

IO-Link Distributed Modular I/O

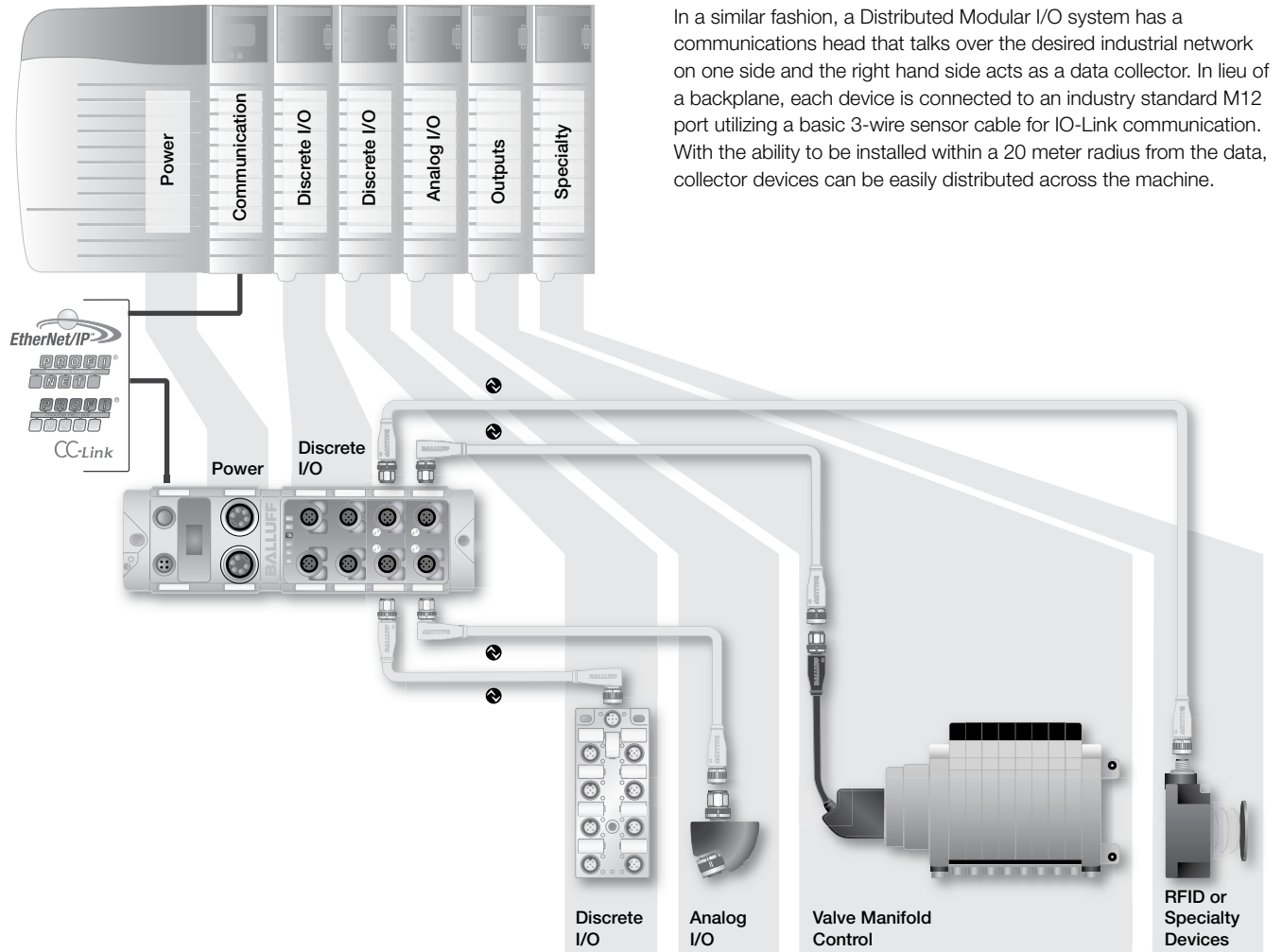
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IO-Link

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.

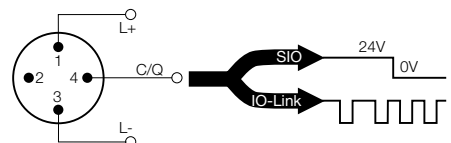
The backplane of Distributed Modular I/O = IO-Link

