

BALLUFF

Weld Select
Series

SOLUTIONS TO BOOST
PRODUCTIVITY IN
AUTOMATED WELDING



 *innovating automation*

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▲ WARNING

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

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Welding Automation

IS DEVICE FAILURE COSTING PRODUCTIVITY IN YOUR WELD CELLS?

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The Weld Select Series is an industry proven group of Balluff products designed for use in the most inhospitable welding environments. Poor sensor selection costs welders in every industry increased downtime, unnecessary maintenance, delayed delivery, and lost profits. Balluff presents a complete package of welding solutions that extends sensor life and increases productivity in the harshest welding environments.

This guide contains two sections. The front section is designed to help workers at all plant levels identify existing issues and offer Balluff-developed solutions to address them. The second section offers an extensive list of products developed by Balluff welding experts from valuable customer input. These products have been tested in the harshest welding environments and provide significant process and part quality improvement.

- Stop wasting sensors and destroying connectors
- Change the paradigm of accepted high volume sensor usage
- Reduce downtime due to sensor failure
- Slash consumption of sensors and connectors
- Boost profitability throughout the plant

Examples of how we've solved downtime problems

The standard expectation in automated welding is a high volume of component replacement and maintenance, repair and operations (MRO). Damaged sensors and burned cables cause unplanned downtime and reduced production, driving up overtime wage costs and creating a crunch on delivery timelines. We work with manufacturers on problem areas to develop the best application specific solutions to increase productivity.



UNPROTECTED SENSORS

Problem

Unprotected and non-bunkered sensors, sensors in damage-prone areas, and/or lightweight brackets result in premature sensor failure.



Solution

Bunker blocks and protective mounts with spatter resistant coatings allow full protection against harsh environments and physical impact.



CABLE DAMAGE

Problem

Damage to unprotected cables can cause failure, shorts and loss of communication.



Solution

Protective high durability cables provide flexibility and resistance to weld-spatter, lubricants, and connector burn-through.



SPATTER DAMAGE

Problem

Spatter accumulation and unprotected pigtail sensors cause excessive downtime.

Solution

PTFE coated prox mounts, protective tubing sealed with wrap, and sacrificial cables improve sensor life and productivity.



PHYSICAL IMPACT

Problem

Physical contact from loading of parts can quickly destroy a basic sensor, especially with the presence of weld spatter.

Solution

Coated steel face sensors resist weld spatter and mechanical impact, and they can be brushed clean with no damage or issues.



YOUR PARTNER IN OPERATIONAL EXCELLENCE

Automated welding requires robust solutions since most standard automation components and basic assembly practices typically do not hold up well in weld cells. To achieve operational excellence Balluff has worked for decades on best practices and solutions to improve uptime and eliminate nuisance stops from failed automation. We use our passion for automation and lasting technology for continuous improvement to help achieve your goals.

Our Mission

We will improve the competitive position of our customers enabling them to get in touch with their business by sharing our passion for automation, contributing to a better future for all stakeholders.

We do this through a focus on the customer and a mindset of responsibility.

Reducing Costs

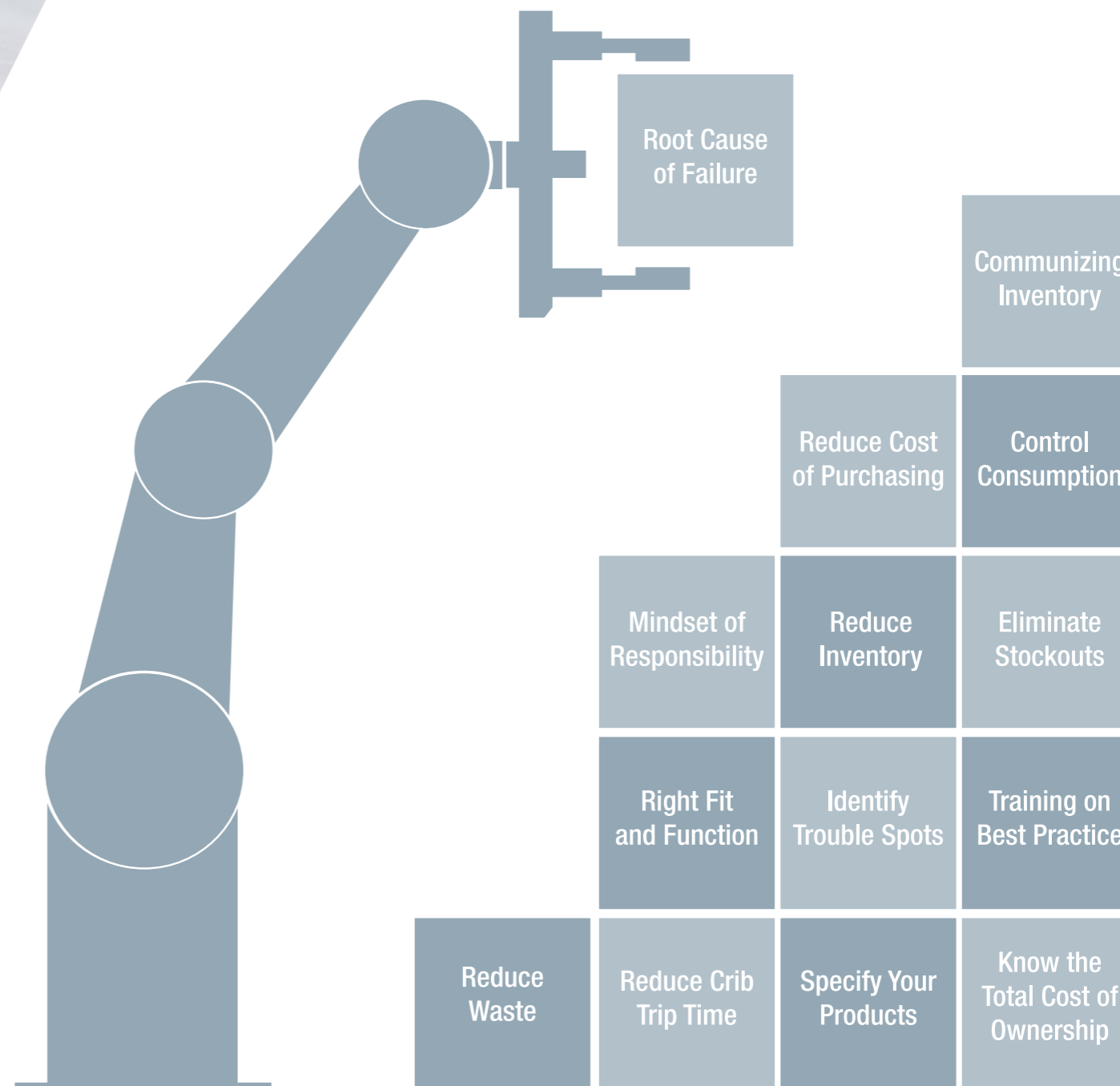
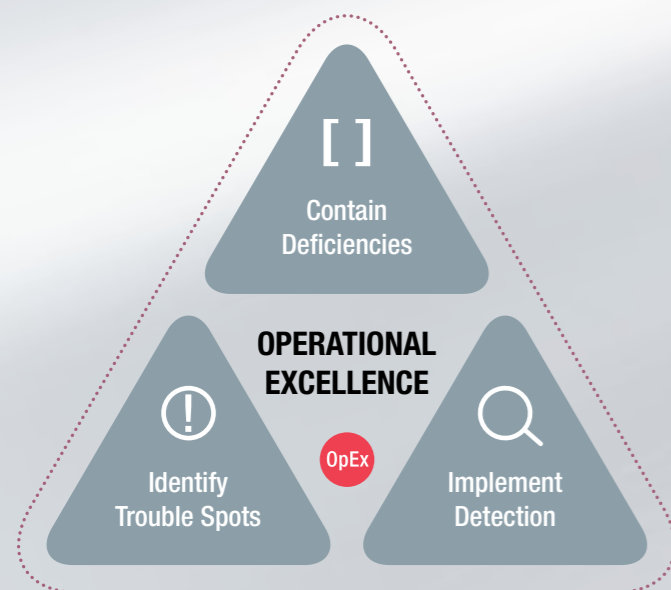
We want to work with you to reduce waste of all kinds in the plant. Controlling consumption, communizing inventory and reducing the cost of purchasing can be accomplished through an understanding of your goals and looking at the total cost of ownership of a problem.

Boosting Productivity

Make more with the equipment and people you have. Reducing unplanned downtime, shortening crib trip time for a replacement part and eliminating stockouts can have a dramatic effect on the productivity of a weld shop. By understanding root cause of failure, identifying right fit/function and implementing training on best practices, we have had a dramatic impact on many manufacturers looking to boost productivity.

Your Partner

Those who work with Balluff have a long-term partner working to improve their production. We use a simple process to identify trouble areas, contain issues and implement lasting solutions. Working together we have positive impact on the operational excellence of manufacturing and automated welding.



Boost Productivity

WELD AUTOMATION BEST PRACTICES

B *innovating automation*

A review of our partnerships over the decades shows the teams who have boosted productivity the best have taken a multi-angle approach to improving and implementing sensing and automation applications. Using best practices in sensing philosophy, we work together toward application specificity: selecting the right sensor, cable and protection for each situation, then learning and duplicating from that experience. Technology best practices include utilizing sensor coatings and multi-metal sensing, determining technology to survive loading impact, and choosing the right cable jacket to resist spatter. Finally, no best practice works without action; documenting sensor failure, auditing high downtime locations, documenting the ROI and training employees on the best solutions are all continuous improvement actions that return dividends to manufacturers.

BEST PRACTICE SENSING PHILOSOPHY



SELECT THE RIGHT SENSOR

When selecting the right sensor, you have to take into account multiple aspects of the application: how the sensor is being used, what environment is it being exposed to, and why the current installation has continuously failed. Common questions to consider are:

- Is there excessive weld-spatter accumulation on the sensor?
- Does a different sensor technology make more sense?
- Is there a better mounting solution for the sensor?

Balluff offers many combinations of sensor technologies for use in welding environments, and the best technology for each application may require some testing before it can be determined.



PROTECT THE SENSOR

When determining how much protection is needed for the sensor, you still have to consider: what is the sensor being exposed to and why the current installation failing. Other common questions to consider are:

- What available space do I have?
- Is the physical contact causing damage to the existing sensor?
- Can I change the tooling in any way?

Balluff offers one of the widest portfolios of accessories specifically designed for applying sensors in the welding environment. The best accessory for your specific application may require adaptation of the tooling for implementation.

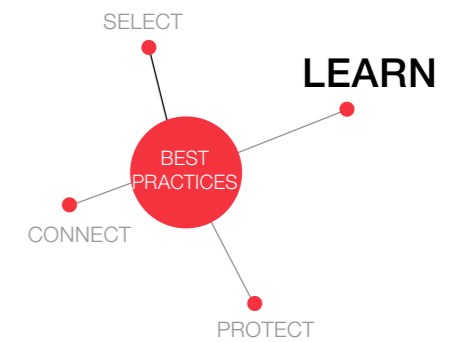


CONNECT WITH PROTECTION

Protecting the connection between the controller and the sensor can be as much of a pain point as keeping the sensor alive. Whether the sensor cable fails from weld-spatter buildup or due to physical damage caused by contact with a part, the cable can be the lynchpin to a successful sensing application. Questions to consider when looking at connectivity options:

- Is the cable collecting spatter or melting from contact with spatter?
- Is the connector not meeting the proper bend radius and being damaged?
- What temperatures and environments is the cable be exposed to?

Balluff offers a strong selection of sensor connectors for your welding applications. These products have been tested in real-world customer applications and extended the life of an application by more than 50 times in some instances.



LEARN WITH CONTINUOUS IMPROVEMENT

There are some things worth doing over and over, but replacing a proximity sensor every shift is not one of them. By learning from our failures and analyzing them we can increase our productivity, improve our quality, and reduce headaches for operators, technicians, and even managers. So when a sensor fails, it is best to document the failure and then make a plan to improve the application. Some questions to consider at a failed sensor application include:

- What caused the eventual end of the sensor? Heat? Spatter? Impact?
- What else is damaging the sensor?
- Is the cable failing?
- Where else do we have a similar installation or application?

Balluff offers many opportunities for training where we can help you improve the skill set of the technicians and engineers. We can bring the training to you.

When working in harsh environments and in heavy duty applications like welding, it is important to take a multi-angle approach to designing the application. Working with existing sensor installations, you must to consider all the reasons for the sensor's failure before determining a winning solution. While blind trial and error will eventually lead to improvements in sensor life, Balluff has developed, with our customers, a strong best-practice approach for applying sensors in automated welding.

Selecting Components for Survivability

- Select the right sensor
- Protect the sensor
- Connect with protection
- Learn with continuous improvement



BEST PRACTICE TECHNOLOGIES

SENSOR COATINGS

Every application is different, but for sensors to survive in an automated welding environment there are some basic principles that are best practice. Plastic-faced brass housings on inductive sensors fail quickly in a weld cell, so special coatings are available for every type of application. Start with a basic coating as your standard. Where failures and issues occur, invest in better or best coatings to extend survivability and improve up-time of the equipment.

Basic

- Good spatter resistance
- Typical Materials: PTFE coatings, Ceramic sensing faces



Better

- Great spatter resistance
- Good abrasion resistance
- Typical Materials: 2K coatings, W51 coatings



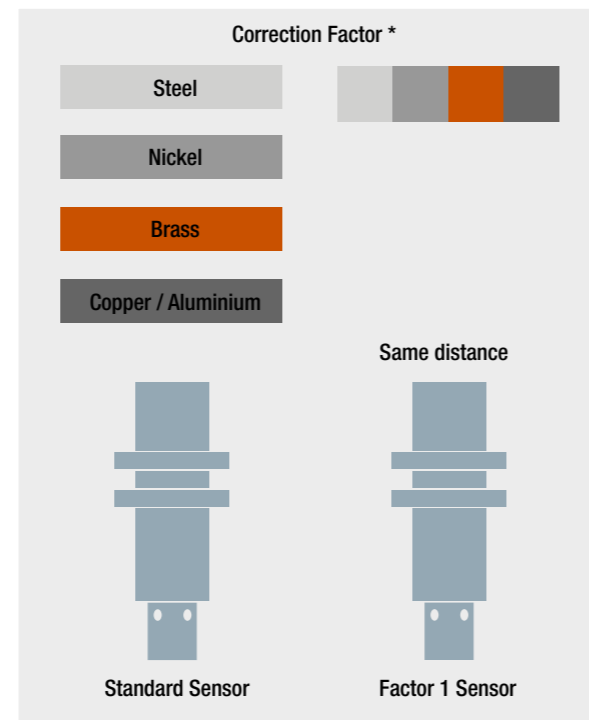
Best

- Exceptional spatter resistance
- Typical Materials: Sun73 coatings, Fortron® PPS, black coating



MULTI-METAL SENSING AND WELD FIELD IMMUNITY

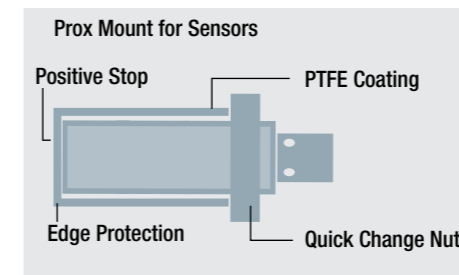
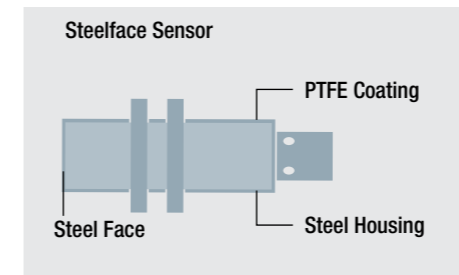
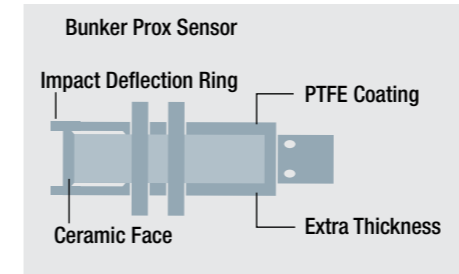
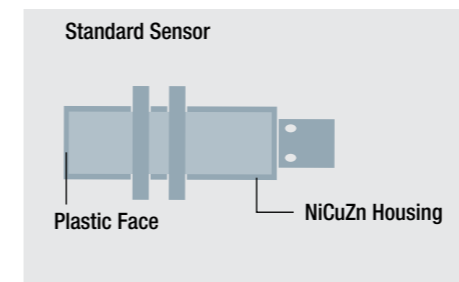
With the large array of new materials used in lightweighting, new variations of steel and the rise of aluminum in structural components, standard inductive proximity sensors can be challenged to reliably detect the material. In addition, electromagnetic weld fields can interrupt the sensor signal causing chatter in the I/O. Factor 1 technology is inherently weld field immune (WFI) and reliably detects all metals at the same distance regardless of ferrous composition.



*drawing not to scale

SURVIVE LOADING AND CONTACT

Many sensors fail from mechanical and physical damage during manual machine loading and unloading of parts. Steel face sensors are specialty inductive proximity sensors designed with a metal sensing surface. This allows for repeated physical impact from part loading. In addition, the Bunkerprox technology has an extra thick housing to reduce damage due to heat and a raised metal ring around the sensing face to deflect physical impact from the ceramic face. Accessories are also available like a prox mount and protecting ring to improve the survivability of sensors in part-loading applications.



CABLE PROTECTION

Cable failure is one of the top cited issues discussed with maintenance teams working in automated welding. Traditional automation cable materials, like PVC or PUR, do not typically have enough robustness to survive in a hostile weld cell. TPE-jacketed sensor and networking cables have a much higher spatter and abrasion resistance which makes them a good go-to product for basic automation applications in the welding environment. As hot spots and high spatter areas occur, it is recommended that better jacket materials like silicone or a silicone-free FEP are applied that have higher resistance to welding debris. Accessory tubing, sheets and wrap are used to add an extra layer of protection to cables and pneumatic/hydraulic lines, and for covering other sensitive automation components.

Basic

- Good spatter resistance
- Good abrasion resistance
- Typical Materials: TPE, PUR



Better

- Great spatter resistance
- Strong thermal barrier
- Typical Materials: PUR welding spark resistant, silicone tube, silicone sheet, silicone wrap



Best

- Exceptional spatter resistance
- Great abrasion resistance
- Typical Materials: FEP (PTFE), silicone jacket



BEST PRACTICE ACTIONS

DOCUMENT SENSOR FAILURE

Throwing sensors away every shift doesn't have to be normal. Instead of dumping them in the closest garbage can, start a sensor collection system or bin in each work area. Have the operator or maintenance person document what happened to the sensor, where the failure happened and when it happened. Track this information for a few weeks and quickly see where the problem areas of the plant are, and which issues you need to address first.

AUDIT HIGH DOWNTIME CELLS

It is important to take a systematic approach to reviewing your downtime to determine what is causing the downtime (what cell, where in the cell, why is it failing), and do side-by-side comparisons of technologies. Own the problem and find solutions one application at a time. Most manufacturers find that only a small percentage of their applications are causing the largest material replacement costs.

DOCUMENT THE ROI

While a more robust technology sounds like an obvious plan, sometimes you need to justify that paying a little more will actually save money in the long run. The best projects start small with one application in one cell. What is causing the most heartache? First document the current state of being. Opinions are OK at first; facts are best but not always available on the floor for every application. Find a better technology and test it in that location. Did it do better? Calculate the savings using the below return on investment (ROI) calculator.

CONTINUOUS IMPROVEMENT TRAINING

Once good solutions are found and ROI is proven, it is necessary to train the maintenance crews on what was discovered. What are the best technologies for the processes in the plant? Education on how to properly install and replace a sensor when it fails is as important as sharing how and when to escalate repeated failure and hotspot sensor applications. Creating a culture of continuous improvement training has been found to dramatically improve productivity and reduce downtime issues.





