

**BALLUFF**

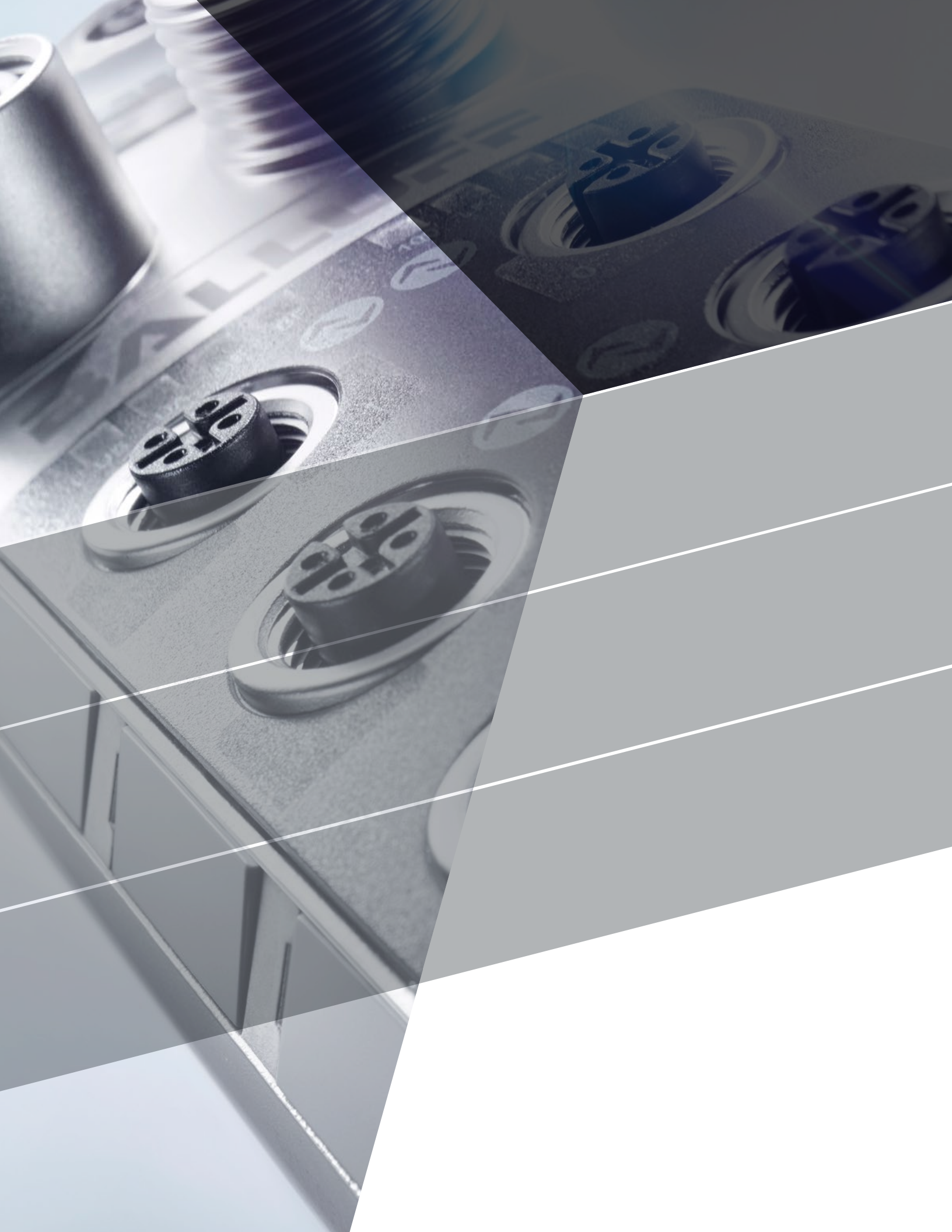
Control systems  
architectures

# COMMON LAYOUTS FOR CONTROL DESIGNERS

 *innovating automation*

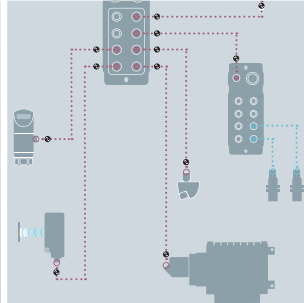
 **IO-Link**





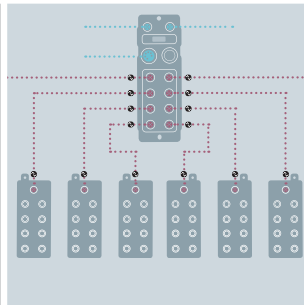
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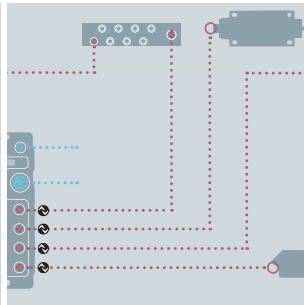
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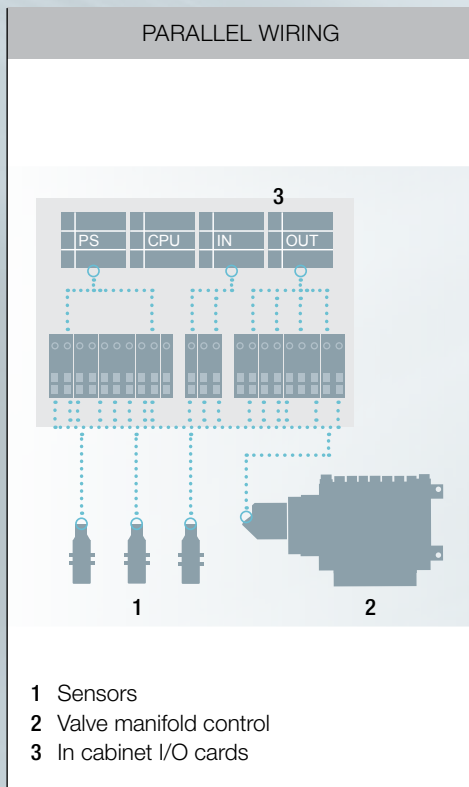
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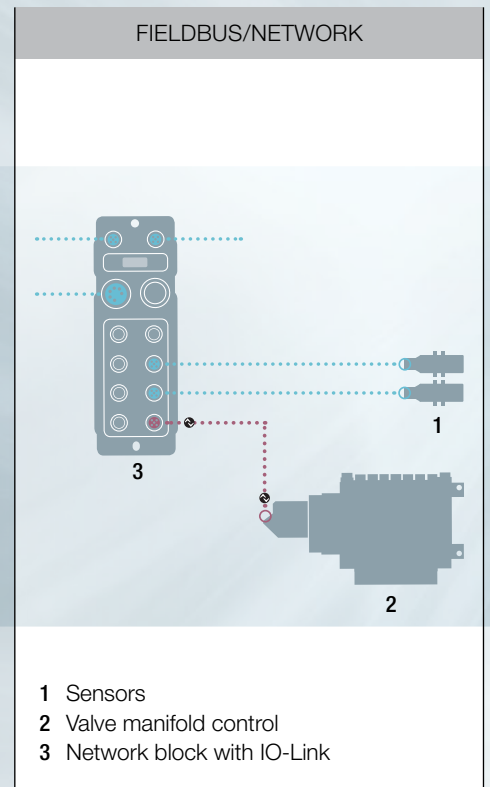


