 24 V	Sensor/Bus Communication Supply
3	0 V	Sensor/Bus Communication Supply
4	0 V	Actuator Supply



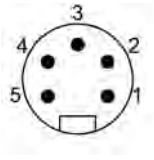
DeviceNet Aux Power Port Male

PIN	Function	Description
1	+ 24 V	Actuator Supply
2	+ 24 V	Sensor Supply
3	FE	Function Ground
4	0 V	Actuator / Sensor Supply



Aux Power Port Female (Profibus/Profinet/CC-Link)

PIN	Function	Description
1	0 V	Actuator Supply
2	0 V	Sensor/Bus Communication Supply
3	FE	Function Ground
4	+ 24 V	Sensor/Bus Communication Supply
5	+ 24 V	Actuator Supply



Aux Power Port Male (Profibus/Profinet/CC-Link)

PIN	Function	Description
1	0 V	Actuator Supply
2	0 V	Sensor/Bus Communication Supply
3	FE	Function Ground
4	+ 24 V	Sensor/Bus Communication Supply
5	+ 24 V	Actuator Supply

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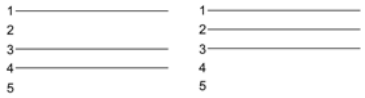
Technical Reference

M8 and M12 single-ended wire diagrams

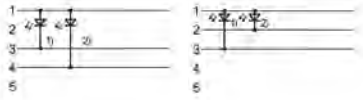
3-Wire

Non-LED	Normally Open	Normally Closed
Wiring code	001	002

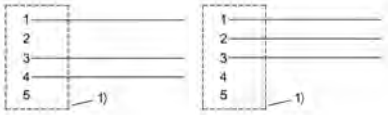


PNP-LED	Normally Open	Normally Closed
Wiring code	004	005

NPN-LED	Normally Open	Normally Closed
Wiring code	006	007

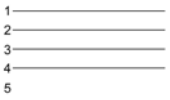


Shielded	Normally Open	Normally Closed
Wiring code	036	037

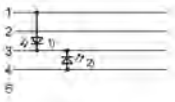


4-Wire

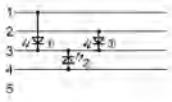
Non-LED	Normally Open/ Normally Closed
Wiring code	003



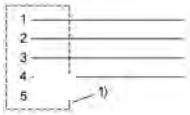
PNP-LED	Normally Open
Wiring code	008



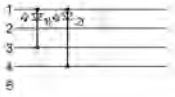
2x PNP-LED	Normally Open/ Normally Closed
Wiring code	010



Shielded	Normally Open/ Normally Closed
Wiring code	014



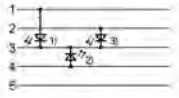
NPN-LED	Normally Open
Wiring code	009



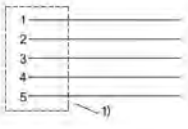
5-Wire

Non-LED	Normally Open/ Normally Closed
Wiring code	017/034

2x PNP-LED	Normally Open/ Normally Closed
Wiring code	039/040



Shielded	Normally Open/ Normally Closed
Wiring code	016/043

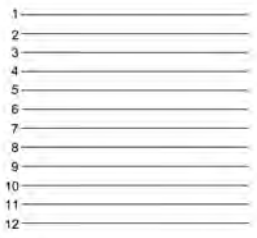


8-Wire

Non-LED	
Wiring code	044

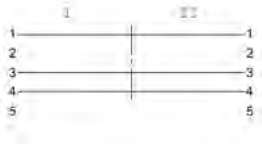
12-Wire

Non-LED	
Wiring code	049

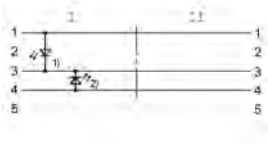


3-Wire

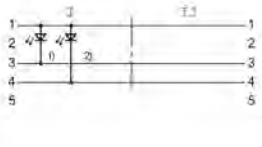
Head I	Head II	
Non-LED	**Non-LED**	Normally Open
Wiring code		300



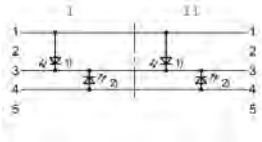
Head I	Head II	
PNP-LED	**Non-LED**	Normally Open
Wiring code		602



Head I	Head II	
NPN-LED	**Non-LED**	Normally Open
Wiring code		603



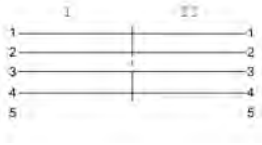
Head I	Head II	
PNP-LED	**PNP-LED**	Normally Open
Wiring code		302



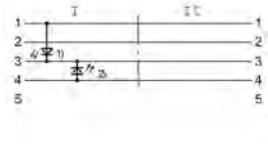
1) Power LED
2) Signal 1 LED
3) Signal 2 LED

4-Wire

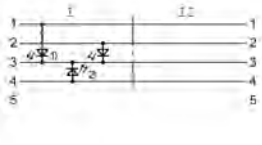
Head I	Head II	
Non-LED	**Non-LED**	Normally Open/ Normally Closed
Wiring code		304



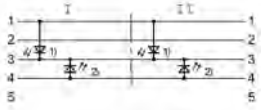
Head I	Head II	
PNP-LED	**Non-LED**	Normally Open
Wiring code		606



Head I	Head II	
2x PNP-LED	**Non-LED**	Normally Open/ Normally Closed
Wiring code		650

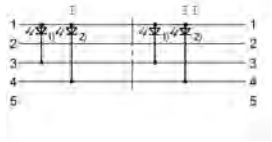


Head I	Head II	
PNP-LED	**PNP-LED**	Normally Open
Wiring code		306

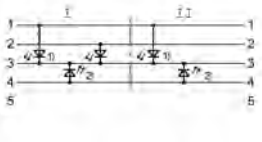


Head I	Head II	
NPN-LED	**Non-LED**	Normally Open
Wiring code		607

Head I	Head II	
NPN-LED	**NPN-LED**	Normally Open
Wiring code		307

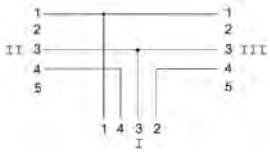


Head I	Head II	
2x PNP-LED	**PNP-LED**	Normally Open/ Normally Closed
Wiring code		651

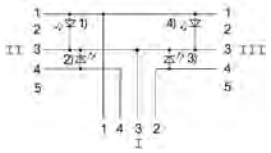


Splitters

Head I	Head II	Head III
Non-LED	**Non-LED**	**Non-LED**
Logic: Signal Splitter		



Head I	Head II	Head III
Non-LED	**PNP N/O LED**	**PNP N/O LED**
Logic: Signal Splitter		



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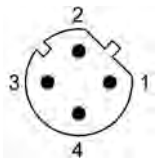
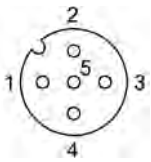
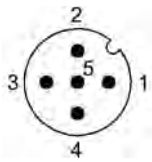
Technical Reference

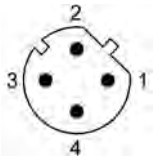
Cable face views and color codes
Network cables

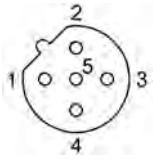


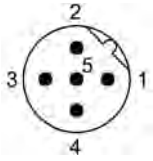




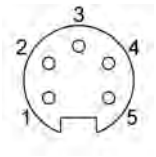
Network	EtherNet/IP		EtherNet/IP		DeviceNet		DeviceNet		
Size	M12		RJ45		M12		M12		
Gender	Male		Male		Female		Male		
Poles	2x2 Twisted Pair		2x2 Twisted Pair		2xNet 2xPower 1xShield		2xNet 2xPower 1xShield		
Shield	Coupling-Nut		Housing		Pin		Pin		
Wire Code	TIA 568 B		TIA 568 B		ODVA		ODVA		
	Color	**Function**	**Color**	**Function**	**Color**	**Function**	**Color**	**Function**	
1	WH/OR	TD+	WH/OR	TD+	Bare	Drain	Bare	Drain	
2	WH/GR	RD+	OR	TD-	RD	V+	RD	V+	
3	OR	TD-	WH/GR	RD+	BK	V-	BK	V-	
4	GR	RD-			WH	CAN_H	WH	CAN_H	
5					BU	CAN_L	BU	CAN_L	
6			GR	RD-					

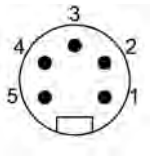


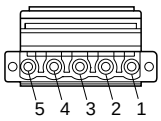




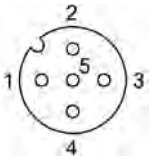
Network	ProfiNet		ProfiNet		Profibus-DP		Profibus-DP		
Size	M12		RJ45		M12		M12		
Gender	Male		Male		Female		Male		
Poles	4-pole Starquad		4-pole Starquad		2-pole		2-pole		
Shield	Coupling-Nut		Housing		Coupling-Nut		Coupling-Nut		
Wire Code	ProfiNet		ProfiNet		Profibus		Profibus		
	Color	**Function**	**Color**	**Function**	**Color**	**Function**	**Color**	**Function**	
1	YE	TD+	YE	TD+					
2	WH	RD+	OR	TD-	GN	RxD/TxD-N	GN	RxD/TxD-N	
3	OR	TD-	WH	RD+					
4	BU	RD-			RD	RxD/TxD-P	RD	RxD/TxD-P	
5									
6			BU	RD-					

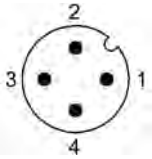


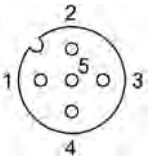


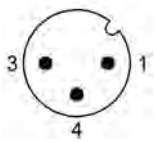


	Network	DeviceNet		DeviceNet		DeviceNet	
	Size	7/8"		7/8"		Open	
	Gender	Female		Male		Female	
	Poles	2xNet 2xPower 1xShield		2xNet 2xPower 1xShield		2xNet 2xPower 1xShield	
	Shield	Pin		Pin		Pin	
	Wire Code	ODVA		ODVA		ODVA	
		Color	**Function**	**Color**	**Function**	**Color**	**Function**
	1	Bare	Drain	Bare	Drain	Bare	Drain
	2	RD	V+	RD	V+	RD	V+
	3	BK	V-	BK	V-	BK	V-
	4	WH	CAN_H	WH	CAN_H	WH	CAN_H
	5	BU	CAN_L	BU	CAN_L	BU	CAN_L
	6						









