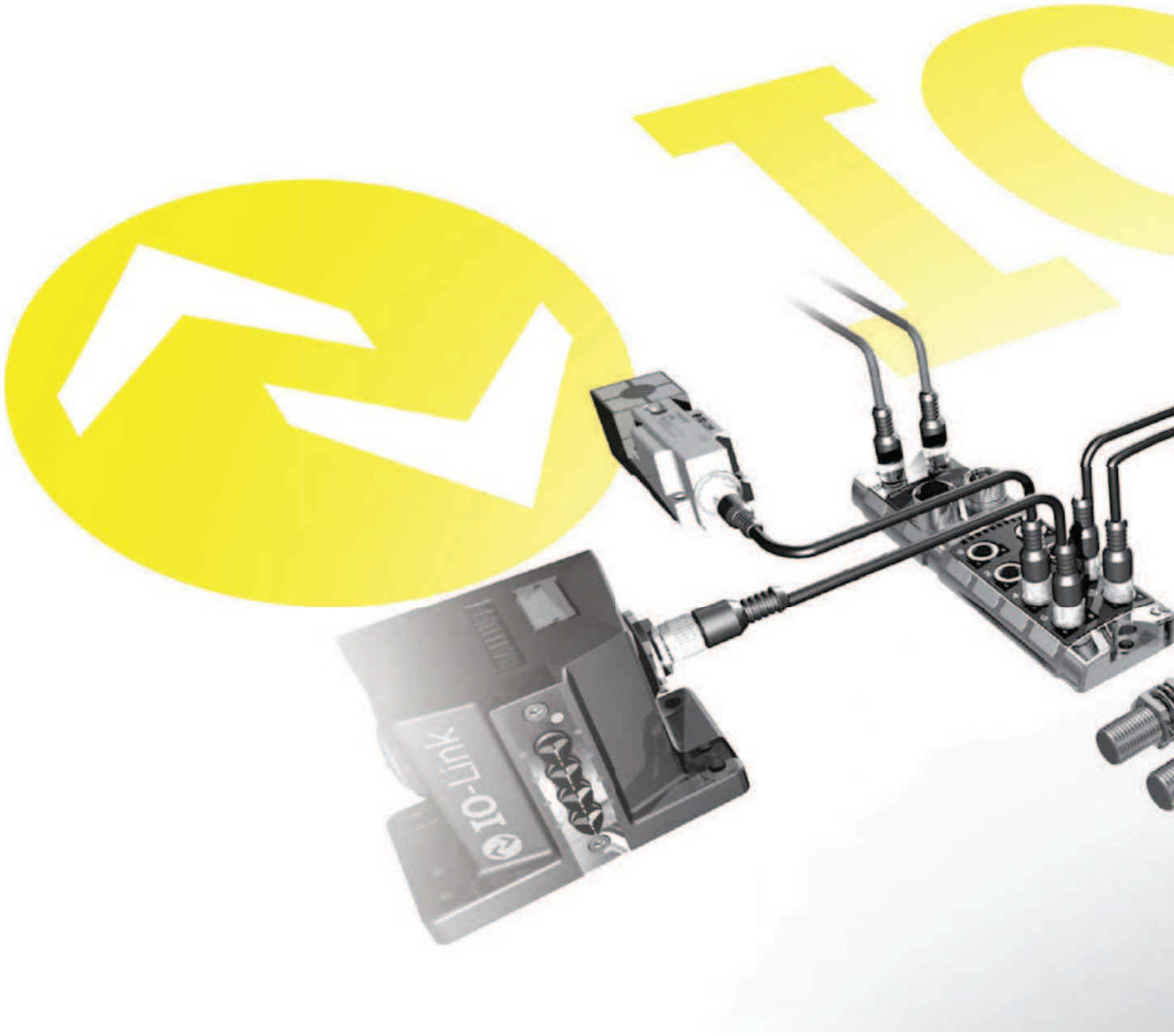
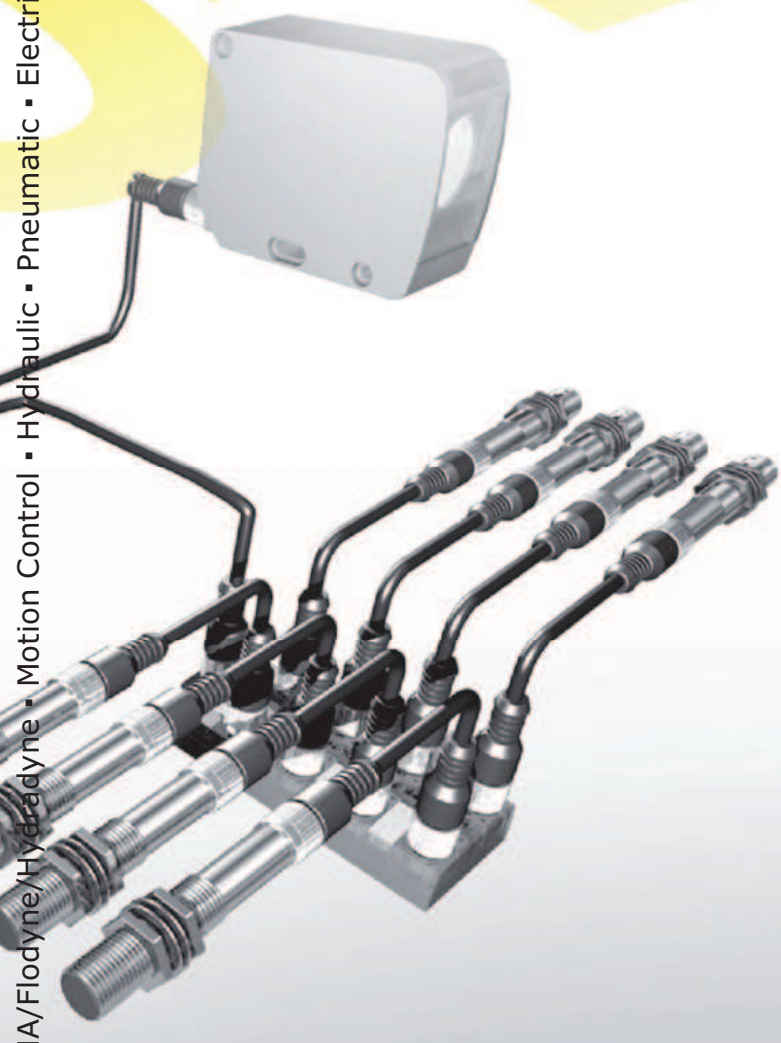
As the first standardized, uniform, universally applicable interface in control technology, IO-Link transmits all sensor and actuator signals to the controller. Likewise, IO-Link passes control data down to the lowest sensor level. All of this makes automation even more powerful than ever before.