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

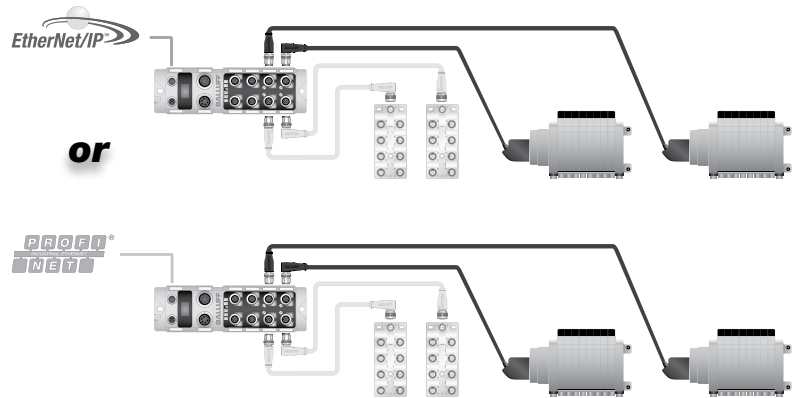


IO-Link

Advantages of Distributed Modular I/O

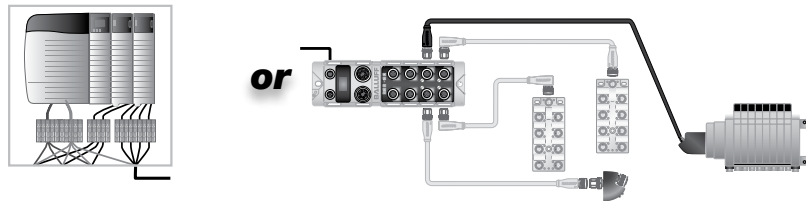
Simplify Controls Quotation Process

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



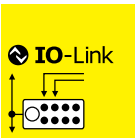
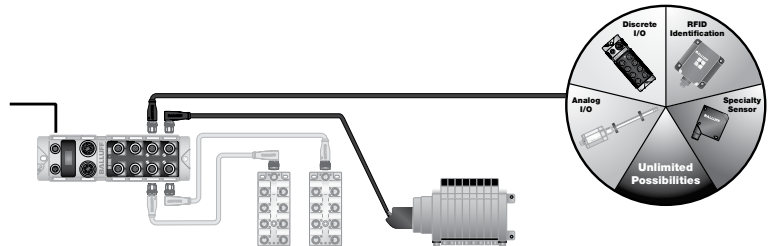
Reduce Total Cost per Point

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



Maximize Spares

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

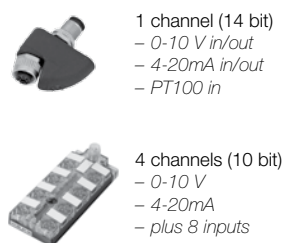


Types of Distributed Modular I/O devices

Discrete I/O



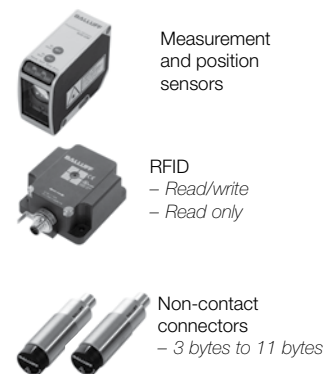
Analog I/O




Valve Manifold Control



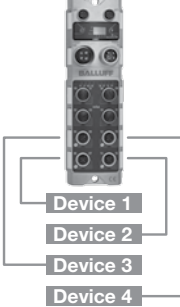
Specialty Devices and RFID



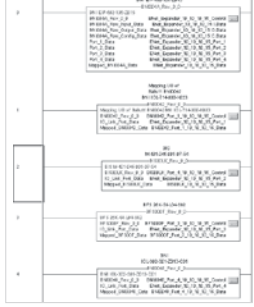
While hardware selection is important to the success of a project, if the hardware is not easily integrated into the engineering software, any benefits gained could be lost. However, Distributed Modular I/O is easily integrated into typical engineering software with an easy three step process. Below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



Step 1
Select hardware

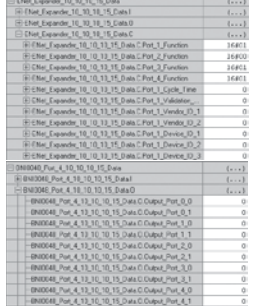



Step 2
Import add on instructions (AOI)



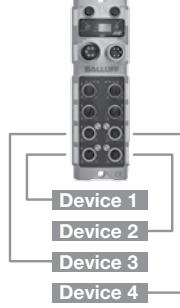
www.balluff.com/AOI

Step 3
Create user defined tags (UDTs)

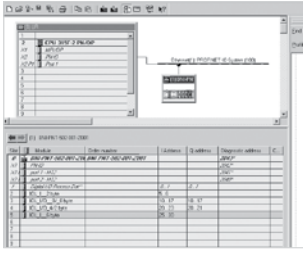




Step 1
Select hardware



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

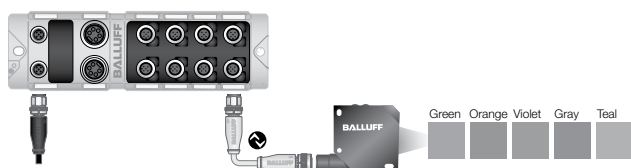
Address	Symbol	Display format	Status value
IB 5		DEC	
IB 6		DEC	
IB 10		DEC	
IB 11		DEC	
QB 10		DEC	
QB 11		DEC	
QV 20		HEX	
QW 20		HEX	
QV 25		HEX	

Device parameterization and configuration

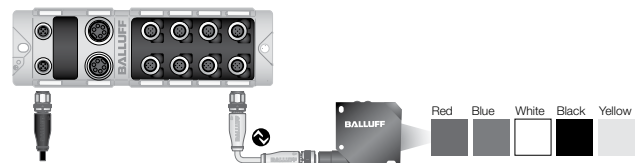
There are multiple advantages to device parameterization. The two major advantages are the ability to quickly swap out a failed device and the ability to reconfigure a device for a recipe or production change on the fly. The controller stores the necessary data for each setup and, when needed, it sends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

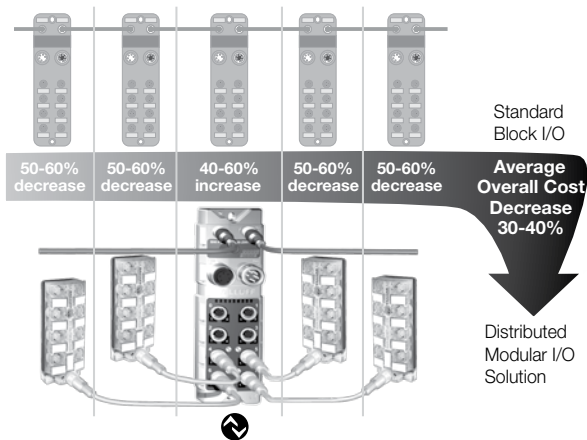
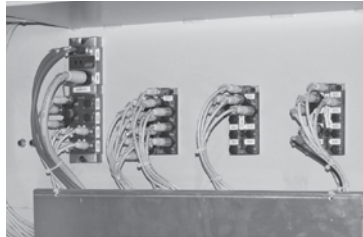