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# THE BALLUFF ADVANTAGE

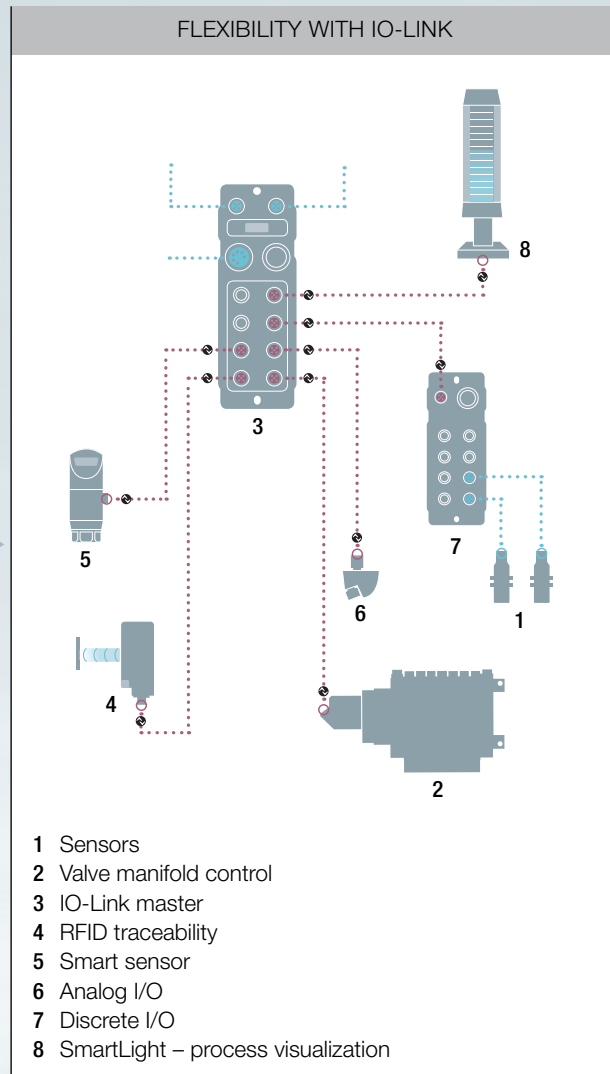


SIMPLIFY  
YOUR  
CONTROL  
COMPLEXITY





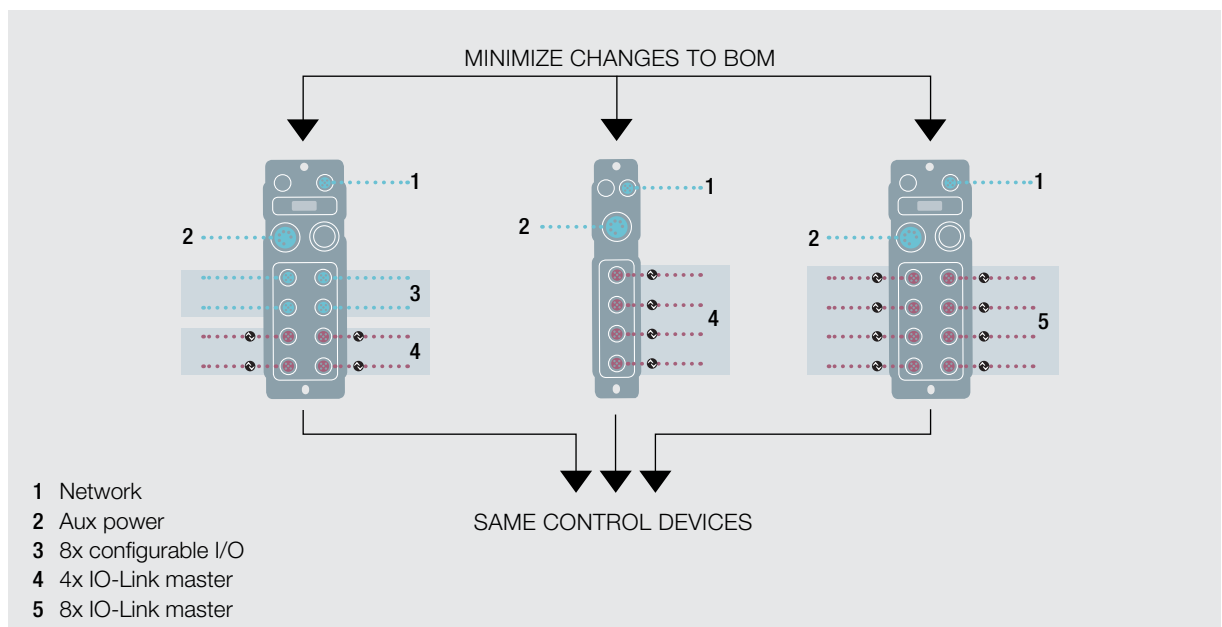
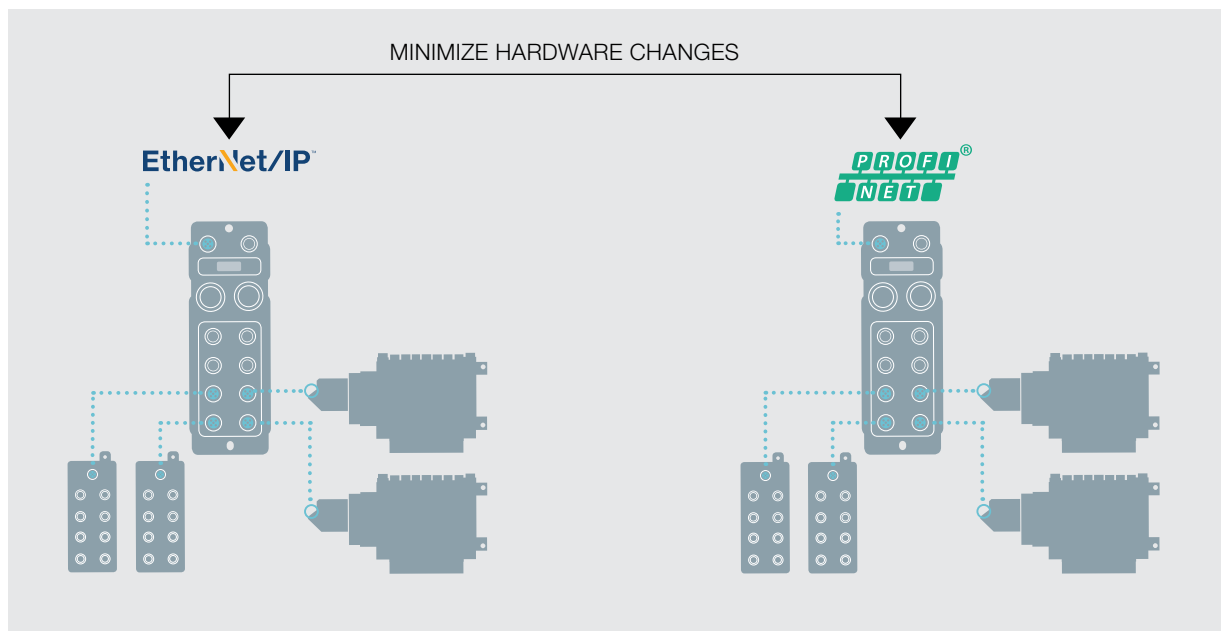
REDUCE YOUR CONTROL COSTS AND  
ENHANCE EQUIPMENT EFFECTIVENESS



## Modular controls architecture

# QUICKLY ADAPT TO YOUR CUSTOMER'S NETWORK CHOICE

With IO-Link onboard, systems can be adapted to any major network with minimum changes to the BOM.



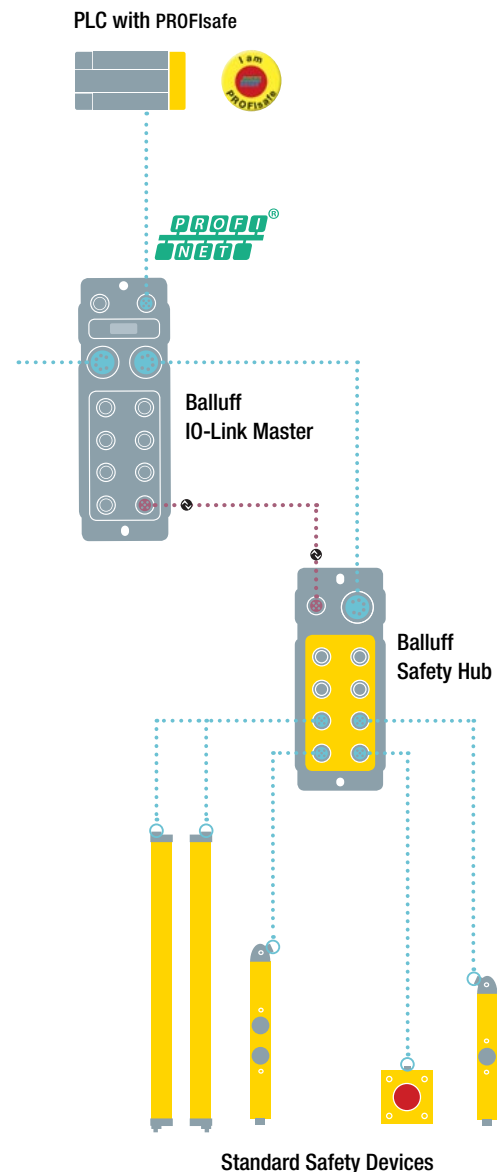
## Safety

# ENHANCE IO-LINK ARCHITECTURE WITH SAFETY

IO-Link enhances value of the distributed architecture by simplifying wiring, adding enhanced diagnostics and easing setup and configuration of the automation system. Safety over IO-Link extends these virtues beyond automation to safety of the system. With seamless integration of safety in the existing topology, safety over IO-Link makes the control architecture truly modular while eliminating need for separate controllers, programming, and additional hardware.

Balluff safety over IO-Link technology utilizes PROFIsafe communication over PROFINET and IO-Link. Balluff safety hub establishes a direct connection with the PROFIsafe enabled safety controller using black channel tunneling feature offered by PROFIsafe.

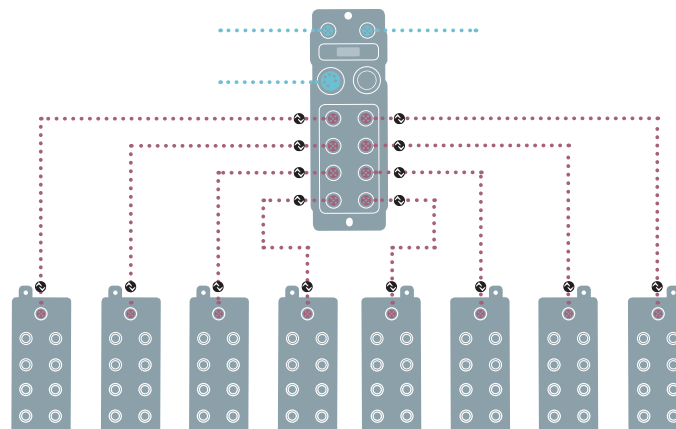
- Achieve Safety Integrity Level (SIL) 3 according to EN 62061 and Performance Level (PL) e according to the ISO 13849-1
- Build application specific architecture by combining safety and standard automation component on the same network node
- Eliminate connection errors, add diagnostics to safety system and simplify machine architecture with functional safety



## Modular controls architecture

# HIGH DENSITY I/O

- Up to 240 I/O points and diagnostics with a single IP address
- Control up to 192 solenoid valve manifold positions per IP address
- Easily set up complex systems with configurable I/O
- Drive up to 2 amp outputs per channel with diagnostics and overload protection
- Simplify connections to smart sensors and analog measurement devices
- Seamless integration of safety with automation  
(Safety over IO-Link available with PROFIsafe and PROFINET)