	Network	CC-Link		CC-Link		IO-Link		IO-Link	
	Size	M12		M12		M12		M12	
	Gender	Female		Male		Female		Male	
	Poles	3-pole 1x Shield		3-pole 1x Shield		3-pole		3-pole	
	Shield	Pin		Pin		None*		None*	
	Wire Code	CLPA		CLPA		DC		DC	
		Color	**Function**	**Color**	**Function**	**Color**	**Function**	**Color**	**Function**
	1	Bare	Shield	Bare	Shield	BR	V+	BR	V+
	2	WH	B Line	WH	B Line				
	3	YE	Ground	YE	Ground	BU	V-	BU	V-
	4	BU	A Line	BU	A Line	BK	C/Q	BK	C/Q
	5								
	6								

*RFID processors require a shielded cable

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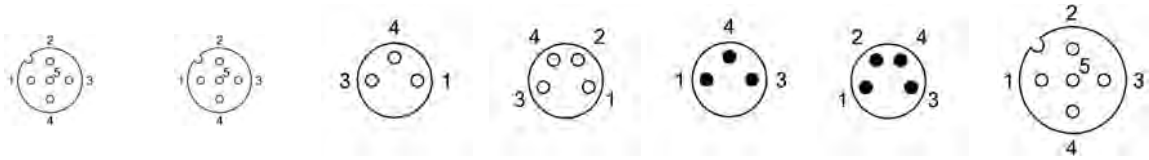
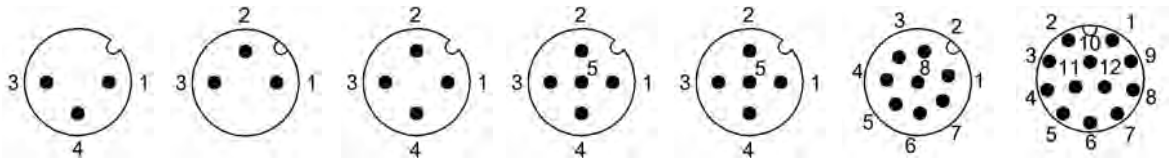
Technical Reference

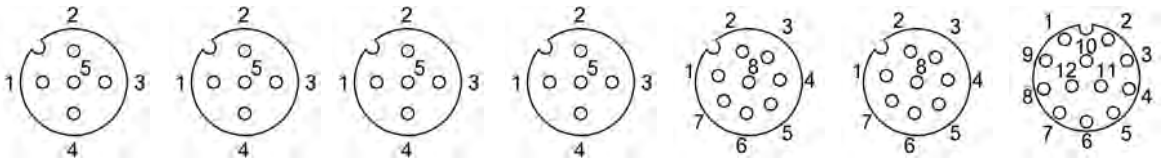
Cable face views and color codes
M5, M8, and M12 sensor cables



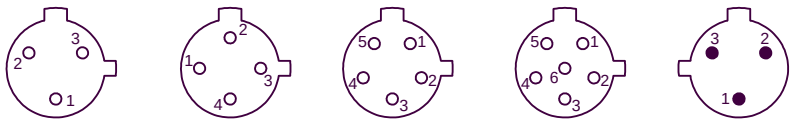
Size	M5	M5	M8	M8	M8	M8	M12	
Gender	Female	Female	Female	Female	Male	Male	Female	
Poles	3-wire (N/O)	4-wire	3-wire	4-wire	3-wire	4-wire	3-wire (N/O)	
Wire Code	DC	DC	DC	DC	DC	DC	DC	
1	BR	BR	BR	BR	BR	BR	BR	
2		WH		WH		WH		
3	BU	BU	BU	BU	BU	BU	BU	
4	BK	BK	BK	BK	BK	BK	BK	
5								
6								
7								
8								
9								
10								
11								
12								



Size	M12	M12	M12	M12	M12	M12	M12
Gender	Male	Male	Male	Male	Male	Male	Male
Poles	3-wire (N/O)	3-wire (N/C)	4-wire	4-wire + PE	5-wire	8-wire	12-wire
Wire Code	DC	DC	DC	DC	DC	DC	DC
1	BR	BR	BR	BR	BR	WH	BN
2		BK	WH	WH	WH	GN	BU
3	BU	BU	BU	BU	BU	YE	WH
4	BK		BK	BK	BK	GY	GN
5				GN/YE	GY	BN	PK
6						PK	YE
7						BU	BK
8						RD	GY
9							RD
10							VI
11							GY/PK
12							RD/BU



	Size	M12	M12	M12	M12	M12	M12	M12
	Gender	Female	Female	Female	Female	Female	Female	Female
	Poles	3-wire (N/C)	4-wire	4-wire + PE	5-wire	8-wire	8-wire	12-wire
	Wire Code	DC	DC	DC	DC	DC	Shielded to Nut	DC
	1	BR	BR	BR	BR	WH	WH	BN
	2	BK	WH	WH	WH	GN	BN	BU
	3	BU	BU	BU	BU	YE	GN	WH
	4		BK	BK	BK	GY	YE	GN
	5			GN/YE	GY	BN	GY	PK
	6					PK	PK	YE
	7					BU	BU	BK
	8					RD	RD	GY
	9							RD
	10							VI
	11							GY/PK
	12							RD/BU



Size	1/2" AC	1/2" AC	1/2" AC	1/2" AC	1/2" AC
Gender	Female	Female	Female	Female	Male
Poles	3-wire	4-wire	5-wire	6-wire	3-wire
Wire Code	Automotive	Automotive	Automotive	Automotive	Automotive
1	GN	RD/BK	RD/WH	RD/WH	GN
2	RD/BK	RD/WH	RD	RD	RD/BK
3	RD/WH	RD	GN	GN	RD/WH
4		GN	RD/YE	RD/YE	
5			RD/BK	RD/BK	
6				RD/BU	
7					
8					
9					
10					
11					
12					

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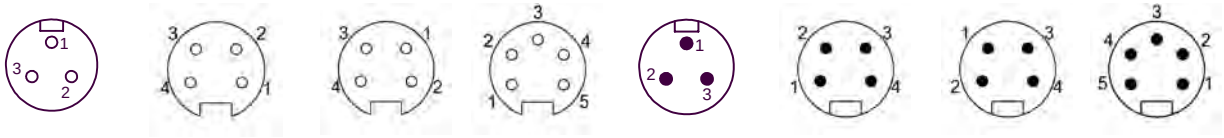
Technical Reference

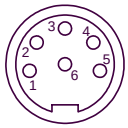
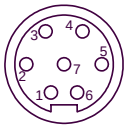
Cable face views and color codes
7/8" mini cables

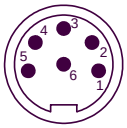
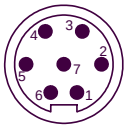
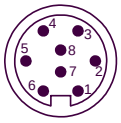
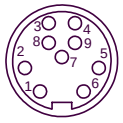


Size	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	
Gender	Female	Female	Female	Female	Male	Male	Male	Male	
Poles	3-wire	4-wire	4-wire	5-wire	3-wire	4-wire	4-wire	5-wire	
Wire Code	US AC	US AC	DC	DC	US AC	US AC	DC	DC	
1	GN	BK	BN	BK	GN	BK	BN	BK	
2	BK	WH	WH	BU	BK	WH	WH	BU	
3	WH	RD	BU	GN/YE	WH	RD	BU	GN/YE	
4		GN	BK	BN		GN	BK	BN	
5				WH				WH	
6									
7									
8									
9									
10									
11									
12									

Technical Reference

Cable face views and color codes
1" and 1 1/8" mini cables


	Size	1"	1"	1"	1"	1"	1"	1 1/8"	1 1/8"
	Gender	Female	Female	Female	Male	Male	Male	Female	Female
	Poles	6-wire	7-wire	8-wire	6-wire	7-wire	8-wire	9-wire	10-wire
	Wire Code	US AC	US AC	US AC	US AC	US AC	US AC	US AC	US AC
	1	OR	WH/BK	OR	OR	WH/BK	OR	OR	OR
	2	BU	BK	BU	BU	BK	BU	BU	BU
	3	BK	WH	WH/BK	BK	WH	WH/BK	RD/BK	WH/BK
	4	WH	RD	BK	WH	RD	BK	GN/BK	RD/BK
	5	RD	OR	WH	RD	OR	WH	WH	GN/BK
	6	GN/YE	BU	RD	GN/YE	BU	RD	RD	OR/BK
	7		GN/YE	GN/YE		GN/YE	GN/YE	GN/YE	RD
	8			RD/BK			RD/BK	WH/BK	GN/YE
	9							BK	BK
	10								WH
	11								
	12								

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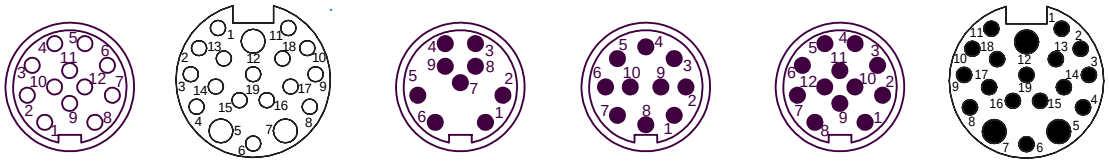
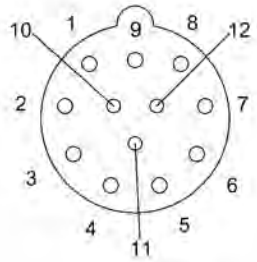
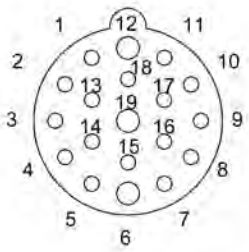
Technical Reference

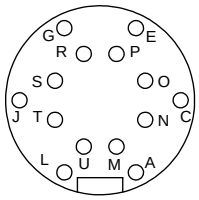
Cable face views and color codes
1 1/8" sensor cables



Size	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	
Gender	Female	Female	Male	Male	Male	Male	
Poles	12-wire	19-wire	9-wire	10-wire	12-wire	19-wire	
Wire Code	US AC	US AC	US AC	US AC	US AC	US AC	
1	OR	VI	OR	OR	OR	VI	
2	BU	RD	BU	BU	BU	RD	
3	WH/BK	GY	RD/BK	WH/BK	WH/BK	GY	
4	RD/BK	RD/BU	GN/BK	RD/BK	RD/BK	RD/BU	
5	GN/BK	BU	WH	GN/BK	GN/BK	BU	
6	OR/BK	GN	RD	OR/BK	OR/BK	GN	
7	BU/BK	BN	GN/YE	RD	BU/BK	BN	
8	BK/WH	WH/GN	WH/BK	GN/YE	BK/WH	WH/GN	
9	GN/YE	WH/YE	BK	BK	GN/YE	WH/YE	
10	RD	WH/GY		WH	RD	WH/GY	
11	WH	BK			WH	BK	
12	BK	GN/YE			BK	GN/YE	
13		YE/BN				YE/BN	
14		BN/GN				BN/GN	
15		WH				WH	
16		YE				YE	
17		PK				PK	
18		GY/BN				GY/BN	
19		GY/PK				GY/PK	