IO-Link

Distributed Modular I/O applications

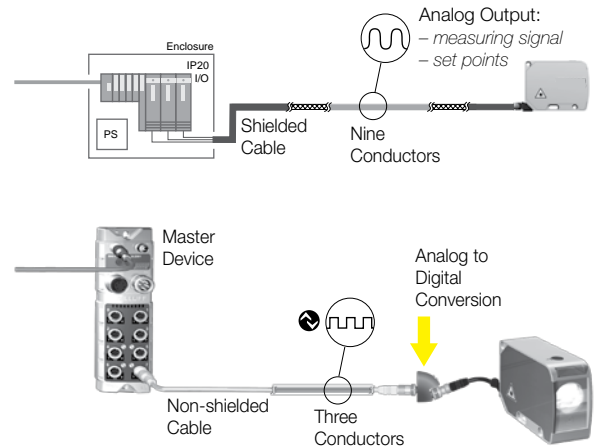
Discrete I/O Savings

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



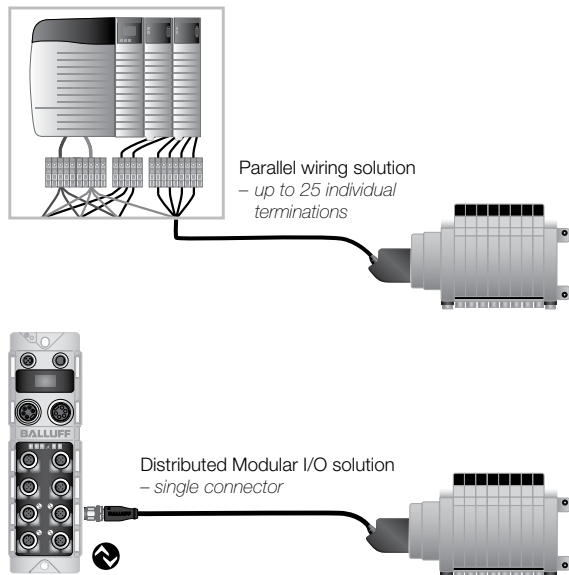
Analog I/O Savings

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



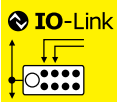
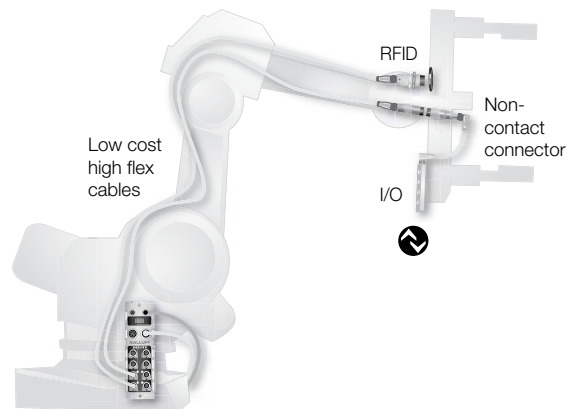
Valve Manifold Control

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



Quick Tool Change

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

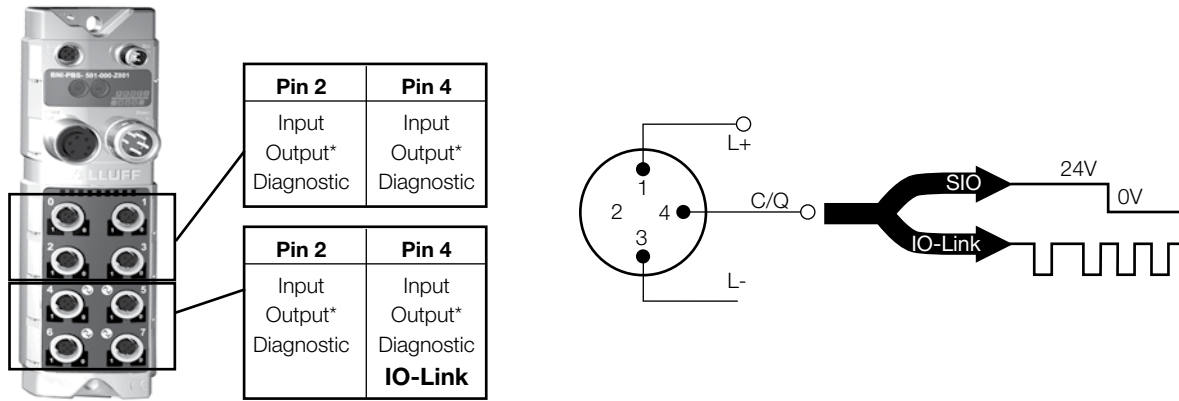


IO-Link

Master blocks

Flexible IO-Link Master Blocks

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

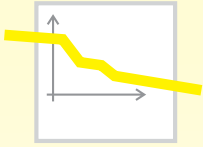


*Only available in configurable versions



Network Protocol	EtherNet/IP	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 BNI EIP-502-105-Z015	BNI005A* BNI DNT-502-100-Z001*	BNI004U BNI PNT-502-105-Z015	BNI003K BNI PBS-502-001-Z001	
8 IO-Link / 8 Configurable	BNI006A* BNI EIP-508-105-Z015		BNI005H* BNI PNT-508-105-Z015		