IO-Link advantages at a glance
- Easy to get started, time-saving installation
- Automatic adjustment during operation
- Continuous monitoring

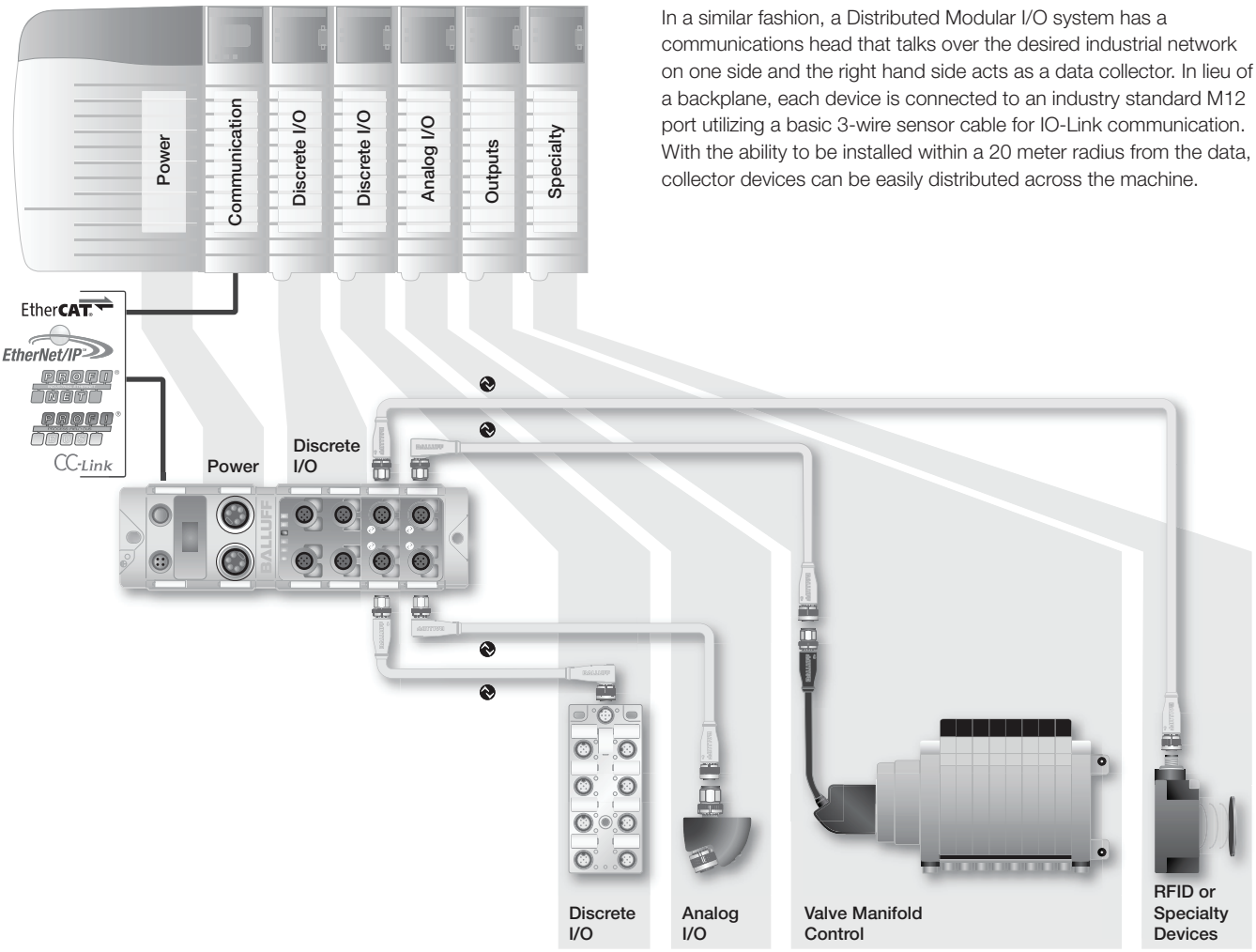




IO-Link
Distributed Modular I/O

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.



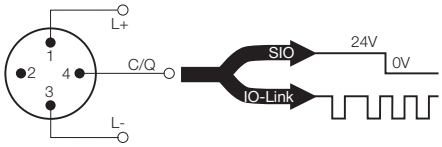
In a similar fashion, a Distributed Modular I/O system has a communications head that talks over the desired industrial network on one side and the right hand side acts as a data collector. In lieu of a backplane, each device is connected to an industry standard M12 port utilizing a basic 3-wire sensor 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

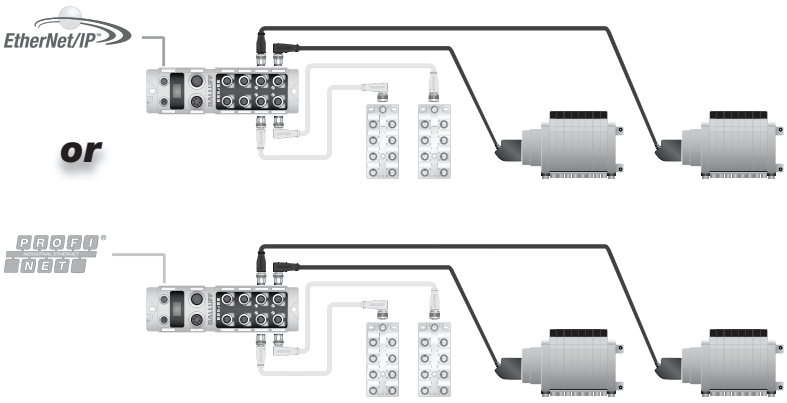
20 Meters maximum



Advantages of Distributed Modular I/O

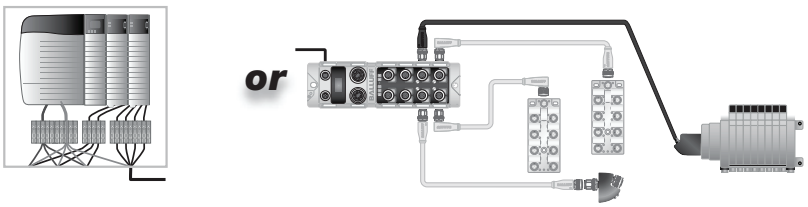
Simplify Controls Quotation Process

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.



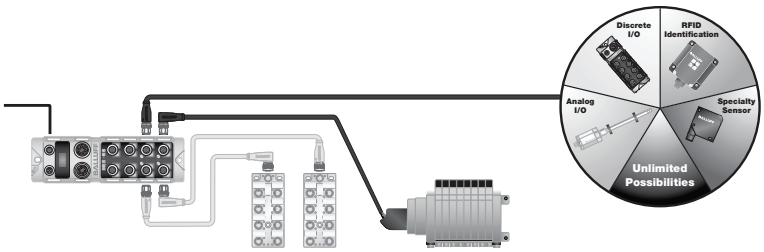
Reduce Total Cost per Point

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

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

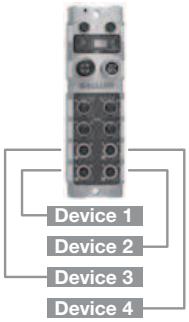
Non-contact connectors
– 3 bytes to 11 bytes

Ease of integration

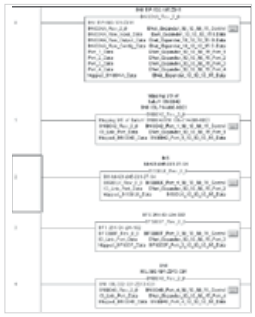
While hardware selection is important to the success of a project, if the hardware is not easily integrated into the engineering software, any benefits gained could be lost. However, Distributed Modular I/O is easily integrated into typical engineering software with an easy three step process. Below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

EtherNet/IP™

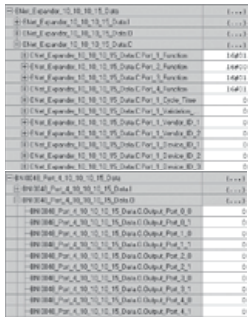
Step 1
Select hardware



Step 2
Import add on instructions (AOI)