BALLUFF

**WELDING SOLUTIONS
FOR EVALUATION
10301**

Cell Name _____

OP # _____

Location _____

Submitted by _____

Date _____

Reason for Failure _____

Replacement Frequency

Shift Day Week Month

ROI CALCULATION TOOL

Application Information
 Date: _____
 Location: _____
 Annual Operating Days: _____ (A)

TIME COST
 Average Minutes Down to Replace _____ (B)
 Downtime Cost per Minute _____ (C)

Calculate Replacement Time Cost (D)

$$\frac{\text{(B: Average minutes down to replace)}}{\text{(C: Downtime cost per minute)}} \times \text{(A)} = \text{(D: Cost to replace part)}$$

CURRENT SOLUTION
 Part Vendor and Part Number: _____
 Part Cost: \$ _____ (E)
 Number of Days between Replacements: _____ (F)

Calculate Quantity Consumed Per Year (G)

$$\frac{\text{(A: Annual Operating Days)}}{\text{(F: Number of Days between Replacements)}} = \text{(G: Quantity Consumed Per Year)}$$

Calculate Replacement Time Costs (H)

$$\text{(D: Cost to Replace Part)} \times \text{(G: Quantity Consumed Per Year)} = \text{(H: Replacement Time Costs)}$$

Determine Annual Part Costs (I)

$$\text{(E: Part Cost)} \times \text{(G: Quantity Consumed Per Year)} = \text{(I: Annual Part Cost)}$$

Determine Current Total Cost of Ownership (J)

$$\text{(H: Replacement Time Costs)} + \text{(I: Annual Part Cost)} = \text{(J: Current Total Cost of Ownership)}$$

BALLUFF SOLUTION
 Part Number: _____
 Part Cost: \$ _____ (K)
 Number of Days between Replacements : _____ (L)

Determine Quantity Consumed (M)

$$\frac{\text{(A: Annual Operating Days)}}{\text{(L: Number of Days between Replacements)}} = \text{(M: Quantity Consumed)}$$

Calculate Replacement Time Costs (O)

$$\text{(D: Cost to Replace Part)} \times \text{(M: Quantity Consumed)} = \text{(N: Replacement Time Costs)}$$

Calculate Annual Part Costs

$$\text{(K: Part Cost)} \times \text{(M: Quantity Consumed)} = \text{(O: Annual Part Costs)}$$

Determine New Total Cost of Ownership (P)

$$\text{(N: Replacement Time Costs)} + \text{(O: Annual Part Costs)} = \text{(P: New Total Cost of Ownership)}$$

APPLICATION SAVINGS
 Calculate Percentage of Application Savings
 Subtract
$$\text{(J: Current Total Cost of Ownership)} - \text{(P: New Total Cost of Ownership)} = \text{(Q: Monetary Application Savings)}$$

 Divide
$$\frac{\text{(Q: Monetary Application Savings)}}{\text{(J: Old Total Cost of Ownership)}} = \text{(R: Percentage of Application Savings)} \%$$

Downtime Issues

COMMON PROBLEMS IN AUTOMATED AND ROBOTIC WELDING.

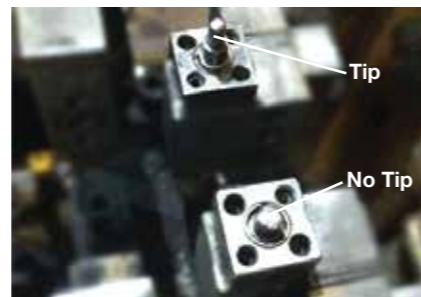


Keeping a structural or component production line running with high efficiency is a big challenge. Welding throws off debris, spatter and molten metal making the environment dirty and difficult for standard automation products to survive. Operators loading parts hour after hour can impact sensors and cause physical damage to automation devices. In this section we will review the most common problems in automated and robotic welding and suggest solutions to the most common problems:

- Damage from weld spatter
- Damage from physical contact
- Problems with nut detection
- Exposure to high temperatures
- Damaged photoelectric sensors
- Detecting position in cylinders and clamping
- Connectivity and cable failure
- Rotation and slip-ring challenges

Nut Detection

One of the most common and frustrating applications in automated and robotic welding is reliably detecting the presence of a weld nut. There are some solutions and technologies on the market that have varying levels of success. Detection of the weld nut is very application specific: sense it during the load or in a secondary check station? How much space is available for a sensor and connector? Is it sensed from under the part or on top of the part? What is the size or shape of the nut? What are the tolerances? Each type of technology brings benefits and weaknesses based up on the answers to these questions.



FALSE READ NUT DETECTION

Problem

Error proofing nut detection applications require sensors that can come in contact without damaging the sensor. Standard sensors can fail due to contact with the sensor face.



Solution

The Balluff Plunger Probe with nut tip detects and error proofs components in harsh environments. The Plunger Probe is offered in PNP and NPN with four different tips to choose from, providing a very flexible sensor solution.



NUT DETECTION AND ORIENTATION

Problem

For those who make metal parts for the white goods, recreation equipment and automotive industries, there is inevitably a point where a nut needs to be welded to a part. Many times these nuts are welded in place and then additional processes are performed around the nut, removing the possibilities to rework the part if a mistake has been made.

Solution

Automated pedestal or nut welders have improved this process better, but issues can still occur if a nut is missing or misaligned, or two nuts are fed into the process by accident. Today many applications look for the proper height of the welder with adjustable position discrete proximity sensors, continuous or linear position sensors.



BROKEN SPECIALTY NUT DETECTION

Problem

Heavy metal parts being loaded into a welding cell regularly damage specialty nut detection sensors designed to stick through a hole in a part.



Solution

The Balluff plunger probe with M4, M6, M8 or M10 nut tips detects a weld nut reliably with mechanical contact. If the nut is present, the plunger depresses; if there is not a weld nut the probe goes through the hole and does not trigger.



PHOTOELECTRIC FALSE NUT PRESENCE

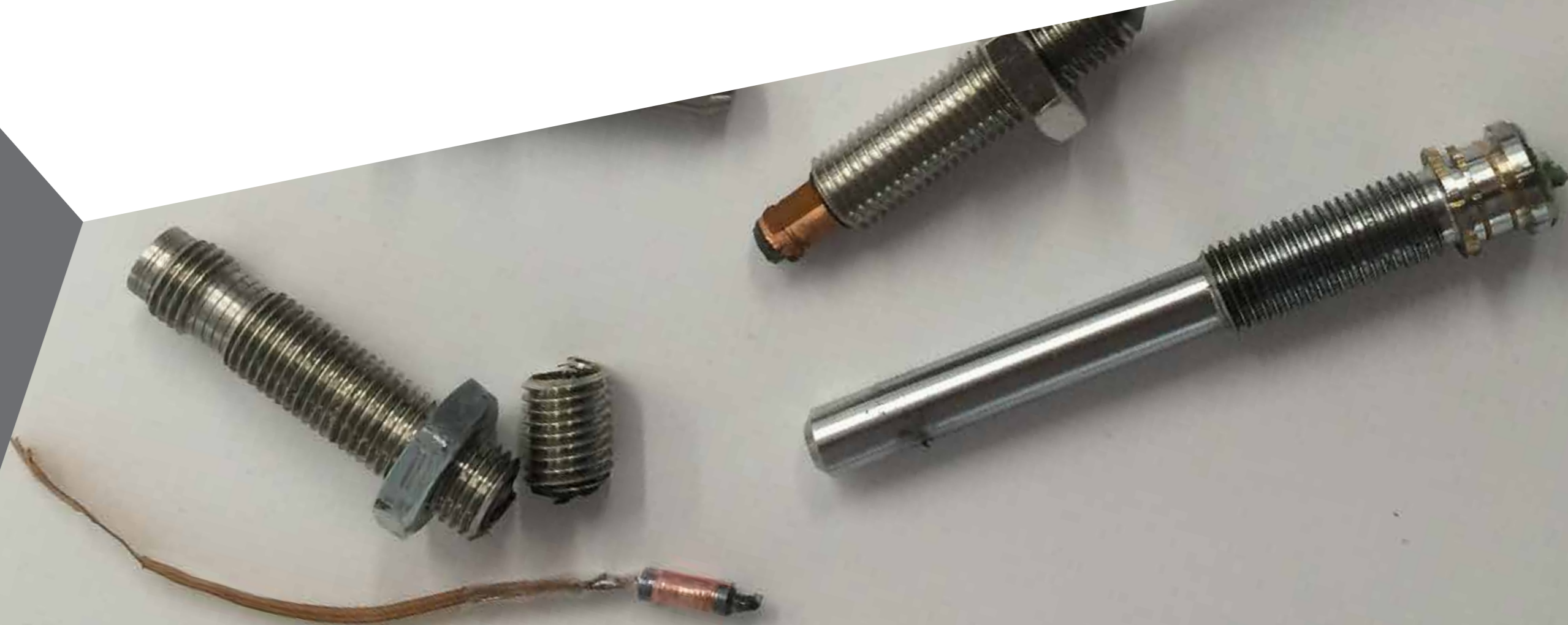


Problem

Photoelectric sensors applied improperly can have intermittent results when attempting to detect the presence of a weld nut.

Solution

Robust metal housings and a protective mounting ensure that the sensor does not get damaged in the part loading process. Measurement lasers and background suppression sensors more reliably detect the presence of a nut versus traditional photoelectric technologies.



Welding environment

Non-contact inductive proximity sensors must perform a wide variety of clamping and nesting indication, as well as poka-yoke functions in harsh welding environments. Hot weld-spatter accumulation, elevated ambient temperatures, and strong electromagnetic fields emitted by weld guns can cause false triggering and degrade sensor performance.



WELD SPATTER

Problem

Hot weld spatter sticks to sensor faces and bodies and causes premature failure of sensors in weld cells.



Solution

Coatings on sensor faces resist weld debris and provide a thermal barrier, significantly enhancing sensor longevity and reducing false triggering. Coated sensor bodies resist weld debris accumulation and promote weld spatter removal during regular scheduled maintenance periods.



ELECTROMAGNETIC WELD FIELDS

Problem

Strong electromagnetic fields cause conventional sensors to false trigger or "chatter."



Solution

Balluff inductive proximity and magnetic field sensors with weld field immunity (WFI) resist electromagnetic fields emitted by weld guns up to 100 kA/m.



DAMAGE FROM LOADING IMPACT

Problem

Severe loading impact and continuous operational impact damages plastic and/or coated sensor faces as well as sensor bodies.

**Solution**

Every precaution should be taken to prevent electronics such as sensors from being hit, but in many cases, loading impact cannot be avoided. By nesting a Balluff steel face inductive proximity sensor into a rugged prox mount or bunker block, the likelihood of premature failure is reduced, even with repeated impact over time.



SENSOR FACE DAMAGED BY IMPACT

Problem

Standard tubular sensors often fail from damage to the sensor face and coil caused by spatter and impact. Over time, small repeated impacts can damage the face and lead to sensor failure.

**Solution**

Balluff steel face inductive proximity sensors with extended range and stainless steel housings resist impact, providing long life in weld cell impact zones. Balluff bunker blocks and Plunger Probes provide sensors an extraordinary degree of physical protection, resisting or eliminating contact damage to the sensor body and face as well as rapid sensor removal and replacement without need for recalibration.

Loading impact

Incidental sensor damage caused by impact during parts loading can significantly degrade sensor performance, shorten sensor life, or even destroy a sensor. Balluff steel face inductive proximity sensors can withstand multiple heavy impacts and abrasion, and often have a long sensing range so it can be placed out of harm's way.



Photoelectric sensors

Photoelectric and fiber optic sensors require special protection and mounting expertise when integrated into welding cells. Balluff has a wide range of photoelectrics with application-specific infrared, red light, or laser capability that can reliably sense through smoke, oil and dirt. In addition, Balluff provides a range of accessories that protect photoelectric optics from heat, spatter, and lens occlusion in the hostile weld cell environment such as ceramic caps, face savers, and bunkerblocks.



FIBER OPTIC LIMITATIONS

Problem

Fiber optics can become occluded in the weld cell and stop functioning. They can become broken when weld fixtures are removed, causing fibers to vibrate loose. Or they can get damaged by weld spatter, and cables with excess length break when tied back.



Solution

Typically, fiber optic solutions are not the best choice in weld cells. Metal-body laser sensors or inductive proximity sensors are almost always a better choice. Remote weld spatter removal during regular scheduled maintenance periods will extend sensor life.



SENSOR DAMAGE BY LOADING IMPACT

Problem

Impact-prone photoelectric sensors can easily become physically damaged in welding environments.



Solution

Bunker blocks and prox mounts can be used to protect tubular photoelectric sensors. They provide a thermal barrier, protect against weld spatter and impact, and provide rapid sensor change out. Bunker blocks, available in several sizes and styles, protect block style photoelectric sensors in the weld environment.



SENSOR CABLE DAMAGE

Problem

Many times small and weak magnetic field sensor cables are damaged before the actual sensor fails, ruining a good sensor.

**Solution**

By selecting sensors with weld spatter resistant cabling integrated into the housing and connector, the life of the sensors can be extended, and connector wiring survives better in weld hostility.



PREMATURE REED SWITCH FAILURE

Problem

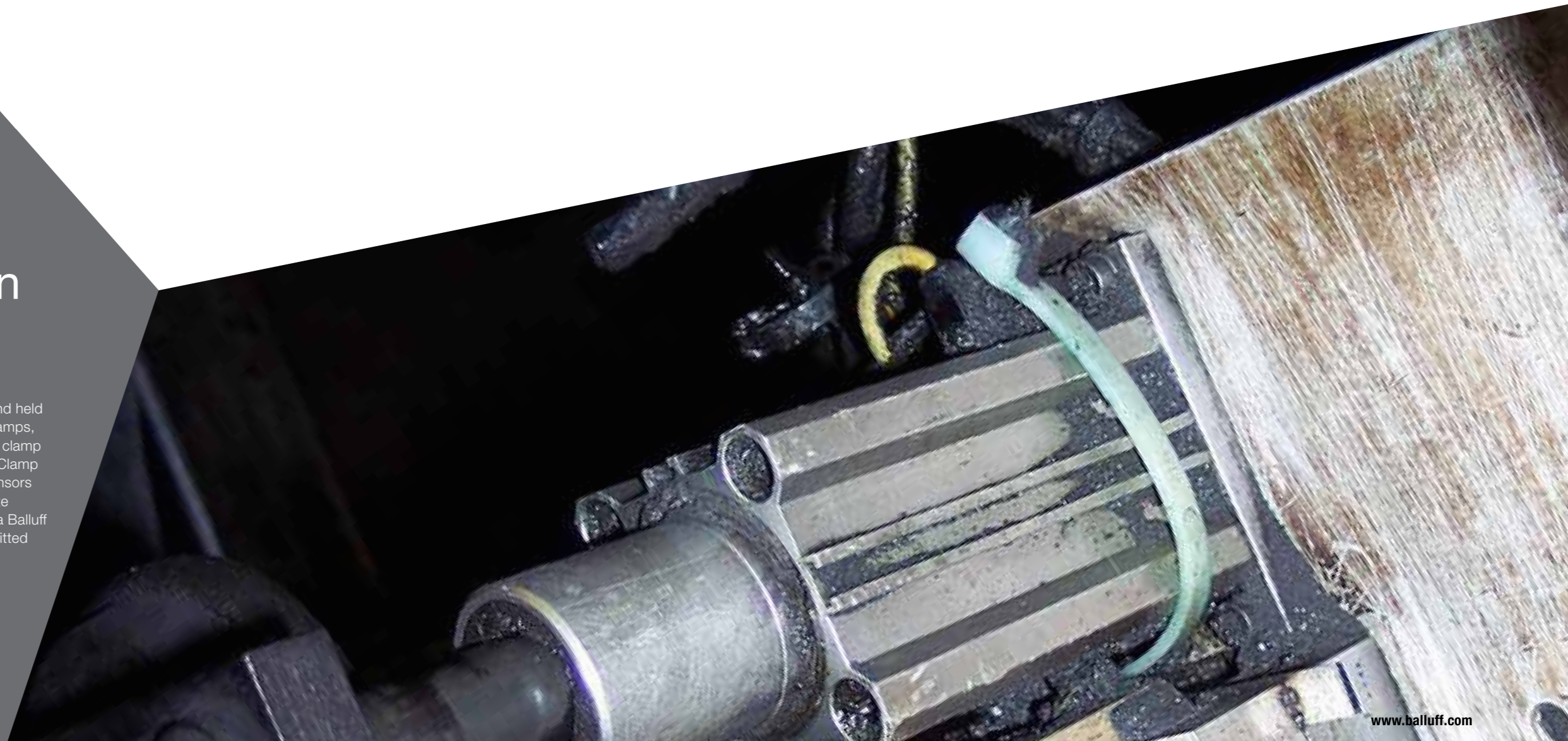
When installed on pneumatic clamping cylinders, failure-prone reed switches and drift-prone Hall Effect sensors deteriorate, often providing inaccurate switch points before failing completely, or being mounted poorly.

**Solution**

Balluff magnetoresistive sensors come with a lifetime warranty and fit virtually all cylinder housing styles and brands. They provide precise switch points and withstand the rigors of the weld process, while providing wear-free, non-contact reliability.

Cylinder position detection

Parts welded in a robotic weld cell must be nested and held in place by pneumatically or hydraulically actuated clamps, which are often equipped with sensors located in the clamp jaws to indicate "clamped" or "unclamped" position. Clamp position can also be determined by magnetic field sensors located on the outer wall of an aluminum or composite pneumatic cylinder. To determine clamping position, a Balluff magnetoresistive sensor tracks the magnetic field emitted by a magnet attached to the cylinder's piston.



Protecting connectivity

Weld cells demand the toughest connectivity solutions. Weld debris shortens the life of a cable in different fashions. Weld-spatter can build up on the jacket, pulling the cable out of the connector. Weld sparks can burn through the cable causing shorts in the connection, and the extreme environment temperatures can cook components. Balluff's family of high durability cables were designed with weld environments in mind. The bodies of the connectors are weld spark immune with PTFE coated nuts to prevent spatter from sticking or burning the connectors. This family has multiple cable jackets to endure different environments.



SENSOR CABLE BURN-THROUGH

Problem

Weld spatter burns through and destroys conventional cabling. It's weight often pulls the cable away from the connector, exposing it to even more damage.



Solution

Balluff engineered a new line of high durability cables to encompass every part of the cable helping it withstand a welding environment. This line of cables has a PTFE coated nut to prevent accumulation of debris, as well as a weld spark immune connector body to withstand sudden increases in temperature. Balluff tested different cable jackets in weld cells until finding our most durable cables: silicone tube, silicone cable, and FEP cable. These different options keep production moving and reduce the need for cable replacements.



NETWORK I/O BLOCKS DAMAGED

Problem

Sensor connections often terminate into plastic junction blocks or network blocks which can easily be damaged in welding cells.



Solution

A rugged line of industrial I/O products designed for use in the harshest environments offer a greater degree of strength and durability for applications like robotic welding cells. Most major bus and Ethernet based industrial networks are supported and provide detailed diagnostics on the connections from short circuit protection to network status. In the dark confines of a weld cell, the large, bright LEDs are easy to see.

More information about
our weld select series can be
found at www.balluff.com



BROKEN OR WORN OUT SLIP RINGS

Problem

Rotational weld cells, or cells that use interchangeable fixtures, often incur high maintenance and frequent stoppages due to damaged slip rings and tangled, over-flexed, or twisted wiring.

**Solution**

Non-contact connector systems provide communication between two or more separated weld cell components through an air gap to energize and communicate between the controller and the sensors. Since there is no hard wired connection, weld fixtures can be inserted into a weld cell frame without the need for mechanical connections, facilitating rapid change out.