*Consult factory for availability



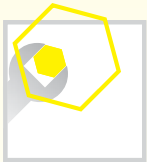
Reduce Costs

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



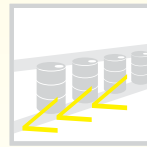
Reduce Engineering and Commissioning

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



Reduce Maintenance

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



Increase Uptime

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



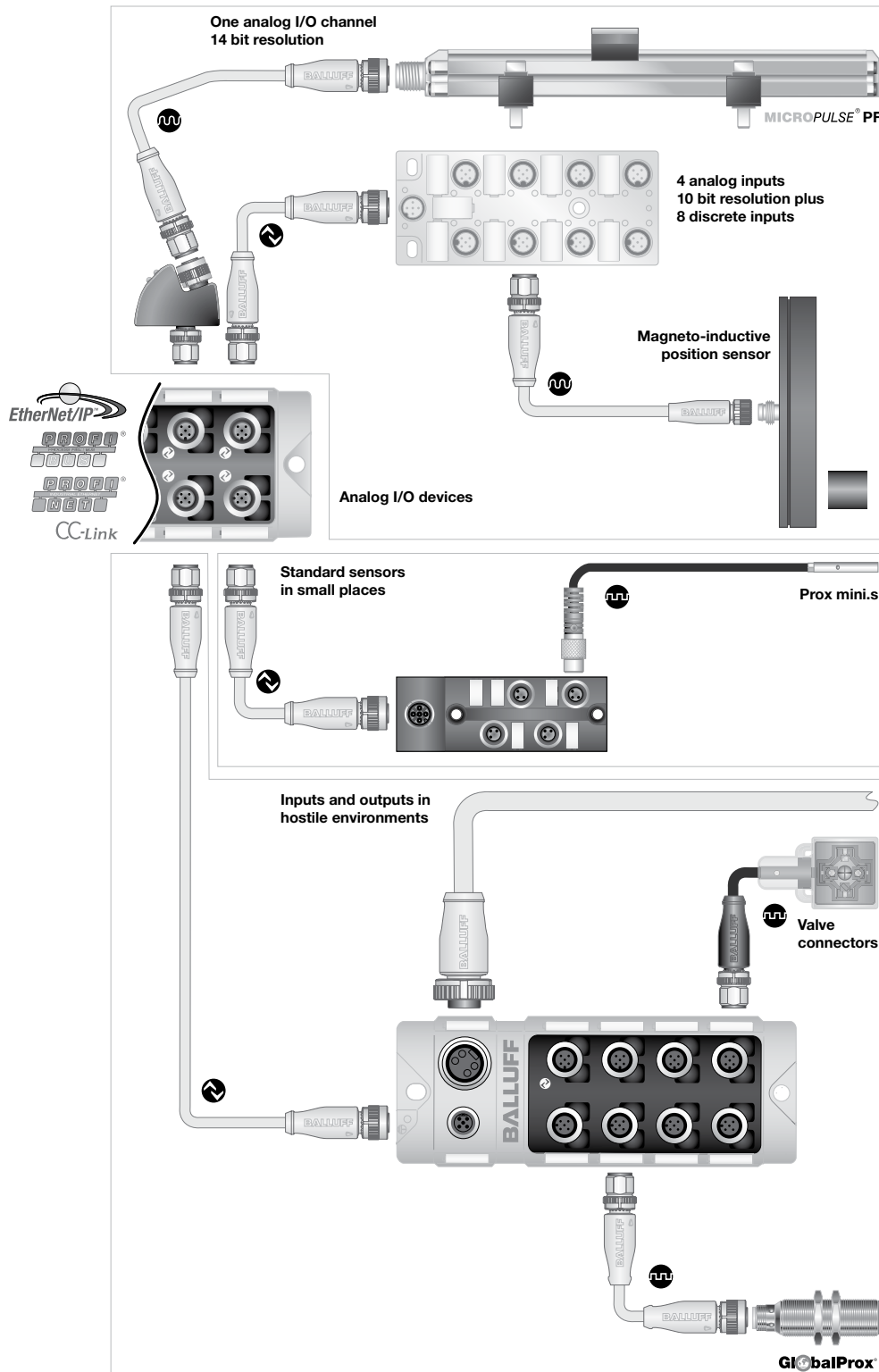
Profibus	Profibus	Profibus	Profibus	CC-Link
Display	Rotary Dials	Rotary Dials	Display	Display
			BIS00T3	
			BIS V-6102-019-C001	
	BNI003P	BNI0030		
	BNI PBS-507-001-Z011	BNI PBS-504-001-K008		
BNI005R				BNI0040
BNI PBS-502-101-Z001				BNI CCL-502-100-Z001

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

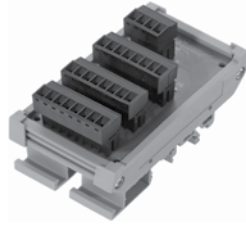
I/O Devices



IO-Link

IP20 terminal I/O hubs
M12 analog I/O plugs

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

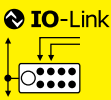


Connection Type	Spring Terminal	Spring Terminal
8 Configurable	BNI004K	
	BNI IOL-309-000-K024	
16 Configurable		BNI004L
		BNI IOL-310-000-K025
Max Output Current/Channel	400 mA	400 mA
Max Current	<1.4 A	<1.4 A
Mounting	DIN Rail	DIN Rail
Data	1 Byte IN, 1 Byte OUT	2 Bytes IN, 2 Bytes OUT

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) BNI IOL-101-000-K018	BNI000R (8 input) BNI IOL-102-000-K019		
3-wire input, w/diagnostics	4 or 8 PNP	–	BNI001W (4 input) BNI IOL-101-S01-K018	BNI001Y (8 input) BNI IOL-102-S01-K019		
4-wire input	8 or 16 PNP	–		BNI0021 (16 input) BNI IOL-104-000-K021	BNI0005 (8 input) 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	

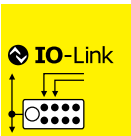
*Consult factory for availability

IO-Link

M12 discrete I/O hubs



M12 Metal	M12 Metal	M12 Metal	M12 Metal
with Integrated Power	with 4-pole Auxiliary Power	with 5-pole Auxiliary 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	