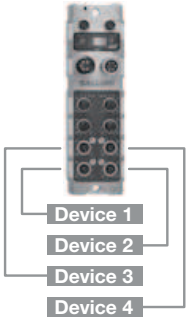
Step 3
Create user defined tags (UDTs)



www.balluff.com/AOI

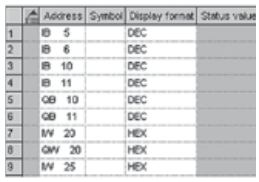
PROFINET INDUSTRIAL ETHERNET

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



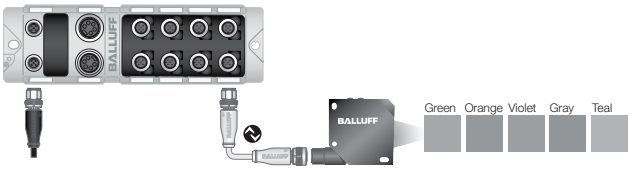
		Address	Symbol	Display format	Status value
1		IB 5		DEC	
2		IB 6		DEC	
3		IB 10		DEC	
4		IB 11		DEC	
5		QB 10		DEC	
6		QB 11		DEC	
7		IW 20		HEX	
8		QW 20		HEX	
9		IW 25		HEX	

Device parameterization and configuration

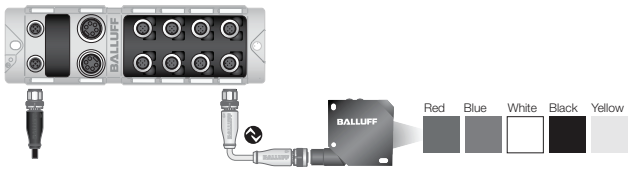
There are multiple advantages to device parameterization. The two major advantages are the ability to quickly swap out a failed device and the ability to reconfigure a device for a recipe or production change on the fly. The controller stores the necessary data for each setup and, when needed, it sends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



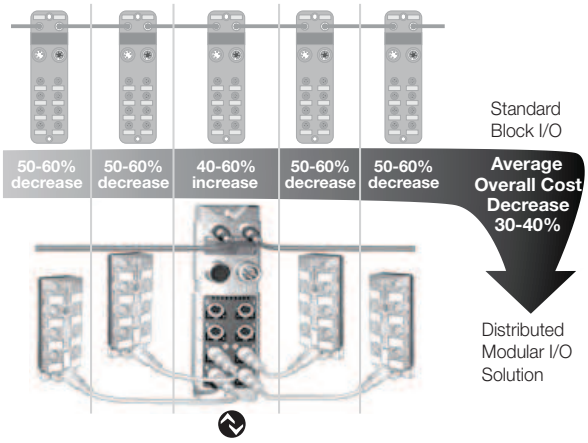
After the required parts are run off, a new project is begun with a different color set. In the past, a second color sensor would be required, or the operator would have to reprogram the current sensor for each new color. By using device parameterization, the controller tells the sensor its configuration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



Distributed Modular I/O applications

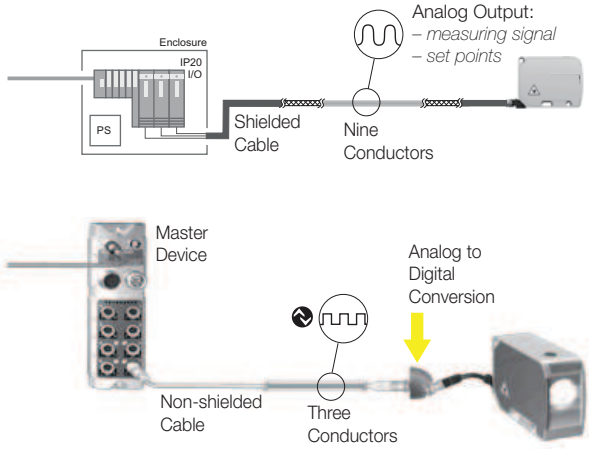
Discrete I/O Savings

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



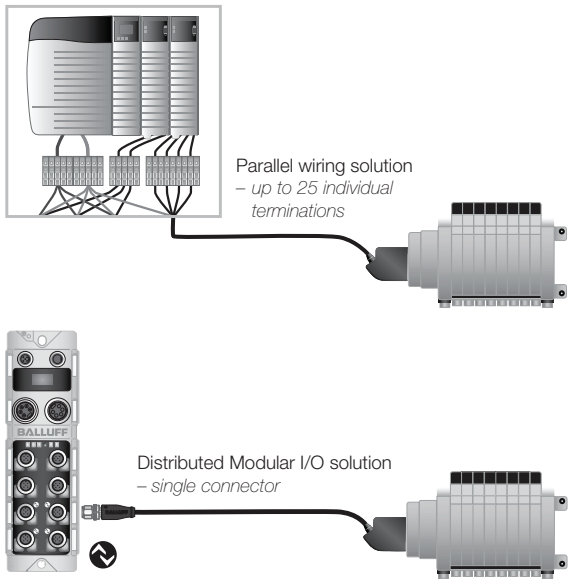
Analog I/O Savings

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



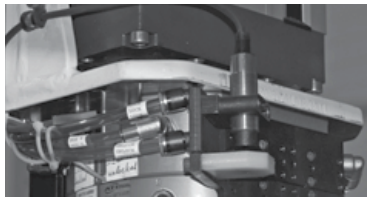
Valve Manifold Control

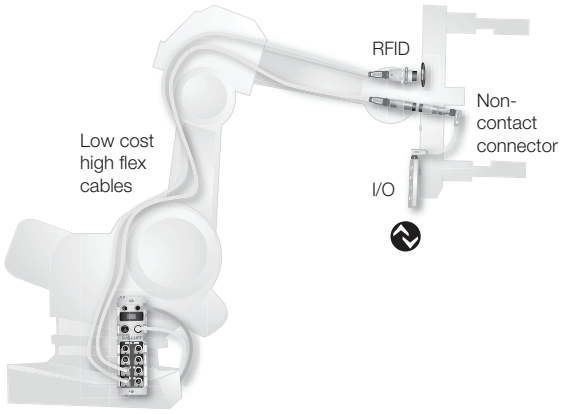
Every pneumatic action requires valve control. The typical parallel wiring of valve manifolds can be labor intensive and add dramatically to cabinet space and setup time.