ROTATING AND CHANGE TOOLING

Problem

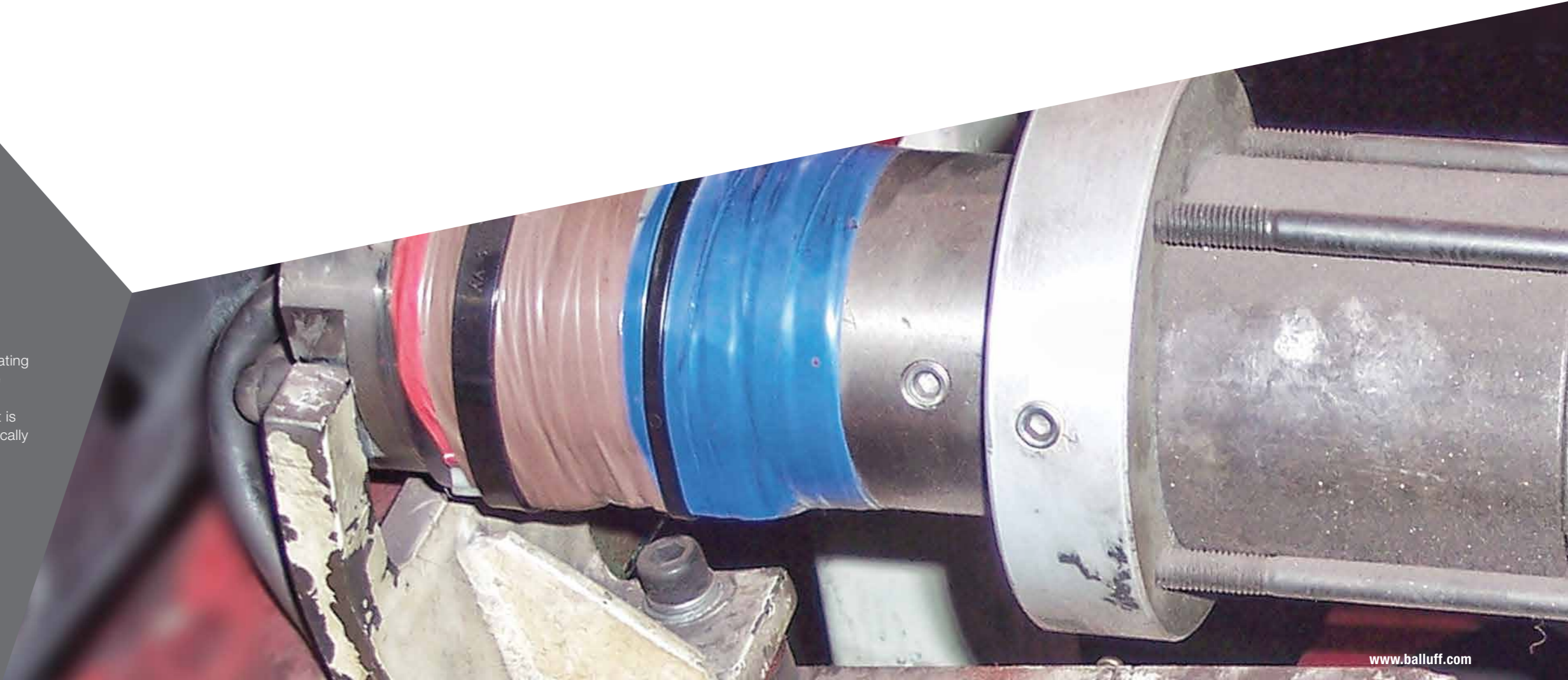
Maintaining connectivity to sensors and devices on the tooling in a weld cell can be challenging. A-side/B-side production or 360° degree dial tables require lots of movement in the connectivity, putting strain on cables and cordsets. Interchangeable tooling is becoming more common and large multi-pin connectors are easy to damage and costly to repair.

**Solution**

Non-contact connector systems can be mounted at each workstation, allowing for power and signal to be sent across the airgap. Power-only versions can drive up to 5Amps, while IO-Link versions allow for inputs and outputs to be controlled in the tooling. By utilizing this technology, tooling can be seamlessly changed and operators don't have to remember to disconnect connectors. Protection, resisting or eliminating contact damage to the sensor body and face as well as rapid sensor removal and replacement without need for recalibration.

Non-contact coupling

Any place with an A-side/B-side production or 360° rotating table needs connections across an axis of rotation. The non-contact coupler from Balluff provides transparent connection between the sensors and controller. Since it is non-contact, it is completely wear-free and has dramatically reduced repair and downtime versus many traditional connection methods.



Technology Considerations

WELDING AUTOMATION APPLICATIONS.



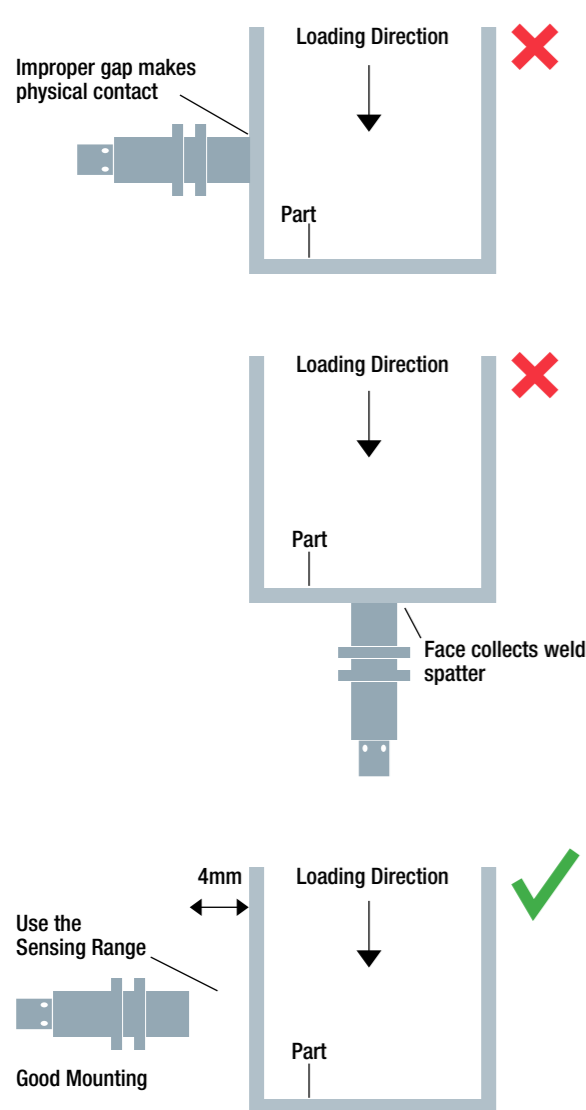
When designing an automation application for manual welding, robotic welding or pedestal welding, there are some key technology considerations to take into account during the sensor and device selection process. Whether it is proper mounting clamp and sensor combinations or I/O mounting considerations, reliable applications are laid out in the following pages to reduce downtime, improve efficiency and empower visibility at all levels of the plant.

- Sensing considerations
- Connectivity considerations
- I/O architectures with IO-Link
- Inductive coupling utilization
- IIoT capabilities
- Alternative joining techniques
- Safety over IO-Link

SENSING CONSIDERATIONS

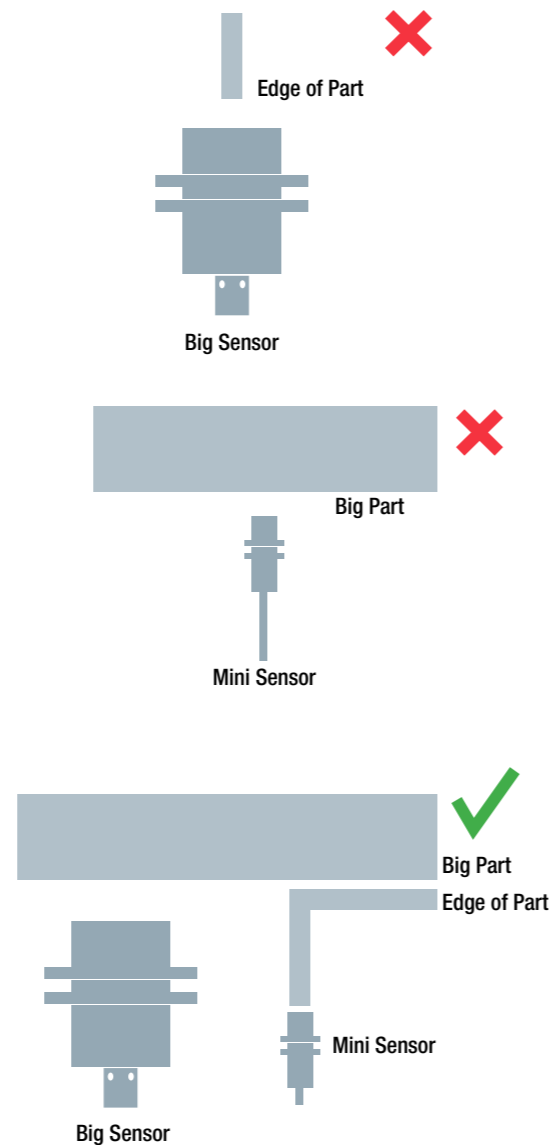
PROPER MOUNTING AND GAPPING

When deciding how to position a sensor to detect the part, the whole application needs to be considered. What is the loading direction of the part and where will welding occur? Where could weld spatter collect? Sensors should be positioned as much as possible so that weld spatter cannot easily accumulate or burn the sensing face. Proper gapping according to the sensor's full sensing range reduces the chance of impact to the sensor from part loading and reduces possible failure from mechanical damage.



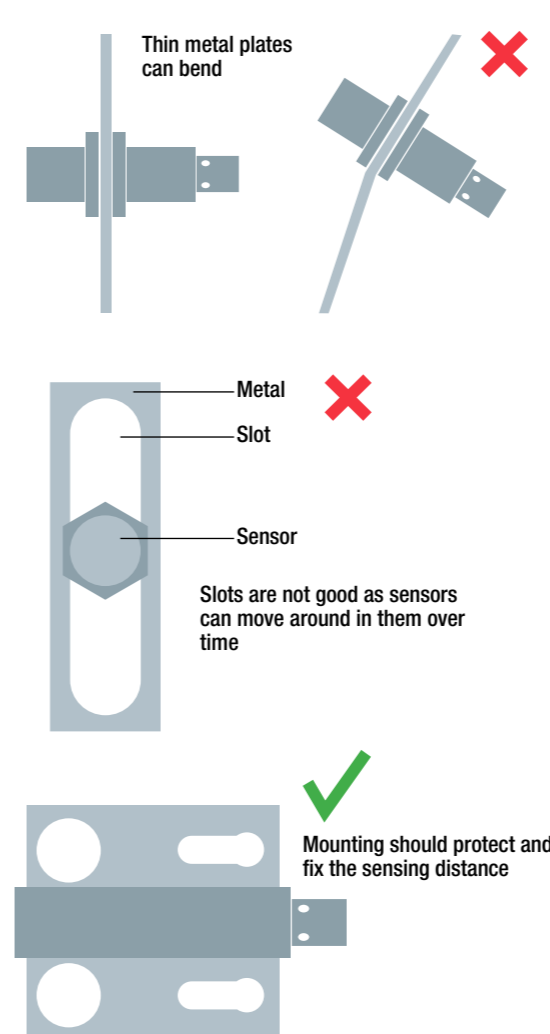
SENSOR SIZE SELECTION

For inductive proximity sensors, size matters. The larger the sensing face, typically the longer the range of the sensor. This has two ramifications in an automated welding application. First it can be challenging to detect the edge of a part with a sensor, so it is recommended that the surface, not the edge, be detected. If an edge needs to be the target, it is recommended that the sensor face be similar in diameter to the thickness of the part. Second, it is important to not use mini sensors for detecting large parts. Mini sensors are more prone to damage from large parts due to their short sensing range and small mass. These mini sensors are powerful when used properly but should be used sparingly with large parts, or kept for use in sub-assembly fixtures.



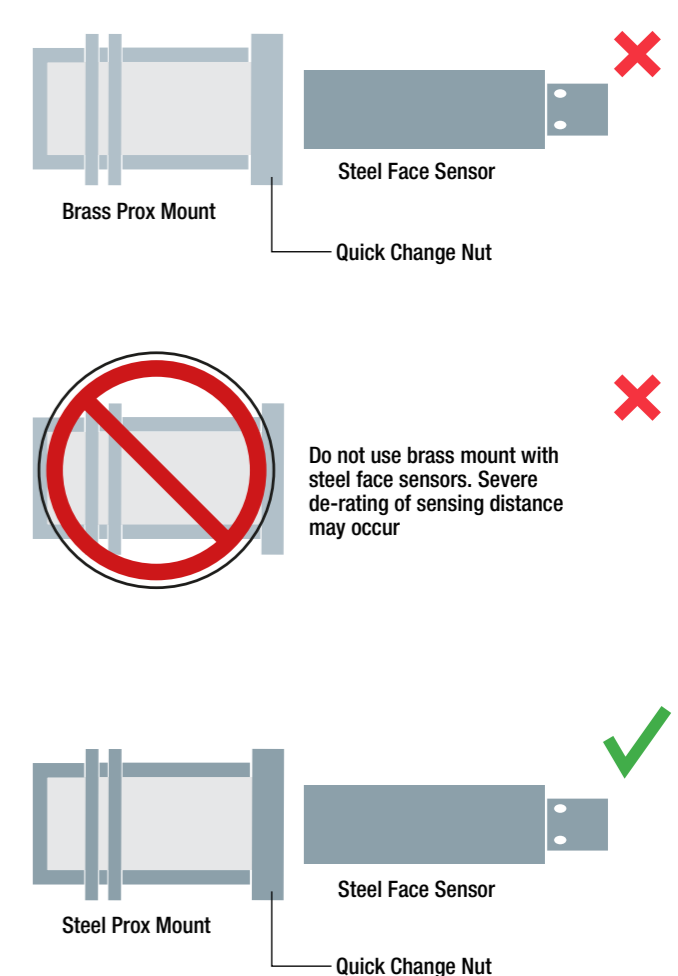
SENSOR MOUNTING

When designing a sensor mount, it is important to understand the entire process being implemented around the sensor. Will a heavy part be loaded by an operator nearby? Is the tool steel strong enough to take repeated pounding by the loaded part? Thin steel plates can easily get bent and damaged, causing the sensor, though originally gapped properly, to become a physical stop for the loaded part creating unplanned downtime. Slots are sometimes used to allow for easy adjustment of the sensor position. Unfortunately slots over time get loose and sensors cause nuisance failures as they move or fall. Mounting should protect the sensor and fix the sensing distance to the part for process reliability.



PROX MOUNTS WITH STEEL FACE SENSORS

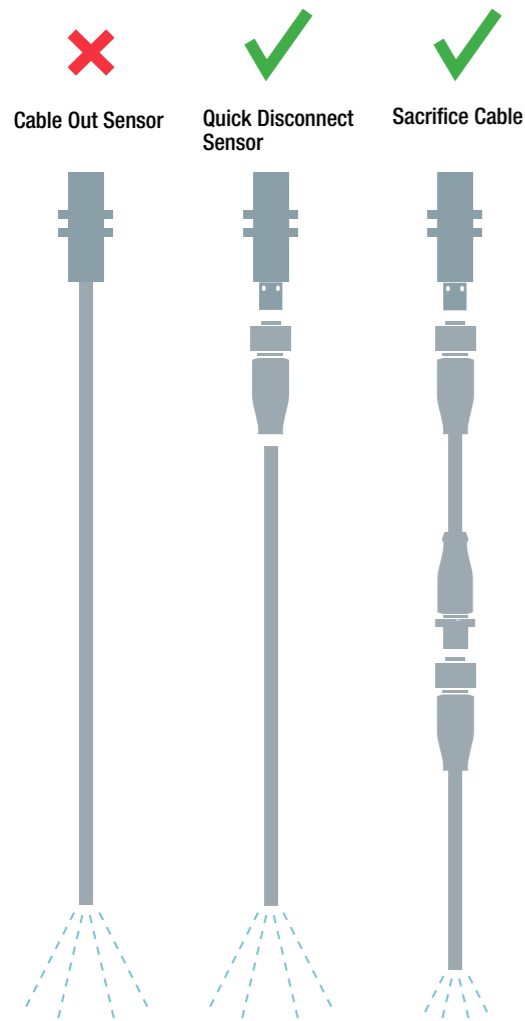
Prox mounts are very reliable tools for welding automation to guarantee the right sensing position and easy change-out of a failed sensor. These mounts have a positive stop that creates repeatability of the sensing distance. Due to the technology used in development of steel face sensors, they can only be used with prox mounts made of steel to maintain a reliable sensing distance. When specifying steel face with a prox mount, it is recommended to use the black coated steel prox mounts to ensure a well functioning application.



CONNECTIVITY CONSIDERATIONS

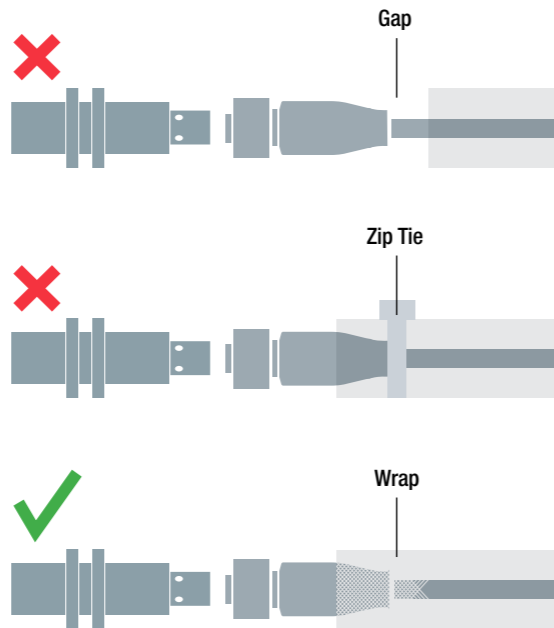
QUICK DISCONNECTS AND SACRIFICE CABLES

Sensors with cable out are one of the cheapest options from most suppliers, but they aren't typically suitable for welding automation. The sensor cable is one of the most common points of failure in a weld cell due to damage from weld spatter. Having to replace a perfectly working electronic sensor due to cable damage is not operational excellence. Quick disconnect sensors allow for replacement of only the failed component and reduce time to replace. Including a short sacrificial cable in extremely harsh applications can reduce cordset replacement downtime when it is inevitable due to application design.



PROTECTION TUBE AND WRAP

Using standard automation cable by itself is a risk of downtime in automated welding. Protection tubes provide a layer of resistance to weld spatter and provide a thermal barrier from the heat in the environment. While using a protection tube on its own can have a positive effect, the open end of the tube can slide off the cable or collect welding debris and expose the vulnerable cable inside. Some attempt to seal the tube with zip ties or cable ties, however these fail from only brief contact with a hot weld spark. Silicone wraps hold the tube in place, up and over the nut and connector. This seals the end so that weld debris cannot collect inside the tube and the tube cannot fall back exposing the cable underneath. Many manufacturers use these products to protect cables, pneumatics and hydraulics in the weld cell and increase up-time.



SILICONE VS. SILICONE FREE

When working in rugged environments it's important to choose a cordset that will stand up to the harshest situations. Many manufacturers have found that silicone is one of the best products for resisting spatter damage and have found major improvements in productivity from its use as protection for connectivity. Some corporate specifications, however, do not allow silicone based sprays or lubricants in the plant thereby eliminating this option, so other reliable materials are available like FEP and TPE. Third party testing has verified that the use of silicone-based protection products from Balluff does not impact production in the same way sprays or lubricants have. Contact Balluff for a copy of the report at 1-800-543-8390.

Silicone Free Options

Basic: TPE, PUR weld spark resistant

- Flexible
- Abrasion resistant
- Spatter resistant



Best: FEP (PTFE)

- Rigid
- High spatter resistance
- High abrasion resistance



PROTECTION SHEETS

Automation components like valve manifolds or I/O blocks can be particularly vulnerable to damage from weld spatter. Like a large blanket, protection sheets can be installed and hung to protect valuable and expensive automation equipment from damage and rouge weld spatter. Customers also utilize this sheeting to protect end-effectors on robots and interchangeable tooling, like weld guns, from damage due to flying weld sparks. Easily cut to size or modified with grommets, this sheeting is extremely weld spatter resistant and effective in protecting equipment.