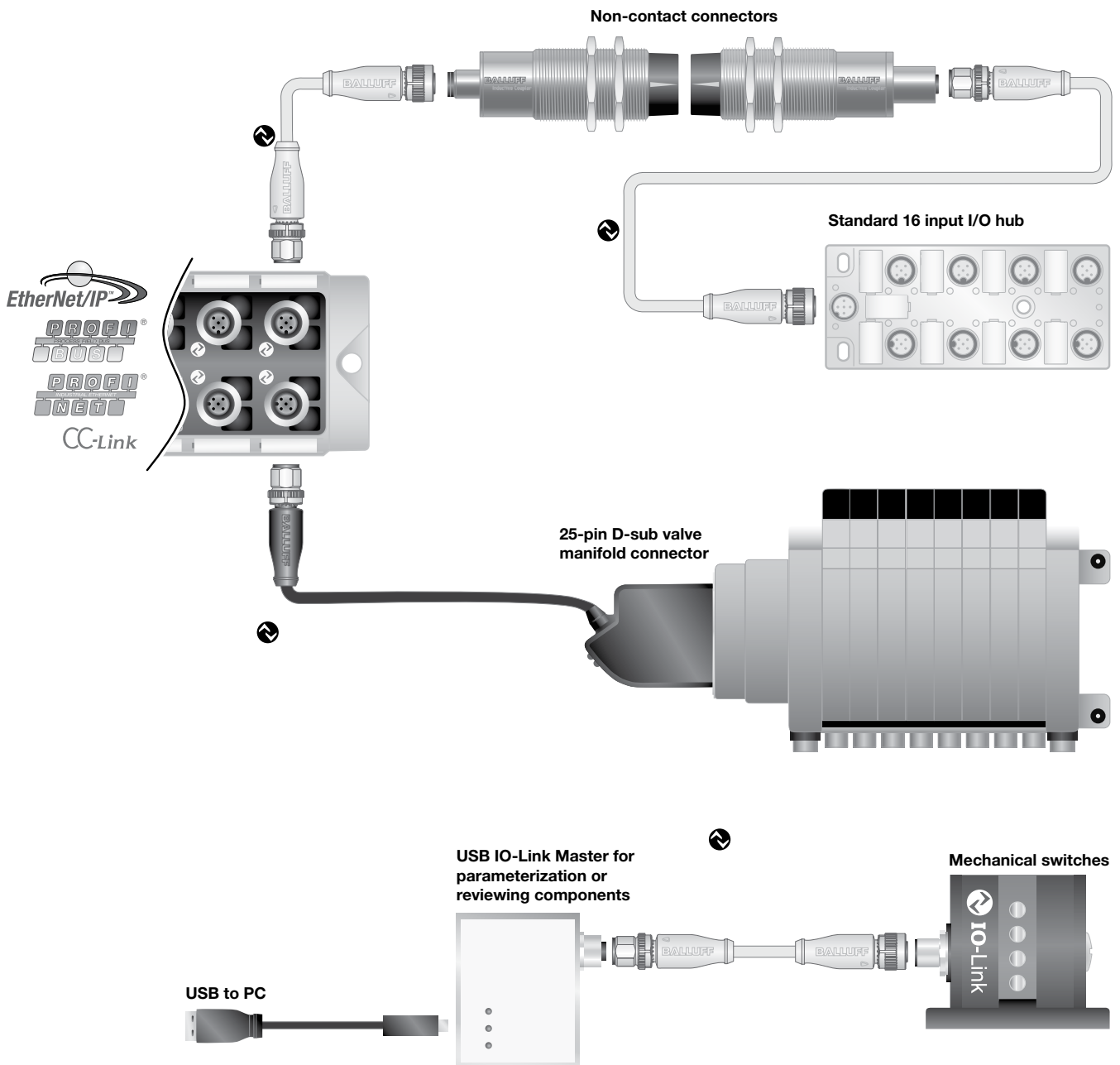
IO-Link

IO-Link connection devices

Connectivity Products with IO-Link

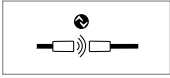
IO-Link's versatility can be seen in the deep product offering covered in these pages. There are times when a standard sensor cable is just not enough. Maybe you need to have I/O on constantly changing end effectors or a rotating fixture. Valve banks with built in network control can add additional costs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

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



IO-Link

Non-contact connectors
USB master



Non-Contact Connectors

Base	BIC005A BIC 110-I2A50-Q40KFU-SM4A4A	BIC000C BIC 110-I2A50-M30MI3-SM4A4A	BIC0053 BIC 110-IAA50-M30MI3-SM4A4A
Remote	BIC005C BIC 210-I2A50-Q40KFU-SM4A5A	BIC000E BIC 210-I2A50-M30MI3-SM4A5A	BIC0054 BIC 210-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

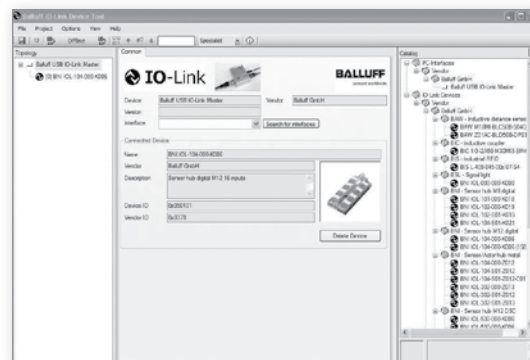


USB Master Features:

- 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

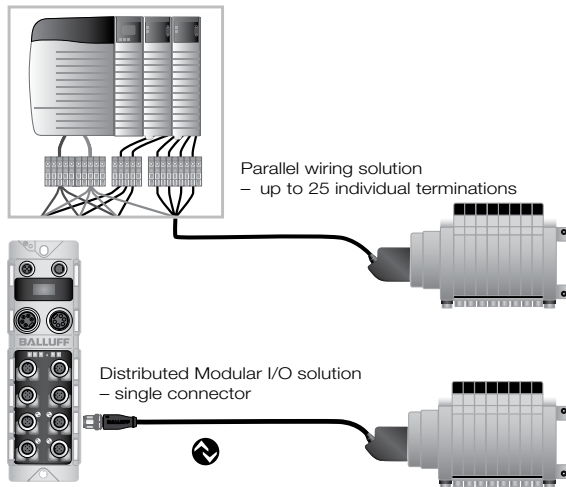


IO-Link

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 Mainfold 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.