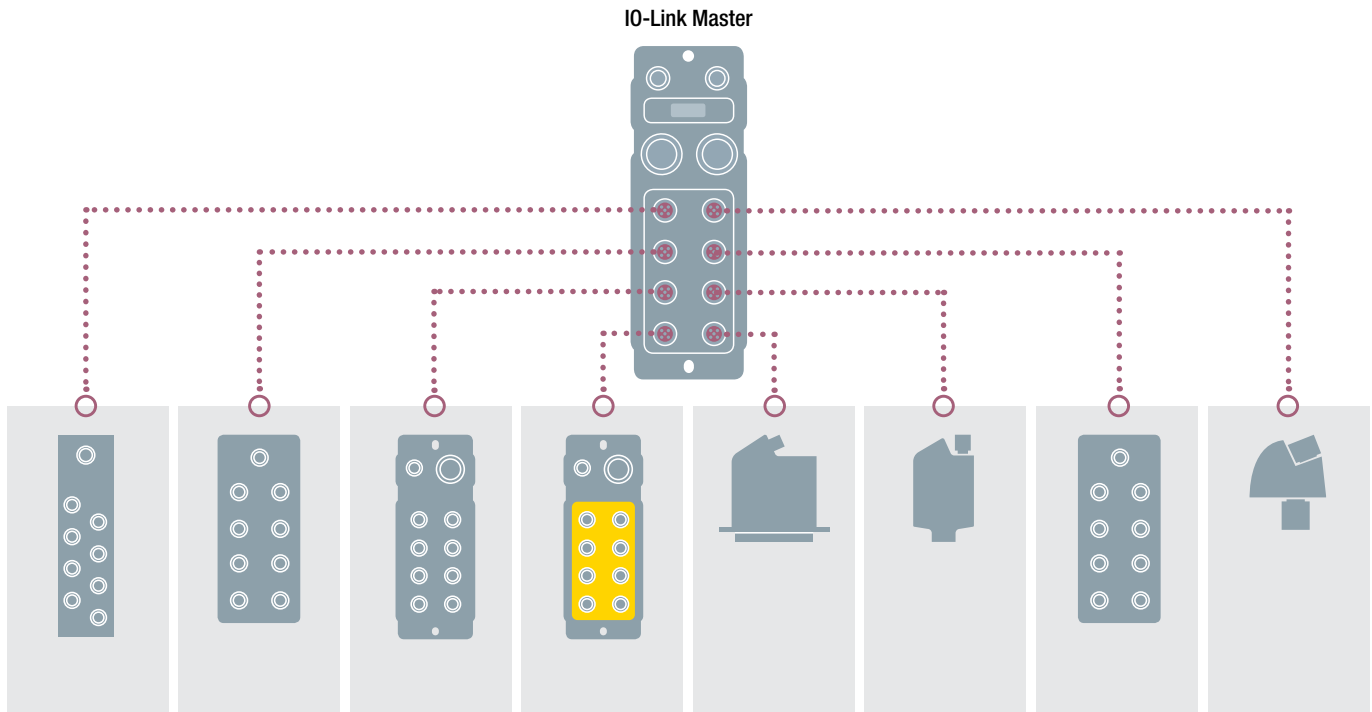
## **IO-Link** ADVANTAGE

### **WARNING**

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

Balluff, Inc. - [www.balluff.com](http://www.balluff.com) - 1-800-543-8390





IO-LINK MASTERS  
4 PORT AND 8 PORT

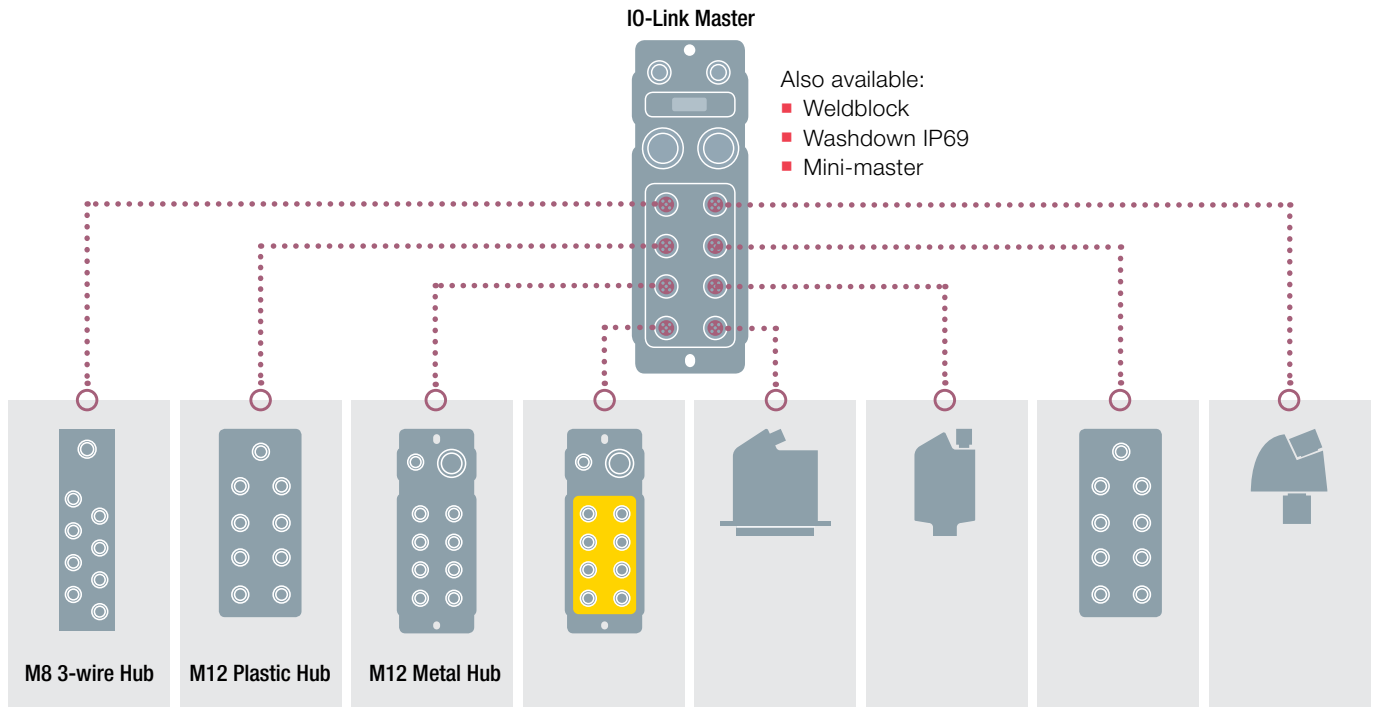


**ECOLAB**

EtherNet/IP	BNI004A	BNI008Z	BNI009T	BNI00AA	BNI006A	BNI008M	BNI0096
DeviceNet	BNI005A						
PROFINET	BNI004U		BNI0092	BNI00A9	BNI005H		BNI009M
PROFIBUS	BNI005R						
CC-Link	BNI0040						
CC-Link IE					BNI008C		
EtherCAT			BNI009U	BNI00AC	BNI0077		
Interface	4x IO-Link +8DIO	4x IO-Link +8DIO	4x IO-Link	4x IO-Link	8x IO-Link	8x IO-Link	8x IO-Link
Port type	Type A	Type A	Type A	Type B	Type A	Type A	Type A
Housing	Die-cast zinc IP67	Polypropylene sulfide IP67	Die-cast zinc IP67	Die-cast zinc IP67	Die-cast zinc IP67	Polypropylene sulfide IP67	Stainless steel 1.4571 IP69

**Modular controls architecture**

# HIGH DENSITY I/O



M8 3-WIRE HUB



Configurable with expansion	BNI0093	BNI00AU		
Inputs – PNP with expansion			BNI0099	BNI00AY
Inputs, PNP	≤8	≤16	8	16
Outputs	≤8	≤16		
Housing	Die-cast zinc IP67	Die-cast zinc IP67	Die-cast zinc IP67	Die-cast zinc IP67



## M12 PLASTIC HUB



Inputs plastic – PNP	BNI0006		BNI0090*	
Inputs plastic – NPN	BNI0074			
Config I/O with expansion – PNP		BNI007Z		BNI0091*
Config I/O with expansion – NPN		BNI00AF		
Inputs	16	≤16	16	≤16
Outputs		≤16		≤16
Housing	Polyamide transparent IP67	Polyamide transparent IP67	Polypropolyne sulfide (PPS) IP67	Polypropolyne sulfide (PPS) IP67
			*Weldblock	*Weldblock



## M12 METAL HUB

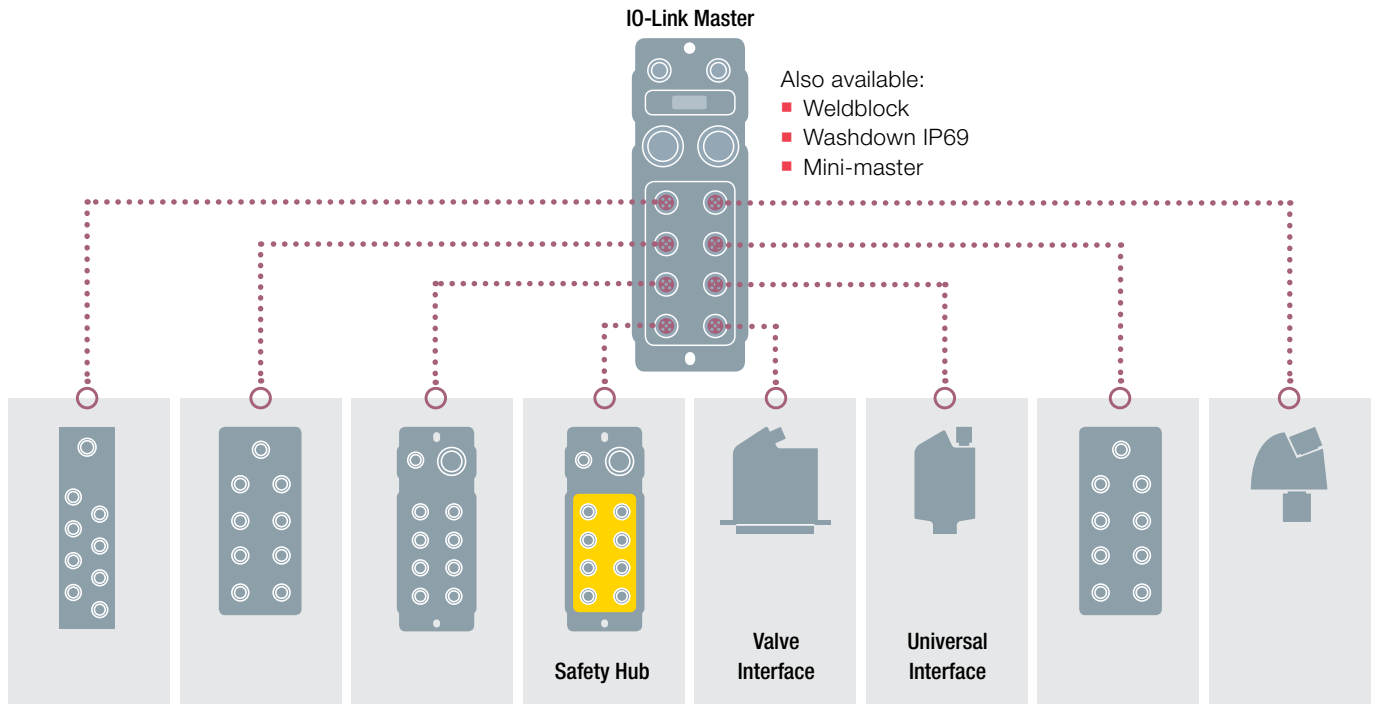


Inputs – PNP	BNI0039			
Inputs – NPN	BNI0063			
Config I/O – 9A Aux 5-pin			BNI0046	BNI00AT*
Config I/O – 9A Aux 4-pin			BNI00CP	
Config I/O – 1.6A output		BNI00CM		BNI00AR*
Inputs	16	≤16	≤16	≤16
Outputs		≤16	≤16	≤16
Housing	Die-cast zinc IP67	Die-cast zinc IP67	Die-cast zinc IP67	Stainless steel (1.4571)