	Size	M23	M23	M16	
	Gender	Female	Female	Female	
	Poles	12-wire	19-wire	12-pole	
	Wire Code	---	---	---	
	1	WH	VT	**P**	WH
	2	GN	RD	**J**	GN
	3	YE	GY	**T**	YE
	4	GY	RD/BU	**S**	GY
	5	GY/PK	GN	**G**	PK
	6	RD/BU	BU	**R**	RD
	7	WH/GN	GY/PK	**E**	BK
	8	BN/GN	WH/GN	**O**	VT
	9	BU	WH/YE	**A**	BN
	10	BU	WH/GY	**M**	BN
	11	BN	BK	**L**	BU
	12	YE/GN	GN/YE	**U**	BU
	13		YE/BN		
	14		BN/GN		
	15		WH		
	16		YE		
	17		PK		
	18		GY/BN		
	19		BN		

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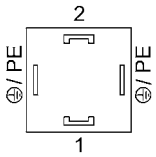
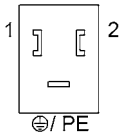
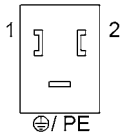
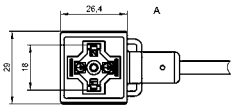
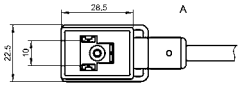
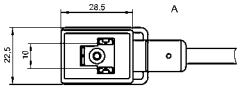
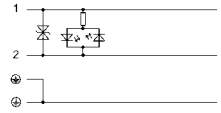
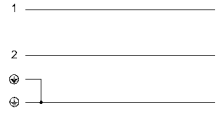
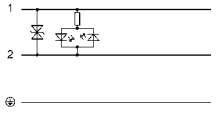
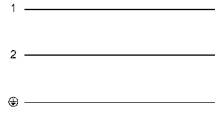
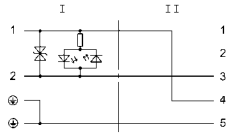
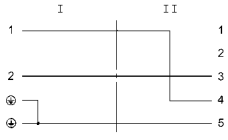
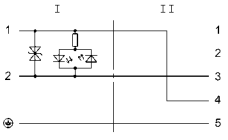
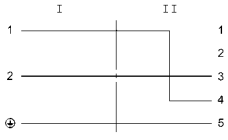
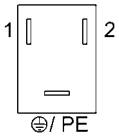


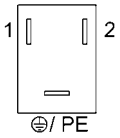


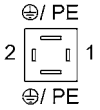


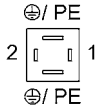
Head Code	VA04	VB03	VB23	
Size	DIN A	DIN B	DIN B	
Sex	Female	Female	Female	
Poles	3	3	3	
PE	GN/YE	GN/YE	GN/YE	
1	BN	BN	BN	
2	BU	BU	BU	
Cable Orientation				

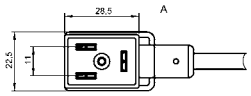
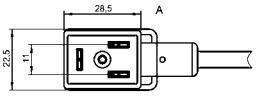
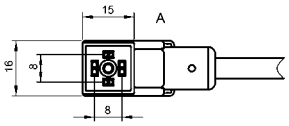
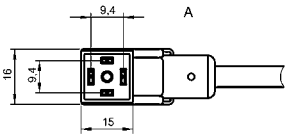
Type	DIN A, DIN C, IND C	DIN A, DIN C, IND C	DIN B, IND B	DIN B, IND B
Number of Wires	3-wire	3-wire	3-wire	3-wire
LED	PNP	No	PNP	No
Extra	Supressor Diode	No	Supressor Diode	No
Single-Ended Code	053	054	055	056
				
Double-Ended Code	664	665	666	667
				









	VB43	VB63	VC04	VC44
	IND B	IND B	DIN C	IND C
	Female	Female	Female	Female
	3	3	3	3
	GN/YE	GN/YE	GN/YE	GN/YE
	BN	BN	BN	BN
	BU	BU	BU	BU
				

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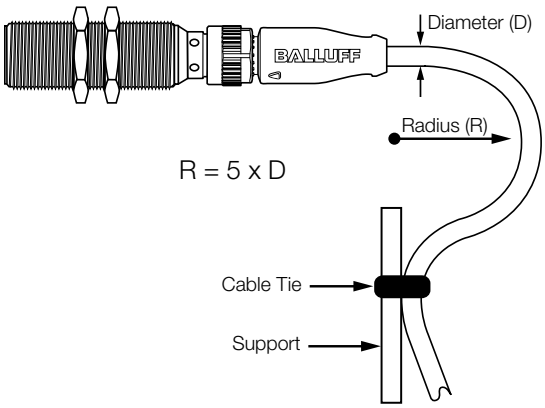
Mounting Suggestions for Cables on Sensors

To obtain the maximum cable life from a cable-out sensor, the following mounting guidelines should be followed. These guidelines apply to all types of cable jackets supplied. The bend radius values shown apply to all cable-out sensors and all pigtail (cable with moulded connector) sensors with potted in cables.

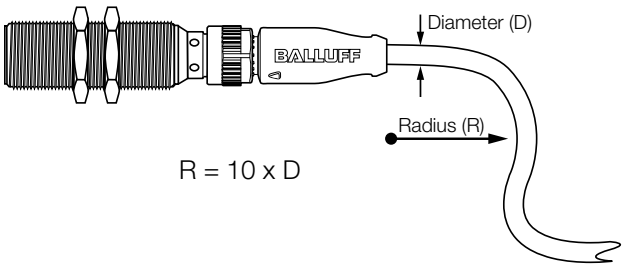
Fixed Installation

The minimum bend radius should be 5 times the cable diameter.



Flexing Installation

The minimum bend radius should be 10 times the cable diameter.



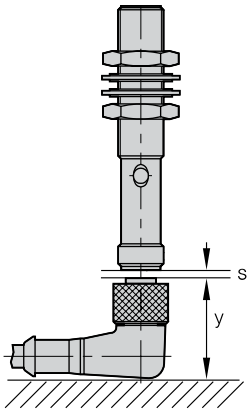
NOTE: Even when the minimum bend radius is observed, unintentional stress can be placed on the rear of the connector body at the cable exit. Proper cable loops should be maintained to prevent unnecessary stress to this area.

Tightening torques

For permissible tightening torque, see data sheets or sensor packaging.

Removal clearance

The removal clearance refers to the necessary clearance which must be allowed for when removing the connector without difficulty. It results from the connector height “y” plus a space “s”, which is determined mainly by the spatial conditions.



Relative Cable Performance

Resistance to:	PVC	PUR	TPE
Oxidation	E	E	O
Heat	G - E	E	O
Oil	F	O	O
Low Temperature Flexibility	P - G	E	O
Weather, Sun	G - E	E	O
Ozone	E	E	E
Abrasion	F - G	E	E
Electrical Properties	F - G	E	E
Flame	E	E	O
Nuclear Radiation	F	E	P
Water	G - E	G - E	E
Acid	G - E	E	E
Alkali	G - E	E	E
Gasoline	P	E	E
Benzol	P - F	E	E
Degreaser Solvents	P - F	E	E
Alcohol	G - E	E	E
Weld Slag	F	E	E

KEY:
P = Poor
F = Fair
G = Good
E = Excellent
O = Outstanding

Note: These relative ratings are based on average performance. Special selective compounding of the jacket can improve the performance.

NFPA 79 2007 Standard (12.2.7.3)

"Single conductor or multi-conductor Type AWM shall not be permitted."

Exact Text (page 79-34 of 2007 Edition)

12.2.7.3* Appliance Wiring Material. Single conductor or multi-conductor Type AWM shall not be permitted.

Exception: When part of a listed assembly suitable for the intended application, Type AWM shall be permissible.

Clarification of the Exception

To summarize from above; Recognized wire types are not permitted but Listed wire types are permitted. This exception states that AWM cable cannot be used unless:

A. The raw AWM rated cable is used as a component in another assembly that is UL Listed. An example of this would be an overmolded cordset that is UL listed.

or

B. It conforms to a specific list of UL listed raw cable types. These can be found in the table below taken from chapter 12 of the NFPA 79 document.

MTW	THWN	RHW-2	THHN	RHH
SJOW	SEOW	SJEOW	STOW	MI
TC PLTC	ITC	CM	CL2	
XHHW	THW	RHW	XHHW-2	SOOW

How do I find the UL information on the raw cable?

Information on the raw cable is usually printed on the cable jacket or can be found on the raw cable datasheet. For example, the raw cable used in a Balluff C04 AEL-00-VY-050M spells out the below information:

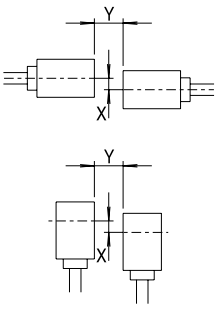
4/C 22AWG E41663 ЯU AWM2661 105°C 300V LL33361 CSA AWM I/II A/B 80°C 300V FT1

The "E41663 ЯU AWM2661" part of this number helps us find the detailed UL information by then using the UL website's certification search engine.

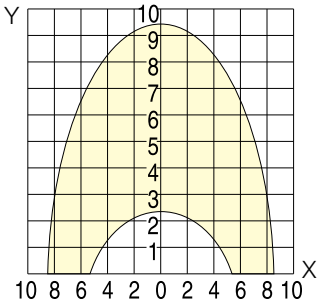
http://database.ul.com/cgi-bin/XYV/template/LIGenderT/1FRAME/index.html

Transmission Effects

- Distance of separation can affect the current capacity and operational functionality of the device. This range is demonstrated in the Y-axis of the diagrams on the right.
- Shift or offset can also affect the current capacity and operational functionality of the device. This distance is demonstrated in the X-axis of the diagrams on the right.
- Consult the device manual for exact X-axis and Y-axis values.