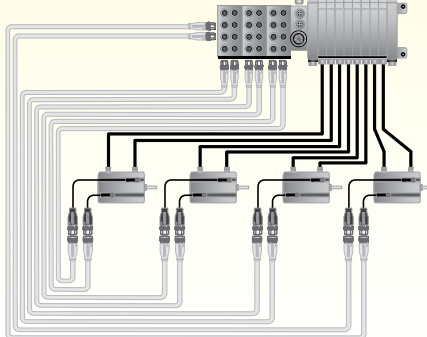
Valve Mainfold Control via Distributed Modular I/O

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

Network Manifold with Reed Switches

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

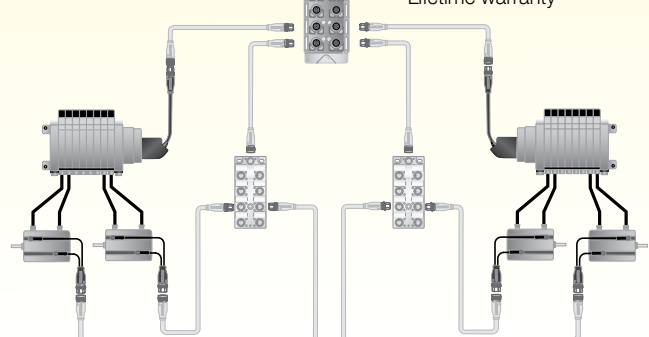
Before



BMV V-Twin & Valve Manifold Control

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

After



IO-Link

Valve manifold control



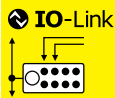
Part Overview

Part Number	BNI IOL-751-V__-K007	BNI IOL-770-V06-A027	BNI IOL-77_-000-_027*
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					
MACConnect	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



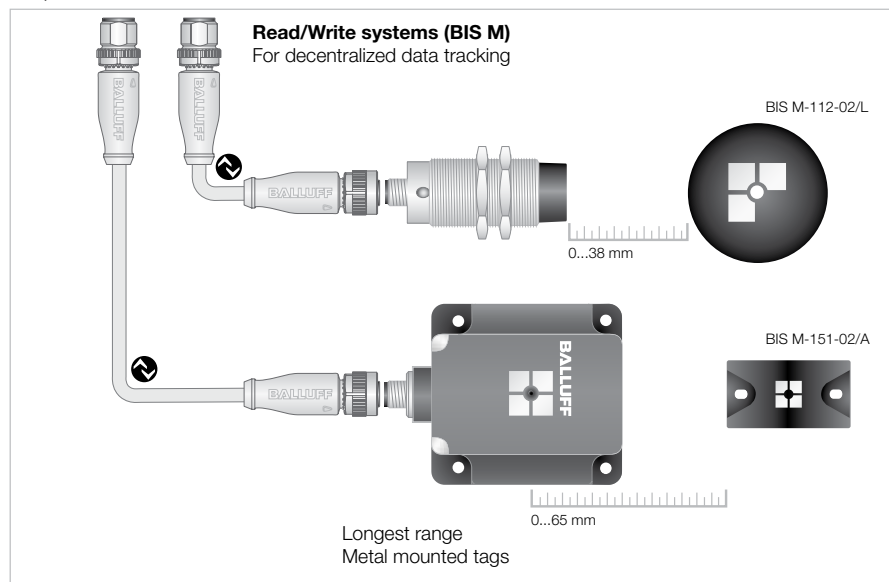
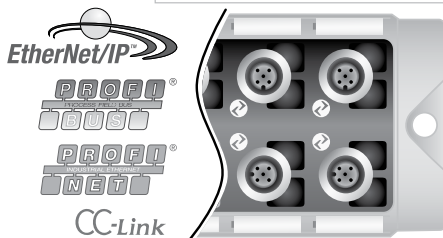
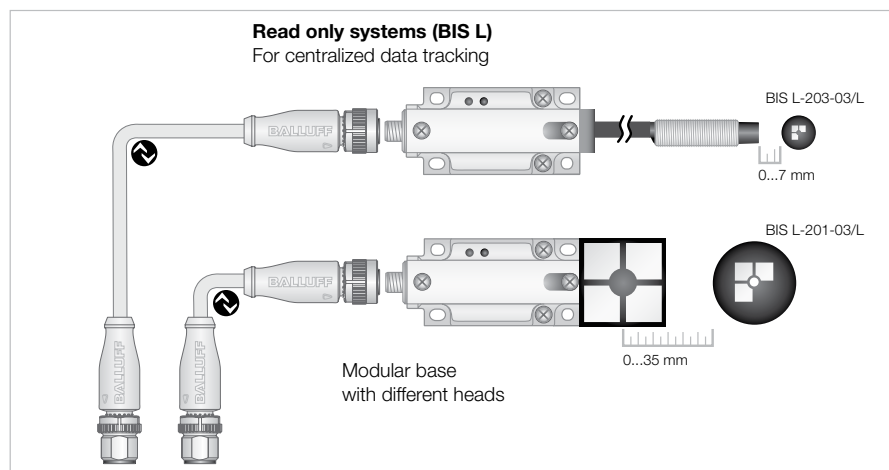
IO-Link

Radio frequency identification

Data Tracking with Industrial RFID using IO-Link

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

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



Select your RFID system in 4 easy steps:

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

Yes → see page 2.18

No → see page 2.17

2. Choose the appropriate data carrier form factor.

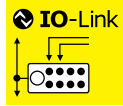
3. Determine the head based on distance.