\*Protection degree IP69

**Modular controls architecture**

# HIGH DENSITY I/O



SAFETY HUBS



IP67 with Aux	BNI0098	BNI00CL
Protocol	PROFIsafe	Galvanic Isolation
Inputs	0	8
Safe inputs	12	0
Safe outputs	2	
Isolated outputs		8



VALVE INTERFACE 25P DSUB



Bosch Rexroth, Festo	BNI006N			
MAC		BNI006M		
SMC, Parker, Norgen			BNI006P	
Numatics				BNI006R
Outputs	24	16	24	22



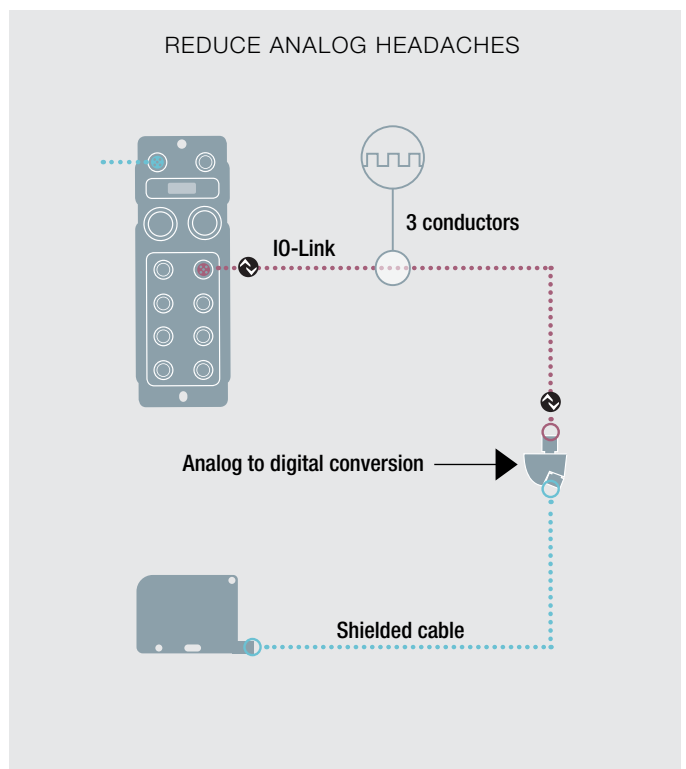
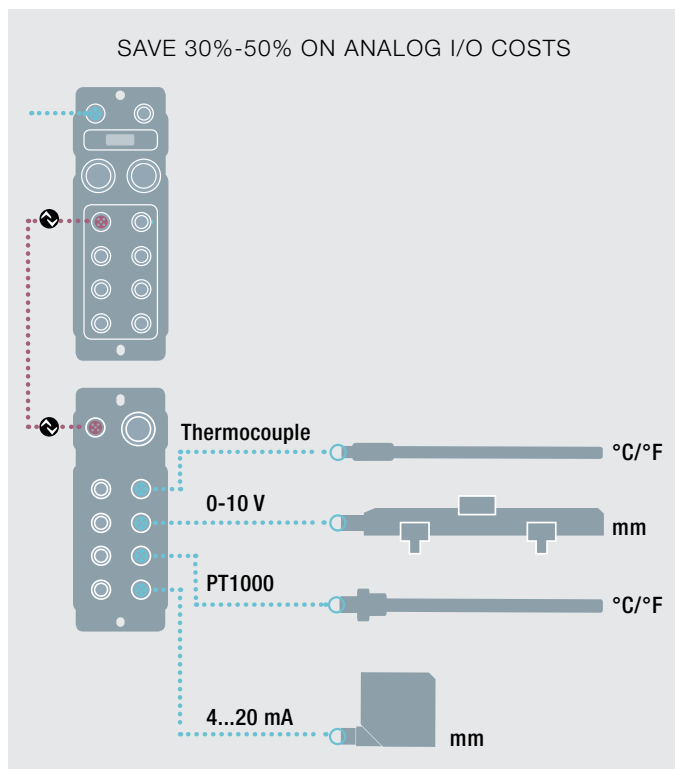
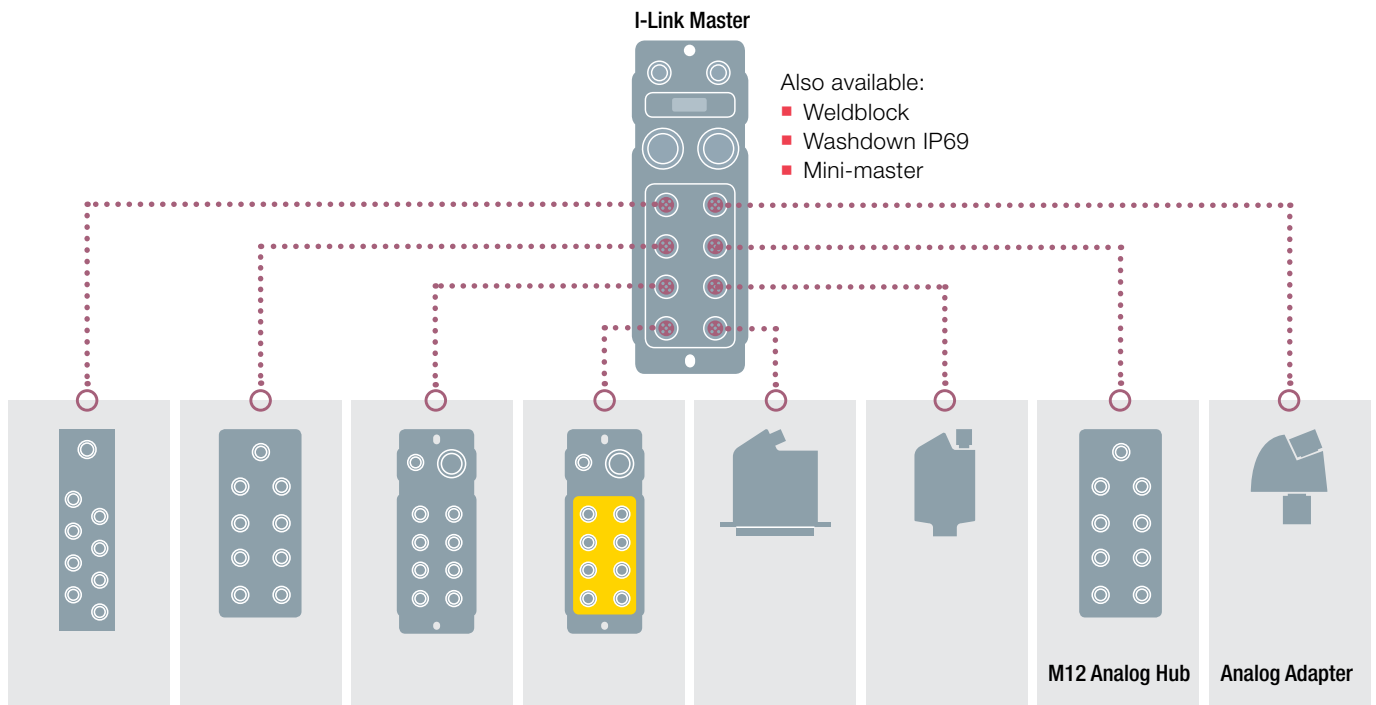
UNIVERSAL INTERFACE



IP54 config I/O – wires	BNI005M	BNI005N
Inputs, PNP	≤8	≤16
Outputs	≤8	≤16

## Modular controls architecture

# HIGH DENSITY I/O







## M12 ANALOG HUB



Fixed inputs	BNI0007	BNI0008	
Configurable inputs for current, voltage or temperature			BNI00AJ
Digital inputs	8x PNP	8x PNP	0
Analog inputs	4x current	4x voltage	8x configurable



## M12 ANALOG ADAPTER



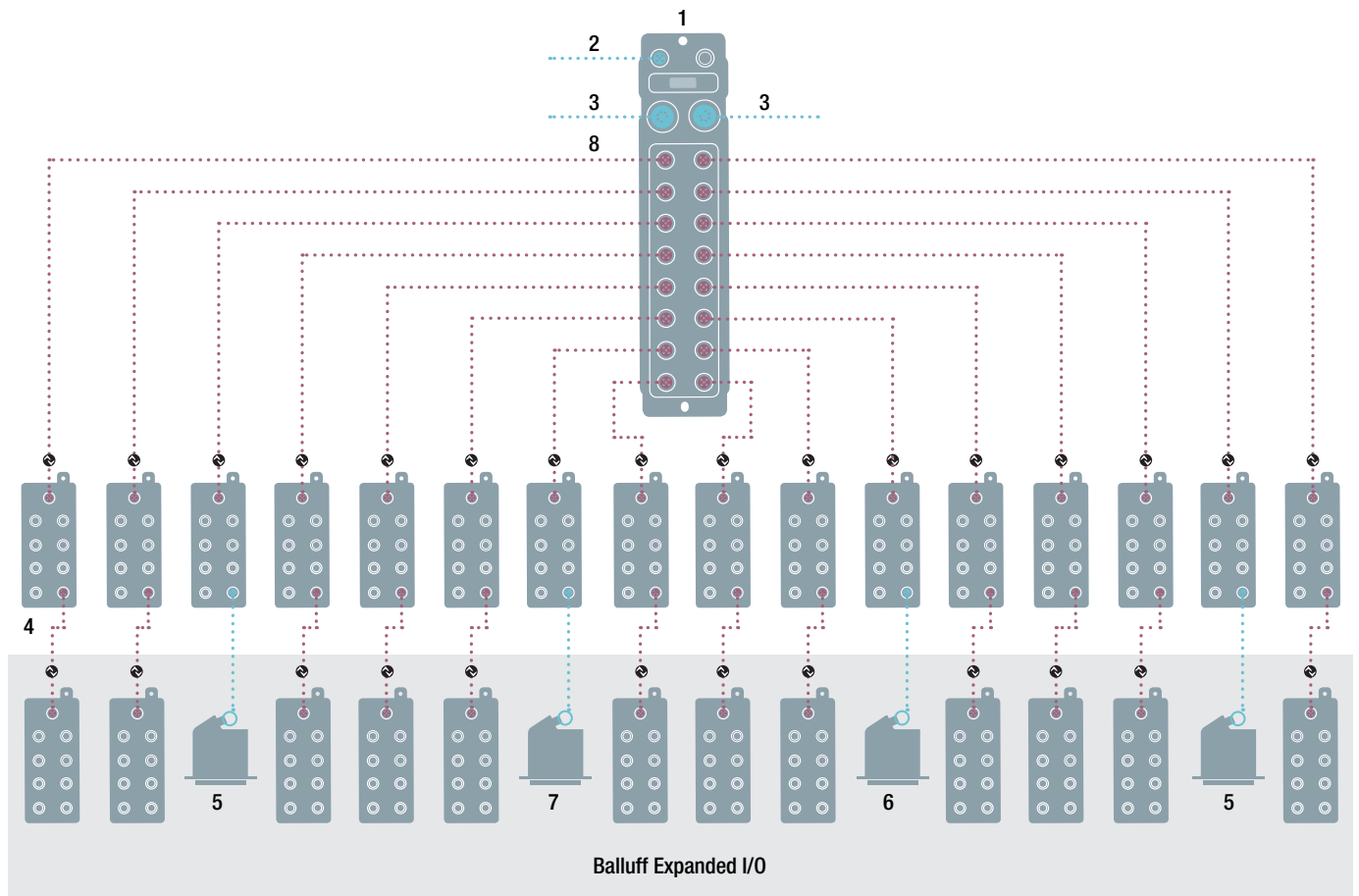
Current measurement IN (4...20 mA)	BNI0041	
Current measurement OUT (4...20 mA)	BNI004C	
Voltage measurement IN (0...10 V)	BNI0042	
Voltage measurement OUT (0...10 V)	BNI004E	
Temperature measurement (RTD)	BNI004T	
Temperature measurement (thermocouple; Type J, K)		BNI00C7
Configurable analog IN (current, voltage, thermocouple, RTD)		BNI00C9
Configurable analog OUT (current, voltage)		BNI00C8
Configurable IN/OUT		BNI00C6