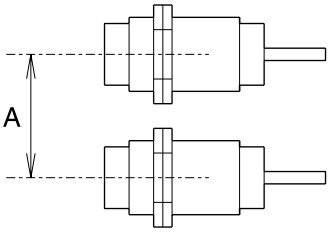


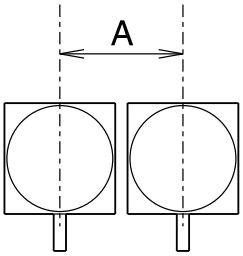
X: Center off-set
Y: Transmitting distance



Mutual Interference

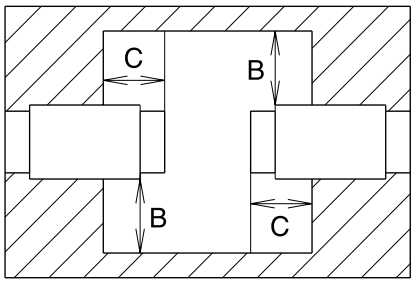
- Every non-contact connector requires a certain space between each base and/or remote mounted in parallel. This distance is represented in the A distance in the diagrams on the right as a minimum distance.
- Consult the device manual for exact A values.

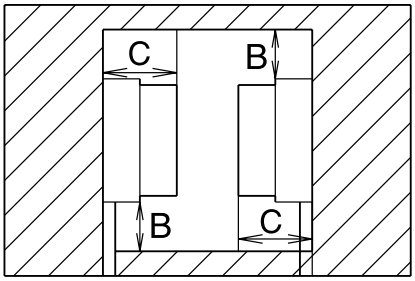




Mounting in Metal

- To avoid the influence of surrounding metal when the sensor is mounted in metal, there is a required clearance.
- Distance between the face fo the connector and the back metal is represented by distance C.
- Distance between the side of the connector and metal is represented by distance B.
- Consult the device manual for exact B and C values.





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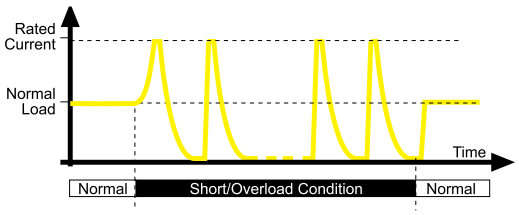
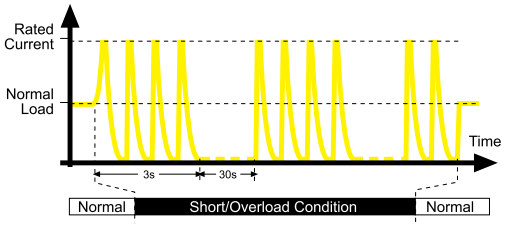
Output Short Circuit Protection

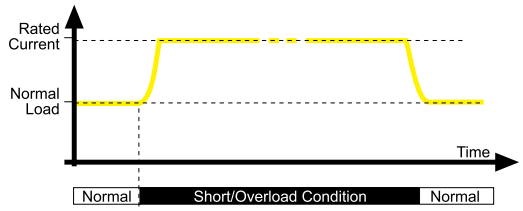
Hiccup mode overload protection*



Hiccup mode with shutdown overload protection*

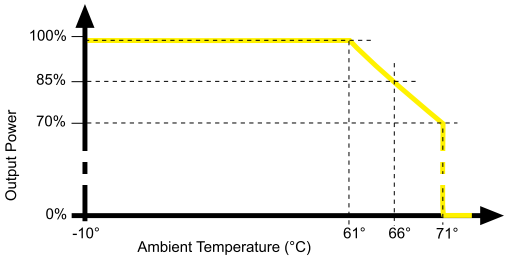


Current limited and fold forward overload protection*



*Note: Diagrams are for illustration purposes only. They do not reflect actual waveforms.

Temperature Derating

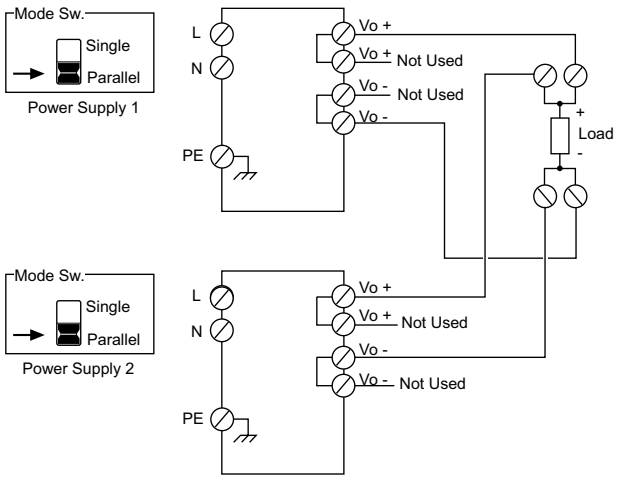


LED Definition

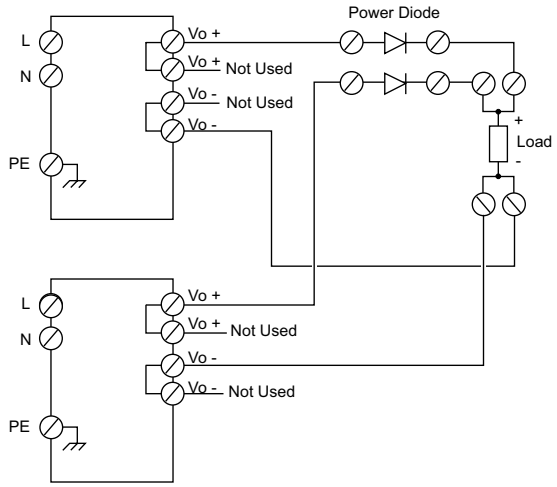
DC ON	DC LO	Possible Situation
off	off	AC power off, internal fuse blown, short circuit
on	off	Normal Operation
off	on	Output voltage < 19.2V
on	on	Power Supply Fault

Parallel Mode Wiring**

BAE0002, BAE0003 BAE0006, BAE0008, BAE0009, BAE003J



BAE0001, BAE0004, BAE0005, BAE0007, BAE000A



**Note: When wiring power supplies in parallel, it is recommended that the wire lengths be equal for all DC connections to the load.

HEARTBEAT™

Load level
Reversible in short term

Load level indicates the current load on the device. The display indicates the load without delay.

LED Definitions
Green: 0-80% load
Yellow: 81-100 load
Red (IP20 output): 101-150% load

Causes of Status Change
- Leakage current
- Additional devices installed
- Short circuit

Stress level
Reversible in medium term

Stress level indicates the physical and thermal loads. A change in the load status delays the "pulse" of the device slightly.

LED Definitions
Green: OK, long life expected
Yellow: Temperature and load levels high
Increased aging speed
Red (IP20 output): Lifetime is dramatically reduced

Causes of Status Change
- Raised environment temperature
- Poor input power quality
- High load level

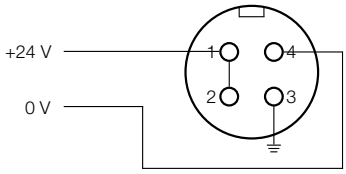
Lifetime
Irreversible in long term

Lifetime indicates the remaining useful life of the device and is based on the combination of all loads.

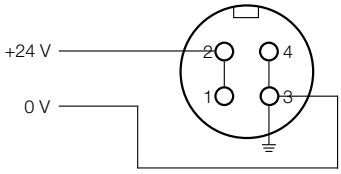
LED Definitions
Green: Long lifetime
Yellow: Replacement in next maintenace cycle
Red (IP20 output): Replace immediately

Causes of Status Change
- Aging of the power supply
- Long term stress level

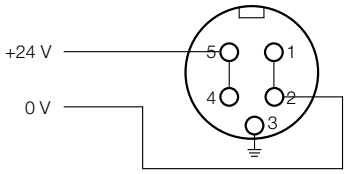
4-pole, Isolated Output, SELV and GND pin



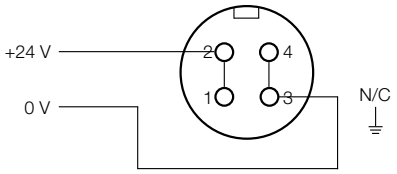
4-pole, Grounded Output, PELV



5-pole, Isolated Output, SELV and GND pin



4-pole, Isolated Output, SELV



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Part Number/Order Code Index