4. Determine your required memory capacity.



Size	M12	M18	25x50	40x40
IO-Link Processors	BIS00E1	BIS00E0	BIS00E2	BIS00CZ
Read only	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
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				

Data Carriers



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.

IO-Link

RFID read/write systems
Standard and metal mount data carriers



Standard Data Carriers

	Size	M15.5	M18
	IO-Link Processors	BIS00LJ	BIS00LW
	Read/Write Heads	BIS M-400-045-002-07-S4	BIS M-402-045-002-07-S4
	752 bytes		
	2000 bytes		
	BIS0048	BIS004A	
	BIS M-122-01/A	BIS M-122-02/A	0...5(6) mm
	BIS0040	BIS0042	0...6(9) mm
	BIS M-105-01/A	BIS M-105-02/A	0...5 mm
		BIS0044	0...15 mm
		BIS M-110-02/L	0...8 mm
	BIS003Y		0...15 mm
	BIS M-101-01/L		
	BIS003Z		0...18 mm
	BIS M-102-01/L		
		BIS0043	0...20 mm
		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	BIS00LM
	Read/Write Heads	BIS M-451-045-001-07-S4
Metal Mount Data Carriers	BIS004F	0...65 mm
	BIS M-150-02/A (vertical mount)	
	BIS004H	0...65 mm
	BIS M-151-02/A (horizontal mount)	

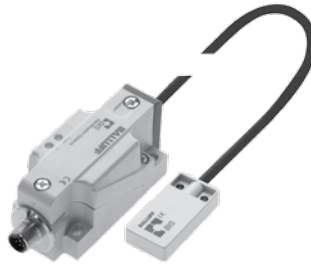
Metal Mount Series: These tags provide highly reliable RFID performance mounted on any metal surface.

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

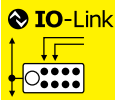
Metal mounting plate 40x22mm
BIS Z-MP-001 please order separately (10 to a package).
Required if no metal substrate is used.

IO-Link

RFID read/write systems
Shielded cable options



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



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 mm ²	4x 0.34 mm ²
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!"

**P
reventative
D
iagnostics**

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!"

**A
utomatic
C
onfiguration**

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

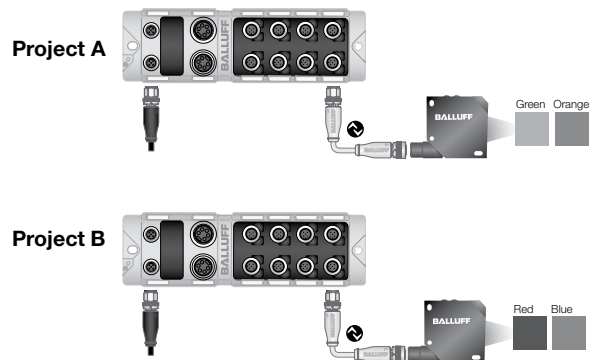
Reliable diagnostics are extremely important for highly dynamic machines. You can identify quality issues linked to the manufacturing process in real-time and take appropriate measures immediately. In the printing and paper machine industry, for example, the machine must react to faults within milliseconds.