## Common architectures

# ENHANCED HIGH DENSITY I/O

With enhanced expansion port functionality, a single network node could host a significantly large I/O count.

- Maximum outputs: 608
- Maximum inputs: 480
- Maximum configurable I/O: 480



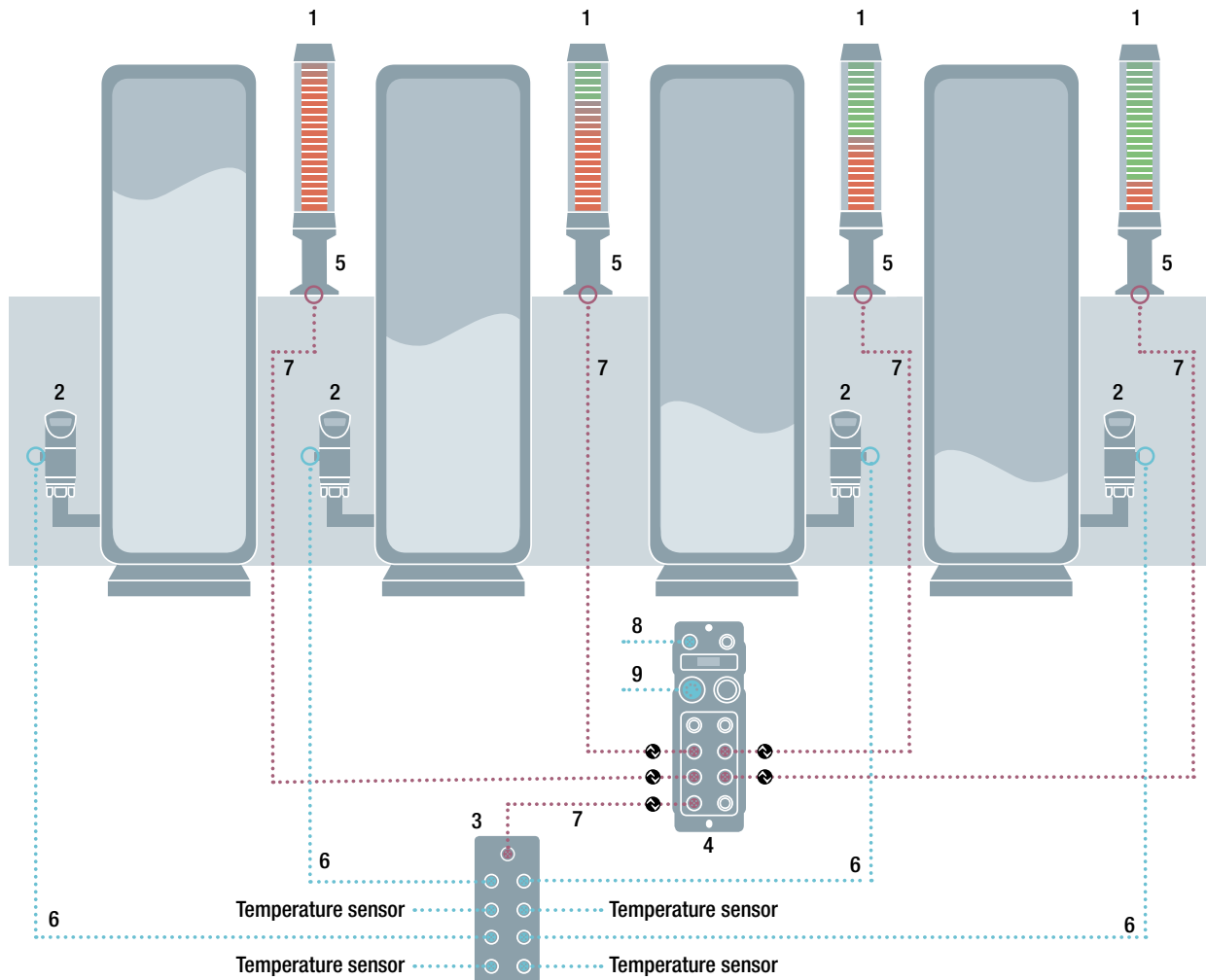
Key	Description	Part number	Quantity	Inputs	Outputs	
1	PROFINET 16 port IO-Link master	BNI PNT-509-105-Z033	BNI007M	1	≤ 32	≤ 32
2	PROFINET cable M12-RJ45, 2m*	BCC M414-E834-8G-668-PS54N2-020*	BCC0JF0	1		
3	Aux power cable 7/8" 5-wire, 2m*	BCC A315-0000-10-063-VX45W6-020*	BCC09CK	2		
4	M12 – configurable I/O with expansion port	BNI IOL-302-002-K006	BNI007Z	≤ 32	≤ 16	≤ 16
5	Valve connector: Festo, Bosch Rexroth	BNI IOL-751-V08-K007	BNI006N	≤ 16		24
6	Valve connector: SMC, Parker, Norgren	BNI IOL-751-V10-K007	BNI006P	≤ 16		24
7	Valve connector: Numatics	BNI IOL-751-V13-K007	BNI006R	≤ 16		22
8	Sensor cable M12-M12 4-wire, 2m*	BCC M415-M414-3A-304-VX44T2-020*	BCC05MC	≤ 32		

\*See website for available lengths.

## Common architectures

## EASILY MONITOR TANK LEVELS

- Tie SmartLights to values for easy to visualize level indication
- Eliminate manual overflow or empty tank issues
- Eliminate scrap due to mixing and dosing errors
- Easily integrate temperature monitoring



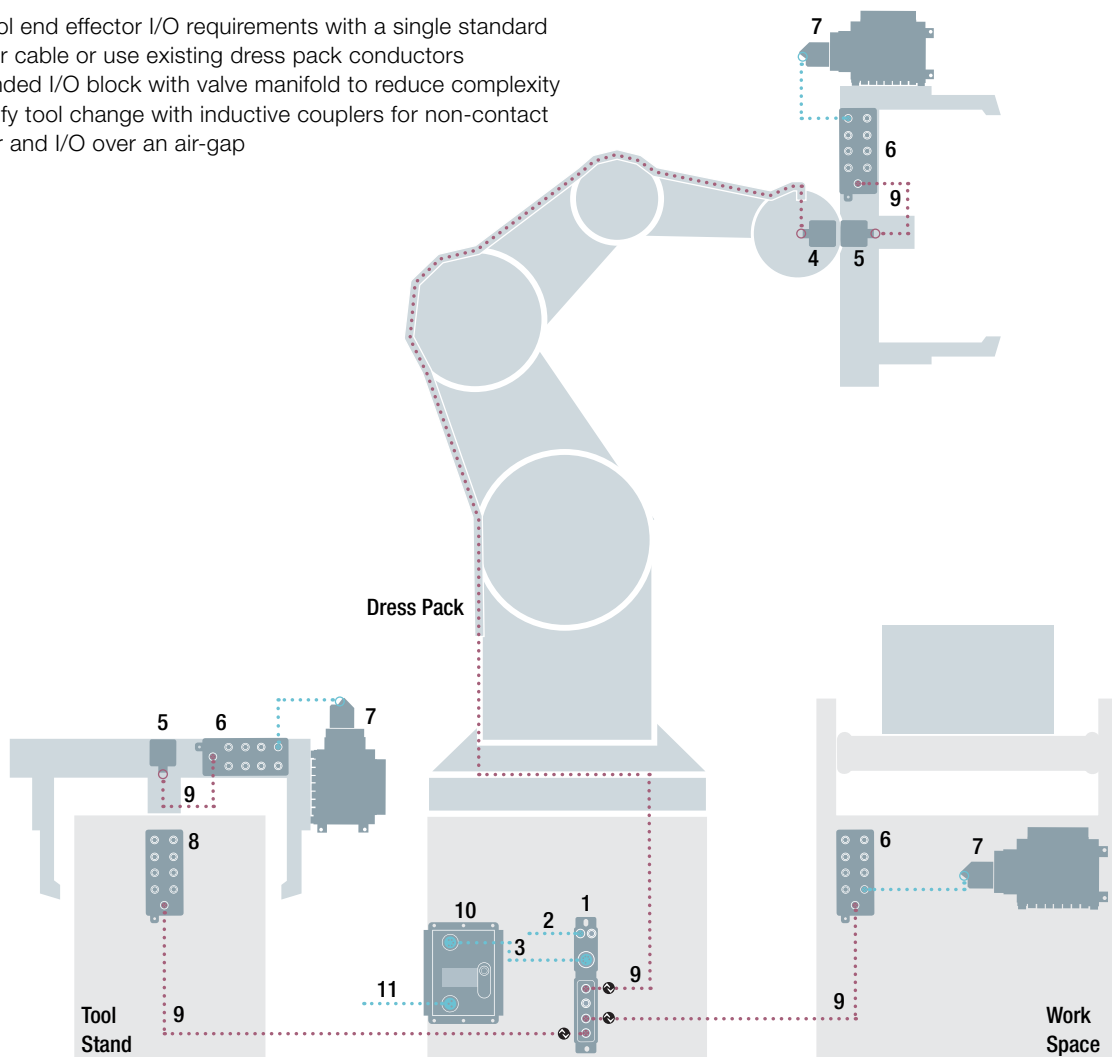
Key	Description	Part number		Quantity
1	5 segment SmartLight with buzzer	BNI IOL-802-102-Z037	BNI0085	4
2	Pressure sensor, 0...10V, 0...100 bar	BSP B100-EV002-A00A0B-S4	BSP0010	4
3	Analog hub, 8x configurable inputs	BNI IOL-719-002-Z012	BNI00AJ	1
4	Ethernet/IP master 8x IO-Link ports	BNI EIP-508-105-Z015	BNI006A	1
5	SmartLight pedestal mount, 100 mm	BAM MB-NI-017-100-1	BAM026K	4
6	M12 to M12 shielded cable, 2m*	BCC M415-M414-3A-305-PS0434-020*	BCC0C00	4
7	M12 to M12 cable, 2m*	BCC M415-M414-3A-304-VX44T2-020*	BCC05MC	5
8	M12 to M12, D-coded, Ethernet/IP network cable, 2m*	BCC M414-M414-6D-366-EX64N9-020*	BCC0CLZ	1
9	7/8" Aux power cable, 4-wire, 2m*	BCC A314-0000-10-003-VX44W6-020*	BCC090W	1