Quick Tool Change

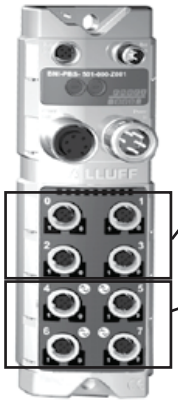
With the increasing demand for multiple recipe manufacturing, the need to quickly change tooling on a robot or in a fixture is growing. Utilizing multiple technologies, the connection can be made quickly without failure; tool verification can be included with RFID. This speed has improved our customers'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





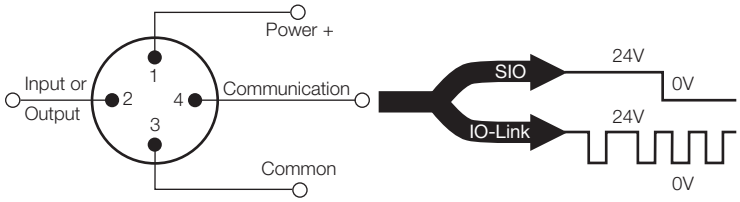
Flexible IO-Link Master Blocks

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



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

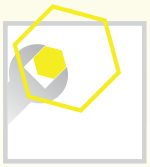
*Consult factory for availability

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

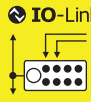


Reduce Maintenance

- 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

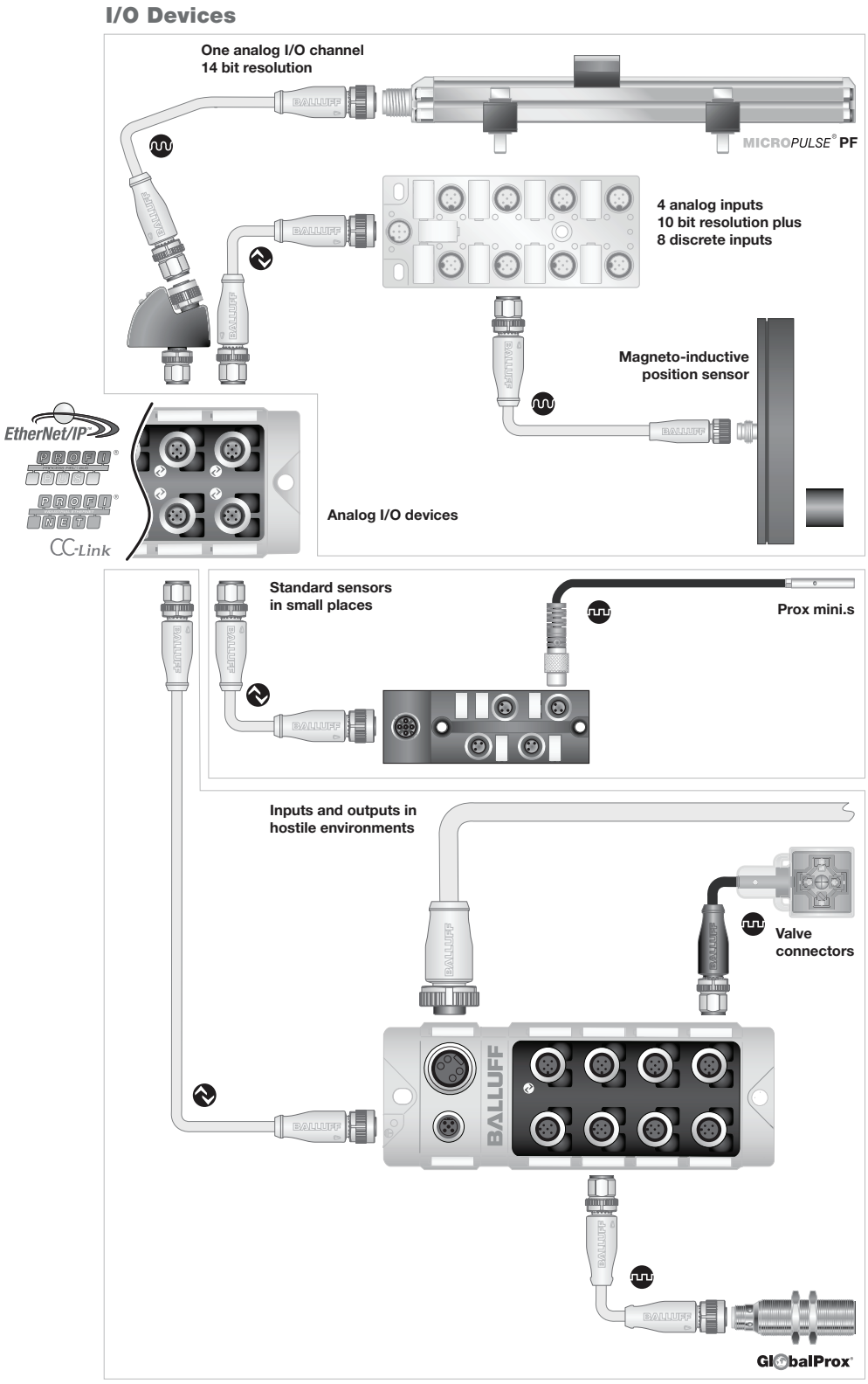


	Profibus	**Profibus**	**Profibus**	**Profibus**	**CC-Link**
	Rotary Dials	Display	Rotary Dials	Rotary Dials	Display
		BIS00T3			**BIS010P**
		BIS V-6102-019-C001			BIS V-6111-073-C003
			BNI003P	**BNI0030**	
			BNI PBS-507-001-Z011	BNI PBS-504-001-K008	
	BNI003K	**BNI005R**			**BNI0040**
	BNI PBS-502-001-Z001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

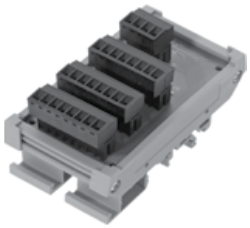
IO-Link Input/Output Devices

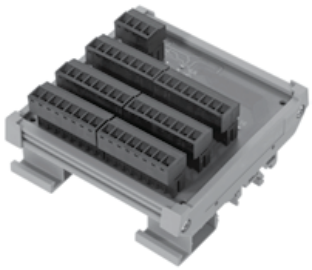
One of the major values of IO-Link over standard network I/O is the ability to run many sensors and actuators back through one node or IP address. This is accomplished using the many varieties of I/O hubs offered by Balluff.

- 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
M12 analog I/O plugs





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

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

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

Type	Inputs	Outputs	Order Code/Part Number
0-10 V Analog (14 bit), 3-wire input	1		**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

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**	**BNI0074**
					16x PNP	16x NPN
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			**BNI005T**	
					BNI IOL-302-S01-K006	
5-wire configurable , w/diagnostics, w/2 bytes ID data	max 16 PNP	max 16			**BNI005W**	
					BNI IOL-302-S01-K006-C01	
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	