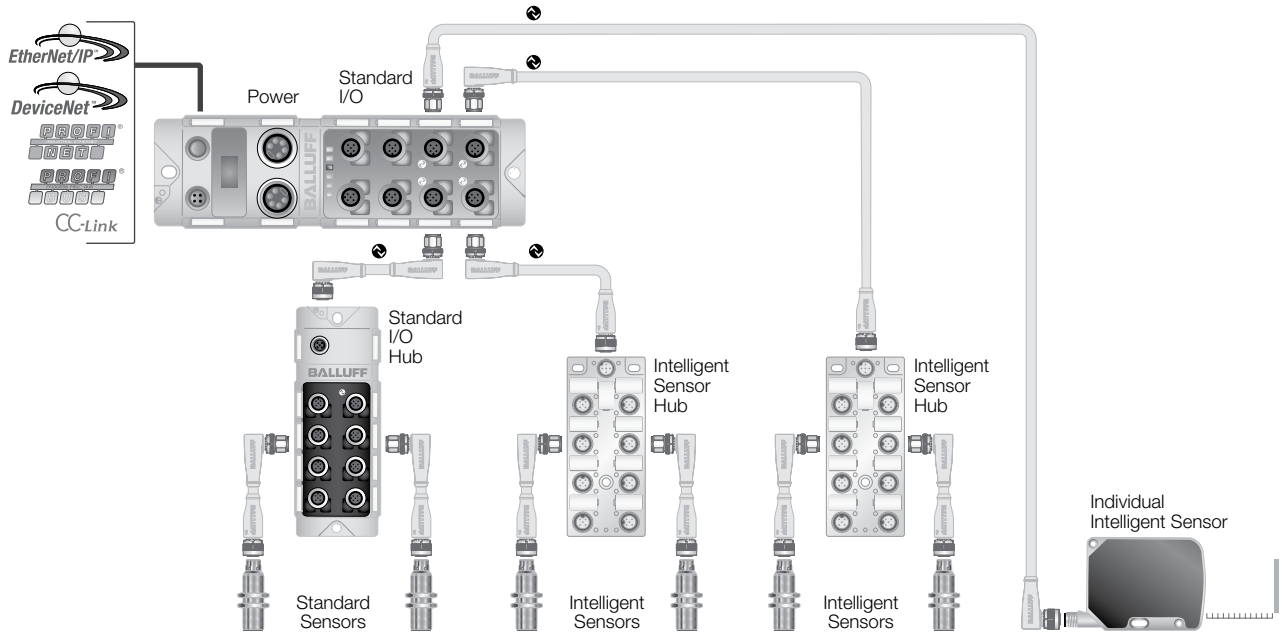
Color Sensor Example

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

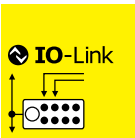
After the required parts are run off, a new project is begun with a different color set. In the past, a second color sensor would be required, or the operator would have to reprogram the current sensor for each new color. By using device parameterization, the controller tells the sensor its configuration 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 ON OFF Constant Condition Monitoring Preventative Diagnostics Automatic Configuration
Balluff brands	Standard sensors	Sensors	Sensors	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

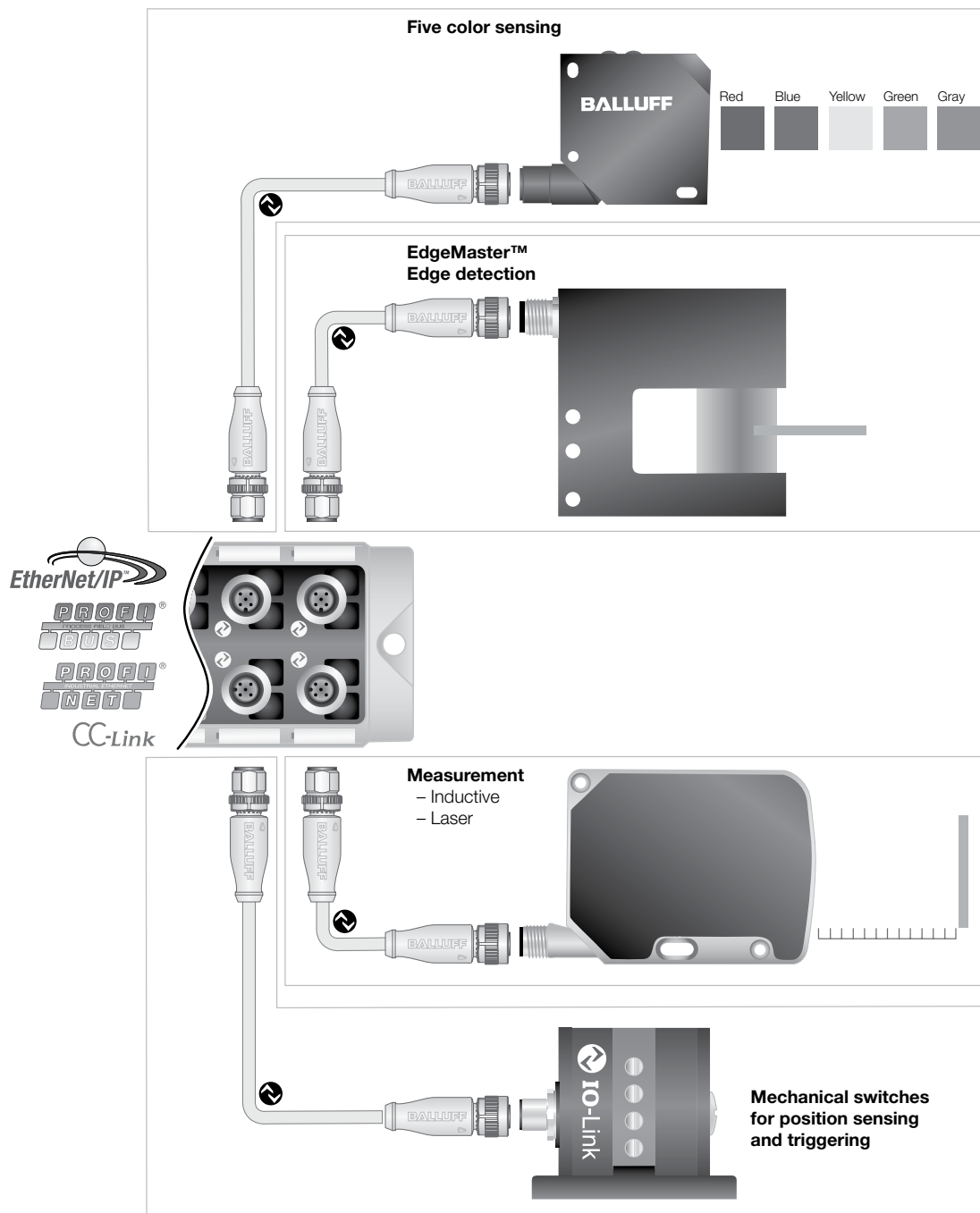
IO-Link

Intelligent sensors

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



IO-Link

Level 1 intelligent sensors



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, 3x0.25 mm ²

ON
OFF

Constant
Condition
Monitoring

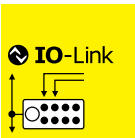


Inductive M12 Sensors

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	M12x1, non-flush	M12x1, non-flush	M12x1, 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

IO-Link

Level 2 intelligent sensors

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

CE



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

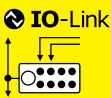
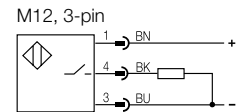
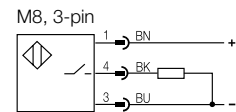
IO-Link

Level 2 intelligent sensors

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



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	Thru-beam Receiver	Thru-beam 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	C onstant C ondition M onitoring	P reventative D iagnostics
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IO-Link

Level 3 IO-Link intelligent sensors



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**

IO-Link

Level 3 IO-Link intelligent sensors



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









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











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

*Consult factory for availability

Ordering Instructions:

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



Mechanical Switches

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