Balluff Part Number	Order Code	Location
BAE - Power Supplies		
BAE PS-XA-1W-12-015-001	BAE0036	5.4
BAE PS-XA-1W-12-025-002	BAE0039	5.5
BAE PS-XA-1W-12-050-002	BAE003E	5.5
BAE PS-XA-1W-12-100-003	BAE003H	5.6
BAE PS-XA-1W-24-007-001	BAE0001	5.4
BAE PS-XA-1W-24-012-002	BAE0004	5.5
BAE PS-XA-1W-24-025-002	BAE0005	5.5
BAE PS-XA-1W-24-038-003	BAE003J	5.6
BAE PS-XA-1W-24-038-601	BAE00EN	5.11
BAE PS-XA-1W-24-038-602	BAE00EP	5.11
BAE PS-XA-1W-24-038-603	BAE00ER	5.11
BAE PS-XA-1W-24-038-607	BAE00FW	5.11
BAE PS-XA-1W-24-050-003	BAE0006	5.6
BAE PS-XA-1W-24-050-013	BAE00EK	5.10
BAE PS-XA-1W-24-080-604	BAE00ET	5.11
BAE PS-XA-1W-24-080-605	BAE00FL	5.11
BAE PS-XA-1W-24-080-606	BAE00FY	5.11
BAE PS-XA-1W-24-100-004	BAE0002	5.7
BAE PS-XA-1W-24-100-014	BAE00EU	5.10
BAE PS-XA-1W-24-200-005	BAE0003	5.7
BAE PS-XA-1W-48-025-003	BAE003K	5.6
BAE PS-XA-1W-48-050-004	BAE003L	5.7
BAE PS-XA-1W-48-100-005	BAE003M	5.7
BAE PS-XA-3Y-24-050-009	BAE0007	5.8
BAE PS-XA-3Y-24-100-006	BAE0008	5.8
BAE PS-XA-3Y-24-200-007	BAE0009	5.9
BAE PS-XA-3Y-24-400-010	BAE003R	5.9
BAM - Mechanical Accessories		
BAM AD-XA-006-50-3	BAM01FH	5.4
BAM AD-XA-009-1U0-1	BAM01LM	3.74
BAM AD-XA-009-7U8-1	BAM01LP	3.74
BAM AD-XA-009-9U8-1	BAM01LN	3.74
BAM CS-XA-001-M8-C	BAM01C1	1.54, 3.74
BAM CS-XA-002-M12-A	BAM01C2	1.54, 3.74
BAM CS-XA-006-M12-1	BAM01LT	1.55, 3.74
BAM IA-XA-005-1X12-Y	BAM1KW	1.54
BAM IA-XA-004-4X6-Y	BAM01JU	1.54
BAM IA-XA-003-4X5-Y	BAM01JT	1.54
BAM FK-NI-DNT-01-C	BAM01H4	1.55
BAM FK-NI-PBS-01-C	BAM01J0	1.55
BAM PC-NI-009-4	BAM01RC	2.13
BAM TO-CC-001-A3-1,5/24,0	BAM00ZN	3.75
BAM TO-CC-001-M3-0,4/8,0	BAM00ZL	3.75
BAM TO-CC-001-M4-0,6/12,0	BAM00ZM	3.75
BAW - IO-Link Inductive Sensors		
BAW M18MI-BLC50B-S04G	BAW002F	2.26
BAW Z01AC-BLD50B-DP03	BAW003A	2.26
BCC - Cables, Connectors, and Cordsets		
BCC 0000-0000-00-000-PS54N2-10X	BCC0AC6	1.37
BCC 0000-0000-00-000-PS72N1-10X	BCC0ACA	1.45
BCC 0000-0000-00-001-EX43T2-10X	BCC0AEC	3.19
BCC 0000-0000-00-001-PX43T2-10X	BCC0AE9	3.19
BCC 0000-0000-00-001-VX43T2-10X	BCC0AE7	3.19
BCC 0000-0000-00-003-EX44T2-10X	BCC0AEE	3.19
BCC 0000-0000-00-003-EX44W6-10X	BCC0APC	3.42
BCC 0000-0000-00-003-PX44T2-10X	BCC0AEA	3.19
BCC 0000-0000-00-003-VX44T2-10X	BCC0AE8	3.19
BCC 0000-0000-00-003-VX44W6-10X	BCC0AEJ	3.42
BCC 0000-0000-00-030-PS85N4-10X	BCC0AEM	1.25
BCC 0000-0000-00-030-PS85N6-10X	BCC0AER	1.25
BCC 0000-0000-00-030-VS85N4-10X	BCC0AEL	1.25
BCC 0000-0000-00-030-VS85N5-10X	BCC0AEN	1.25
BCC 0000-0000-00-030-VS85N6-10X	BCC0AEP	1.25
BCC 0000-0000-00-063-VX45W6-10X	BCC0AEK	3.43
BCC 0000-0000-00-071-VX43W6-10X	BCC0AEF	3.42
BCC 0000-0000-00-072-VX44W6-10X	BCC0AEH	3.42
BCC 0000-0000-00-102-EM64N9-10X	BCC0CP9	1.19
BCC 0000-0000-00-102-EX64N9-10X	BCC0CN3	1.19
BCC 0000-0000-00-168-ES64N9-10X	BCC0AUJ	1.19
BCC 0000-0000-00-168-VS64N9-10X	BCC0AZ9	1.19
BCC A233-0000-10-000-41X3W8-000	BCC08AU	3.68
BCC A233-0000-20-000-41X3W8-000	BCC08AY	3.68
BCC A243-0000-10-000-41X3W8-000	BCC08AW	3.68
BCC A243-0000-20-000-41X3W8-000	BCC08AZ	3.68
BCC A313-0000-10-071-VX43W6-020	BCC099E	3.42
BCC A313-0000-10-071-VX43W6-050	BCC099F	3.42
BCC A313-0000-10-071-VX43W6-100	BCC099H	3.42
BCC A313-0000-10-071-VX43W6-150	BCC099J	3.42
BCC A313-0000-10-071-VX43W6-200	BCC099K	3.42
BCC A313-0000-20-071-VX43W6-020	BCC0ACJ	3.43
BCC A313-0000-20-071-VX43W6-050	BCC0ACK	3.43
BCC A313-0000-20-071-VX43W6-100	BCC0ACL	3.43
BCC A313-0000-20-071-VX43W6-150	BCC0ACM	3.43
BCC A313-0000-20-071-VX43W6-200	BCC0ACN	3.43
BCC A313-A313-30-345-VX43W6-006	BCC099T	3.44
BCC A313-A313-30-345-VX43W6-020	BCC099U	3.44
BCC A313-A313-30-345-VX43W6-050	BCC099W	3.44
BCC A313-A313-30-345-VX43W6-100	BCC099Y	3.44
BCC A313-A313-30-345-VX43W6-150	BCC099Z	3.44
BCC A313-A313-30-345-VX43W6-200	BCC09A0	3.44
BCC A313-A313-70-345-VX43W6-006	BCC09AN	3.44
BCC A313-A313-70-345-VX43W6-020	BCC09AP	3.44
BCC A313-A313-70-345-VX43W6-050	BCC09AR	3.44
BCC A313-A313-70-345-VX43W6-100	BCC09AT	3.44
BCC A313-A313-70-345-VX43W6-150	BCC09AU	3.44
BCC A313-A313-70-345-VX43W6-200	BCC09AW	3.44
BCC A313-A313-A313-T0021-000	BCC0AA5	3.46
BCC A313-A323-30-345-VX43W6-006	BCC09A7	3.45
BCC A313-A323-30-345-VX43W6-020	BCC09A8	3.45
BCC A313-A323-30-345-VX43W6-050	BCC09A9	3.45
BCC A313-A323-30-345-VX43W6-100	BCC09AA	3.45
BCC A313-A323-30-345-VX43W6-150	BCC09AC	3.45
BCC A313-A323-30-345-VX43W6-200	BCC09AE	3.45
BCC A313-A323-70-345-VX43W6-006	BCC09C4	3.45
BCC A313-A323-70-345-VX43W6-020	BCC09C5	3.45
BCC A313-A323-70-345-VX43W6-050	BCC09C6	3.45
BCC A313-A323-70-345-VX43W6-100	BCC09C7	3.45
BCC A313-A323-70-345-VX43W6-150	BCC09C8	3.45
BCC A313-A323-70-345-VX43W6-200	BCC09C9	3.45

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BCC A313-M413-3E-RA031-000	BCC0A7E	3.47
BCC A314-M414-3E-RA032-000	BCC0A7F	3.47
BCC A314-0000-10-003-EX44W6-020	BCC0A8C	3.42
BCC A314-0000-10-003-EX44W6-050	BCC0A8E	3.42
BCC A314-0000-10-003-EX44W6-100	BCC0A8F	3.42
BCC A314-0000-10-003-EX44W6-150	BCC0A8H	3.42
BCC A314-0000-10-003-EX44W6-200	BCC0A8J	3.42
BCC A314-0000-10-003-VX44W6-010	BCC0963	3.42
BCC A314-0000-10-003-VX44W6-020	BCC090W	3.42
BCC A314-0000-10-003-VX44W6-030	BCC0964	3.42
BCC A314-0000-10-003-VX44W6-050	BCC090Y	3.42
BCC A314-0000-10-003-VX44W6-060	BCC0965	3.42
BCC A314-0000-10-003-VX44W6-080	BCC0C98	3.42
BCC A314-0000-10-003-VX44W6-090	BCC0966	3.42
BCC A314-0000-10-003-VX44W6-100	BCC090Z	3.42
BCC A314-0000-10-003-VX44W6-120	BCC0967	3.42
BCC A314-0000-10-003-VX44W6-150	BCC0910	3.42
BCC A314-0000-10-003-VX44W6-200	BCC0911	3.42
BCC A314-0000-10-072-VX44W6-020	BCC092H	3.42
BCC A314-0000-10-072-VX44W6-050	BCC092J	3.42
BCC A314-0000-10-072-VX44W6-100	BCC092K	3.42
BCC A314-0000-10-072-VX44W6-150	BCC092L	3.42
BCC A314-0000-10-072-VX44W6-200	BCC092M	3.42
BCC A314-0000-20-003-EX44W6-020	BCC0A8K	3.43
BCC A314-0000-20-003-EX44W6-050	BCC0A8L	3.43
BCC A314-0000-20-003-EX44W6-100	BCC0A8M	3.43
BCC A314-0000-20-003-EX44W6-150	BCC0A8N	3.43
BCC A314-0000-20-003-EX44W6-200	BCC0A8P	3.43
BCC A314-0000-20-003-VX44W6-010	BCC0968	3.43
BCC A314-0000-20-003-VX44W6-020	BCC0917	3.43
BCC A314-0000-20-003-VX44W6-030	BCC0969	3.43
BCC A314-0000-20-003-VX44W6-050	BCC0918	3.43
BCC A314-0000-20-003-VX44W6-060	BCC096A	3.43
BCC A314-0000-20-003-VX44W6-090	BCC096C	3.43
BCC A314-0000-20-003-VX44W6-100	BCC0919	3.43
BCC A314-0000-20-003-VX44W6-120	BCC096E	3.43
BCC A314-0000-20-003-VX44W6-150	BCC091A	3.43
BCC A314-0000-20-003-VX44W6-200	BCC091C	3.43
BCC A314-0000-20-003-VX44W6-300	BCC0C7Y	3.43
BCC A314-0000-20-072-VX44W6-020	BCC092W	3.43
BCC A314-0000-20-072-VX44W6-050	BCC092Y	3.43
BCC A314-0000-20-072-VX44W6-100	BCC092Z	3.43
BCC A314-0000-20-072-VX44W6-150	BCC0930	3.43
BCC A314-0000-20-072-VX44W6-200	BCC0931	3.43
BCC A314-A314-30-304-EX44W6-006	BCC0A8R	3.44
BCC A314-A314-30-304-EX44W6-020	BCC0A8T	3.44
BCC A314-A314-30-304-EX44W6-030	BCC0C9A	3.44
BCC A314-A314-30-304-EX44W6-050	BCC0A8U	3.44
BCC A314-A314-30-304-EX44W6-060	BCC0AZL	3.44
BCC A314-A314-30-304-EX44W6-100	BCC0A8W	3.44
BCC A314-A314-30-304-EX44W6-150	BCC0A8Y	3.44
BCC A314-A314-30-304-EX44W6-200	BCC0A8Z	3.44
BCC A314-A314-30-304-VX44W6-006	BCC091L	3.44
BCC A314-A314-30-304-VX44W6-010	BCC0949	3.44
BCC A314-A314-30-304-VX44W6-020	BCC091M	3.44
BCC A314-A314-30-304-VX44W6-030	BCC094A	3.44
BCC A314-A314-30-304-VX44W6-040	BCC094C	3.44
BCC A314-A314-30-304-VX44W6-050	BCC091N	3.44
BCC A314-A314-30-304-VX44W6-060	BCC094E	3.44
BCC A314-A314-30-304-VX44W6-080	BCC094F	3.44
BCC A314-A314-30-304-VX44W6-090	BCC094H	3.44
BCC A314-A314-30-304-VX44W6-100	BCC091P	3.44
BCC A314-A314-30-304-VX44W6-120	BCC094J	3.44
BCC A314-A314-30-304-VX44W6-150	BCC091R	3.44
BCC A314-A314-30-304-VX44W6-200	BCC091T	3.44
BCC A314-A314-30-304-VX44W6-250	BCC0CE3	3.44
BCC A314-A314-30-304-VX44W6-300	BCC0CEE	3.44
BCC A314-A314-30-304-VX44W6-350	BCC0CE2	3.44
BCC A314-A314-30-304-VX44W6-400	BCC0CE1	3.44
BCC A314-A314-30-304-VX44W6-600	BCC0CE0	3.44
BCC A314-A314-30-346-VX44W6-006	BCC0937	3.44
BCC A314-A314-30-346-VX44W6-010	BCC07Y0	3.44
BCC A314-A314-30-346-VX44W6-020	BCC07YL	3.44
BCC A314-A314-30-346-VX44W6-030	BCC07YM	3.44
BCC A314-A314-30-346-VX44W6-040	BCC09K5	3.44
BCC A314-A314-30-346-VX44W6-050	BCC07YN	3.44
BCC A314-A314-30-346-VX44W6-060	BCC07YP	3.44
BCC A314-A314-30-346-VX44W6-080	BCC07YR	3.44
BCC A314-A314-30-346-VX44W6-090	BCC0C70	3.44
BCC A314-A314-30-346-VX44W6-100	BCC07YT	3.44
BCC A314-A314-30-346-VX44W6-120	BCC07YU	3.44
BCC A314-A314-30-346-VX44W6-150	BCC07YW	3.44
BCC A314-A314-30-346-VX44W6-180	BCC0CR3	3.44
BCC A314-A314-30-346-VX44W6-200	BCC0938	3.44
BCC A314-A314-30-346-VX44W6-250	BCC09K6	3.44
BCC A314-A314-30-346-VX44W6-300	BCC0C71	3.44
BCC A314-A314-30-346-VX44W6-350	BCC0CE5	3.44
BCC A314-A314-30-346-VX44W6-400	BCC0C72	3.44
BCC A314-A314-30-346-VX44W6-500	BCC09K7	3.44
BCC A314-A314-30-346-VX44W6-600	BCC0CE4	3.44
BCC A314-A314-A314-T0001-000	BCC071Y	3.46
BCC A314-A314-A314-T0022-000	BCC0AA6	3.46
BCC A314-A324-30-304-EX44W6-006	BCC0A90	3.45
BCC A314-A324-30-304-EX44W6-020	BCC0A91	3.45
BCC A314-A324-30-304-EX44W6-050	BCC0A92	3.45
BCC A314-A324-30-304-EX44W6-100	BCC0A93	3.45
BCC A314-A324-30-304-EX44W6-150	BCC0A94	3.45
BCC A314-A324-30-304-EX44W6-200	BCC0A95	3.45
BCC A314-A324-30-304-VX44W6-006	BCC0922	3.45
BCC A314-A324-30-304-VX44W6-010	BCC094K	3.45
BCC A314-A324-30-304-VX44W6-020	BCC0923	3.45
BCC A314-A324-30-304-VX44W6-030	BCC094L	3.45
BCC A314-A324-30-304-VX44W6-050	BCC0924	3.45
BCC A314-A324-30-304-VX44W6-060	BCC094M	3.45
BCC A314-A324-30-304-VX44W6-090	BCC094N	3.45
BCC A314-A324-30-304-VX44W6-100	BCC0925	3.45
BCC A314-A324-30-304-VX44W6-120	BCC094P	3.45
BCC A314-A324-30-304-VX44W6-150	BCC0926	3.45
BCC A314-A324-30-304-VX44W6-200	BCC0927	3.45
BCC A314-A324-30-346-VX44W6-006	BCC093J	3.45