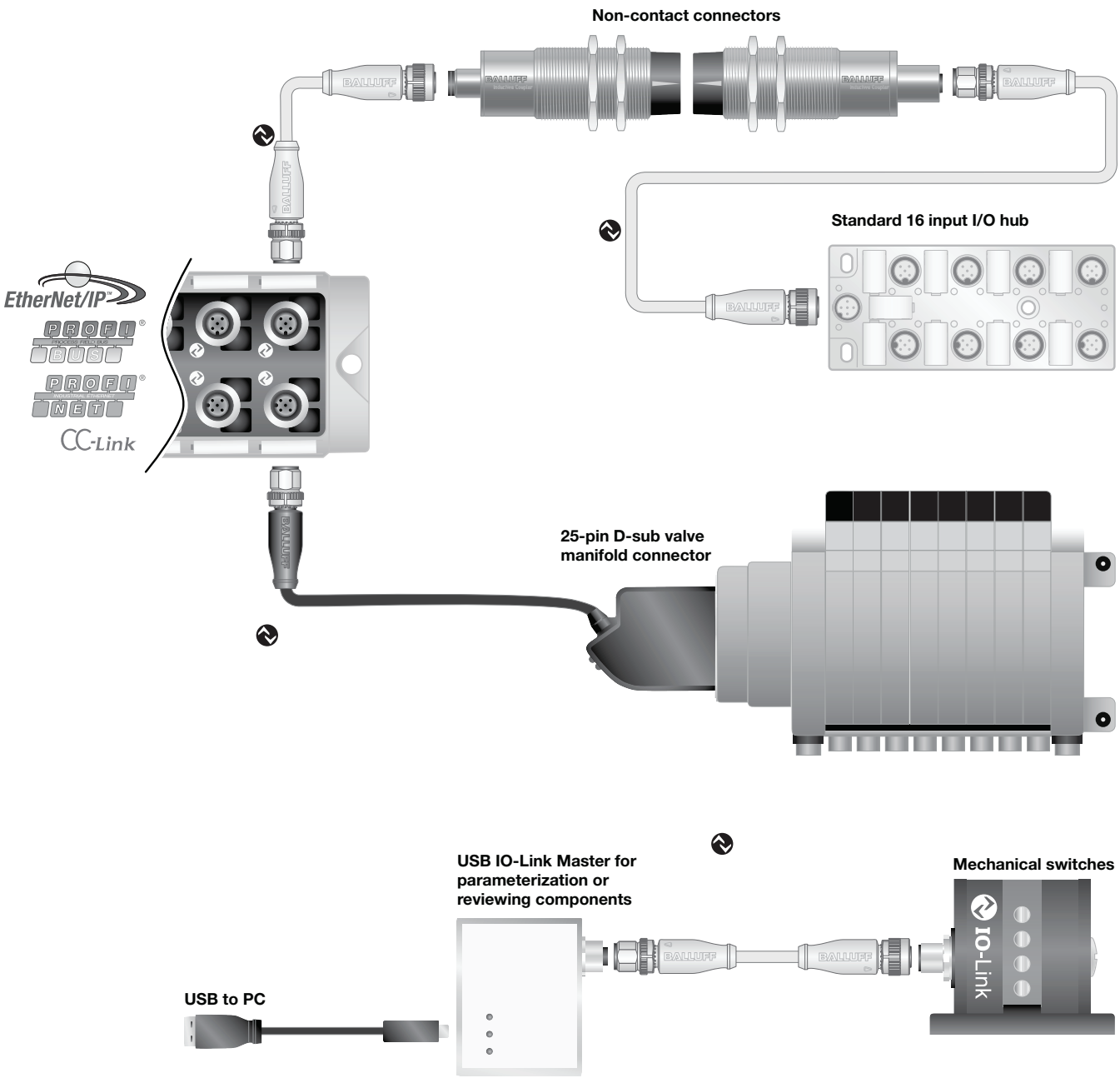

M12 Metal		**M12 Metal**	**M12 Metal**	**M12 Metal**
with Integrated Power		with 4-pole Auxilliary Power	with 5-pole Auxilliary Power	with Galvanic Isolation
8		8	8	8
0.5A / 1.4A		2A / 9A	2A / 9A	2A / 9A
BNI0031 (8 input)				
BNI IOL-102-000-Z012				
				BNI0033
				BNI IOL-252-000-Z013
BNI0032	**BNI0063**			
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	

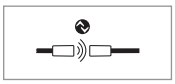
IO-Link connection devices

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





Non-Contact Connectors

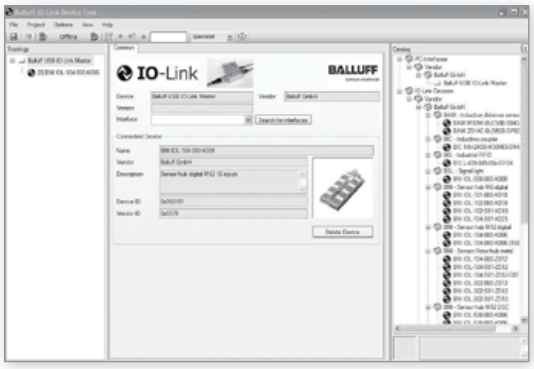
Base	**BIC0070**	**BIC005A**	**BIC000C**	**BIC0053**
	BIC 1B0-ITA50-Q40KFU-SM4A4A	BIC 1I0-I2A50-Q40KFU-SM4A4A	BIC 1I0-I2A50-M30MI3-SM4A4A	BIC 1I0-IAA50-M30MI3-SM4A4A
Remote	**BIC0071**	**BIC005C**	**BIC000E**	**BIC0054**
	BIC 2B0-ITA50-Q40KFU-SM4A5A	BIC 2I0-I2A50-Q40KFU-SM4A5A	BIC 2I0-I2A50-M30MI3-SM4A5A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

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

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

Ordering code BCC0E5T, 0.3 m

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



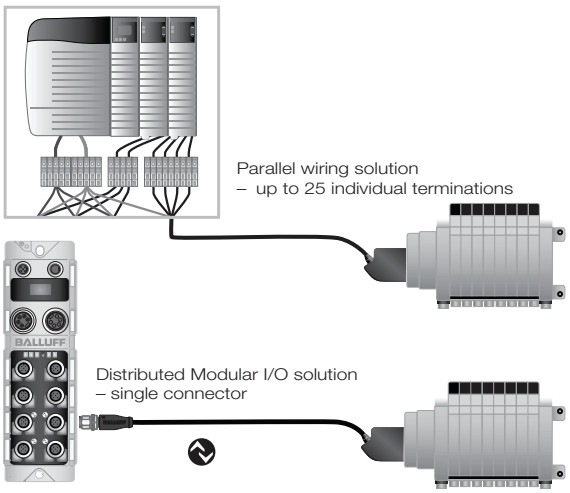
USB Master

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

Valve manifold control utilizing Distributed Modular I/O

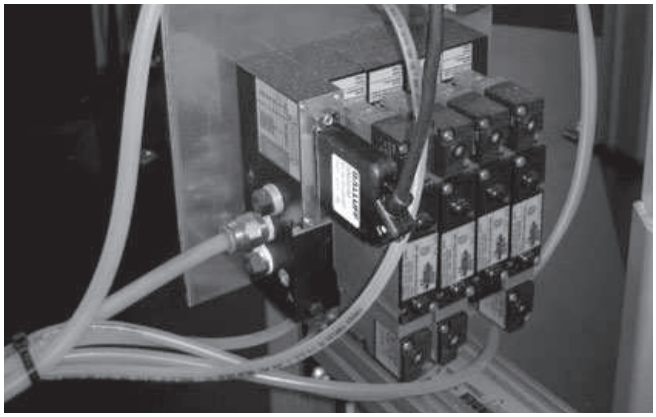
When controls engineers get involved in specifying valve manifolds a slippery slope can develop. Where does the mechanical design end and the electrical design begin? Being able to order simple valve manifolds with 25-pin D-sub connectors removes this situation and provides multiple advantages: these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

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



Valve Mainifold Control over EtherNet/IP

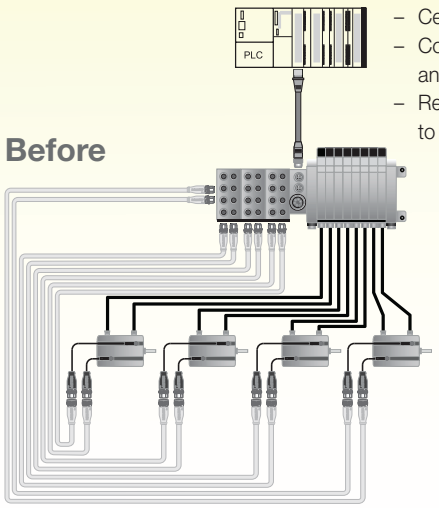
In this conveyor application, a few cylinders are being used for gate control to help sort packages as they come through the process. The valve manifold has a simple 25pin D-sub connector controlling 7 positions on the conveyor. Controlling the valve manifold is a 25pin D-sub valve manifold controller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