\*See website for available lengths.

## Common architectures

# ROBOTIC AUTOMATION

- Control end effector I/O requirements with a single standard sensor cable or use existing dress pack conductors
- Expanded I/O block with valve manifold to reduce complexity
- Simplify tool change with inductive couplers for non-contact power and I/O over an air-gap



Key	Description	Part number		Quantity
1	EtherNet/IP 4x IO-Link master	BNI EIP-507-005-Z040	BNI009T	1
2	Ethernet cable M12-RJ45 shielded, 2m*	BCC M414-E894-8G-672-ES64N9-020*	BCC0E90	1
3	Aux power cable 7/8" 4-wire, 0.6, double ended*	BCC A314-A314-30-346-VX44W6-006*	BCC0937	1
4	Bi-directional IO-Link inductive coupler base for power and data	BIC 1B0-ITA50-Q40KFU-SM4A4A	BIC0070	1
5	Bi-directional IO-Link inductive coupler remote for power and data	BIC 2B0-ITA50-Q40KFU-SM4A5A	BIC0071	2
6	Configurable 16x I/O hub with expansion port (port 7)	BNI IOL-302-002-K006	BNI007Z	3
7	Valve connector 24 outputs SMC, Parker or Norgren valve manifold	BNI IOL-751-V10-K007	BNI006P	3
8	M12 16x input PNP hub for tool holder	BNI IOL-104-000-K006	BNI0006	1
9	Sensor cable M12- M12 4-wire, 2m*	BCC M415-M414-3A-304-VX44T2-020*	BCC05MC	5
10	Machine mount power supply	BAE PS-XA-1W-24-038-607-I	BAE00TP	1
11	AC power cable, 7/8" 3-wire, 2m*	BCC A313-0000-10-071-VX43W6-020*	BCC099E	1

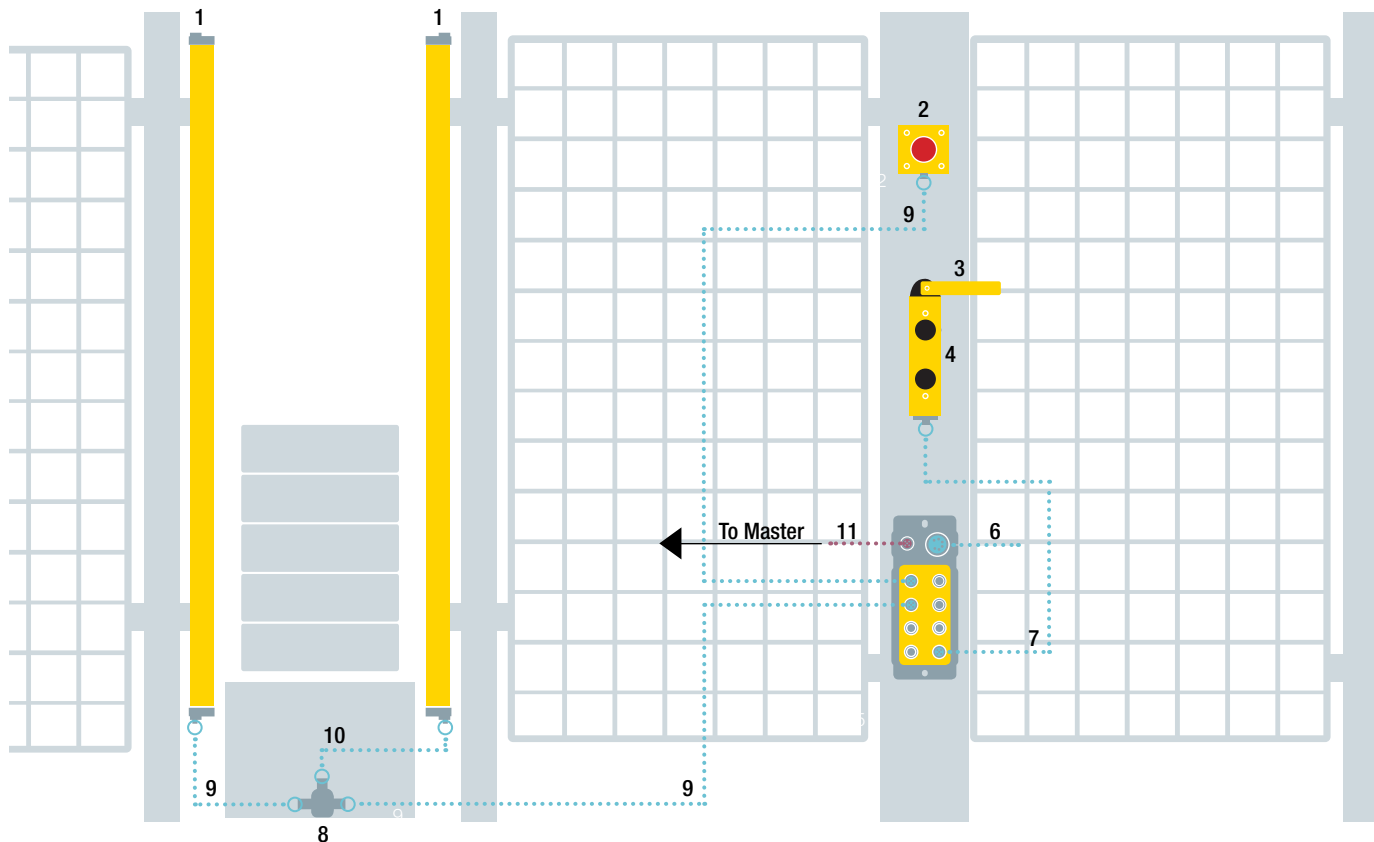
\*See website for available lengths.

## Common architectures

## SAFETY – ROBOTIC AUTOMATION

Zone based safety for a work cell can be combined into a single safety hub.

- Create and define multiple safety zones and integrate various safety field devices with a single IO-Link safety hub
- The safety hub connects to a Balluff PROFINET master with a standard 3-pin prox cable, up to 20m long



**Warning:** The devices shown are for example purposes. Selection of safety devices varies based on risk analysis and application.