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BCC A315-0000-20-030-VS85N6-150	BCC09WJ	1.25
BCC A315-0000-20-030-VS85N6-200	BCC09WK	1.25
BCC A315-0000-20-063-VX45W6-020	BCC0ACY	3.43
BCC A315-0000-20-063-VX45W6-050	BCC0ACZ	3.43
BCC A315-0000-20-063-VX45W6-100	BCC09K4	3.43
BCC A315-0000-20-063-VX45W6-150	BCC0AE0	3.43
BCC A315-0000-20-063-VX45W6-200	BCC0AE1	3.43
BCC A315-A315-30-330-PS85N4-003	BCC0C82	1.24
BCC A315-A315-30-330-PS85N4-006	BCC08PF	1.24
BCC A315-A315-30-330-PS85N4-010	BCC0959	1.24
BCC A315-A315-30-330-PS85N4-020	BCC095A	1.24
BCC A315-A315-30-330-PS85N4-030	BCC095C	1.24
BCC A315-A315-30-330-PS85N4-040	BCC095E	1.24
BCC A315-A315-30-330-PS85N4-050	BCC095F	1.24
BCC A315-A315-30-330-PS85N4-060	BCC095H	1.24
BCC A315-A315-30-330-PS85N4-070	BCC095J	1.24
BCC A315-A315-30-330-PS85N4-080	BCC095K	1.24
BCC A315-A315-30-330-PS85N4-090	BCC095L	1.24
BCC A315-A315-30-330-PS85N4-100	BCC095M	1.24
BCC A315-A315-30-330-PS85N4-120	BCC095N	1.24
BCC A315-A315-30-330-PS85N4-150	BCC095P	1.24
BCC A315-A315-30-330-PS85N4-200	BCC095T	1.24
BCC A315-A315-30-330-PS85N4-300	BCC095W	1.24
BCC A315-A315-30-330-PS85N6-006	BCC08Z5	1.25
BCC A315-A315-30-330-PS85N6-010	BCC08Z6	1.25
BCC A315-A315-30-330-PS85N6-020	BCC08Z7	1.25
BCC A315-A315-30-330-PS85N6-030	BCC08Z8	1.25
BCC A315-A315-30-330-PS85N6-040	BCC08Z9	1.25
BCC A315-A315-30-330-PS85N6-050	BCC08ZA	1.25
BCC A315-A315-30-330-PS85N6-060	BCC08ZC	1.25
BCC A315-A315-30-330-PS85N6-070	BCC08ZE	1.25
BCC A315-A315-30-330-PS85N6-080	BCC08ZF	1.25
BCC A315-A315-30-330-PS85N6-090	BCC08ZH	1.25
BCC A315-A315-30-330-PS85N6-100	BCC08ZJ	1.25
BCC A315-A315-30-330-PS85N6-120	BCC08ZK	1.25
BCC A315-A315-30-330-PS85N6-150	BCC08ZL	1.25
BCC A315-A315-30-330-PS85N6-200	BCC08ZM	1.25
BCC A315-A315-30-330-PS85N6-300	BCC08ZN	1.25
BCC A315-A315-30-330-VS85N4-006	BCC09TP	1.24
BCC A315-A315-30-330-VS85N4-010	BCC07YY	1.24
BCC A315-A315-30-330-VS85N4-020	BCC07YZ	1.24
BCC A315-A315-30-330-VS85N4-030	BCC07Z0	1.24
BCC A315-A315-30-330-VS85N4-040	BCC07Z1	1.24
BCC A315-A315-30-330-VS85N4-050	BCC07Z2	1.24
BCC A315-A315-30-330-VS85N4-060	BCC07Z3	1.24
BCC A315-A315-30-330-VS85N4-070	BCC07Z4	1.24
BCC A315-A315-30-330-VS85N4-080	BCC07Z5	1.24
BCC A315-A315-30-330-VS85N4-090	BCC07Z6	1.24
BCC A315-A315-30-330-VS85N4-100	BCC07Z7	1.24
BCC A315-A315-30-330-VS85N4-120	BCC07Z8	1.24
BCC A315-A315-30-330-VS85N4-150	BCC07Z9	1.24
BCC A315-A315-30-330-VS85N4-200	BCC07ZA	1.24
BCC A315-A315-30-330-VS85N4-300	BCC08K0	1.24
BCC A315-A315-30-330-VS85N5-006	BCC08U0	1.24
BCC A315-A315-30-330-VS85N5-010	BCC08U1	1.24
BCC A315-A315-30-330-VS85N5-020	BCC08U2	1.24
BCC A315-A315-30-330-VS85N5-030	BCC08U3	1.24
BCC A315-A315-30-330-VS85N5-040	BCC08U4	1.24
BCC A315-A315-30-330-VS85N5-050	BCC08U5	1.24
BCC A315-A315-30-330-VS85N5-060	BCC08U6	1.24
BCC A315-A315-30-330-VS85N5-070	BCC08U7	1.24
BCC A315-A315-30-330-VS85N5-080	BCC08U8	1.24
BCC A315-A315-30-330-VS85N5-090	BCC08U9	1.24
BCC A315-A315-30-330-VS85N5-100	BCC08UA	1.24
BCC A315-A315-30-330-VS85N5-120	BCC08UC	1.24
BCC A315-A315-30-330-VS85N5-150	BCC08UE	1.24
BCC A315-A315-30-330-VS85N5-200	BCC08UF	1.24
BCC A315-A315-30-330-VS85N5-300	BCC08UH	1.24
BCC A315-A315-30-330-VS85N6-006	BCC09YA	1.25
BCC A315-A315-30-330-VS85N6-010	BCC09YC	1.25
BCC A315-A315-30-330-VS85N6-020	BCC09YE	1.25
BCC A315-A315-30-330-VS85N6-030	BCC09YF	1.25
BCC A315-A315-30-330-VS85N6-040	BCC09YH	1.25
BCC A315-A315-30-330-VS85N6-050	BCC09YJ	1.25
BCC A315-A315-30-330-VS85N6-060	BCC09YK	1.25
BCC A315-A315-30-330-VS85N6-070	BCC09YL	1.25
BCC A315-A315-30-330-VS85N6-080	BCC09YM	1.25
BCC A315-A315-30-330-VS85N6-090	BCC09YN	1.25
BCC A315-A315-30-330-VS85N6-100	BCC09YP	1.25
BCC A315-A315-30-330-VS85N6-120	BCC09YR	1.25
BCC A315-A315-30-330-VS85N6-150	BCC09YT	1.25
BCC A315-A315-30-330-VS85N6-200	BCC09YU	1.25
BCC A315-A315-30-330-VS85N6-300	BCC09YW	1.25
BCC A315-A315-30-335-VX45W6-006	BCC09CZ	3.44
BCC A315-A315-30-335-VX45W6-020	BCC09E0	3.44
BCC A315-A315-30-335-VX45W6-050	BCC09E1	3.44
BCC A315-A315-30-335-VX45W6-100	BCC09E2	3.44
BCC A315-A315-30-335-VX45W6-150	BCC09E3	3.44
BCC A315-A315-30-335-VX45W6-200	BCC09E4	3.44
BCC A315-A315-A315-T0023-000	BCC0AA7	3.46
BCC A315-A325-30-330-PS85N4-006	BCC08PR	1.24
BCC A315-A325-30-330-PS85N4-010	BCC08PT	1.24
BCC A315-A325-30-330-PS85N4-020	BCC08PU	1.24
BCC A315-A325-30-330-PS85N4-030	BCC08PW	1.24
BCC A315-A325-30-330-PS85N4-050	BCC095Z	1.24
BCC A315-A325-30-330-PS85N4-060	BCC08PY	1.24
BCC A315-A325-30-330-PS85N4-090	BCC08PZ	1.24
BCC A315-A325-30-330-PS85N4-100	BCC08R0	1.24
BCC A315-A325-30-330-PS85N4-120	BCC08R1	1.24
BCC A315-A325-30-330-PS85N4-150	BCC08R2	1.24
BCC A315-A325-30-330-PS85N4-200	BCC08R3	1.24
BCC A315-A325-30-330-PS85N6-006	BCC0904	1.25
BCC A315-A325-30-330-PS85N6-010	BCC0905	1.25
BCC A315-A325-30-330-PS85N6-020	BCC0906	1.25
BCC A315-A325-30-330-PS85N6-030	BCC0907	1.25
BCC A315-A325-30-330-PS85N6-060	BCC0908	1.25
BCC A315-A325-30-330-PS85N6-090	BCC0909	1.25
BCC A315-A325-30-330-PS85N6-100	BCC090A	1.25
BCC A315-A325-30-330-PS85N6-120	BCC090C	1.25