Valve Mainifold Control via Distributed Modular I/O

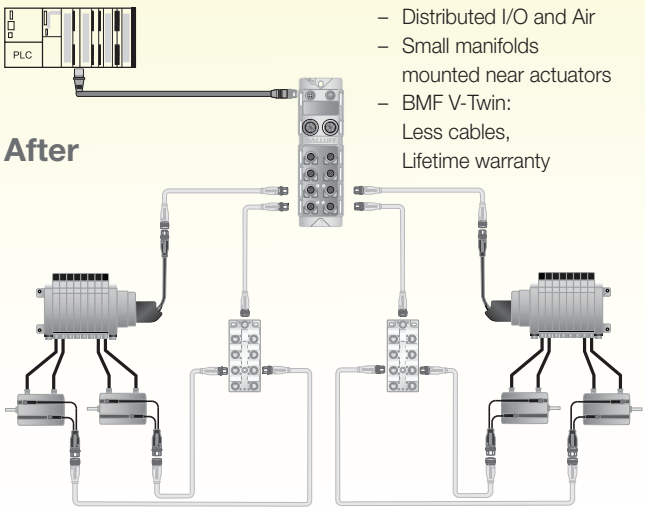
Pneumatic Systems Improvement – BMF V-Twin & Valve Manifold Control

Network Manifold with Reed Switches



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

BMF V-Twin & Valve Manifold Control



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

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

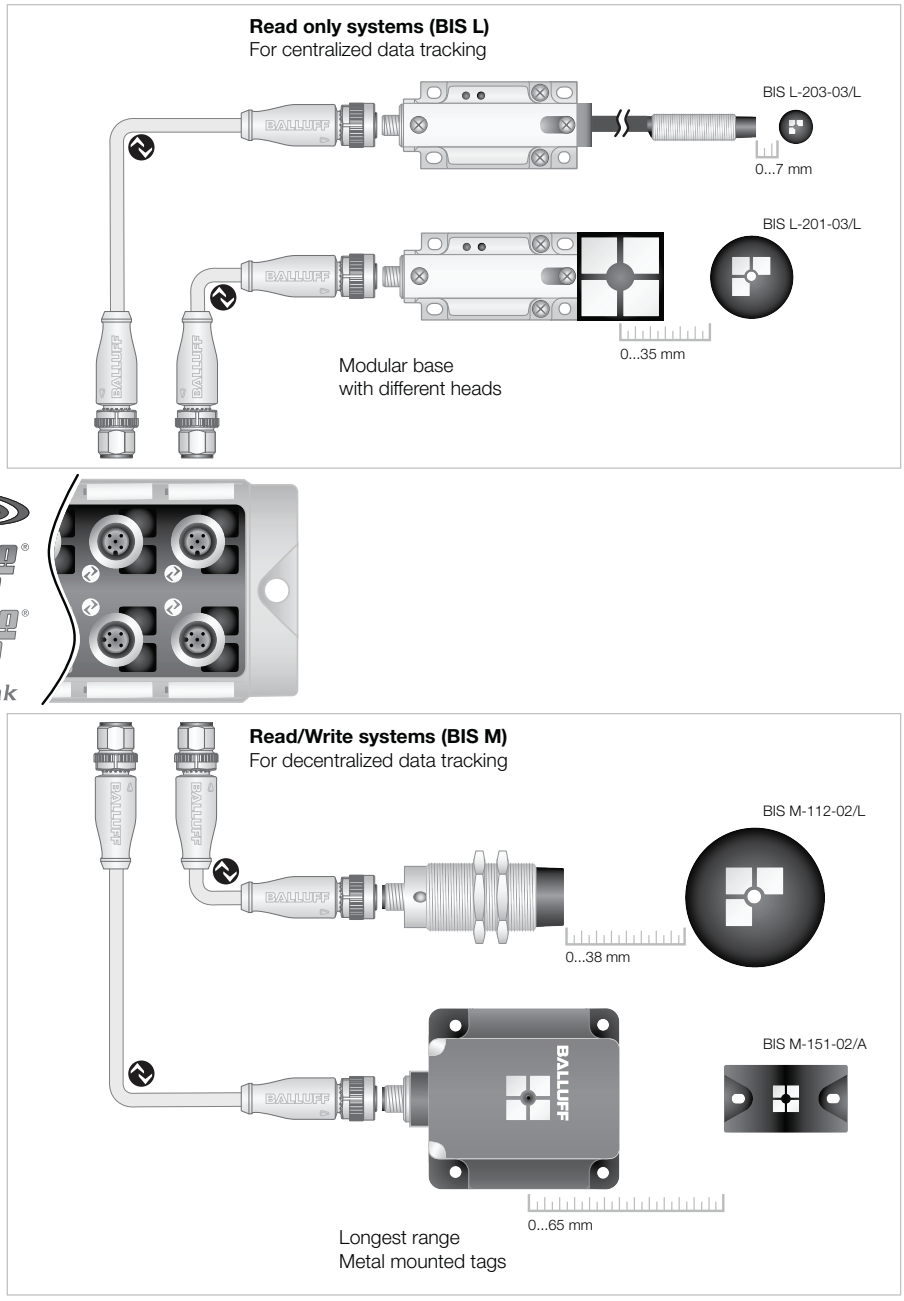
Control by Manufacturer	Connector Type	Max Positions	Balluff Ordering Code Balluff Part Number	Accessory	Accessory Description
MAC Valve Manifolds					
MAConnect	D-sub 25pin	16	**BNI001L** BNI IOL-751-V02-K007		
Bosch Rexroth Valve Manifolds					
LS04, HFO2-LG, HFO3-LG, HFO4	D-sub 25pin	24	**BNI001K** 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	**BNI006R** BNI IOL-751-V13-K007		
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.

	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 BIS L-100-05/L-RO	---	0...15 mm	0...15 mm	0...25 mm
	BIS0038 BIS L-101-05/L-RO	---	0...18 mm	0...18 mm	0...35 mm
	BIS003C BIS L-102-05/L-RO	---	---	---	0...48 mm
	BIS003F BIS L-103-05/L-RO	0...7 mm	0...10 mm	0...10 mm	0...16 mm
	BIS003R BIS L-200-03/L	---	0…15 mm	0…15 mm	0…25 mm
	BIS003T BIS L-201-03/L	---	0…18 mm	0…18 mm	0…35 mm
	BIS003U BIS L-202-03/L	---	---	---	0…48 mm
	BIS003W BIS L-203-03/L	0…7 mm	0…10 mm	0… 10 mm	0…16 mm

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.

RFID read/write systems
Standard and metal mount data carriers

	Size			M15.5	M18	
	IO-Link Processors 10 bytes			**BIS00LJ**	**BIS00LW**	
				BIS M-400-045-002-07-S4	BIS M-402-045-002-07-S4	
	IO-Link Processors 32 bytes			**BIS0104**	**BIS0105**	
				BIS M-400-072-002-07-S4	BIS M-402-072-002-07-S4	
	Read/Write Heads					
Standard Data Carriers	752 bytes	2000 bytes	8000 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	**BIS0111**	0…20 m		
		BIS M-108-02/L	BIS M-108-20/A			
		BIS0045		0…20 mm		
		BIS M-111-02/L				
		BIS0046		0…28 mm		
		BIS M-112-02/L				
	BIS0047					
	BIS M-120-01/L					

* only for use with 32 byte processors

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

	Size	80x84
	IO-Link Processors 10 bytes	**BIS00LM**
		BIS M-451-045-001-07-S4
	IO-Link Processors 32 bytes	**BIS0103**
		BIS M-451-072-001-07-S4
	Read/Write Heads	
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.