1. Protection sheet

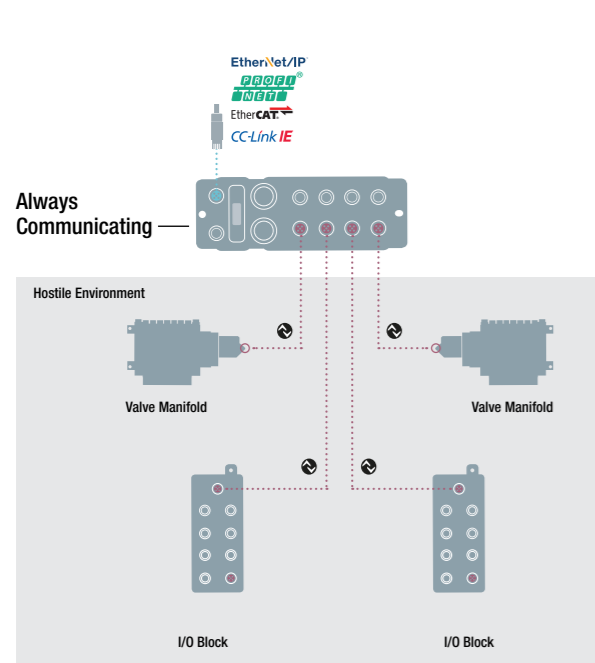


2. Protection sheet

I/O ARCHITECTURES

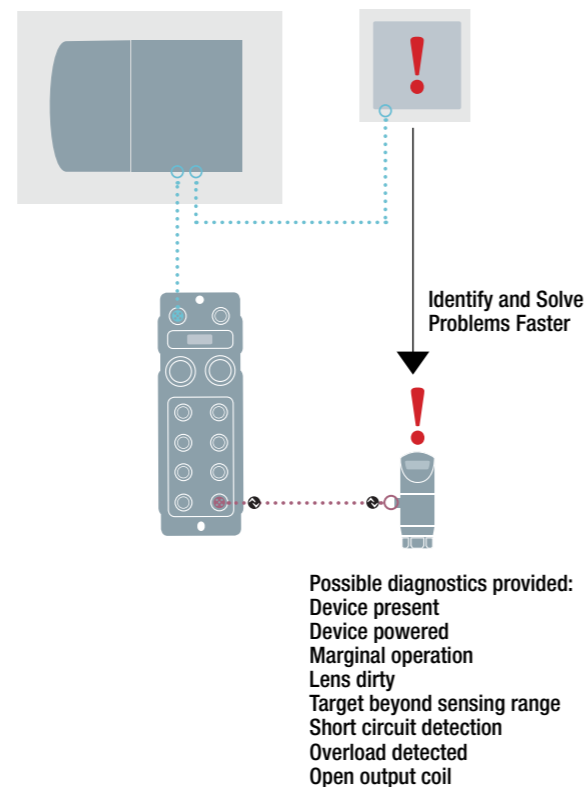
KEEP COMMUNICATING

I/O hubs have become a very common device used for connecting the many sensors used in automated welding. These devices are nice because they are connected to a network and can provide diagnostic data, such as short circuits and overloads. However, many manufacturers struggle with damaged network cables or homerun cables that can cause intermittent communication issues that are difficult to troubleshoot. By using IO-Link hubs and masters for I/O, the master can be mounted out of harm's way so it can always communicate with the PLC and network. The I/O and sensing devices are mounted in the workcell where the damage can occur. If a device fails, the master can report the details up the chain. This architecture allows for improved troubleshooting through constant communication and readily available diagnostics.



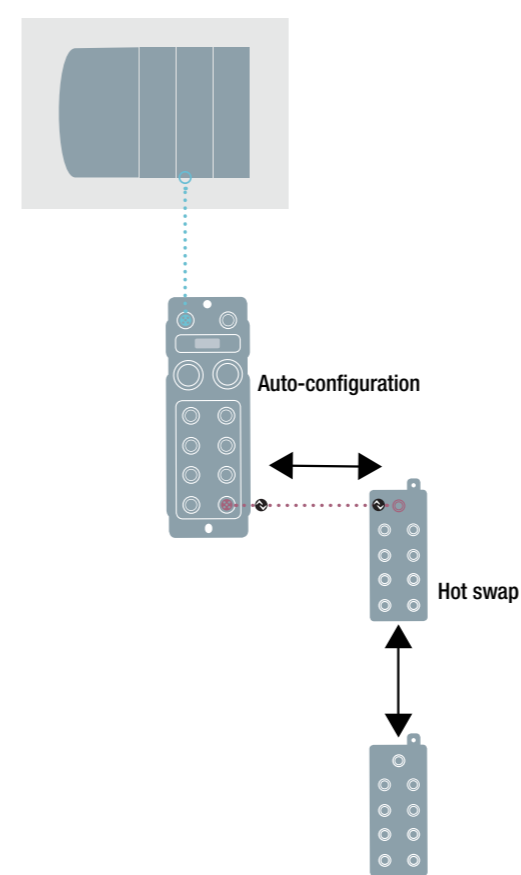
FAST TROUBLESHOOTING

Time is a valuable resource. When a problem occurs, maintenance crews and operators need to quickly find a solution and get the equipment running. By implementing IP67 machine mount I/O, the failed points become more visible and accessible. In addition, diagnostics provided by the individual intelligent devices can help narrow the scope of the problem and speed recovery. Operators can provide technicians exact details of the failure and time can be saved for the technician by knowing and preparing for the problem before they even arrive at the equipment.



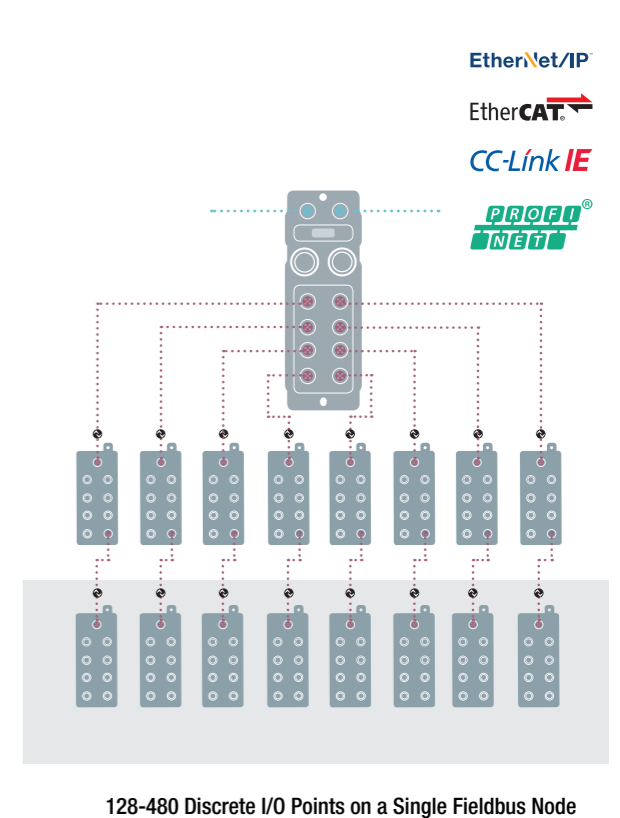
HOT SWAP

Duration of downtime can be significantly reduced and can require less skill to replace with IO-Link. When a typical I/O device is damaged in production, the maintenance technician has to swap the old device for a new one and then program the IP address, set any configurations required and reestablish network communication. In addition, there is little verification that the proper part was reinstalled. With IO-Link, the I/O hub is swapped and the master verifies the correct device is connected then automatically configures the device without any effort from the technician.



HIGH I/O PER IP

From stack lights to solenoid valves to proxies to measurement devices, a variety of inputs and outputs are required to make a production line run and flexibly operate. IP20 slice style solutions require a collection of other products like terminals, circuit breakers, and control cabinets. Available with discrete or analog I/O options and an open standard, they allow any vendor's IO-Link device to be utilized. By utilizing IO-Link, a machine can have dramatically reduced wiring, smaller electrical cabinets, and provide diagnostics that allow for quick troubleshooting of I/O problems.



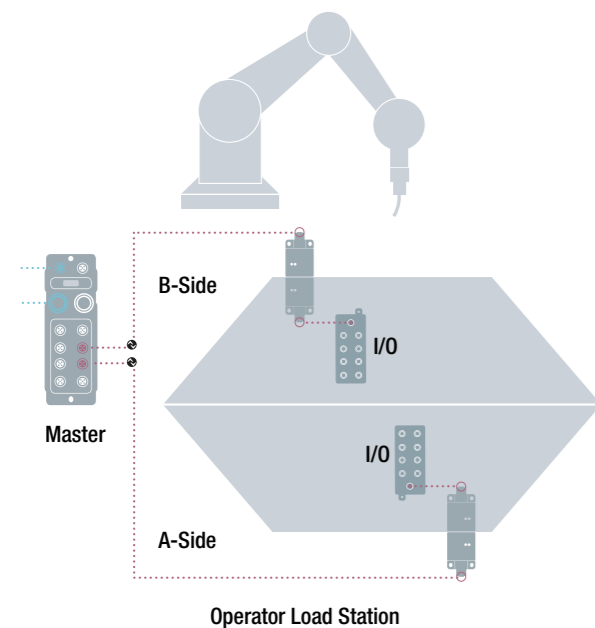
UTILIZING INDUCTIVE COUPLING

HOW NON-CONTACT COUPLERS WORK

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

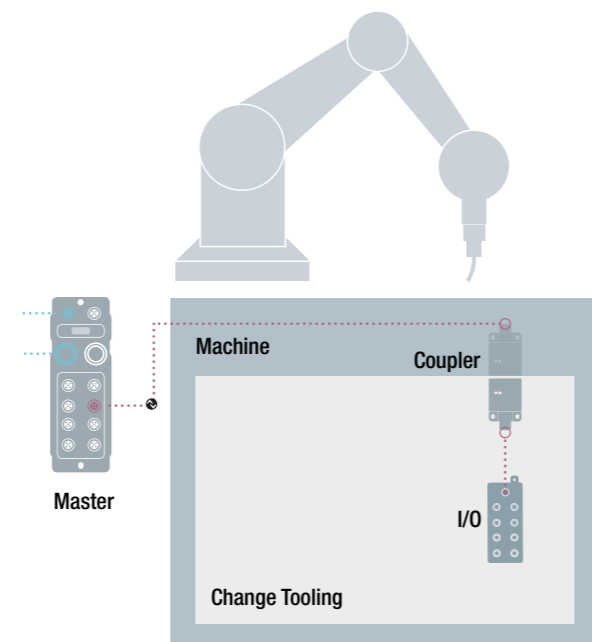
ROTATING WORK TABLE

Any place with an A-side/B-side or 360° rotating table needs connections across an axis of rotation. The non-contact coupler from Balluff provides transparent connection between the sensors and controller. Since it is non-contact, it is completely wear-free and has dramatically reduced repair and downtime versus many traditional connection methods. By placing the coupler on each side connectivity is made during loading and unloading to ensure that parts are seated properly.



CHANGE TOOLING

In automated welding production using pedestal welders and robotic work cells, it is becoming more common to see flexibility being added to the work cell through the use of interchangeable tooling. Manufacturers wanting to get the most throughput out of their investments in automation can make more than one component or sub assembly in a single work cell. Tooling mounted on interchangeable plates or even rolling carts have been used to add flexibility and utilization of the capital investments. Inductive coupling allows for simple connection to the sensors in the tooling, reducing the need for operators to connect the devices and eliminating costly damage to large multipin or milspec connectors.



ENABLING IIoT WITH IO-LINK

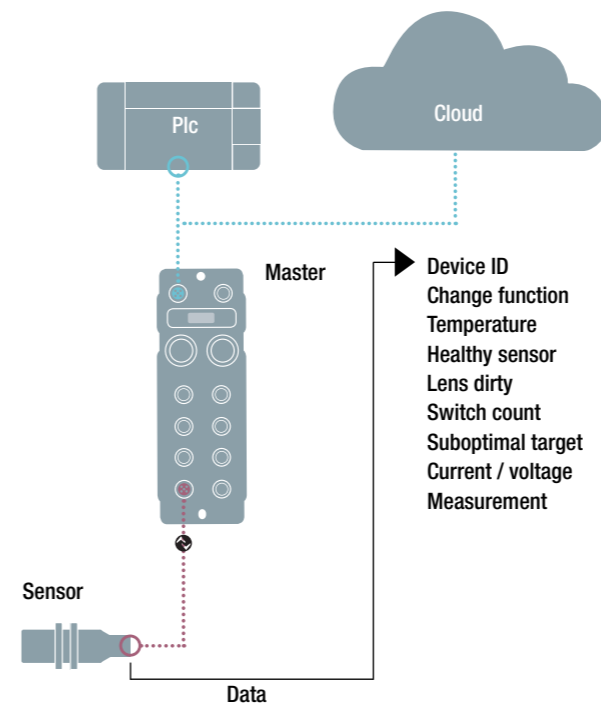
INDUSTRIAL INTERNET OF THINGS (IIoT)

IO-Link is a major enabling force for Industry 4.0 and smart manufacturing. Motivations for flexible manufacturing, efficient production and visibility require that we have more diagnostics and data available for analysis and monitoring. IIoT is simply about connecting devices on the plant floor to a network. These connections provide new ways to generate and collect useful data. This network can provide visibility down into the machine, enabling predictive maintenance and big data analytics. With IIoT, we are able to improve overall equipment effectiveness and provide new insights into our business.

VISIBILITY DOWN TO A SENSOR

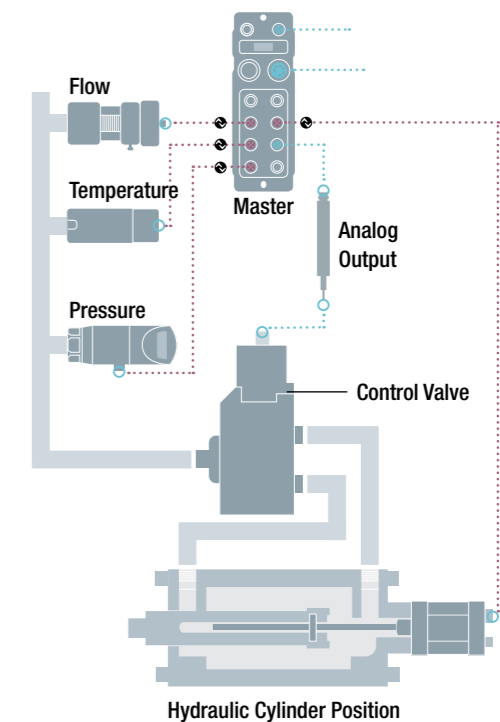
IIoT is about connecting devices on the plant floor to a network. These connections deliver new ways to generate and collect useful data. By providing visibility down into the process, IIoT allows for significant improvements to productivity and quality, including more predictive maintenance and big data analytics.

With IO-Link you can create visibility down to every sensor in the plant and gain the flexibility and reliability that you need for sustainable competitiveness in the global market. More than just providing control, data can be captured, and you can use the resulting analytics to drive your decisions.



MACHINE CONDITION MONITORING

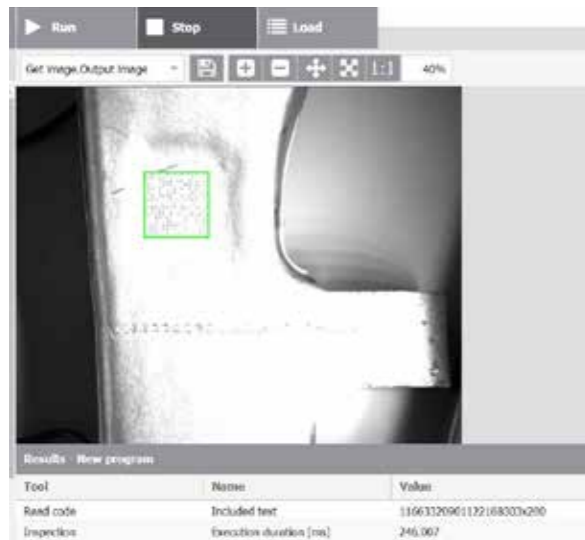
To implement predictive maintenance, repair or replacement work, it is essential to have information about the condition of the sensors, the process chain and the workpieces. IO-Link sensors not only provide information about system control, they also gather machine data which serves as information in higher level systems. Continuous condition monitoring of machines provides information in real-time and ensures proper control and utilization of the production processes. This lowers costs while at the same time optimizing productivity. IO-Link sensors and systems developed for machine monitoring can be installed directly in the desired production system or retrofitted simply.



MACHINE VISION SOLUTIONS

TRACEABILITY AND PART VERIFICATION

Identifying high value parts is becoming more important as tracking lineage and production information about the part has serious value during a recall or rework situation. Various solutions like 1D/2D barcodes on industrial stickers and dot peen data matrix codes are used to identify good parts, bad parts and lot or production data. Vision based identification systems can be used to ensure that only good parts are used in the next step of the process or that the proper product is sent to the proper customer. If a quality or production problem is identified, lots or runs can be quickly identified and contained utilizing the data stored on the part mark 2D or dot peen data matrix.



ERROR PROOFING

Due to lightweighting and technological advances, components and welded parts are more complex than ever. Vision systems are being applied in post-production check stations to verify that all the processes executed well and that a good part has been made. Missing components like weld nuts or small mounting flanges can cause major issues if they are allowed to pass downstream in the production and must be identified and contained in the weld cell to ensure production quality and customer satisfaction. Error proofing can be done with sensors but typically requires a combination of sensors and vision systems to be successful.



BVS COCKPIT: NO EXPERTISE REQUIRED

VISIBILITY

The BVS Cockpit user interface makes it easy to access all functions. You can intuitively set up our cameras with no prior knowledge. In short: our camera concept is designed for everyone.

Configuration

Individual tools are combined into an inspection program. A program includes the camera setting, image processing tools, and definition of the results data.

Monitor

The monitor shows you the current inspection program. The SmartCamera can store up to 100 inspection programs, which you can select individually either directly or through the controller.

Statistics

While the camera is performing an inspection, you can access the statistics, view the entire production quality, and analyze the results parameters statistically and quickly. Just a click lets you switch from a graph point to the associated inspection display in monitor mode, directly or through the controller.

Store test reports

You can automatically create a results report in XML-format after each inspection and save the associated images to an FTP server. The storage condition can be defined with filter settings (ok/nok).

Definition of inputs and outputs

Up to eight digital channels are assigned to electrical connector pins by type, function, and time behavior.

Embed data into saved images

Saved images can be embedded with data from the current inspection: date/time stamps, project/inspection name or with information sent to the camera like VIN number or serial number.

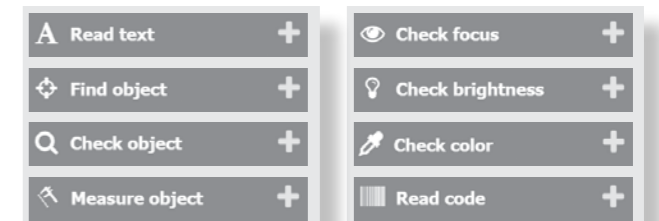
Industrial network integration

The cockpit is used to setup the communication protocol of the camera's industrial network ports. Capable of acting as a UDP, Profinet or EtherNet/IP device, the SmartCamera can also be setup as an IO-Link master to control some devices with limited function or to allow PLC control of smart devices like SmartLight tower lights or RFID processors with full functionality.



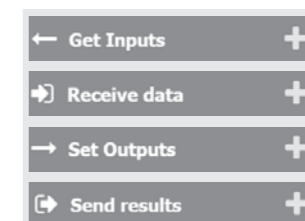
Image processing tools

The SmartCamera offers intuitive operation and simple to use tools which are based on industry-standard HALCON basic algorithms – all of which ensures you of fast and reliable solutions.



Interface tools

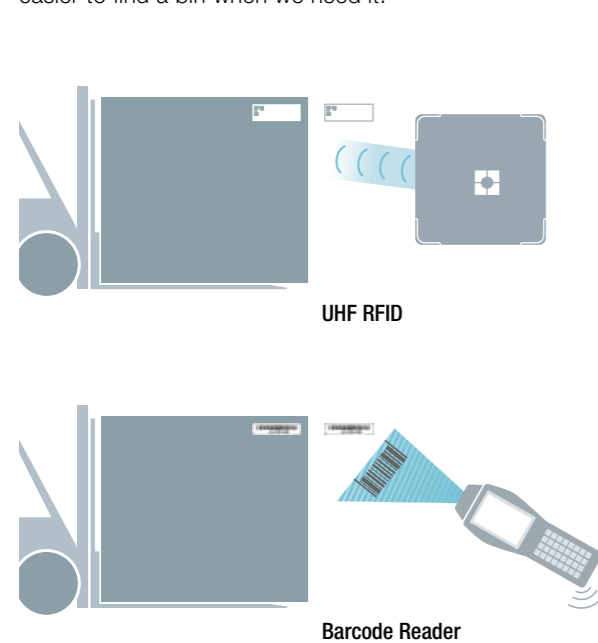
Results can be passed dynamically to the appropriate interface for the particular industrial system.