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BCC A325-A315-30-330-VS85N6-200	BCC09ZM	1.25
BCC A325-A315-30-335-VX45W6-006	BCC09E5	3.44
BCC A325-A315-30-335-VX45W6-020	BCC09E6	3.44
BCC A325-A315-30-335-VX45W6-050	BCC09E7	3.44
BCC A325-A315-30-335-VX45W6-100	BCC09E8	3.44
BCC A325-A315-30-335-VX45W6-150	BCC09E9	3.44
BCC A325-A315-30-335-VX45W6-200	BCC09EA	3.44
BCC A325-A325-30-330-PS85N4-006	BCC08R4	1.24
BCC A325-A325-30-330-PS85N4-010	BCC08R5	1.24
BCC A325-A325-30-330-PS85N4-020	BCC08R6	1.24
BCC A325-A325-30-330-PS85N4-030	BCC08R7	1.24
BCC A325-A325-30-330-PS85N4-060	BCC08R8	1.24
BCC A325-A325-30-330-PS85N4-090	BCC08R9	1.24
BCC A325-A325-30-330-PS85N4-100	BCC08RA	1.24
BCC A325-A325-30-330-PS85N4-120	BCC08RC	1.24
BCC A325-A325-30-330-PS85N4-150	BCC08RE	1.24
BCC A325-A325-30-330-PS85N4-200	BCC08RF	1.24
BCC A325-A325-30-330-PS85N6-006	BCC090H	1.25
BCC A325-A325-30-330-PS85N6-010	BCC090J	1.25
BCC A325-A325-30-330-PS85N6-020	BCC090K	1.25
BCC A325-A325-30-330-PS85N6-030	BCC090L	1.25
BCC A325-A325-30-330-PS85N6-060	BCC090M	1.25
BCC A325-A325-30-330-PS85N6-090	BCC090N	1.25
BCC A325-A325-30-330-PS85N6-100	BCC090P	1.25
BCC A325-A325-30-330-PS85N6-120	BCC090R	1.25
BCC A325-A325-30-330-PS85N6-150	BCC090T	1.25
BCC A325-A325-30-330-PS85N6-200	BCC090U	1.25
BCC A325-A325-30-330-VS85N4-006	BCC09UH	1.24
BCC A325-A325-30-330-VS85N4-010	BCC09UJ	1.24
BCC A325-A325-30-330-VS85N4-020	BCC09UK	1.24
BCC A325-A325-30-330-VS85N4-030	BCC09UL	1.24
BCC A325-A325-30-330-VS85N4-060	BCC09UM	1.24
BCC A325-A325-30-330-VS85N4-090	BCC09UN	1.24
BCC A325-A325-30-330-VS85N4-100	BCC09UP	1.24
BCC A325-A325-30-330-VS85N4-120	BCC09UR	1.24
BCC A325-A325-30-330-VS85N4-150	BCC09UT	1.24
BCC A325-A325-30-330-VS85N4-200	BCC09UU	1.24
BCC A325-A325-30-330-VS85N5-006	BCC08W9	1.24
BCC A325-A325-30-330-VS85N5-010	BCC08WA	1.24
BCC A325-A325-30-330-VS85N5-020	BCC08WC	1.24
BCC A325-A325-30-330-VS85N5-030	BCC08WE	1.24
BCC A325-A325-30-330-VS85N5-050	BCC0958	1.24
BCC A325-A325-30-330-VS85N5-060	BCC08WF	1.24
BCC A325-A325-30-330-VS85N5-090	BCC08WH	1.24
BCC A325-A325-30-330-VS85N5-100	BCC08WJ	1.24
BCC A325-A325-30-330-VS85N5-120	BCC08WK	1.24
BCC A325-A325-30-330-VS85N5-150	BCC08WL	1.24
BCC A325-A325-30-330-VS85N5-200	BCC08WM	1.24
BCC A325-A325-30-330-VS85N6-006	BCC09ZN	1.25
BCC A325-A325-30-330-VS85N6-010	BCC09ZP	1.25
BCC A325-A325-30-330-VS85N6-020	BCC09ZR	1.25
BCC A325-A325-30-330-VS85N6-030	BCC09ZT	1.25
BCC A325-A325-30-330-VS85N6-060	BCC09ZU	1.25
BCC A325-A325-30-330-VS85N6-090	BCC09ZW	1.25
BCC A325-A325-30-330-VS85N6-100	BCC09ZY	1.25
BCC A325-A325-30-330-VS85N6-120	BCC09ZZ	1.25
BCC A325-A325-30-330-VS85N6-150	BCC0A00	1.25
BCC A325-A325-30-330-VS85N6-200	BCC0A01	1.25
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BCC A325-A325-30-335-VX45W6-200	BCC09ET	3.45
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BCC A335-0000-20-000-51X5A5-000	BCC070J	3.69
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BCC A335-0000-20-000-71X5A5-000	BCC070L	3.69
BCC A335-0000-20-000-81X5A5-000	BCC0ATF	3.69
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BCC A354-0000-20-RN059-006	BCC0CU9	3.59
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BCC M323-M323-30-300-PX43T2-050	BCC0576	3.23
BCC M323-M323-30-300-VX43T2-010	BCC0577	3.23
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BCC M323-M323-30-602-PX43T2-003	BCC0579	3.23
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BCC M323-M413-3E-602-PX43T2-020	BCC058F	3.22
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BCC M323-M423-3E-602-EX43T2-010	BCC0592	3.23
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BCC M323-M423-3E-602-PX43T2-006	BCC0594	3.23
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BCC M414-M414-6D-331-PS54T2-100	BCC04K3	1.37
BCC M414-M414-6D-331-PS54T2-150	BCC04ZH	1.37
BCC M414-M414-6D-331-PS54T2-200	BCC04K4	1.37
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BCC M414-M414-6D-338-VS64N9-750	BCC0CFZ	1.18
BCC M414-M414-6D-338-VS64N9-900	BCC0CH1	1.18
BCC M414-M414-6D-366-EM64N9-100	BCC0CPA	1.18
BCC M414-M414-6D-366-EM64N9-200	BCC0CPC	1.18
BCC M414-M414-6D-366-EM64N9-300	BCC0CPE	1.18
BCC M414-M414-6D-366-EM64N9-400	BCC0CPF	1.18
BCC M414-M414-6D-366-EM64N9-500	BCC0CPH	1.18
BCC M414-M414-6D-366-EM64N9-600	BCC0CPJ	1.18
BCC M414-M414-6D-366-EX64N9-003	BCC0CLU	1.18
BCC M414-M414-6D-366-EX64N9-006	BCC0CLW	1.18
BCC M414-M414-6D-366-EX64N9-010	BCC0CLY	1.18