	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
	BIS0108	**BIS0106**	**BIS0102**
	BIS M-400-072-001-07-S4	BIS M-402-072-004-07-S4	BIS M-401-072-001-07-S4
		0...5 (8) mm	
	0…7(11) mm	0...6 (8) mm	
	0…20 mm	0...15 mm	0…30 mm
	0…20 mm		0…28 mm
	0…28 mm		0…45 mm
	0…28 mm		0…40 mm
	0…28 mm		0…40 mm
	0…38 mm		0…60 mm
			0…50 mm

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

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**

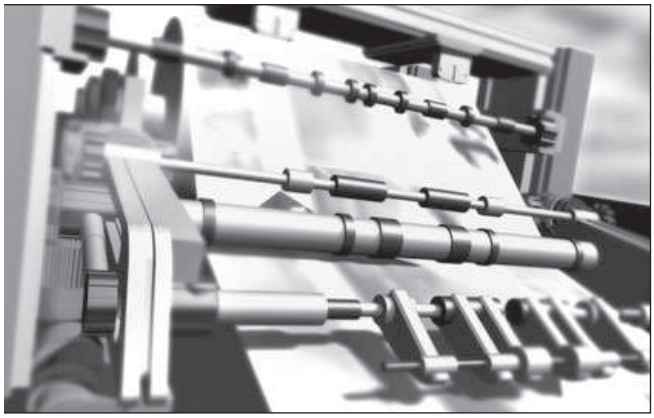
Increasing equipment throughput
Increasing process reliability
Maintaining high quality
"Tell me what to do!"

Automatic Configuration

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

Applications of intelligent sensors

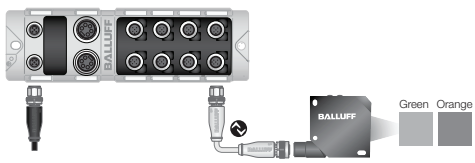
Printing and Paper Example
Reliable diagnostics are extremely important for highly dynamic machines. You can identify quality issues linked to the manufacturing process in real-time and take appropriate measures immediately. In the printing and paper machine industry, for example, the machine must react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

Project A



Project B


Scanning range			**20…150 mm**	**30…250 mm**
Straight				
Resolution			0.069 mm	0.069 mm
push/pull	NO/NC	**Ordering code**	**BUS0020**	**BUS0029**
	IO-Link	Part number	BUS M18M1-GPXI-02/015-S92G	BUS M18M1-GPXI-03/025-S92G
Angled				
Resolution			0.069 mm	0.069 mm
push/pull	NO/NC	**Ordering code**	**BUS0023**	**BUS002A**
	IO-Link	Part number	BUS W18M1-GPXI-02/015-S92G	BUS W18M1-GPXI-03/025-S92G
Size			M18×1	M18×1
Supply voltage			10...30 V DC	10...30 V DC
Output current			200 mA	200 mA
Degree of protection as per EN 60529			IP 67	IP 67
Operating temperature			–25...+70 °C	–25...+70 °C
Material		Housing	Nickel-plated brass tube	Nickel-plated brass tube
		Plastic parts	PBT	PBT
		Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection			M12 connector, 5-pin	M12 connector, 5-pin

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


Scanning range			**65…350 mm**	**120…1000 mm**
Straight				
Resolution			0.069 mm	0.069 mm
push/pull	NO/NC	**Ordering code**	**BUS004Z**	**BUS004P**
	IO-Link	Part number	BUS M18M1-GPXI-07/035-S92G	BUS M18M1-GPXI-12/100-S92G
Angled				
Resolution			0.069 mm	0.069 mm
push/pull	NO/NC	**Ordering code**	**BUS004Y**	**BUS004N**
	IO-Link	Part number	BUS W18M1-GPXI-07/035-S92G	BUS W18M1-GPXI-12/100-S92G
Size			M18×1	M18×1
Supply voltage			10...30 V DC	10...30 V DC
Output current			200 mA	200 mA
Degree of protection as per EN 60529			IP 67	IP 67
Operating temperature			–25...+70 °C	–25...+70 °C
Material		Housing	Nickel-plated brass tube	Nickel-plated brass tube
		Plastic parts	PBT	PBT
		Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection			M12 connector, 5-pin	M12 connector, 5-pin

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

IO-Lin

Fluid detection – BSP Pressure sensors

PNP pressure sensors

Two switching points (NO or NC)

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

–1...2 bar (–14.5...29 psi)	**Ordering code**	**BSP0086**	**BSP008L**
	Part number	BSP V002-EV002-D00S1B-S4	BSP V002-EV002-A00S1B-S4
–1...10 bar (–14.5...145 psi)	**Ordering code**	**BSP0087**	**BSP008M**
	Part number	BSP V010-EV002-D00S1B-S4	BSP V010-EV002-A00S1B-S4
0...2 bar (0...29 psi)	**Ordering code**	**BSP0088**	**BSP008N**
	Part number	BSP B002-EV002-D00S1B-S4	BSP B002-EV002-A00S1B-S4
0...5 bar (0...73 psi)	**Ordering code**	**BSP0089**	**BSP008P**
	Part number	BSP B005-EV002-D00S1B-S4	BSP B005-EV002-A00S1B-S4
0...10 bar (0...145 psi)	**Ordering code**	**BSP008A**	**BSP008R**
	Part number	BSP B010-EV002-D00S1B-S4	BSP B010-EV002-A00S1B-S4
0...20 bar (0...290 psi)	**Ordering code**	**BSP008C**	**BSP008T**
	Part number	BSP B020-EV002-D00S1B-S4	BSP B020-EV002-A00S1B-S4
0...50 bar (0...725 psi)	**Ordering code**	**BSP008E**	**BSP008U**
	Part number	BSP B050-EV002-D00S1B-S4	BSP B050-EV002-A00S1B-S4
0...100 bar (0...1450 psi)	**Ordering code**	**BSP008F**	**BSP008W**
	Part number	BSP B100-EV002-D00S1B-S4	BSP B100-EV002-A00S1B-S4
0...250 bar (0...3626 psi)	**Ordering code**	**BSP008H**	**BSP008Y**
	Part number	BSP B250-EV002-D00S1B-S4	BSP B250-EV002-A00S1B-S4
0...400 bar (0...5802 psi)	**Ordering code**	**BSP008J**	**BSP008Z**
	Part number	BSP B400-EV002-D00S1B-S4	BSP B400-EV002-A00S1B-S4
0...600 bar (0...8702 psi)	**Ordering code**	**BSP008K**	**BSP0090**
	Part number	BSP B600-EV002-D00S1B-S4	BSP B600-EV002-A00S1B-S4
Housing Material		PA 6.6 and stainless steel	PA 6.6 and stainless steel
Plug connector		M12 connector, 4-pin	M12 connector, 4-pin
Process connection		Internal thread G¼" per DIN EN 3852	Internal thread G¼" per DIN EN 3852

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

BSP Accessories

Manometer screw connection per DIN EN 837

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

BSP Pressure sensor accessories

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

Two switching points (NO or NC)