TRACEABILITY APPLICATIONS

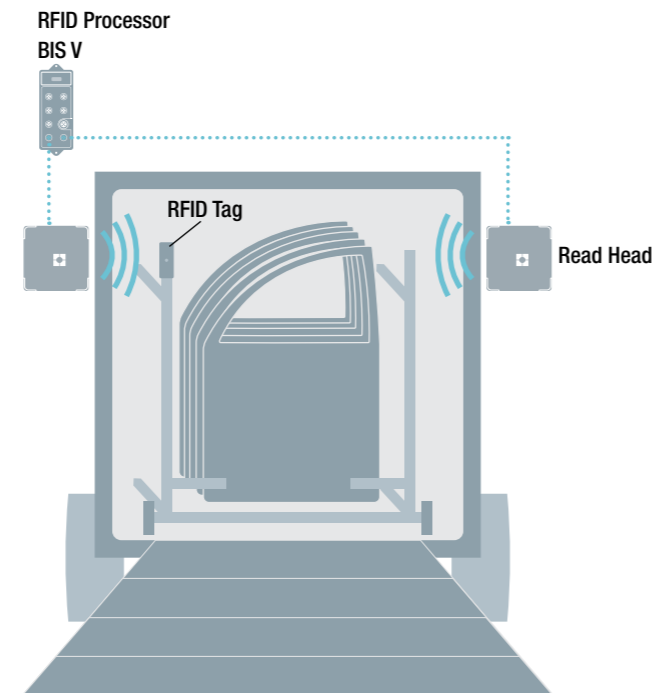
PART BIN TRACKING

As parts are produced at a stamping press or as an output from a welding sub-assembly process, they are typically loaded into bins or racks. These storage units can be very expensive, and the parts stored inside even more so. When parts move through the plant, it is not uncommon for an entire bin to disappear or be misplaced. This can cause production delays or delivery issues for a customer. By using traceability technology and information like RFID or barcodes, we can identify the parts in the bin, determine the production run, or the machine they came from. We can verify at a work-cell that the right bin of parts has been provided and not a part that looks similar. Utilizing RFID gateways or handheld barcode scanners, we can track where a bin was stored by the fork truck operator, making it easier to find a bin when we need it.



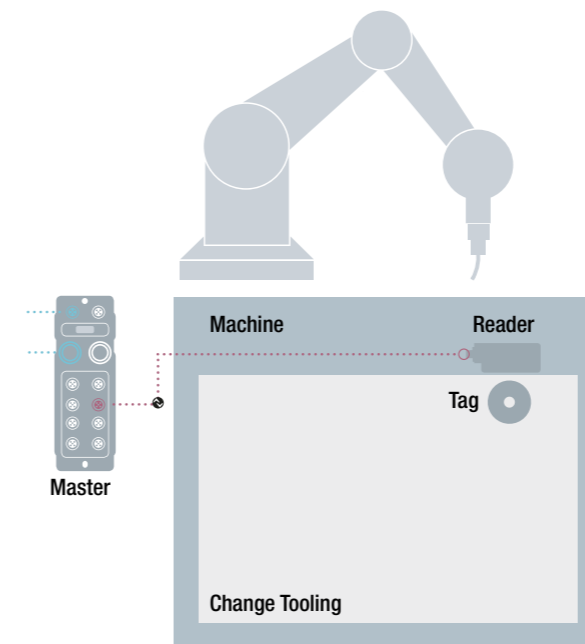
DUNNAGE CART RETURN

When moving materials between production facilities, it is vital to keep track of what left the building and what has been returned. This becomes even more important when shipping parts to a customer. Specialized dunnage carts and racks for moving finished parts can be high priced. If these racks are not returned or go missing, it can eat away at profit margins or make it harder to deliver parts safely to a customer. By using UHF RFID systems, manufacturers are recording every cart that leaves the facility, they know which truck and at what time it left. This allows for documentation of delivery as well as chain of ownership awareness of valuable dunnage carts and racks.



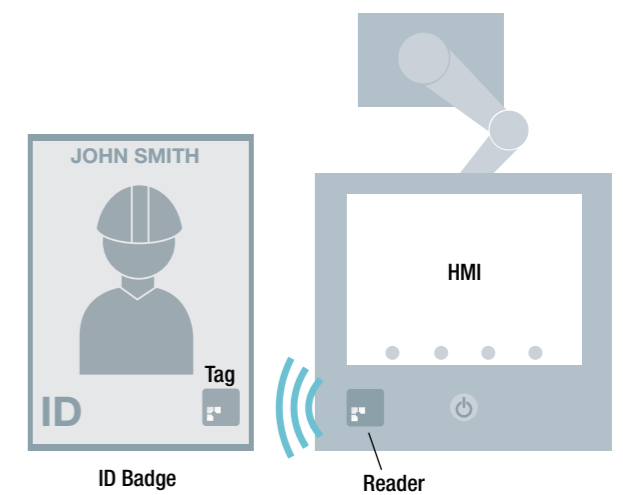
CHANGE TOOL IDENTIFICATION

In automated welding production using pedestal welders and robotic work cells, it is becoming more common to see flexibility being added to the work cell through the use of interchangeable tooling. Tooling mounted on interchangeable plates or even rolling carts have been used to add flexibility and utilization of the capital investments. RFID technology allows for easy asset management of the change tools and fixtures. A data carrier tag is mounted on each tool and can store a variety of information: part number, number of cycles run, last maintenance time, last operator, and valid work cells. The tag can also drive flexibility in the robot program or the operator guidance systems, improving capital asset utilization.



OPERATOR ACCESS CONTROL

Industrial RFID systems provide a controlled and tamper-resistant solution for limiting access to the machine. Differentiating between operators, technicians, supervisors and engineers provides restricted access to certain maintenance screens or automatically changes the views for the HMI or Interface. Access control is used for verifying the operator's work times, tracking regular maintenance or supervisor override status. Many current solutions utilize physical keys for supervisor override or maintenance calls, but keys are easily copied, lost or shared by employees on the floor causing issues and confusion.



ALTERNATIVE JOINING TECHNIQUES AND MATERIALS

For metal fabricators, MIG and TIG welding aren't the only processes in the joining toolbox. Lightweighting, new materials, and new delivery expectations are driving the use of complementary joining and alternate materials. Riveting is a common process being utilized and is now being paired with adhesives or glues for some specialty materials or when joining two different materials. Spot welding also has a different impact on the automation versus MIG and TIG welding. And handling carbon fiber at production volumes has generated new challenges for automation equipment and is requiring new processes and sensors.

RIVETING

Riveting is a common process being utilized and is now being paired with adhesives or glues for some specialty materials or when joining two different materials. Detection of the position of the rivet gun is solved using linear position transducer sensors. I/O on the tool and in the fixture are handled easily by IO-Link technology, which simplifies the integration of automation with the end effector of the robot.



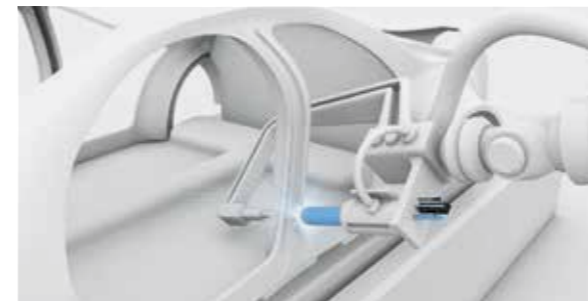
GLUE / ADHESIVE

Assuring that the glue or adhesive seam covers the entire length of the joint is an important part of using this alternative joining technique. The application of the adhesive needs to be regularly inspected to ensure proper joint strength. Vision systems allow for extraordinary flexibility and allow for additional demanding quality checks. Ultrasonic, photoelectric, and capacitive technologies are all used regularly for detection of the adhesive. Capacitive, flow, temperature, and pressure sensors are all used to monitor the condition of the application of glue and the processing of the adhesive material.



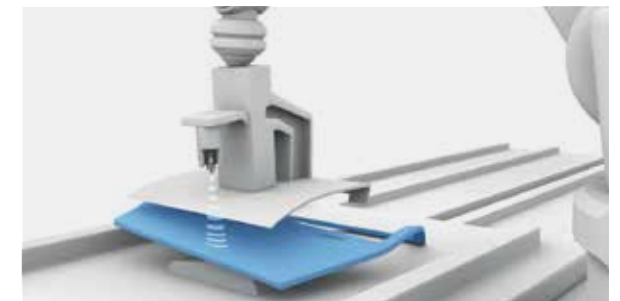
SPOT WELDING

To perfectly join chassis parts in fully automated spot welding systems, we have the answers. Our inductive positioning systems help to precisely position the electrodes prior to welding. This means you can control the welding process even more efficiently. The sensor installed on the spot welder generates all the parameters needed for spot welding.



CARBON FIBER

When the trimmed carbon fibers are inserted during the preform process, our ultrasonic sensors check whether the gripper is correctly holding the mat. By doing so they ensure that the carbon fiber blanks are correctly formed. Dust and dirt, which could affect photoelectric sensors, have no impact on ultrasonic sensors. And in contrast to capacitive sensors, these rugged jacks-of-all-trades simply ignore any electrostatic discharge that might arise.



Easy to integrate, cost-saving and flexible

DISCOVER THE BENEFITS OF SAFETY OVER IO-LINK



Using IO-Link advantages for safety

Reliable, flexible exchange of information, data transfer across all levels, easy connection and universal standardized interfaces – are all possible with Safety over IO-Link. It delivers the advantage of having the proven safety benefits of IO-Link.

Easy to integrate

Integrating safety technology only requires you to connect the I/O module to the IO-Link master. You can connect nearly any safety device to this system, which is open all the way to the sensor level. Parameters are configured centrally using the controller. Safety-related information is sent directly through the master to the controller. Using Profisafe via Profinet guarantees secure communication with the controller. In some cases you can even dispense with a separate hub. This is because the safety hub makes it possible to bundle signals from standard binary sensors as well.

A simple system setup reduces machine installation space

An intelligent expansion of IO-Link with the addition of safety components makes it easy for you to set up the system. You cut down on wiring and reduce the volume of your control cabinet as well as the installation space of your machine.

Safety over IO-Link lowers overall costs

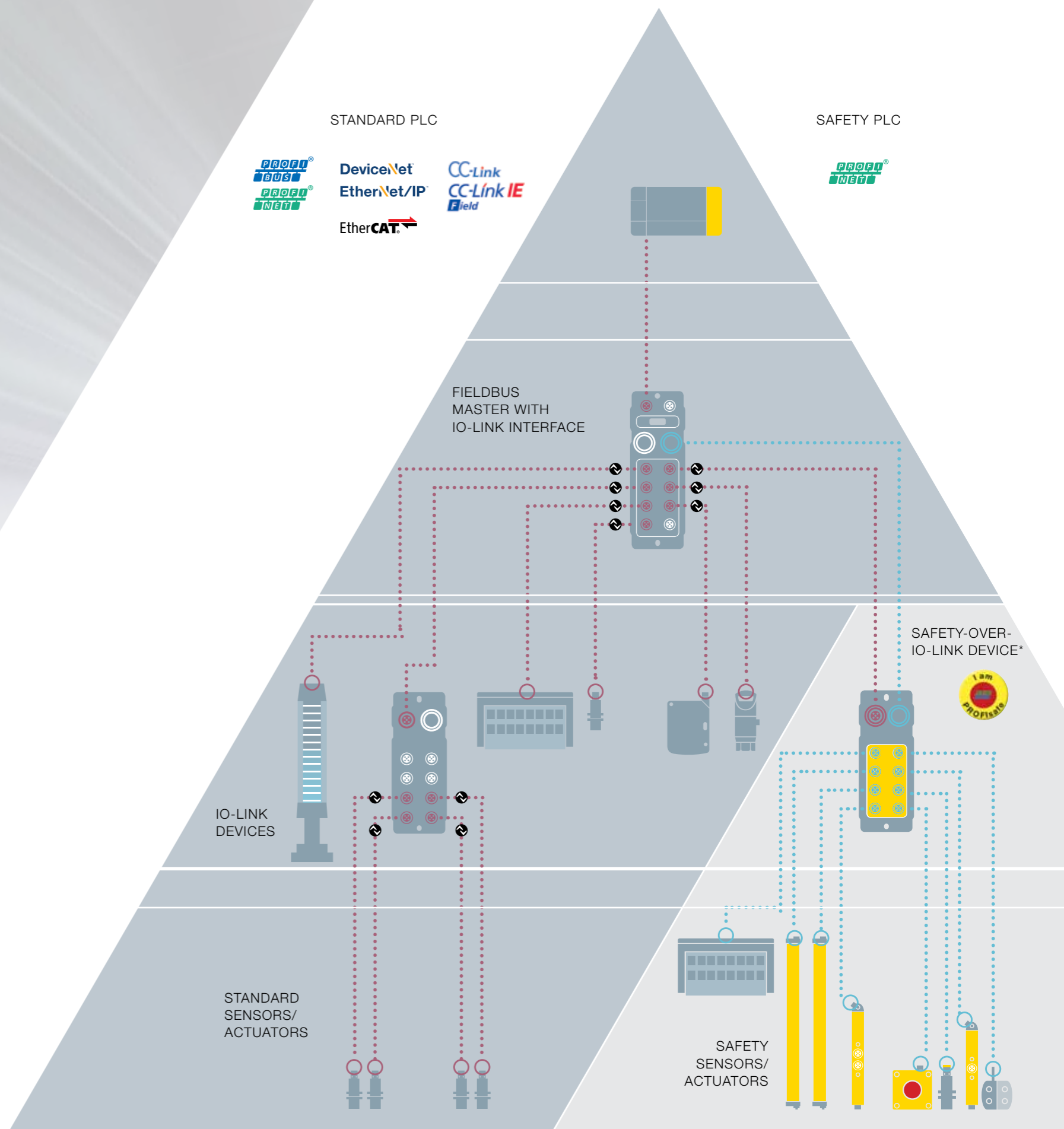
Safety over IO-Link combines safety and automation in one system. The safe I/O modules can be added to the existing IO-Link topology in the field. And the savings potential from IO-Link provides you with benefits over the entire life cycle of your machine.

Scalability increases system performance

With Safety over IO-Link the existing network topology is scalable to accommodate future needs. You can connect both safety and standard components to the I/O module. This maintains the function of your system just the way you use it and ensures safety. Both topologies are successfully combined and increase the performance of your system.

Safety over IO-Link

- Combines automation and safety technology
- High degree of process reliability
- More space in your control cabinet
- Easy to integrate
- Simple system structure
- Lower overall costs
- Increased system performance
- High flexibility



*for use only with Profinet

Weld Select Portfolio

THE BEST TECHNOLOGIES FOR WELDING AUTOMATION.



Balluff specializes in delivering dependable, rugged products for industrial sensing, networking, and ID to help prevent downtime and eliminate errors. We are your complete system and component supplier. We add technologies that unlock hidden productivity potential.

Our products include a complete line of sensors, transducers, ID systems, and connectivity products. Our sensor lines include photoelectric, inductive, capacitive, and magnetic, as well as other more specialized sensor products to fit virtually any sensing application.

- Inductive
- Photoelectric
- Magnetic field
- Networking
- Cables
- Accessories



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INDUCTIVE SENSORS

- 62 Inductive sensors
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PHOTOELECTRIC SENSORS

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ACCESSORIES

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Highest quality and precision
for a variety of applications

INDUCTIVE SENSORS

Exact, non-contact position detection is essential for processes in automation technology. Inductive sensors from Balluff reliably monitor, regulate and automate sequences and statuses in the highest quality. Every sensor is optimized for its respective application: from standard to extended sensing distance, from temperature- and high-pressure-resistant up to Factor 1, from mini to maxi. They are always wear-free, resistant to dirt, and short-circuit-proof.

Contents

62	Inductive 2-wire sensors
66	Inductive Factor 1 sensors
72	Weld field-resistant inductive sensors
74	Steelface inductive sensors
78	Weld field immune inductive sensors
88	Temperature-rated inductive sensors
90	Plunger probe solutions



	BES03H7 BES M08ME1-USC20B-S04G-U	BES0324 BES M08MG-GSC20B-BP00,3-GS04-101	BES048U BES M08MG-GSC20B-BZ00,3-GS04-U02		BES0326 BES M12MG-GSC30B-BP00,3-GS04-101	BES039W BES M12MG-GSC30B-BX00,3-GS04-U	BES039U BES M12MF-GSC30B-S04G-U	BES03HL BES M12MF-USC30B-S04G-U
Dimension	Ø 8 x 50 mm	Ø 8 x 40 mm	Ø 8 x 40 mm		Ø 12 x 43 mm	Ø 12 x 43 mm	Ø 12 x 50 mm	Ø 12 x 50 mm
Style	M8x1	M8x1	M8x1		M12x1	M12x1	M12x1	M12x1
Installation	for flush mounting	for flush mounting	for flush mounting		for flush mounting	for flush mounting	for flush mounting	for flush mounting
Range	2 mm	2 mm	2 mm		3 mm	3 mm	3 mm	3 mm
Switching output	non-polarized normally open (NO)	polarized normally open (NO)	polarized normally open (NO)		polarized normally open (NO)	polarized normally open (NO)	polarized normally open (NO)	non-polarized normally open (NO)
Switching frequency	1500 Hz	1500 Hz	1500 Hz		1300 Hz	1300 Hz	1300 Hz	1300 Hz
Housing material	Brass	Brass	Brass		Brass	Brass	Brass	Brass
Surface protection	PTFE coated	Nickel-free coated	PTFE coated		Nickel-free coated	PTFE coated	PTFE coated	PTFE coated
Material sensing surface	LCP PTFE	ceramic coated	LCP PTFE		ceramic coated	LCP PTFE	LCP PTFE	LCP PTFE
Connection	Connector, M12x1 male, 4-pin	Cable with connector, M12x1 male, 4-pin, 0.30 m, PUR	Cable with connector, M12x1 male, 4-pin, 0.30 m, TPU		Cable with connector, M12x1 male, 4-pin, 0.30 m, PUR	Cable with connector, M12x1 male, 4-pin, 0.30 m, PUR	Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin
Operating voltage U_b	10...36 VDC	10...30 VDC	10...36 VDC		10...30 VDC	10...36 VDC	10...36 VDC	10...36 VDC
Ambient temperature	-25...70 °C	-25...70 °C	-25...70 °C		-25...70 °C	-25...70 °C	-25...70 °C	-25...70 °C
Protection degree	IP67	IP67	IP67		IP67	IP67	IP67	IP67
Approval/Conformity	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE		CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE
Recommended prox mount	BAM0312	BAM0312	BAM0312		BAM0247	BAM0247	BAM0247	BAM0247



	BES03FJ BES M18MG-GSC70B-BX00,3-GS04-U	BES03FH BES M18MF-GSC70B-S04G-U		BES027K BES M30MF-GSC15B-BX00,3-GS04-U	BES03KL BES M30MF-GSC15B-S04G-U		
Dimension	Ø 18 x 46 mm	Ø 18 x 51 mm		Ø 30 x 42.5 mm	Ø 30 x 51 mm		
Style	M18x1	M18x1		M30x1.5	M30x1.5		
Installation	for flush mounting	for flush mounting		for flush mounting	for flush mounting		
Range	7 mm	7 mm		15 mm	15 mm		
Switching output	polarized normally open (NO)	polarized normally open (NO)		polarized normally open (NO)	polarized normally open (NO)		
Switching frequency	600 Hz	600 Hz		400 Hz	400 Hz		
Housing material	Brass	Brass		Brass	Brass		
Surface protection	PTFE coated	PTFE coated		PTFE coated	PTFE coated		
Material sensing surface	LCP PTFE	LCP PTFE		LCP PTFE	LCP PTFE		
Connection	Cable with connector, M12x1 male, 4-pin, 0.30 m, PUR	Connector, M12x1 male, 4-pin		Cable with connector, M12x1 male, 4-pin, 0.30 m, PUR	Connector, M12x1 male, 4-pin		
Operating voltage U_b	10...36 VDC	10...36 VDC		10...36 VDC	10...36 VDC		
Ambient temperature	-25...70 °C	-25...70 °C		-25...70 °C	-25...70 °C		
Protection degree	IP67	IP67		IP67	IP67		
Approval/Conformity	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE		CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE		
Recommended prox mount	BAM022F	BAM022F		BAM024C	BAM024C		