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BCC M415-0000-1A-007-VX43T2-100	BCC05HL	3.24
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BCC M415-0000-1A-017-PX0534-020	BCC08FE	3.30
BCC M415-0000-1A-017-PX0534-030	BCC098E	3.30
BCC M415-0000-1A-017-PX0534-050	BCC098C	3.30
BCC M415-0000-1A-017-PX0534-100	BCC0860	3.30
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BCC M415-0000-1B-031-PS72N1-100	BCC0710	1.44
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BCC M415-0000-2A-034-PX0534-100	BCC08JA	3.23
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BCC M415-0000-2B-R02	BCC0719	1.45
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BCC M415-M313-3F-300-EX43T2-030	BCC05JL	3.28
BCC M415-M313-3F-300-EX43T2-050	BCC05JM	3.28
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BCC M415-M313-3F-300-PX43T2-006	BCC05JP	3.28
BCC M415-M313-3F-300-PX43T2-010	BCC05JR	3.28
BCC M415-M313-3F-300-PX43T2-015	BCC05JT	3.28
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BCC M415-M314-3F-304-PX44T2-015	BCC05KA	3.28
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BCC M425-0000-1A-006-EX43T2-100	BCC05UH	3.24
BCC M425-0000-1A-006-PX43T2-050	BCC05UJ	3.24
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BCC M425-0000-1A-006-VX43T2-050	BCC05UL	3.24
BCC M425-0000-1A-006-VX43T2-100	BCC05UM	3.24
BCC M425-0000-1A-007-EX43T2-020	BCC05UN	3.24
BCC M425-0000-1A-007-EX43T2-050	BCC05UP	3.24
BCC M425-0000-1A-007-EX43T2-100	BCC05UR	3.24
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BCC M425-0000-1A-007-VX43T2-020	BCC05UU	3.24
BCC M425-0000-1A-007-VX43T2-050	BCC05UW	3.24
BCC M425-0000-1A-007-VX43T2-100	BCC05UY	3.24
BCC M425-0000-1A-008-EX44T2-020	BCC05UZ	3.24
BCC M425-0000-1A-008-EX44T2-050	BCC05W0	3.24
BCC M425-0000-1A-008-EX44T2-100	BCC05W1	3.24
BCC M425-0000-1A-008-EX44T2-150	BCC05W2	3.24
BCC M425-0000-1A-008-PX44T2-020	BCC05W3	3.24
BCC M425-0000-1A-008-PX44T2-050	BCC05W4	3.24
BCC M425-0000-1A-008-PX44T2-100	BCC05W5	3.24
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BCC M425-0000-1A-008-VX44T2-050	BCC05W7	3.24
BCC M425-0000-1A-008-VX44T2-100	BCC05W8	3.24
BCC M425-0000-1A-008-VX44T2-150	BCC0AWE	3.24
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BCC M425-0000-1A-009-VX44T2-050	BCC05WH	3.24
BCC M425-0000-1A-009-VX44T2-100	BCC05WJ	3.24
BCC M425-0000-1A-010-EX44T2-050	BCC05WK	3.24
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BCC M425-0000-1A-014-VS8434-100	BCC036W	3.32
BCC M425-0000-1A-016-PS0525-050	BCC0AT1	3.32
BCC M425-0000-1A-016-PS0525-100	BCC0AT2	3.32
BCC M425-0000-1A-017-PX0534-020	BCC09H7	3.30
BCC M425-0000-1A-017-PX0534-050	BCC08FC	3.30
BCC M425-0000-1A-017-PX0534-100	BCC08FA	3.30
BCC M425-0000-1A-017-VX8534-050	BCC0AT7	3.30
BCC M425-0000-1A-017-VX8534-150	BCC083H	3.30
BCC M425-0000-1A-034-PX0534-020	BCC08F9	3.30
BCC M425-0000-1A-034-PX0534-050	BCC08F8	3.30
BCC M425-0000-1A-034-PX0534-100	BCC08F7	3.30
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BCC M425-0000-1A-036-PS0334-100	BCC031J	3.32
BCC M425-0000-1A-036-PS0334-150	BCC083A	3.32
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BCC M425-M324-3F-606-PX44T2-010	BCC05Z5	3.29
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BCC M453-0000-2A-RN052-006	BCC0CWF	3.57
BCC M453-0000-2A-RN052-020	BCC0CWH	3.57
BCC M453-0000-2A-RN058-006	BCC0CWJ	3.57
BCC M453-0000-2A-RN058-020	BCC0CWK	3.57
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BCC M454-0000-1A-RN053-006	BCC0CWL	3.57
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BCC M454-0000-2A-RN060-020	BCC0CZ5	3.57
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BCC M455-0000-1A-RM071-006	BCC0CWU	3.57
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BCC M455-0000-1A-RN064-020	BCC0CYM	3.57
BCC M455-0000-1B-RN038-020	BCC0A7T	1.45
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BCC M475-0000-2A-000-01X575-000	BCC086A	3.67
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BCC M62C-0000-10-065-PX0BP4-020	BCC06KT	3.55
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BCC M62C-0000-10-065-PX0BP4-100	BCC06KW	3.55
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BCC M65C-0000-D0-RM078-006	BCC0CTU	3.56
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BCC S415-0000-1A-003-VX8434-250	BCC06MA	3.34
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BCC S415-0000-1A-003-VX8434-350	BCC06ME	3.34
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BCC S415-S414-3A-304-VX44T2-030	BCC0CH8	3.34
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BCC S415-S414-3A-606-VX44T2-015	BCC0CHL	3.34
BCC S415-S414-3A-606-VX44T2-020	BCC0CHK	3.34
BCC S415-S414-3A-606-VX44T2-030	BCC0CHJ	3.34
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BCC VB03-M413-3E-666-VX8350-015	BCC066L	3.73
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BCC VB03-M423-3E-666-PX0350-015	BCC068N	3.73
BCC VB03-M423-3E-666-PX0350-020	BCC068P	3.73
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BCC VB03-M423-3E-666-PX0350-050	BCC068T	3.73
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BCC VB43-M413-3E-667-PX0350-010	BCC0662	3.73
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BCC VB43-M423-3E-666-PX0350-015	BCC0696	3.73
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BCC VB43-M423-3E-666-PX0350-030	BCC0698	3.73
BCC VB43-M423-3E-666-PX0350-050	BCC0699	3.73
BCC VB43-M423-3E-666-VX8350-003	BCC06C5	3.73
BCC VB43-M423-3E-666-VX8350-006	BCC06C6	3.73
BCC VB43-M423-3E-666-VX8350-010	BCC06C7	3.73
BCC VB43-M423-3E-666-VX8350-015	BCC06C8	3.73
BCC VB43-M423-3E-666-VX8350-020	BCC06C9	3.73
BCC VB43-M423-3E-666-VX8350-030	BCC06CA	3.73
BCC VB43-M423-3E-666-VX8350-050	BCC06CC	3.73
BCC VB43-M423-3E-667-PX0350-003	BCC06A4	3.73
BCC VB43-M423-3E-667-PX0350-006	BCC06A5	3.73
BCC VB43-M423-3E-667-PX0350-010	BCC06A6	3.73
BCC VB43-M423-3E-667-PX0350-015	BCC06A7	3.73
BCC VB43-M423-3E-667-PX0350-020	BCC06A8	3.73
BCC VB43-M423-3E-667-PX0350-030	BCC06A9	3.73
BCC VB43-M423-3E-667-PX0350-050	BCC06AA	3.73
BCC VB43-M423-3E-667-VX8350-003	BCC06E6	3.73
BCC VB43-M423-3E-667-VX8350-006	BCC06E7	3.73
BCC VB43-M423-3E-667-VX8350-010	BCC06E8	3.73
BCC VB43-M423-3E-667-VX8350-015	BCC06E9	3.73
BCC VB43-M423-3E-667-VX8350-020	BCC06EA	3.73
BCC VB43-M423-3E-667-VX8350-030	BCC06EC	3.73
BCC VB43-M423-3E-667-VX8350-050	BCC06EE	3.73
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BCC VB63-0000-10-055-PX0350-050	BCC03YR	3.73
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BCC VB63-0000-10-055-VX8350-020	BCC0408	3.73
BCC VB63-0000-10-055-VX8350-050	BCC0409	3.73
BCC VB63-0000-10-055-VX8350-100	BCC040A	3.73
BCC VB63-0000-10-056-PX0350-020	BCC03Z5	3.73
BCC VB63-0000-10-056-PX0350-050	BCC03Z6	3.73
BCC VB63-0000-10-056-PX0350-100	BCC03Z7	3.73
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BCC VB63-0000-10-056-VX8350-100	BCC040T	3.73
BCC VB63-M413-3E-666-PX0350-003	BCC0656	3.73
BCC VB63-M413-3E-666-PX0350-006	BCC0657	3.73
BCC VB63-M413-3E-666-PX0350-010	BCC0658	3.73
BCC VB63-M413-3E-666-PX0350-015	BCC0659	3.73
BCC VB63-M413-3E-666-PX0350-020	BCC065A	3.73
BCC VB63-M413-3E-666-PX0350-030	BCC065C	3.73
BCC VB63-M413-3E-666-PX0350-050	BCC065E	3.73
BCC VB63-M413-3E-666-VX8350-003	BCC0678	3.73
BCC VB63-M413-3E-666-VX8350-006	BCC0679	3.73
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BCC VB63-M413-3E-667-PX0350-006	BCC0668	3.73
BCC VB63-M413-3E-667-PX0350-010	BCC0669	3.73
BCC VB63-M413-3E-667-PX0350-015	BCC066A	3.73
BCC VB63-M413-3E-667-PX0350-020	BCC066C	3.73
BCC VB63-M413-3E-667-PX0350-030	BCC066E	3.73
BCC VB63-M413-3E-667-PX0350-050	BCC066F	3.73
BCC VB63-M413-3E-667-VX8350-003	BCC0689	3.73
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BCC VB63-M423-3E-666-PX0350-010	BCC069E	3.73
BCC VB63-M423-3E-666-PX0350-015	BCC069F	3.73
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BCC VB63-M423-3E-666-VX8350-015	BCC06CJ	3.73
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BCC VB63-M423-3E-667-PX0350-010	BCC06AF	3.73
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BCC VB63-M423-3E-667-VX8350-015	BCC06EK	3.73
BCC VB63-M423-3E-667-VX8350-020	BCC06EL	3.73
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BCC VC04-0000-10-054-PX0350-020	BCC04N5	3.73
BCC VC04-0000-10-054-PX0350-050	BCC04N6	3.73
BCC VC04-0000-10-054-PX0350-100	BCC04N7	3.73
BCC VC04-0000-10-054-VX8350-020	BCC04N8	3.73
BCC VC04-0000-10-054-VX8350-050	BCC04N9	3.73
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BCC VC04-M413-3E-664-PX0350-006	BCC04NE	3.73
BCC VC04-M413-3E-664-PX0350-010	BCC04NF	3.73
BCC VC04-M413-3E-664-PX0350-015	BCC04NH	3.73
BCC VC04-M413-3E-664-PX0350-020	BCC04NJ	3.73
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BCC VC04-M413-3E-665-PX0350-010	BCC04P0	3.73
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BCC VC04-M423-3E-664-VX8350-050	BCC04PY	3.73
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BCC VC04-M423-3E-665-PX0350-010	BCC04R1	3.73
BCC VC04-M423-3E-665-PX0350-015	BCC04R2	3.73
BCC VC04-M423-3E-665-PX0350-020	BCC04R3	3.73
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BCC VC04-M423-3E-665-VX8350-003	BCC04R6	3.73
BCC VC04-M423-3E-665-VX8350-006	BCC04R7	3.73
BCC VC04-M423-3E-665-VX8350-010	BCC04R8	3.73
BCC VC04-M423-3E-665-VX8350-015	BCC04R9	3.73
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BKS-S115-PU-05	BCC00YF	4.19
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SmartLevel
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Photoelectric Sensors
Laser Sensors

Fluid Detection

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Pressure Sensors
Capacitive Sensors
Fluid Level Sensors

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IP67 Industrial Power Supplies
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