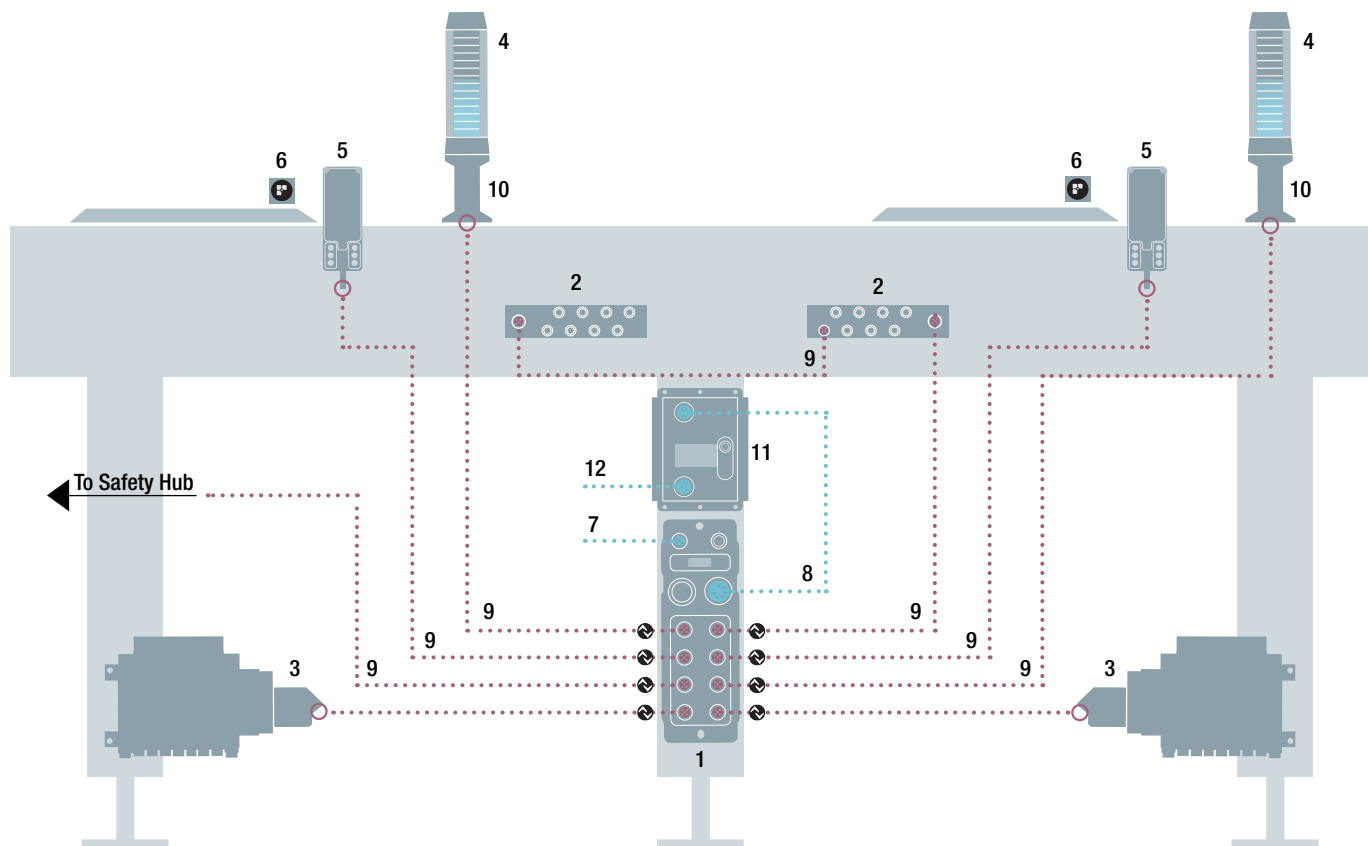
Key	Description	Part number		Quantity
1	Safety light curtain, _ _ _ mm	BLG 4A-120-50X-B04-O01-SX	BLG0009	1
2	E-stop	BAM ES-XA-01D-01-R01-201-S92	BAM02HA	1
3	Door handle	BAM TG-ID-016-H02	BAM0272	1
4	Interlocking gate switch	BID F101-2M1E3R-M02AZ0-S115	BID0001	1
5	Safety I/O module (PROFIsafe, IO-Link)	BNI IOF-329-P02-Z038	BNI0098	1
6	Aux power cable 7/8" 5-wire, 2m*	BCC A315-0000-10-063-VX45W6-020*	BCC09CK	1
7	Sensor cable M12- M12 8-wire, 2m*	BCC M418-M418-3A-320-PX4825-020-C033*	BCC0H25	1
8	Cable splitter	BDN T-DTN-DD-01	BCC07WR	1
9	Sensor cable M12 female-M12 male, 5-pin, 5m*	BCC M415-M415-3A-313-EX45T2-050*	BCC08A9	3
10	Sensor cable M12 female-M12 male, 5-pin, 2m*	BCC M415-M414-3A-304-EX44T2-020*	BCC05LY	1
11	Sensor cable M12 female-M12 male, 4-wire, 10m*	BCC M415-M414-3A-304-VX44T2-100*	BCC085J	1

\*See website for available lengths.

## Common architectures

# ASSEMBLY AUTOMATION

- Our most popular configuration of product
- Industrial RFID, sensor inputs, valve control, and SmartLight indication
- One master typically runs islands of automation
- Easily build modular equipment for transport or flexibility
- Change in network? Only change the master block.



Key	Description	Part number		Quantity	Inputs	Outputs
1	8x master - PROFINET	BNI PNT-508-105-Z015	BNI005H	1	16	16
2	M8 4-wire inputs - PNP	BNI IOL-104-S01-K021	BNI0022	2	16	0
3	SMC 24 valve connector	BNI IOL-751-V10-K007	BNI006P	2	0	24
4	3 segment SmartLight	BNI IOL-801-102-Z036	BNI0088	2		3
5	ISO read/write domino type head	BIS M-408-045-001-07-S4	BIS014J	2		
6	RFID data tag (based on number of pallets)	BIS M-110-02/L	BIS0044			
7	PROFINET cable M12-RJ45, 2m*	BCC M414-E834-8G-668-PS54T2-020*	BCC04K7	1		
8	Aux power cable 7/8" 5-wire, 2m*	BCC A315-A315-30-335-VX45W6-020*	BCC09E0	1		
9	Sensor cable M12-M12 4-wire, 2m*	BCC M415-M414-3A-304-VX44T2-020*	BCC05MC	7		
10	SmartLight stand, 100 mm	BAM MB-NI-017-100-1	BAM026K	2		
11	Machine mount power supply 3.8A	BAE PS-XA-1W-24-080-605-I	BAE00TM	1		
12	AC power cable, 7/8" 3-wire, 2m*	BCC A313-0000-10-071-VX43W6-020*	BCC099E	1		
Total Inputs/Outputs					32	54

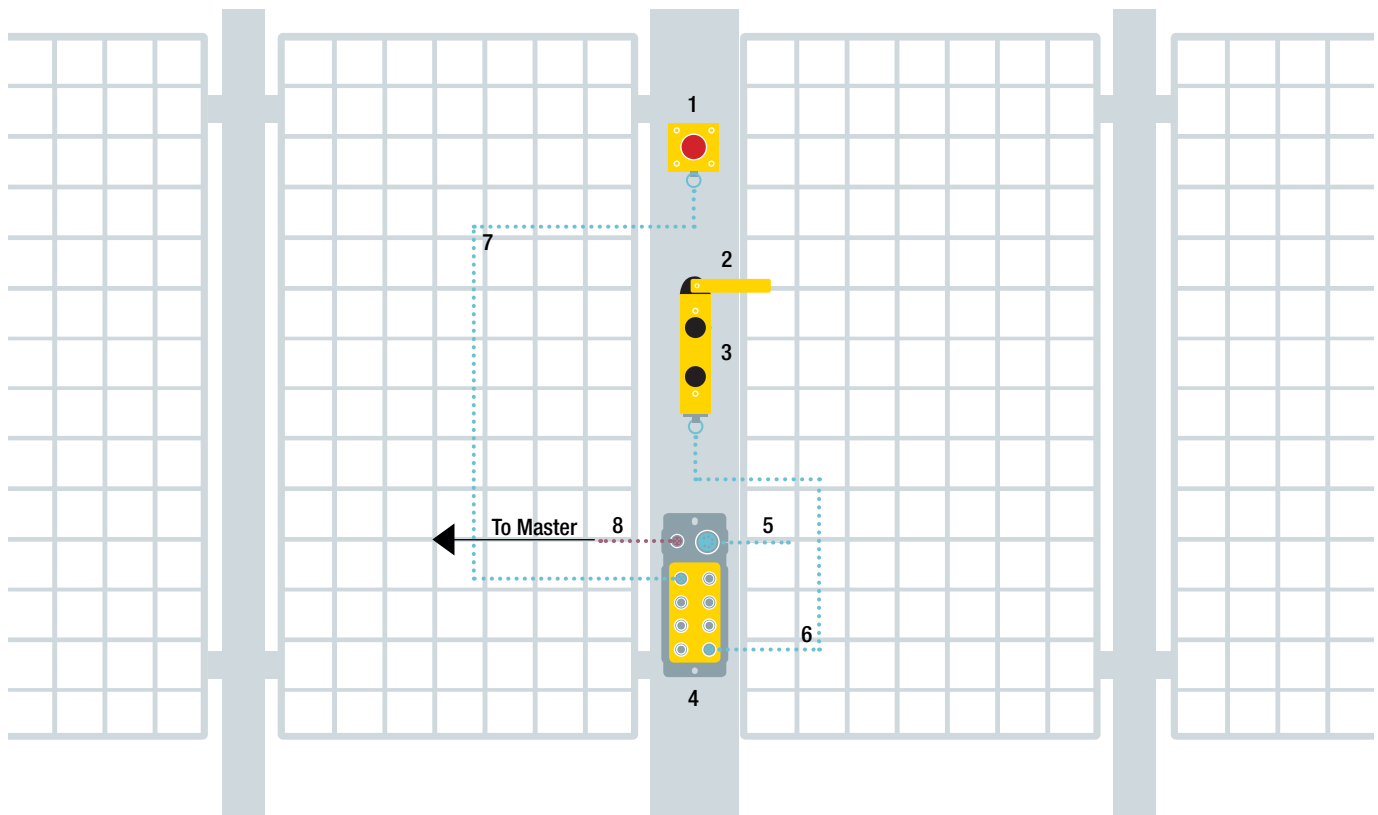
\*See website for available lengths.



## Common architectures

## SAFETY – ASSEMBLY AUTOMATION

Enhance assembly automation with safety. Automation I/O and safety I/O can be combined without adding more complexity by eliminating the need for safety relays and separate controls.