	BES02YR BES M08EG-PSC15A-S04G-W	BES02YT BES M08EG1-PSC15A-S04G-W	BES02JZ BES M12MF1-PSC30A-S04G-W		BES02JW BES M12MD1-PSC80E-S04G-W	BES0567 BES M12EI-PSC40A-S04G-S02	BES02K5 BES M12ML-PSC80E-S04G-W	BES05AJ BES M18ME-PSC80A-S04G-W08
Dimension	Ø 8 x 49 mm	Ø 8 x 57 mm	Ø 12 x 50 mm		Ø 12 x 50 mm	Ø 12 x 65 mm	Ø 12 x 65 mm	Ø 18 x 46 mm
Style	M8x1	M8x1	M12x1		M12x1	M12x1	M12x1	M18x1
Installation	for flush mounting	for flush mounting	for flush mounting		non-flush	for flush mounting	non-flush	for flush mounting
Range	1.5 mm	1.5 mm	3 mm		8 mm	4 mm	8 mm	8 mm
Switching output	PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)
Switching frequency	2000 Hz	2000 Hz	2000 Hz		2000 Hz	80 Hz	2000 Hz	2500 Hz
Housing material	Stainless steel (1.4301)	Stainless steel (1.4301)	Brass		Brass	Stainless steel	Brass	Brass
Surface protection	PTFE coated	PTFE coated	PTFE coated		PTFE coated	PTFE coated	PTFE coated	PTFE coated
Material sensing surface	PBT PTFE	PBT PTFE	LCP PTFE		LCP PTFE	Stainless steel, PTFE coated	LCP PTFE	PBT
Connection	Connector, M8x1 male, 3-pin	Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin		Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin	Connector, M12x1 male, 3-pin
Operating voltage U _b	10...30 VDC	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	10...30 VDC
Ambient temperature	-25...70 °C	-25...70 °C	-25...70 °C		-25...70 °C	-25...70 °C	-25...70 °C	-40...85 °C
Magnetic field immune	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)		magnetic field immune (AC/DC)	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)
Protection degree	IP67	IP67	IP67		IP67	IP67	IP67	IP68
Approval/Conformity	CE, EAC, WEEE	CE, EAC, WEEE	CE, cULus, EAC, WEEE		CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE
Additional features	Factor 1, Weld immune	Factor 1, Weld immune	Factor 1, Weld immune		Factor 1, Weld immune	Factor 1, Weld immune, Housing resistant to weld spatter	Factor 1, Weld immune	Factor 1, Extended temperature range, Housing resistant to weld spatter, weld-immune (magnetic field 100kA/m)
Recommended prox mount	BAM0312	BAM0312	BAM0247		BAM0247	BAM00CW	BAM0247	BAM022F



	BES05NC BES M18EG1-PSC80A-S04G-S02	BES05AH BES M18MI-PSC80A-S04G-W07		BES05AK BES M18MI-PSC80A-S04G-W08	BES05AL BES M18ME-PSC12E-S04G-W08	BES05AM BES M18MI-PSC12E-S04G-W08	BES02KM BES M30ML-PSC10A-S04G-W
Dimension	Ø 18 x 56 mm	Ø 18 x 66 mm		Ø 18 x 66 mm	Ø 18 x 56 mm	Ø 18 x 76 mm	Ø 30 x 65 mm
Style	M18x1	M18x1		M18x1	M18x1	M18x1	M30x1.5
Installation	for flush mounting	for flush mounting		for flush mounting	non-flush	non-flush	for flush mounting
Range	8 mm	8 mm		8 mm	12 mm	12 mm	10 mm
Switching output	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)
Switching frequency	110 Hz	2500 Hz		2500 Hz	2000 Hz	2000 Hz	600 Hz
Housing material	Stainless steel	Brass		Brass	Brass	Brass	Brass
Surface protection	PTFE coated	PTFE coated		PTFE coated	PTFE coated	PTFE coated	PTFE coated
Material sensing surface	Stainless steel, PTFE coated	PBT, PTFE coated		PBT	PBT	PBT	LCP PTFE
Connection	Connector, M12x1 male, 3-pin	Connector, M12x1 male, 3-pin		Connector, M12x1 male, 3-pin	Connector, M12x1 male, 3-pin	Connector, M12x1 male, 3-pin	Connector, M12x1 male, 4-pin
Operating voltage U_b	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	10...30 VDC
Ambient temperature	-25...70 °C	-40...85 °C		-40...85 °C	-40...85 °C	-40...85 °C	-25...70 °C
Magnetic field immune	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)		magnetic field immune (AC/DC)	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)
Protection degree	IP68	IP68		IP68	IP68, IP67	IP68, IP67	IP67
Approval/Conformity	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE		CE, cULus, EAC, WEEE	CE, EAC, cULus, WEEE	CE, EAC, cULus, WEEE	CE, cULus, EAC, WEEE
Additional features	Factor 1	Factor 1, Extended temperature range, Housing resistant to weld spatter, weld-immune (magnetic field 100kA/m)		Factor 1, Extended temperature range, Housing resistant to weld spatter, weld-immune (magnetic field 100kA/m)	Factor 1, Extended temperature range, Housing resistant to weld spatter	Factor 1, Extended temperature range, Housing resistant to weld spatter	Factor 1, Weld immune
Recommended prox mount	BAM00FM	BAM022F		BAM022F	BAM022F	BAM022F	BAM024C



	BES02KN BES M30ML-PSC10A-S04G-W01	BES049Y BES R01EC-PSC50A-BP00,3-GS04-W51		BES04RE * BES R01EC-PSC50A-BS00,3-GS04-W51	BES0457 BES Q40KFU-PAC20A-S04G-W01	BES021K BES Q40KFU-PAC35E-S04G-W01	BES04AW BES Q40KFU-PAC20A-S04G-W14
Dimension	Ø 30 x 65 mm	32 x 20 x 8 mm		32 x 20 x 8 mm	40 x 40 x 62 mm	40 x 40 x 62 mm	40 x 40 x 62 mm
Style	M30x1.5	Block style		Block style	Block style	Block style	Block style
Installation	for flush mounting	for flush mounting		for flush mounting	for flush mounting	non-flush	for flush mounting
Range	10 mm	5 mm		5 mm	20 mm	35 mm	20 mm
Switching output	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	PNP normally open/normally closed (NO/NC)	PNP normally open/normally closed (NO/NC)	PNP normally open/normally closed (NO/NC)
Switching frequency	600 Hz	20 Hz		20 Hz	400 Hz	250 Hz	400 Hz
Housing material	Brass	Stainless steel		Stainless steel	PBT	PBT	PBT
Surface protection	PTFE coated	PTFE coated		PTFE coated	partly coated	partly coated	partly coated
Material sensing surface	ceramic coated	Stainless steel, W51 coating		Stainless steel, W51 coating	ceramic coated	ceramic coated	ceramic coated
Connection	Connector, M12x1 male, 4-pin	Cable with connector, M12x1 male, 4-pin, 0.30 m, PUR		Cable with connector, M12x1 male, 4-pin, 0.30 m, silicone	Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin
Operating voltage U_b	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	10...30 VDC
Ambient temperature	-25...70 °C	-25...70 °C		-25...70 °C	-25...70 °C	-10...70 °C	-25...70 °C
Magnetic field immune	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)		magnetic field immune (AC/DC)	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)
Protection degree	IP67	IP67		IP67	IP67	IP67	IP67
Approval/Conformity	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE		CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	cULus, CE, EAC, WEEE
Additional features	Factor 1, Weld immune	Factor 1, Housing resistant to weld spatter, Weld immune		Factor 1, Housing resistant to weld spatter, Weld immune	Factor 1, Weld immune	Factor 1, Weld immune	Factor 1, Weld immune
Recommended prox mount	BAM024C						

* Contains silicone



	BES05KP BES M12ME-PSC40A-S04G-W08	BES05KU BES M12MI-PSC40A-S04G-W07		BES05KT BES M12MI-PSC40A-S04G-W08	BES05KR BES M12ME-PSC80E-S04G-W08	BES05KW BES M12MI-PSC80E-S04G-W08	
Dimension	Ø 12 x 50 mm	Ø 12 x 65 mm		Ø 12 x 65 mm	Ø 12 x 50 mm	Ø 12 x 65 mm	
Style	M12x1	M12x1		M12x1	M12x1	M12x1	
Installation	for flush mounting	for flush mounting		for flush mounting	non-flush	non-flush	
Range	4 mm	4 mm		4 mm	8 mm	8 mm	
Switching output	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)	
Switching frequency	2000 Hz	2000 Hz		2000 Hz	2000 Hz	2000 Hz	
Housing material	Brass	Brass		Brass	Brass	Brass	
Surface protection	PTFE coated	PTFE coated		PTFE coated	PTFE coated	PTFE coated	
Material sensing surface	PBT	PBT, PTFE coated		PBT	PBT	PBT	
Connection	Connector, M12x1 male, 3-pin	Connector, M12x1 male, 3-pin		Connector, M12x1 male, 3-pin	Connector, M12x1 male, 3-pin	Connector, M12x1 male, 3-pin	
Operating voltage U_b	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	
Ambient temperature	-40...85 °C	-40...85 °C		-40...85 °C	-40...85 °C	-40...85 °C	
Magnetic field immune	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)		magnetic field immune (AC/DC)	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)	
Protection degree	IP68	IP68		IP68	IP68	IP68	
Approval/Conformity	cULus, CE, EAC, WEEE	cULus, CE, EAC, WEEE		cULus, CE, EAC, WEEE	cULus, CE, EAC, WEEE	cULus, CE, EAC, WEEE	
Additional features	Factor 1, Extended temperature range, Housing resistant to weld spatter, weld-immune (magnetic field 100kA/m)	Factor 1, Extended temperature range, Housing resistant to weld spatter, weld-immune (magnetic field 100kA/m)		Factor 1, Extended temperature range, Housing resistant to weld spatter, weld-immune (magnetic field 100kA/m)	Factor 1, Extended temperature range, Housing resistant to weld spatter, weld-immune (magnetic field 100kA/m)	Factor 1, Extended temperature range, Housing resistant to weld spatter, weld-immune (magnetic field 100kA/m)	
Recommended prox mounts	BAM00247	BAM00247		BAM00247	BAM00247	BAM00247	



	BES054M BES M08EE1-PSC20B-S49G-S01	BES02N4 BES M08EH1-NSC20B-S04G-S01		BES02N9 BES M12EI-NSC40B-S04G-S01	BES02NH BES M18EI-NSC72B-S04G-S01	BES02N6 BES M08EH1-PSC20B-S04G-S01	
Dimension	Ø 8 x 50 mm	Ø 8 x 65 mm		Ø 12 x 65 mm	Ø 18 x 65 mm	Ø 8 x 65 mm	
Style	M8x1	M8x1		M12x1	M18x1	M8x1	
Installation	for flush mounting	for flush mounting		for flush mounting	for flush mounting	for flush mounting	
Range	2 mm	2 mm		4 mm	7.2 mm	2 mm	
Switching output	PNP normally open (NO)	NPN normally open (NO)		NPN normally open (NO)	NPN normally open (NO)	PNP normally open (NO)	
Switching frequency	100 Hz	750 Hz		500 Hz	250 Hz	750 Hz	
Housing material	Stainless steel (1.4404)	Stainless steel		Stainless steel	Stainless steel	Stainless steel	
Surface protection	PTFE coated	PTFE coated		PTFE coated	PTFE coated	PTFE coated	
Material sensing surface	Stainless steel (1.4404), PTFE coated	Stainless steel, PTFE coated		Stainless steel, PTFE coated	Stainless steel, PTFE coated	Stainless steel, PTFE coated	
Connection	Connector, M8x1 male, 3-pin	Connector, M12x1 male, 4-pin		Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin	
Operating voltage U_b	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	
Ambient temperature	-25...70 °C	-25...70 °C		-25...70 °C	-25...70 °C	-25...70 °C	
Pressure rating max.	80 bar	80 bar		60 bar	40 bar	80 bar	
Protection degree	IP67	IP67		IP67	IP67	IP67	
Approval/Conformity	cULus, CE, EAC, WEEE	CE, cULus, EAC, WEEE		cULus, CE, EAC, WEEE	cULus, CE, EAC, WEEE	CE, cULus, EAC, WEEE	
Recommended prox mount	BAM00AC	BAM00AC		BAM00CW	BAM00FM	BAM00AC	



	BES05K8 BES M18EG1-PSC80S-S04G-S	BES05K9 BES M18EG1-PSC80N-S04G-S	BES056Z BES M18EI-NSC72B-S04G-S03		BES056C BES M18EI-PSC72B-S04G-S03	BES0572 BES M08EH1-NSC20B-S04G-S03	BES0569 BES M08EH1-PSC20B-S04G-S03	BES056Y BES M12EI-NSC40B-S04G-S03	BES056A BES M12EI-PSC40B-S04G-S03
Dimension	Ø 18 x 56 mm	Ø 18 x 56 mm	Ø 18 x 65 mm		Ø 18 x 65 mm	Ø 8 x 65 mm	Ø 8 x 65 mm	Ø 12 x 65 mm	Ø 12 x 65 mm
Style	M18x1	M18x1	M18x1		M18x1	M8x1	M8x1	M12x1	M12x1
Installation	for flush mounting	for flush mounting	for flush mounting		for flush mounting	for flush mounting	for flush mounting	for flush mounting	for flush mounting
Range	8 mm	8 mm	7.2 mm		7.2 mm	2 mm	2 mm	4 mm	4 mm
Switching output	PNP normally open (NO)	PNP normally open (NO)	NPN normally open (NO)		PNP normally open (NO)	NPN normally open (NO)	PNP normally open (NO)	NPN normally open (NO)	PNP normally open (NO)
Switching frequency	110 Hz	110 Hz	250 Hz		250 Hz	750 Hz	750 Hz	500 Hz	500 Hz
Housing material	Stainless steel	Stainless steel	Stainless steel		Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
Surface protection	—	—	weld spatter resistant, Sun 73		weld spatter resistant, Sun 73	weld spatter resistant, Sun 73	weld spatter resistant, Sun 73	weld spatter resistant, Sun 73	weld spatter resistant, Sun 73
Material sensing surface	Stainless steel	Stainless steel	Stainless steel, weld spatter resistant, Sun 73		Stainless steel, weld spatter resistant, Sun 73	Stainless steel, weld spatter resistant, Sun 73	Stainless steel, weld spatter resistant, Sun 73	Stainless steel, weld spatter resistant, Sun 73	Stainless steel, weld spatter resistant, Sun 73
Connection	Connector, M12x1 male, 3-pin	Connector, M12x1 male, 3-pin	Connector, M12x1 male, 4-pin		Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin	Connector, M12x1 male, 4-pin
Operating voltage U_b	10...30 VDC	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	10...30 VDC	10...30 VDC
Ambient temperature	-25...70 °C	-25...70 °C	-25...70 °C		-25...70 °C	-25...70 °C	-25...70 °C	-25...70 °C	-25...70 °C
Magnetic field immune	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)	—		—	—	—	—	—
Protection degree	IP68	IP68	IP67		IP67	IP67	IP67	IP67	IP67
Approval/Conformity	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE		CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	EAC, cULus, CE, WEEE	CE, cULus, EAC, WEEE
Additional features	Selective ferrous	Selective non-ferrous							
Recommended prox moumt	BAM00FM	BAM00FM	BAM00FM		BAM00FM	BAM00AC	BAM00AC	BAM00CW	BAM00CW



	BES03MY BES M18MI-PSC40B-S04G-W03	BES05K5 * BES R01ZC-PSC50B-BS00,3-GS04-W52				
Dimension	Ø 18 x 65 mm	32 x 20 x 8 mm				
Style	M18x1	Block style				
Installation	for flush mounting	for flush mounting				
Range	4 mm	5 mm				
Switching output	PNP normally open (NO)	PNP normally open (NO)				
Switching frequency	50 Hz	100 Hz				
Housing material	Brass	Zinc, die-cast				
Surface protection	PTFE coated	—				
Material sensing surface	Ceramic, PTFE coated	Fortron 6165 A6				
Connection	Connector, M12x1 male, 4-pin	Cable with connector, M12x1 male, 3-pin, 0.30 m, silicone				
Operating voltage U _b	10...30 VDC	10...30 VDC				
Ambient temperature	-25...70 °C	-25...70 °C				
Magnetic field immune	magnetic field immune (AC/DC)	magnetic field immune (AC/DC)				
Protection degree	IP67	IP67				
Approval/Conformity	cULus, CE, EAC, WEEE	CE, cULus, EAC, WEEE				
Recommended prxo mount						

* Contains silicone



	BES0586 BES 516-3007-G-SA12-E4-C-PU-02	BES0548 BES 516-3005-G-SA12-E4-C-PU-02	BES05PM BES 516-3005-G-SA13-E4-C-S4-00,3		BES05PL BES 516-3005-G-SA13-E4-C-S49-00,3	BES05PA BES M05ED-PSC15B-BP00,3-GS49-119	BES056M BES 516-324-G-SA70-E4-C-02	BES02P1 BES 516-343-SA96-G-E5-C-S49	BES05P6 BES M08EG-PSC20B-S49G-539
Dimension	Ø 4 x 27 mm	Ø 5 x 27 mm	Ø 5 x 27 mm		Ø 5 x 27 mm	Ø 5 x 27 mm	Ø 8 x 30 mm	Ø 8 x 45 mm	Ø 8 x 50 mm
Style	D4.0	M5x0.5	M5x0.5		M5x0.5	M5x0.5	M8x1	M8x1	M8x1
Installation	for flush mounting	for flush mounting	for flush mounting		for flush mounting	for flush mounting	for flush mounting	for flush mounting	for flush mounting
Range	1.5 mm	1.5 mm	1.5 mm		1.5 mm	1.5 mm	2 mm	2 mm	2 mm
Switching output	PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)	NPN normally open (NO)	PNP normally open (NO)
Switching frequency	5000 Hz	5000 Hz	5000 Hz		5000 Hz	5000 Hz	1500 Hz	1500 Hz	5000 Hz
Housing material	Stainless steel	Stainless steel	Stainless steel		Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
Surface protection	2K coated	2K coated	2K coated		2K coated	2K coated	—	—	—
Material sensing surface	2K coated	2K coated	2K coated		2K coated	2K coated	PBT, 2K coated	ceramic coated	PBT, 2K coated
Connection	Cable, 2.00 m, TPE	Cable, 2.00 m, TPE	Cable with connector, M12x1 male, 3-pin, 0.3 m, TPE		Cable with connector, M8x1 male, 3-pin, 0.3 m, TPE	Cable with connector, M8x1 male, 3-pin, 0.3 m, TPE	Cable, 2.00 m, TPU	Connector, M8x1 male, 3-pin	Connector, M8x1 male, 3-pin
Operating voltage U_b	10...30 VDC	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	10...30 VDC	10...30 VDC
Ambient temperature	-25...70 °C	-25...70 °C	-25...70 °C		-25...70 °C	-25...70 °C	-25...70 °C	-25...70 °C	-40...85 °C
Protection degree	IP67	IP67	IP67		IP67	IP67	IP68	IP68	IP68
Approval/Conformity	cULus, CE, EAC, WEEE	cULus, CE, EAC, WEEE	cULus, CE, EAC, WEEE		cULus, CE, EAC, WEEE	cULus, CE, EAC, WEEE	EAC, cULus, CE, WEEE	CE, cULus, EAC, WEEE	cULus, CE, EAC, WEEE
Recommended prox mount							BAM0312	BAM0312	BAM0312



	BES02PN BES M08MH1-NSC20B-S04G-101	BES0558 BES M08EE-PSC25B-S49G-539	BES056P BES M08EB-PSC40F-S49G-539		BES056N BES M08EF-PSC40F-S49G-539	BES03UP BES 516-329-SA96-G-E5-C-S4	BES0588 BES Q08MEC-PSC20B-EZ02-519		
Dimension	Ø 8 x 65 mm	Ø 8 x 40 mm	Ø 8 x 30 mm		Ø 8 x 49.5 mm	Ø 12 x 45 mm	20 x 8 x 8 mm		
Style	M8x1	M8x1	M8x1		M8x1	M12x1	8x8		
Installation	for flush mounting	for flush mounting	non-flush		non-flush	for flush mounting	for flush mounting		
Range	2 mm	2.5 mm	4 mm		4 mm	4 mm	2 mm		
Switching output	NPN normally open (NO)	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	NPN normally open (NO)	PNP normally open (NO)		
Switching frequency	700 Hz	1000 Hz	1500 Hz		1500 Hz	2500 Hz	3000 Hz		
Housing material	Brass	Stainless steel	Stainless steel		Stainless steel	Brass	Brass		
Surface protection	nickel plated	—	—		—	Nickel-free 2K coated	Nickel-free 2K coated		
Material sensing surface	ceramic coated	PBT, 2K coated	PBT, 2K coated		PBT, 2K coated	ceramic coated	PBT, coated		
Connection	Connector, M12x1 male, 4-pin	Connector, M8x1 male, 3-pin	Connector, M8x1 male, 3-pin		Connector, M8x1 male, 3-pin	Connector, M12x1 male, 4-pin	Cable, 2.00 m, PUR		
Operating voltage U _b	12...30 VDC	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC		
Ambient temperature	-25...70 °C	0...60 °C	-25...70 °C		-25...70 °C	-25...70 °C	-25...70 °C		
Protection degree	IP67	IP67	IP68		IP68	IP68	IP67		
Approval/Conformity	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE		EAC, cULus, CE, WEEE	CE, cULus, EAC, WEEE	cULus, CE, EAC, WEEE		
Recommended prox mount	BAM0312	BAM0312	BAM0312		BAM0312	BAM0247			