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

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

	BSP0091	**BSP004Y**	**BSP0050**	**BSP0052**
	BSP V002-EV002-A02S1B-S4	BSP V002-EV003-D00A0B-S4	BSP V002-EV003-A00A0B-S4	BSP V002-EV003-A02A0B-S4
	BSP0092	**BSP004Z**	**BSP0051**	**BSP0053**
	BSP V010-EV002-A02S1B-S4	BSP V010-EV003-D00A0B-S4	BSP V010-EV003-A00A0B-S4	BSP V010-EV003-A02A0B-S4
	BSP0093	**BSP0021**	**BSP002A**	**BSP002N**
	BSP B002-EV002-A02S1B-S4	BSP B002-EV003-D00A0B-S4	BSP B002-EV003-A00A0B-S4	BSP B002-EV003-A02A0B-S4
	BSP0094	**BSP0022**	**BSP002C**	**BSP002P**
	BSP B005-EV002-A02S1B-S4	BSP B005-EV003-D00A0B-S4	BSP B005-EV003-A00A0B-S4	BSP B005-EV003-A02A0B-S4
	BSP0095	**BSP0023**	**BSP002E**	**BSP002R**
	BSP B010-EV002-A02S1B-S4	BSP B010-EV003-D00A0B-S4	BSP B010-EV003-A00A0B-S4	BSP B010-EV003-A02A0B-S4
	BSP0096	**BSP0024**	**BSP002F**	**BSP002T**
	BSP B020-EV002-A02S1B-S4	BSP B020-EV003-D00A0B-S4	BSP B020-EV003-A00A0B-S4	BSP B020-EV003-A02A0B-S4
	BSP0097	**BSP0025**	**BSP002H**	**BSP002U**
	BSP B050-EV002-A02S1B-S4	BSP B050-EV003-D00A0B-S4	BSP B050-EV003-A00A0B-S4	BSP B050-EV003-A02A0B-S4
	BSP0098	**BSP0026**	**BSP002J**	**BSP002W**
	BSP B100-EV002-A02S1B-S4	BSP B100-EV003-D00A0B-S4	BSP B100-EV003-A00A0B-S4	BSP B100-EV003-A02A0B-S4
	BSP0099	**BSP0027**	**BSP002K**	**BSP002Y**
	BSP B250-EV002-A02S1B-S4	BSP B250-EV003-D00A0B-S4	BSP B250-EV003-A00A0B-S4	BSP B250-EV003-A02A0B-S4
	BSP009A	**BSP0028**	**BSP002L**	**BSP002Z**
	BSP B400-EV002-A02S1B-S4	BSP B400-EV003-D00A0B-S4	BSP B400-EV003-A00A0B-S4	BSP B400-EV003-A02A0B-S4
	BSP009C	**BSP0029**	**BSP002M**	**BSP0030**
	BSP B600-EV002-A02S1B-S4	BSP B600-EV003-D00A0B-S4	BSP B600-EV003-A00A0B-S4	BSP B600-EV003-A02A0B-S4
	PA 6.6 and stainless steel	Stainless steel	Stainless steel	Stainless steel
	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	Internal thread G¼" per DIN EN 3852	Internal thread G¼" per DIN EN 3852	Internal thread G¼" per DIN EN 3852	Internal thread G¼" per DIN EN 3852

Internal thread

	BAM0209	**BAM01RP**	**BAM01KT**	**BAM01TR**
	BAM AD-SP-008-1G4/M20X1.5-4	BAM AD-SP-008-1G4/1R4-4	BAM AD-SP-008-1G4/1N4-4	BAM AD-SP-011-1G4/1N4-4
	G1/4"	G1/4"	G1/4"	1/4" NPT
	M20x1.5	R1/4"	NPT1/4"	Internal Thread NPT1/4"

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

Mechanical Switches

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

ON OFF · Constant Condition Monitoring

Inductive Sensors

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

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

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

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)

Photoelectric BOS 50K - Diffuse sensor

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

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

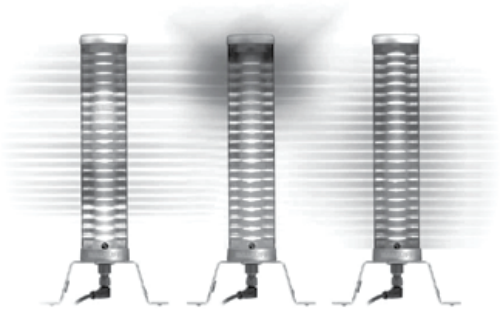
IO-Link

SmartLight – for signaling operating states

Stack light & visualization functions with one configurable part number

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

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



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

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

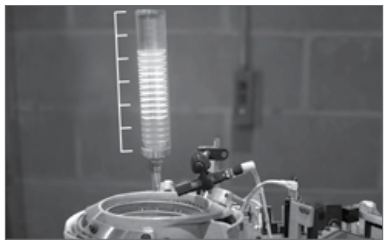
Run Mode
- Indicate running status with a simple scrolling light
- Signal a problem or action required
- Freely configure the color or the scrolling light, background, and speed

Stack Light Process Indication

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

Level Visualization

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



IO-Link	Device	Device	Device
Designation	SmartLight with buzzer, 1-5 zones	SmartLight, 1-5 zones	SmartLight, 1-3 zones
Ordering code	**BNI0085**	**BNI0072**	**BNI007F**
Part number	BNI IOL-802-102-Z037	BNI IOL-802-000-Z036	BNI IOL-801-000-Z036
Supply voltage U_B	18...30 V DC	18...30 V DC	18...30 V DC
Function indicator IO-Link RUN	Green LED	Green LED	Green LED
Power-on indicator	Green LED	Green LED	Green LED
Connection: IO-Link	M12, A-coded, male	M12, A-coded, male	M12, A-coded, male
Connection U_A	via IO-Link interface	via IO-Link interface	via IO-Link interface
Configurable	Yes	Yes	Yes
Max. load current of actuators	0.35 A	0.35 A	0.35 A
Degree of protection as per IEC 60529	IP 54 (only in plugged-in and screwed-down state)	IP 54 (only in plugged-in and screwed-down state)	IP 54 (only in plugged-in and screwed-down state)
Operating temperature T_a	–5…+70 °C	–5…+70 °C	–5…+70 °C
Storage temperature	–25…+70 °C	–25…+70 °C	–25…+70 °C
Mounting	M18 thread	M18 thread	M18 thread
Dimensions (L×W×H)	55×55×295 mm	55×55×295 mm	55×55×213 mm
Housing material	Transparent polycarbonate, nickel-plated die-cast zinc	Transparent polycarbonate, nickel-plated die-cast zinc	Transparent polycarbonate, nickel-plated die-cast zinc
IO-Link Version 1.1			
Transfer rate	COM 2 (38.4 kBaud)	COM 2 (38.4 kBaud)	COM 2 (38.4 kBaud)
Cycle time	5 ms with IO-Link 1.1 Master 20 ms with IO-Link 1.0 Master	5 ms with IO-Link 1.1 Master 20 ms with IO-Link 1.0 Master	5 ms with IO-Link 1.1 Master 20 ms with IO-Link 1.0 Master
Indicators Communication	Flashing green LED	Flashing green LED	Flashing green LED
Power supply	Static green LED	Static green LED	Static green LED
IO-Link process data length	3 byte output	3 byte output	3 byte output

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