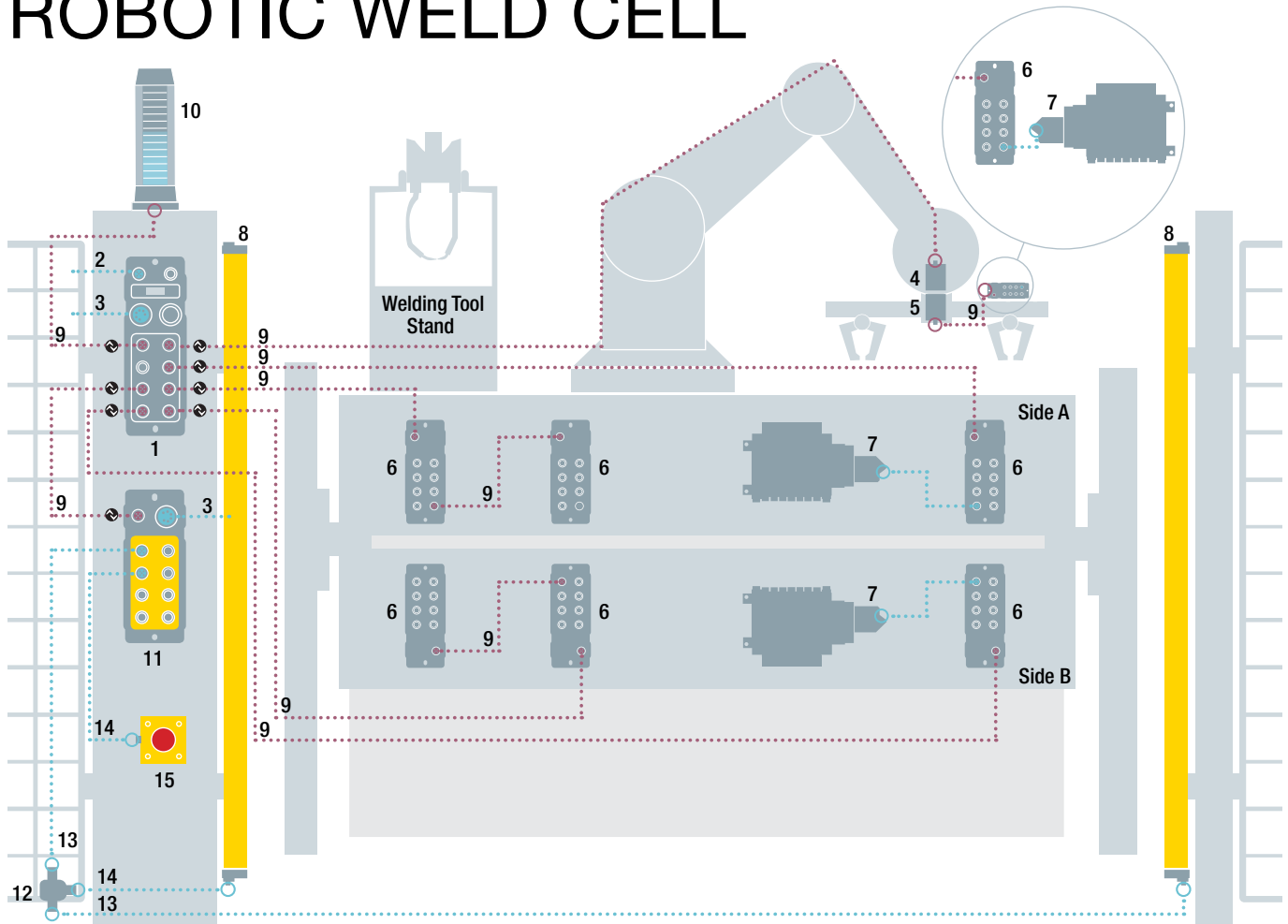
**Warning:** The devices shown are for example purposes. Selection of safety devices varies based on risk analysis and application.

Key	Description	Part number		Quantity
1	E-stop	BAM ES-XA-01D-01-R01-201-S92	BAM02HA	1
2	Door handle	BAM TG-ID-016-H02	BAM0272	1
3	Interlocking gate switch	BID F101-2M1E3R-M02AZ0-S115	BID0001	1
4	Safety I/O module (PROFIsafe, IO-Link)	BNI IOF-329-P02-Z038	BNI0098	1
5	Aux power cable 7/8", 5-wire, 2m*	BCC A315-0000-10-063-VX45W6-020*	BCC09CK	1
6	Sensor cable, M12 female-M12 male, 8-wire, 2m*	BCC M418-M418-3A-320-PX4825-020-C033*	BCC0H25	1
7	Sensor cable, M12 female-M12 male, 5-wire, 10m*	BCC M415-M415-3A-313-EX45T2-100*	BCC08AC	1
8	Sensor cable M12 female-M12 male, 4-wire, 10m*	BCC M415-M414-3A-304-VX44T2-100*	BCC085J	1

\*See website for available lengths.

## Common architectures

# ROBOTIC WELD CELL



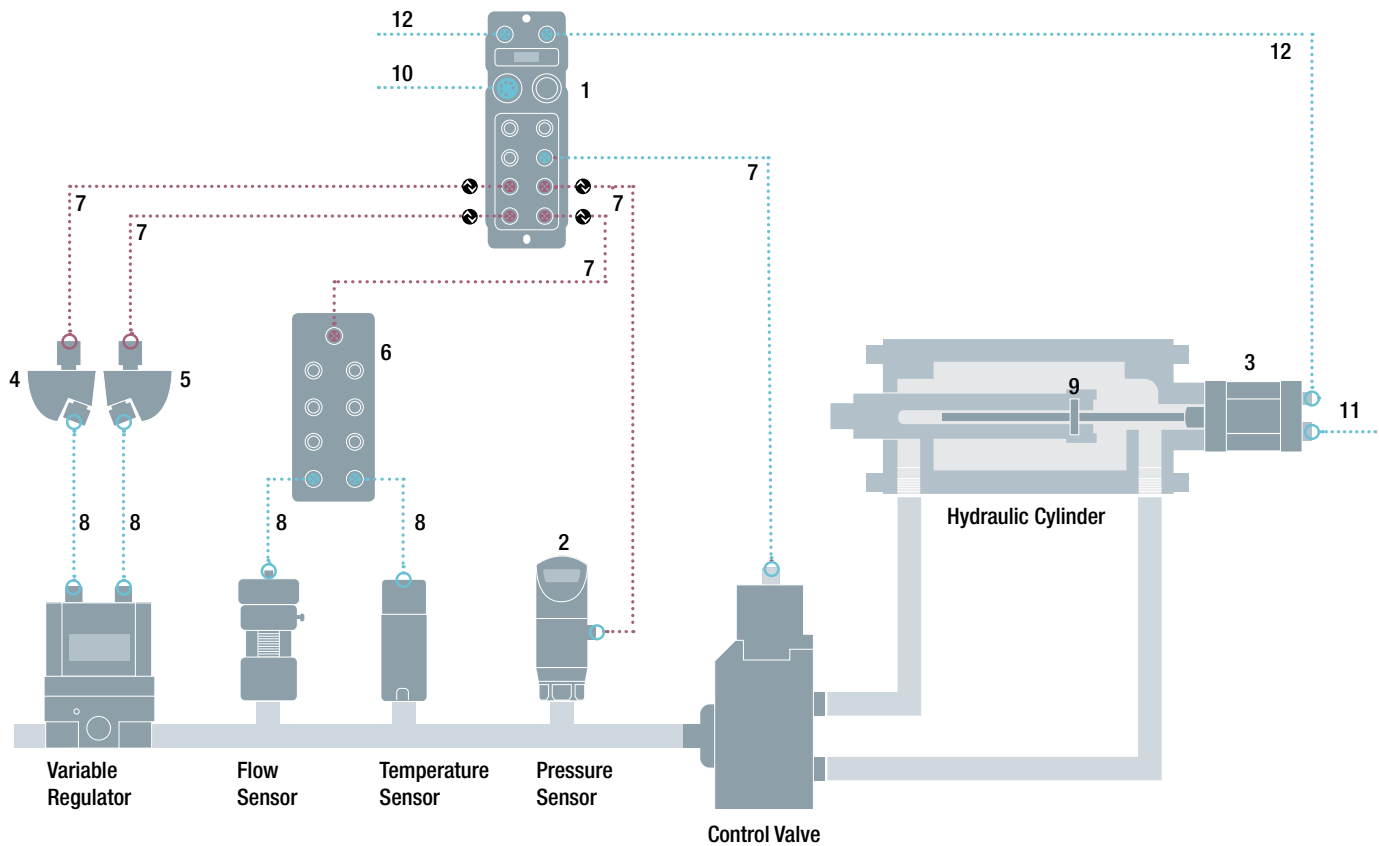
Key	Description	Part number	Quantity
1	PROFINET 8x IO-Link master	BNI PNT-508-105-Z015	BNI005H 1
2	PROFINET cable M12-RJ45, 2m*	BCC M414-E834-8G-668-PS54T2-020*	BCC04K7 1
3	Aux power cable 7/8" 5-wire, 2m*	BCC A315-0000-10-063-VX45W6-020*	BCC09CK 2
4	Bi-directional IO-Link inductive coupler base for power and data	BIC 1B0-ITA50-Q40KFU-SM4A4A	BIC0070 1
5	Bi-directional IO-Link inductive coupler remote for power and data	BIC 2B0-ITA50-Q40KFU-SM4A5A	BIC0071 2
6	Weldblock series input only hub 16xPNP	BNI IOL-104-S02-R026	BNI0090 7
7	Valve connector 24 outputs SMC, Parker or Norgren valve manifold	BNI IOL-751-V10-K007	BNI006P 3
8	Safety light curtain, body protection	BLG 4A-120-50X-B04-O01-SX	BLG0009 1
9	Sensor cable M12- M12 4 wire, 2m*	BCC M415-M414-3A-304-VX44T2-020*	BCC05MC 10
10	5 segment SmartLight with buzzer	BNI IOL-802-102-Z037	BNI0085 1
11	Safety module (PROFIsafe, IO-Link)	BNI IOF-329-P02-Z038	BNI0098 1
12	Cable splitter	BDN T-DTN-DD-01	BCC07WR 1
13	Sensor cable M12 female-M12 male, 5-wire, 2m*	BCC M415-M415-3A-313-EX45T2-020*	BCC08A6 2
14	Sensor cable M12 female-M12 male, 5-wire, 0.6m*	BCC M415-M415-3A-313-EX45T2-010*	BCC08A4 2
15	E-Stop button	BAM ES-XA-01D-01-R01-201-S92	BAM02HA 1

\*See website for available lengths.

## Common architectures

# MEASUREMENT DEVICES AND ANALOG I/O

- Eliminate analog headaches
- Remove shielded cable runs
- Add diagnostics to equipment
- Drive high power valves with 2A outputs



Key	Description	Part number		Quantity
1	Ethernet/IP master 4x IO-Link ports	BNI EIP-502-105-Z015	BNI004A	1
2	Pressure sensor	BSP B010-EV002-D00S1B-S4	BSP008A	1
3	Ethernet/IP linear transducer, embedded cylinder position	BTL7-V50D-M_ _ _ _-Z-C003		1
4	Analog input plug	BNI IOL-714-000-K023	BNI0042	1
5	Analog output plug	BNI IOL-724-000-K023	BNI004E	1
6	Analog hub	BNI IOL-710-000-K006	BNI0008	1
7	M12 to M12 double ended, 2m*	BCC M415-M414-3A-304-VX44T2-020*	BCC05MC	5
8	Shielded cable M12-M12 4-wire, 2m*	BCC M415-M414-3A-305-PS0434-020*	BCC0C00	4
9	BTL Z magnet	BTL-P-1013-4R	BAM013L	1
10	7/8" Aux power cable, 4-wire, 2m*	BCC A314-0000-10-003-VX44W6-020*	BCC090W	1
11	BTL Z power cable M8, 2m*	BCC M313-0000-10-001-EX43T2-020*	BCC050N	1
12	M12 to M12, D-coded, Ethernet/IP network cable, 2m*	BCC M414-M414-6D-366-EX64N9-020*	BCC0CLZ	2

\*See website for available lengths.

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