	BES0587 BES Q08ZC-PSC30B-EZ02-519	BES05RY BES Q08MEC-PSC20B-EZ00,3-GS49-519	BES055A BES Q08ZC-PSC30B-EZ00,3-GS49-519		BES0584 BES R04MC-PSC20B-EZ02-519	BES049E BES R04MC-PSC20B-EP00,2-GS49-107	BES05P9 BES R04MC-PSC20B-EZ00,3-GS49-519	BES05MC BES R12EC-PSC20B-ES00,3-GS04-106	BES05P2 BES R12EC-PSC20B-ES00,3-GS04-118
Dimension	40 x 8 x 8 mm	20 x 8 x 8 mm	40 x 8 x 8 mm		16 x 8 x 4.7 mm	16 x 8 x 4.7 mm	16 x 8 x 4.7 mm	19 x 8 x 4.7 mm	19 x 8 x 4.7 mm
Style	8x8	8x8	8x8		Block style	Block style	Block style	Block style	Block style
Installation	for flush mounting	for flush mounting	for flush mounting		for flush mounting	for flush mounting	for flush mounting	for flush mounting	for flush mounting
Range	3 mm	2 mm	3 mm		2 mm	2 mm	2 mm	2 mm	2 mm
Switching output	PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)
Switching frequency	1000 Hz	3000 Hz	1000 Hz		5000 Hz	5000 Hz	5000 Hz	5000 Hz	5000 Hz
Housing material	Zinc, die-cast	Brass	Zinc, die-cast		Brass	Brass	Brass	Stainless steel	Stainless steel
Surface protection	2K coated	Nickel-free 2K coated	2K coated		2K coated	Nickel-free coated	2K coated	—	—
Material sensing surface	PBT, 2K coated	PBT, 2K coated	PBT, 2K coated		2K coated	Ceramic	2K coated	Ceramic	Ceramic
Connection	Cable, 2.0 m, 3 wire, TPE	Cable with connector, M8x1 male, 3-pin, 0.30 m, PUR	Cable with connector, M8x1 male, 3-pin, 0.30 m, TPE		Cable, 2.00 m, PUR	Cable with connector, M8x1 male, 3-pin, 0.20 m, silicone	Cable with connector, M8x1 male, 3-pin, 0.3 m, TPE	Cable with connector, M12x1 male, 3-pin, 0.30 m, silicone	Cable with LED connector, M12x1 male, 3-pin, 0.30 m, silicone
Operating voltage U_b	10...30 VDC	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	10...30 VDC	10...30 VDC
Ambient temperature	-25...70 °C	-25...70 °C	-25...70 °C		-25...70 °C	-25...70 °C	-25...70 °C	-25...70 °C	-25...70 °C
Protection degree	IP67	IP67	IP67		IP67	IP67	IP67	IP65	IP65
Approval/Conformity	EAC, cULus, CE, WEEE	cULus, CE, EAC, WEEE	EAC, cULus, CE, WEEE		CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	cULus, CE, EAC, WEEE	cULus, CE, EAC, WEEE

* Contains silicone



	BES05KY * BES R12EC-PSC20B-ES00,3-GS49-106	BES05M9 * BES R13EC-PSC20B-ES00,2-GS04-106	BES0484 BES R01ZC-PSC70B-BZ05-108		BES05EP * BES R01ZC-PSC70B-BS00,3-GS04-016	BES0585 * BES R01ZC-PSC70B-BS00,3-GS04-540	BES0492 BES R01ZC-PSC70B-BZ00,2-GS49-108		
Dimension	19 x 8 x 4.7 mm	28 x 8 x 5.5 mm	32 x 20 x 8 mm		32 x 20 x 8 mm	32 x 20 x 8 mm	32 x 20 x 8 mm		
Style	Block style	Block style	Block style		Block style	Block style	Block style		
Installation	for flush mounting	for flush mounting	for flush mounting		for flush mounting	for flush mounting	for flush mounting		
Range	2 mm	2 mm	7 mm		7 mm	7 mm	7 mm		
Switching output	PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)		
Switching frequency	5000 Hz	5000 Hz	150 Hz		150 Hz	150 Hz	150 Hz		
Housing material	Stainless steel	Stainless steel	Zinc, die-cast		Zinc, die-cast	Zinc, die-cast	Zinc, die-cast		
Surface protection	—	—	—		—	—	—		
Material sensing surface	Ceramic	Ceramic	Ceramic coated		Fortron 6165 A6	Ceramic	Ceramic coated		
Connection	Cable with connector, M8x1 male, 3-pin, 0.30 m, silicone	Cable with connector, M12x1 male, 3-pin, 0.20 m, silicone	Cable, 5.00 m, TPU 3-wire		Cable with connector, M12x1 male, 3-pin, 0.30 m, silicone	Cable with connector, M12x1 male, 3-pin, 0.30 m, silicone	Cable with connector, M8x1 male, 3-pin, 0.20 m, TPU		
Operating voltage U _b	10...30 VDC	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC		
Ambient temperature	-25...70 °C	-25...70 °C	-25...70 °C		-25...70 °C	-25...70 °C	-25...70 °C		
Protection degree	IP65	IP65	IP67		IP67	IP67	IP67		
Approval/Conformity	cULus, CE, EAC, WEEE	cULus, CE, EAC, WEEE	CE, cULus, EAC, WEEE		CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE		

* Contains silicone



	BES05FN BES M08EM-PSD20B-ET05-T	BES05N7 BES Q08EC-PSD20B-ES05		BES05N8 BES Q12EC-PSD40B-ES05	BES05N9 BES Q40KG-PSD25F-S04G
Dimension	Ø 8 x 60 mm	8 x 8 x 55 mm		12 x 12 x 59 mm	40 x 40 x 70.7 mm
Style	M8x1	8x8		12x12	40x40
Installation	for flush mounting	for flush mounting		for flush mounting	non-flush
Range	2 mm	2 mm		4 mm	25 mm
Switching output	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	PNP normally open (NO)
Switching frequency	600 Hz	500 Hz		500 Hz	100 Hz
Housing material	Stainless steel	Stainless steel		Stainless steel	Stainless steel (1.4305) LCP
Surface protection	—	—		—	—
Material sensing surface	LCP	LCP		LCP	LCP
Connection	Cable, 5.0 m, 3 wire, PTFE	Cable, 5.0 m, 3 wire, silicone		Cable, 5.0 m, 3 wire, silicone	Connector, M12x1 male, 4-pin
Operating voltage U_b	10...30 VDC	10...30 VDC		10...30 VDC	10...35 VDC
Ambient temperature	0...140 °C	-25...140 °C		-25...130 °C	0...150 °C
Protection degree	IP50	IP65		IP65	IP67
Approval/Conformity	CE, EAC, WEEE	CE, EAC, WEEE		CE, EAC, WEEE	CE, EAC, WEEE

	BCC0K7T BCC M415-0000-1A-001-0H0334-050
Connection	M12x1-Female, Straight, 5-pin, A-coded
Cable	TPE-O electron beam cross-linked black, 5.00 m, higher ambient temperature
Number of conductors	3
Cable temperature, fixed routing	-55...155 °C
Cable temperature, flexible routing	-40...155 °C
Operating voltage U_b	250 VDC / 250 VAC
IP rating	IP68
Approval/Conformity	EAC, WEEE



PNP, NO	SET0167 BAV BP-PH-00100-01	SET0168 BAV BP-PH-00100-02	SET015A BAV BP-PH-00093-01	SET015F BAV BP-PH-00093-02		SET0169 BAV BP-PH-00101-01	SET016A BAV BP-PH-00101-02	SET016C BAV BP-PH-00102-01	SET016E BAV BP-PH-00102-02
NPN, NO	SET017U BAV BP-PH-00100-11	SET017W BAV BP-PH-00100-12	SET017R BAV BP-PH-00093-11	SET017T BAV BP-PH-00093-12		SET017Y BAV BP-PH-00101-11	SET017Z BAV BP-PH-00101-12	SET0180 BAV BP-PH-00102-11	SET0181 BAV BP-PH-00102-12
Short description	Plunger probe with chisel tip	Plunger probe with chisel tip	Plunger probe with round tip	Plunger probe with round tip		Plunger probe with flat tip	Plunger probe with flat tip	Plunger probe with internal threads	Plunger probe with internal threads
Use	for positive stop plunger probe	for positive stop plunger probe	for positive stop plunger probe	for positive stop plunger probe		for positive stop plunger probe	for positive stop plunger probe	for positive stop plunger probe	for positive stop plunger probe
Material	Brass chrome plated Steel Bronze Stainless steel, chrome plated	Brass chrome plated Steel Bronze Stainless steel, chrome plated	Brass chrome plated Steel Bronze Stainless steel, chrome plated	Brass chrome plated Steel Bronze Stainless steel, chrome plated		Brass chrome plated Steel Bronze Stainless steel, chrome plated	Brass chrome plated Steel Bronze Stainless steel, chrome plated	Brass chrome plated Steel Bronze Stainless steel, chrome plated	Brass chrome plated Steel Bronze Stainless steel, chrome plated
Dimension	Ø 18 x 120.5 mm	Ø 18 x 125.6 mm	Ø 18 x 120.5 mm	Ø 18 x 125.6 mm		Ø 18 x 120.5 mm	Ø 18 x 125.6 mm	Ø 18 x 120.5 mm	Ø 18 x 125.6 mm
Mounting	Screws M18	Screws M18	Screws M18	Screws M18		Screws M18	Screws M18	Screws M18	Screws M18
Connection	Connector, M8x1 connector, 3-pin	Cable with connector, M12x1-Male, 4-pin, 0.20 m, PUR	Connector, M8x1 connector, 3-pin	Cable with connector, M12x1-Male, 4-pin, 0.20 m, PUR		Connector, M8x1 connector, 3-pin	Cable with connector, M12x1-Male, 4-pin, 0.20 m, PUR	Connector, M8x1 connector, 3-pin	Cable with connector, M12x1-Male, 4-pin, 0.20 m, PUR
Ambient temperature	0...60 °C	0...60 °C	0...60 °C	0...60 °C		0...60 °C	0...60 °C	0...60 °C	0...60 °C



	BAM02WR BAM SE-AM-009-M18/D09,5	BAM02JU BAM TG-AM-015-003		BAM027T BAM TG-AM-015-002	BAM02JW BAM TG-AM-015-004	BAM02JY BAM TG-AM-015-005	
Short description	Plunger wiper brush	M4 nut detection tip		M6 nut detection tip	M8 nut detection tip	M10 nut detection tip	
Use	for positive stop plunger probe	for plunger probe with internal threads		for plunger probe with internal threads	for plunger probe with internal threads	for plunger probe with internal threads	
Material	Steel (1.7225)	Stainless steel (1.7225) zinc coated, bright		Stainless steel (1.7225) zinc coated, bright	Stainless steel (1.7225) zinc coated, bright	Stainless steel (1.7225) zinc coated, bright	
Dimension	Ø 31.75 x 17.5 mm	Ø 9.5 x 29 mm		Ø 9.5 x 29 mm	Ø 9.5 x 29 mm	Ø 9.5 x 29 mm	
Mounting	M18x1	M6x1		M6x1	M6x1	M6x1	
Ambient temperature	—	0...60 °C		0...60 °C	0...60 °C	0...60 °C	

Generous detection range for high reliability

PHOTOELECTRIC SENSORS

Photoelectric sensors from Balluff reliably recognize the presence of objects. They check shape, color, distance or thickness equally reliably. This is because they have a significantly greater detection range compared to inductive or capacitive technology.

In the area of photoelectric sensors we offer a huge product variety, including all light types from red light to infrared to laser technology, sensors with and without background suppression, as well as many different form factors. For specialty applications, mini-sensors, color sensors, light band and contrast sensors round out our portfolio. With Balluff you achieve not only the highest reliability, but also the greatest flexibility.

Contents

- 96 Photoelectric distance sensors
- 98 Diffuse sensors with background suppression
- 100 Diffuse sensors





	BOD002L BOD 21M-LB105-S4	BOD0020 BOD 23K-LI01-S4				
Series	21M	23K				
Dimension	15 x 51 x 42.5 mm	51 x 23 x 52.4 mm				
Interface	IO-Link 1.1 Analog, current 4...20 mA linear rising/falling 2x PNP/NPN NO/NC	IO-Link 1.1 PNP/NPN/Auto-Detect NO/NC				
Principle of operation	Photoelectric distance sensor	Photoelectric distance sensor				
Principle of optical operation	Triangulation	Light time-of-flight				
Beam characteristic	Focus, typical at 400 mm	Collimated				
Light type	Laser red light	Laser red light				
Light spot size	1.5 x 0.5 mm at 200 mm	5.5 x 7 mm at 5 m				
Range	30...200 mm, adjustable	100...5000 mm				
Accuracy	±1 mm max. (30...170 mm) ±3 mm max. (170...200 mm)	±0.6 %FS				
Repeat accuracy	≤ ± 0.25 mm	0.024 %FS				
Resolution	≤ 10 μm typ. (30...170 mm) 100 μm typ. (170...200 mm)	≤ 5 mm				
Connection	Connector, M12x1 Male, 4-pin	Connector, M12x1 Male, 4-pin				
Housing material	Zinc, die-cast Aluminum, glass, PMMA, black	ABS				
Operating voltage U _b	15...30 VDC	18...30 VDC				
Approval/Conformity	CE, cULus, EAC, IO-Link, WEEE	CE, cULus, EAC, Ecolab, WEEE				



	BOS01J3 BOS 18M-NA-RH23-S4	BOS01J4 BOS 18M-PA-RH23-S4	BOS0201 BOS 21M-NA-LH23-S4		BOS0179 BOS 21M-PA-LH23-S4	BOS01UW BOS 23K-UU-LH11-S92	BOS0179 BOS 23K-NU-RH10-S4	BOS01FL BOS 23K-PA-RH10-S4	
Series	18M	18M	21M		21M	23K	23K	23K	
Dimension	Ø 18 x 75 mm	Ø 18 x 75 mm	15 x 51 x 42.5 mm		15 x 51 x 42.5 mm	23 x 51 x 52.4 mm	23 x 51 x 52.4 mm	23 x 51 x 52.4 mm	
Interface	NPN NO NPN NC	PNP NO PNP NC	NPN NO NPN NC		PNP NO PNP NC	2x PNP/NPN/Auto-Detect NO/NC	NPN normally open/nor- mally closed (NO/NC)	PNP NO PNP NC	
Principle of operation	Photoelectric sensor	Photoelectric sensor	Photoelectric sensor		Photoelectric sensor	Photoelectric sensor	Photoelectric sensor	Photoelectric sensor	
Principle of optical operation	Diffuse sensor, triangu- lation	Diffuse sensor, triangu- lation	Diffuse sensor, triangu- lation		Diffuse sensor, triangu- lation	Light time-of-flight	Diffuse sensor, triangu- lation	Diffuse sensor, triangu- lation	
Special optical feature	Background suppression	Background suppression	Background suppression		Background suppression	Background suppression	Background suppression	Background suppression	
Beam characteristic	Divergent	Divergent	Focus, typical at 400 mm		Focus, typical at 400 mm	Divergent	Focus, typical at 500 mm	Focus, typical at 500 mm	
Light type	LED, red light	LED, red light	Laser red light		Laser red light	Laser red light	LED, red light	LED, red light	
Light spot size	10 x 10 mm at 150 mm	10 x 10 mm at 150 mm	Ø 3 mm at 200 mm		Ø 3 mm at 200 mm	Ø 7 mm at 5 m	15 x 15 mm at focal point	15 x 15 mm at focal point	
Range	30...150 mm	30...150 mm	1...250 mm		1...250 mm	0...5 m	3...800 mm	3...800 mm	
Connection	Connector, M12x1-Male, 4-pin	Connector, M12x1-Male, 4-pin	Connector, M12x1-Male, 4-pin		Connector, M12x1-Male, 4-pin	Connector, M12x1-Male, 5-pin	Connector, M12x1-Male, 4-pin	Connector, M12x1-Male, 4-pin	
Housing material	Brass	Brass	Zinc, die-cast aluminum		Zinc, die-cast aluminum	PC ABS	PC ABS	PC ABS	
Material sensing surface	Glass	Glass	Glass		Glass	PMMA	PMMA	PMMA	
Operating voltage U _b	10...30 VDC	10...30 VDC	10...30 VDC		10...30 VDC	18...30 VDC	10...30 VDC	10...30 VDC	
Approval/Conformity	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	CE, cULus, CDRH, EAC, WEEE		CE, cULus, CDRH, EAC, WEEE	CE, Ecolab, cULus, EAC, WEEE	Ecolab, CE, cULus, EAC, WEEE	CE, Ecolab, cULus, EAC, WEEE	



	BOS01E6 BOS 18M-NA-RD20-S4	BOS01CF BOS 18M-PA-RD20-S4		BOS002W BOS 21M-NA-RD10-S4	BOS0033 BOS 21M-PA-RD10-S4	BOS01FM BOS 23K-PA-RD10-S4	
Series	18M	18M		21M	21M	23K	
Dimension	Ø 18 x 75 mm	Ø 18 x 75 mm		15 x 50 x 42.5 mm	15 x 50 x 42.5 mm	23 x 51 x 52.4 mm	
Interface	NPN NO NPN NC	PNP NO PNP NC		NPN NO NPN NC	PNP NO PNP NC	PNP NO PNP NC	
Principle of operation	Photoelectric sensor	Photoelectric sensor		Photoelectric sensor	Photoelectric sensor	Photoelectric sensor	
Principle of optical operation	Diffuse sensor, energetic	Diffuse sensor, energetic		Diffuse sensor, energetic	Diffuse sensor, energetic	Diffuse sensor, energetic	
Beam characteristic	Divergent	Divergent		Divergent	Divergent	Focus, typical at 500 mm	
Light type	LED, red light	LED, red light		LED, red light	LED, red light	LED, red light	
Light spot size	Ø 50 mm at 600 mm	Ø 50 mm at 600 mm		—	—	15 x 15 mm at focal point	
Range	0...600 mm	0...600 mm		10...1000 mm	10...1000 mm	0...2000 mm	
Connection	Connector, M12x1-Male, 4-pin	Connector, M12x1-Male, 4-pin		Connector, M12x1-Male, 4-pin	Connector, M12x1-Male, 4-pin	Connector, M12x1-Male, 4-pin	
Housing material	Brass	Brass		Zinc, die-cast aluminum	Zinc, die-cast aluminum	PC ABS	
Material sensing surface	Glass, anti-glare	Glass, anti-glare		PMMA	PMMA	PMMA	
Operating voltage U _b	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	
Approval/Conformity	CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE		CE, cULus, EAC, WEEE	CE, cULus, EAC, WEEE	Ecolab, CE, cULus, EAC, WEEE	



Sure position detection even at high speeds

MAGNETIC FIELD SENSORS

Our magnetic field sensors are used chiefly on cylinders and grippers for monitoring the piston position. The sensors recognize the field of the magnet integrated into the piston through the actuator wall, even at high travel speeds.

With their non-contact position detection the magnetic field sensors from Balluff work absolutely reliably and wear-free —no contact burn or bouncing, just clean switching points.

Contents

- 104 Magnetic field sensors for C-slot
- 106 Magnetic field sensors for T-slot



	BMF00M4 BMF 214K-PS-C-2A-SA93-S49-00,3	BMF00MF BMF 243K-PS-C-2A-SA1-S49-00,3		BMF00H6 BMF 243K-PS-C-2A-SA93-S4-00,3	BMF00H7 BMF 243K-PS-C-2A-SA93-S49-00,3	BMF00L0 BMF 243K-PS-C-2A-SA93-S49-00,5	
Dimension	16.8 x 2.9 x 4.5 mm	24 x 3 x 3.75 mm		24 x 3 x 3.75 mm	24 x 3 x 3.75 mm	24 x 3 x 3.75 mm	
Connection	M8x1-Male, 3-pin	M8x1-Male, 3-pin		M12x1-Male, 4-pin, A-coded	M8x1 Male, 3-pin	M8x1 Male, 3-pin	
Cable	PUR with silicone tube, 0.30 m	PUR, 0.30 m		PUR with silicone tube, 0.30 m	PUR with silicone tube, 0.30 m	PUR with silicone tube, 0.50 m	
Application	Optimized response path especially suited for short-stroke cylinders.	Pneumatic cylinder with C-slot, e.g. SMC, Festo*, Schunk, Sommer, Gimatic (*not suitable for Festo Series ADVC and AEVC)		Pneumatic cylinder with C-slot, e.g. SMC, Festo*, Schunk, Sommer, Gimatic (*not suitable for Festo Series ADVC and AEVC)	Pneumatic cylinder with C-slot, e.g. SMC, Festo*, Schunk, Sommer, Gimatic (*not suitable for Festo Series ADVC and AEVC)	Pneumatic cylinder with C-slot, e.g. SMC, Festo*, Schunk, Sommer, Gimatic (*not suitable for Festo Series ADVC and AEVC)	
Mounting	—	can be installed in C-slot from above		can be installed in C-slot from above	can be installed in C-slot from above	can be installed in C-slot from above	
Housing material	PA 12	PA 12		PA 12	PA 12	PA 12	
Switching output	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)	
Switching frequency	7000 Hz	3000 Hz		3000 Hz	3000 Hz	3000 Hz	
Operating voltage U_b	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	
Ambient temperature	-25...85 °C	-25...85 °C		-25...85 °C	-25...85 °C	-25...85 °C	
Protection degree	IP67	IP67		IP67	IP67	IP67	
Approval/Conformity	CE, cULus, WEEE	cULus, CE, WEEE		cULus, CE, WEEE	CE, cULus, WEEE	cULus, CE, WEEE	



	BMF00.JC BMF 235K-PS-C-2A-SA5-S49-00,3	BMF00H5 BMF 235K-PS-C-2A-SA93-S4-00,3		BMF00H3 BMF 235K-PS-C-2A-SA93-S49-00,3	BMF00KF BMF 235K-PS-C-2A-SA5-S49-00,5	BMF00.J6 BMF 235K-PS-C-2A-SA5-02	
Dimension	23.5 x 5 x 5.5 mm	23.5 x 5 x 5.5 mm		23.5 x 5 x 5.5 mm	23.5 x 5 x 5.5 mm	23.5 x 5 x 5.5 mm	
Connection	M8x1-Male, 3-pin	M12x1-Male, 4-pin, A-coded		M8x1-Male, 3-pin	M8x1 connector, 3-pin	3-wire	
Cable	TPE, welding spark resistant, 0.30 m	PUR with silicone tube, 0.30 m		PUR with silicone tube, 0.30 m	TPE, welding spark resistant, 0.50 m	TPE welding spark resistant, 2.00 m	
Application	Pneumatic cylinder with T-slot. For dimensions, see sketch in product view.	Pneumatic cylinder with T-slot. For dimensions, see sketch in product view.		Pneumatic cylinder with T-slot. For dimensions, see sketch in product view.	Pneumatic cylinder with T-slot. For dimensions, see sketch in product view.	Pneumatic cylinder with T-slot. For dimensions, see sketch in product view.	
Mounting	can be installed in T-slot from above	can be installed in T-slot from above		can be installed in T-slot from above	can be installed in T-slot from above	can be installed in T-slot from above	
Housing material	PA 12	PA 12		PA 12	PA 12	PA 12	
Switching output	PNP normally open (NO)	PNP normally open (NO)		PNP normally open (NO)	PNP normally open (NO)	PNP normally open (NO)	
Switching frequency	3000 Hz	3000 Hz		3000 Hz	3000 Hz	3000 Hz	
Operating voltage U_b	10...30 VDC	10...30 VDC		10...30 VDC	10...30 VDC	10...30 VDC	
Ambient temperature	-25...85 °C	-25...85 °C		-25...85 °C	-25...85 °C	-25...85 °C	
Protection degree	IP67	IP67		IP67	IP67	IP67	
Approval/Conformity	CE, cULus, WEEE	cULus, CE, WEEE		cULus, CE, WEEE	cULus, CE, WEEE	CE, cULus, WEEE	



Image processing devices for reliable detection and recording

MACHINE VISION AND OPTICAL IDENTIFICATION.

 *innovating automation*

The demands on modern production equipment are high: they must be extremely productive and flexible while achieving maximum quality. Our Balluff vision solutions are designed precisely to meet these requirements. They reliably detect error, check quality, and are suitable for reliable reading and verification of codes. They scan objects, 1D and 2D barcodes, and plain text.

The sensors are extremely flexible – for parts checking in assembly or parts tracking in production. Their standardized interface means the devices are simple to integrate and easy to use.

Contents

110 SmartCamera for machine vision



	BVS002F BVS SC-C1280Z00-30-000	BVS002C BVS SC-M1280Z00-07-000	BVS002A BVS SC-M1280Z00-30-000	BVS0033 BVS SC-M1280Z00-30-020
Application	Object inspection, Analyze color, Range, Object detection, Positioning, Barcode-, 2D-, OCR identification	Object inspection, Range, Object detection, Positioning, Barcode-, 2D-, OCR identification	Object inspection, Range, Object detection, Positioning, Barcode-, 2D-, OCR identification	Object inspection, Range, Object detection, Positioning, Barcode-, 2D-, OCR identification, HDevelop script import
Image resolution	1280 x 1024 pixels	1280 x 1024 pixels	1280 x 1024 pixels	1280 x 1024 pixels
Sensor type Vision	CMOS 1/1,8" color global shutter	CMOS 1/1.8" monochrome global shutter	CMOS 1/1.8" monochrome global shutter	CMOS 1/1.8" monochrome global shutter
Housing material	Aluminum	Aluminum	Aluminum	Aluminum
Dimension	62 x 55 x 110 mm	62 x 55 x 110 mm	62 x 55 x 110 mm	62 x 55 x 110 mm
Switching output	2x IO configurable	8x IO configurable	2x IO configurable	2x IO configurable
Interface	LAN (Gigabit Ethernet), Profinet / EtherNet/IP, IO-Link	LAN (Gigabit Ethernet)	LAN (Gigabit Ethernet), Profinet / EtherNet/IP, IO-Link	LAN (Gigabit Ethernet), Profinet / EtherNet/IP, IO-Link
Operating voltage Ub	19.2...28.8 VDC	19.2...28.8 VDC	19.2...28.8 VDC	19.2...28.8 VDC
Ambient temperature	0...55 °C	0...55 °C	0...55 °C	0...55 °C
Approval/Conformity	CE, cULus, WEEE	CE, cULus, WEEE	CE, cULus, WEEE	CE, cULus, WEEE
Protection degree	IP67 with protection tube	IP67 with protection tube	IP67 with protection tube	IP67 with protection tube



Safety with Balluff quality

SAFETY

 *innovating automation*

Automation requires safety. And safety is based on reliability. The Balluff safety concept consists of products and solutions that fulfill their tasks over the course of years with the same reliability and precision. With Safety over IO-Link from Balluff you enjoy the proven benefits of IO-Link now for the safety of people and equipment as well. By linking automation technology and safety technology, you get full machine security in one system, because IO-Link communicates down to the last meter and provides both sensor/actuator details as well as safety information.

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114	Safety command devices
116	Inductive safety sensors
120	Electromechanical guard locking devices
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128	IO-Link blocks for safety applications



	BAM02HA BAM ES-XA-01D-01-R01-201-S92
B10d (EN ISO 13849-1)	0.1 million Switching operations
Approval/Conformity	UL CERTIFIED, CE, TÜV, WEEE
Operating principle	Mechanical
No of contacts	2x positive opening
Utilization category	AC-15, DC -13
Type of release	Turning
Life expectancy mechanical	0.06 million Switching operations
Connection	M12x1-Male, 5-pin, A-coded
Dimension	80 x 106 x 72 mm
Ambient temperature	-25...70 °C
Protection degree	IP65
Housing material	Plastic



	BES0577 BES M30EP-PFC12F-S04G-D12		BES057A BES Q40ZU-PFC15B-S04G-D12	BES057C BES Q40ZU-PFC20F-S04G-D12	BES0574 BES M12EN-PFC40F-S04G-D11
Performance Level	e		e	e	d
Safety category (EN ISO 13849-1)	3		3	3	2
SIL (IEC 61508)	3		3	3	2
SIL CL (EN 62061)	3		3	3	2
Response time max.	200 ms		200 ms	200 ms	1 ms
Approval/Conformity	CE, TÜV, cULus, WEEE		CE, TÜV, cULus, WEEE	CE, TÜV, cULus, WEEE	CE, TÜV, cULus, WEEE
Operating principle	non-contact (inductive)		non-contact (inductive)	non-contact (inductive)	non-contact (inductive)
Approach direction	any to sensing surface		any to sensing surface	any to sensing surface	any to sensing surface
Assured operating distance Sao	12 mm		15 mm	20 mm	4 mm
Assured switch off distance Sar	30 mm		30 mm	45 mm	6 mm
Connection	M12x1-Male, 4-pin, A-coded		M12x1-Male, 4-pin, A-coded	M12x1-Male, 4-pin, A-coded	M12x1-Male, 4-pin, A-coded
Switching output	2x PNP OSSD		2x PNP OSSD	2x PNP OSSD	PNP OSSD, PNP normally closed (NC)
Installation	non-flush		Flush on one side	non-flush	non-flush
Dimension	Ø 30 x 80 mm		40 x 66 mm	40 x 66 mm	Ø 12 x 70 mm
Ambient temperature	-25...70 °C, for service life ≤ 10 years 10...40 °C, for service life ≤ 20 years		-25...70 °C, for service life ≤ 10 years 10...40 °C, for service life ≤ 20 years	-25...60 °C, for service life ≤ 10 years 10...40 °C, for service life ≤ 20 years	-25...70 °C, for service life ≤ 10 years 10...40 °C, for service life ≤ 20 years
Protection degree	IP68, IP69K		IP67	IP67	IP67
Housing material	Stainless steel (1.4404)		Die-cast zinc	Die-cast zinc	Stainless steel (1.4404)



	BES0575 BES M18EN-PFC80F-S04G-D11		BES0576 BES M18MN-PFC50B-S04G-D11		BES0578 BES M30EN-PFC15F-S04G-D11		BES0579 BES M30MN-PFC10B-S04G-D11
Performance Level	d		d		d		d
Safety category (EN ISO 13849-1)	2		2		2		2
SIL (IEC 61508)	2		2		2		2
SIL CL (EN 62061)	2		2		2		2
Response time max.	1 ms		1 ms		1 ms		1 ms
Approval/Conformity	CE, TÜV, cULus, WEEE		CE, TÜV, cULus, WEEE		CE, TÜV, cULus, WEEE		CE, TÜV, cULus, WEEE
Operating principle	non-contact (inductive)		non-contact (inductive)		non-contact (inductive)		non-contact (inductive)
Approach direction	any to sensing surface		any to sensing surface		any to sensing surface		any to sensing surface
Assured operating distance Sao	8 mm		5 mm		15 mm		10 mm
Assured switch off distance Sar	12 mm		7 mm		22 mm		15 mm
Connection	M12x1-Male, 4-pin, A-coded		M12x1-Male, 4-pin, A-coded		M12x1-Male, 4-pin, A-coded		M12x1-Male, 4-pin, A-coded
Switching output	PNP OSSD, PNP normally closed (NC)		PNP OSSD, PNP normally closed (NC)		PNP OSSD, PNP normally closed (NC)		PNP OSSD, PNP normally closed (NC)
Installation	non-flush		for flush mounting		non-flush		for flush mounting
Dimension	Ø 18 x 70.5 mm		Ø 18 x 70.5 mm		Ø 30 x 70 mm		Ø 30 x 70 mm
Ambient temperature	-25...70 °C, for service life ≤ 10 years 10...40 °C, for service life ≤ 20 years		-25...70 °C, for service life ≤ 10 years 10...40 °C, for service life ≤ 20 years		-25...70 °C, for service life ≤ 10 years 10...40 °C, for service life ≤ 20 years		-25...70 °C, for service life ≤ 10 years 10...40 °C, for service life ≤ 20 years
Protection degree	IP67		IP67		IP67		IP67
Housing material	Stainless steel (1.4571)		Brass		Stainless steel (1.4571)		Brass



	BID0004 BID F101-2M1M3-M02AZ0-S115		BID0002 BID F101-2M1M3R-M02AZ0-S115	BID0003 BID F101-2M1E3-M02AZ0-S115	BID0001 BID F101-2M1E3R-M02AZ0-S115
B10d (EN ISO 13849-1)	5 million Switching operations		5 million Switching operations	5 million Switching operations	5 million Switching operations
Coding level (EN ISO 14119)	low		low	low	low
Approval/Conformity	CE, TÜV NRTL, TÜV, RoHS, WEEE		CE, TÜV NRTL, TÜV, RoHS, WEEE	CE, TÜV NRTL, TÜV, RoHS, WEEE	TÜV NRTL, TÜV, CE, RoHS, WEEE
Operating principle	mechanical - force, contact		mechanical - force, contact	mechanical - force, contact	mechanical - force, contact
No of contacts	2x positive opening		2x positive opening	2x positive opening	2x positive opening
Utilization category	AC-15, DC -13		AC-15, DC -13	AC-15, DC -13	AC-15, DC -13
Approach direction	laterally + above		laterally + above	laterally + above	laterally + above
Guard locking, principle	yes, spring force (power to unlock)		yes, spring force (power to unlock)	yes, magnetic force (power to lock)	yes, magnetic force (power to lock)
Holding force FZH	2500 N		2500 N	2500 N	2500 N
Axillary release	key		key	no	no
Escape release	no		yes	no	yes
Life expectancy mechanical	1 mil. switching operations		1 mil. switching operations	1 mil. switching operations	1 mil. switching operations
Connection	Connector, M12x1 Male, 8-pin		Connector, M12x1 Male, 8-pin	Connector, M12x1 Male, 8-pin	Connector, M12x1 Male, 8-pin
Dimension	40 x 197.7 x 47.5 mm		40 x 247.7 x 61.3 mm	40 x 197.7 x 44 mm	40 x 247.7 x 61.3 mm
Ambient temperature	0...40 °C		0...40 °C	0...40 °C	0...40 °C
Protection degree	IP65		IP65	IP65	IP65
Housing material	Aluminum		Aluminum	Aluminum	Aluminum



	BID0005 BID F101-2M100-M20ZZ0-S92
B10d (EN ISO 13849-1)	5 million Switching operations
Coding level (EN ISO 14119)	low
Approval/Conformity	TÜV NRTL, CE, RoHS, TÜV, WEEE
Operating principle	mechanical - force, contact
No of contacts	2x positive opening
Utilization category	AC-15, DC -13
Approach direction	laterally + above
Life expectancy mechanical	1 million Switching operations
Connection	M12x1-Male, 5-pin, A-coded
Dimension	40 x 147.7 x 43.5 mm
Ambient temperature	0...40 °C
Protection degree	IP65
Housing material	Aluminum



	BAM0270 BAM TG-ID-016-A01	BAM0271 BAM TG-ID-016-H01		BAM0272 BAM TG-ID-016-H02			
Principle of operation	Actuator	Actuator		Actuator			
Version	Actuator	Actuator with parallel handle		Actuator with perpendicular handle			
Use	for safety switch BID	for safety switch BID		for safety switch BID			
Material	Stainless steel	Aluminum, Stainless steel		Aluminum, Stainless steel			
Dimension	17 x 32 x 48 mm	145 x 72 x 113 mm		145 x 72 x 113 mm			
Mounting	Screw M5	Screw M5		Screw M5			
Ambient temperature	—	—		—			



	BNI0098 BNI IOF-329-P02-Z038
Principle of operation	IO-Link master
Dimension	68 x 32.4 x 181.5 mm
Housing material	Die-cast zinc
Connection ports	2x M12x1-Female, 8-pole, A-coded 6x M12x1-Female, 5-pole, A-coded
Number of safe inputs	12
Number of safe outputs	2
Digital inputs	12x PNP, Type 3
Digital outputs	—
Operating voltage U_b	18...30.2 VDC
Current sum US, sensor	4.8 A
Current sum UA, actuator	8 A
Output current max. US, sensor	—
Output current max. UA, actuator	—
Interface	PROFIsafe over IO-Link
Ambient temperature	-5...55 °C
Protection degree	IP67
Performance Level	e
Safety category (EN ISO 13849-1)	4
SIL (IEC 61508)	3
SIL CL (EN 62061)	3
Response time max.	20 ms
Approval/Conformity	CE, TÜV, cULus, WEEE



	BNIOCL BNI IOL-355-S02-Z013
Principle of operation	IO-Link master
Dimension	68 x 32.4 x 181.5 mm
Housing material	Die-cast zinc
Connection ports	8x M12x1-Female, 5-pin, A-coded
Digital inputs	8x PNP, Type 3
Digital outputs	8x PNP
Operating voltage U_b	18...30.2 VDC
Output current max.	2 A
Current sum I_A , actuator	9 A
Auxiliary interfaces	Galvanically Isolated Outputs
Interface	IO-Link 1.1
Ambient temperature	-5...55 °C
Protection degree	IP67
Performance Level	d
Safety category (EN ISO 13849-1)	3
SIL (IEC 61508)	2
SIL CL (EN 62061)	2
Response time max.	1 ms
Approval/Conformity	CE, TÜV, IO-Link, cULus, WEEE

Reliable information exchange across all levels

INDUSTRIAL NETWORKING

 *innovating automation*

The demands on industrial networking continually increase: The rising quantities of data and ever more complex communication require high-performance components that can reliably transport the information across all levels. This is especially true if high protection ratings, robustness, use at high temperatures, or special interfaces and connections for maximum security are needed.

With an intelligent combination of high-performance industrial networking technology and the IO-Link communication standard, Balluff makes flexible and smooth communication possible in the greatest variety of applications.

Contents

- 132 IO-Link masters for Ethernet/IP
- 136 IO-Link sensor/actuator hubs
- 138 Inductive couplers for IO-Link signal transmission
- 140 Inductive couplers for power supply



	BNI008M BNI EIP-508-105-R015	BNI008Z BNI EIP-502-105-R015		BNI00CE BNI EIP-508-105-R015-007	BNI00CY BNI EIP-538-105-R015		
Principle of operation	Active splitter	Active splitter		Active splitter	Active splitter		
Interface	Ethernet/IP	Ethernet/IP		Ethernet/IP	Ethernet/IP		
Operating voltage U _b	18...30.2 VDC	18...30.2 VDC		18...30.2 VDC	18...30.2 VDC		
Connection (COM 1)	M12x1-Female, 4-pole, D-coded	M12x1-Female, 4-pole, D-coded		M12x1-Female, 4-pole, D-coded	M12x1-Female, 4-pole, D-coded		
Connection (COM 2)	M12x1-Female, 4-pole, D-coded	M12x1-Female, 4-pole, D-coded		M12x1-Female, 4-pole, D-coded	M12x1-Female, 4-pole, D-coded		
Connection (supply voltage IN)	7/8"-Male, 4-pole	7/8"-Male, 4-pole		7/8"-Male, 4-pole	7/8"-Male, 4-pole		
Connection (supply voltage OUT)	7/8"-Female, 4-pole	7/8"-Female, 4-pole		7/8"-Female, 4-pole	7/8"-Female, 4-pole		
Connection ports	8x M12x1-Female, 5-pole, A-coded	8x M12x1-Female, 5-pole, A-coded		8x M12x1-Female, 5-pole, A-coded	8x M12x1-Female, 5-pole, A-coded		
Digital inputs	16x PNP, Type 3	16x PNP, Type 3		16x PNP, Type 2	12x PNP, Type 3		
Digital outputs	16x PNP	16x PNP		—	8x PNP, Type 3		
Configurable inputs/outputs	yes	yes		yes	—		
Output current max.	2 A	2 A		—	—		
Current sum US, sensor	9.0 A	9.0 A		9.0 A	9.0 A		
Current sum UA, actuator	9.0 A	9.0 A		—	—		
Housing material	PPS	PPS		PPS	PPS		
Dimension	68 x 42.9 x 226 mm	68 x 42.9 x 226 mm		68 x 42.9 x 226 mm	68 x 42.9 x 226 mm		
Ambient temperature	-5...70 °C	-5...70 °C		-5...50 °C	-5...50 °C		
Protection degree	IP67	IP67		IP67	IP67		
Auxiliary interfaces	8x IO-Link	4x IO-Link		8x IO-Link	8x IO-Link		
IO-Link version	1.1	1.1		—	1.1		
Port-class	Type A	Type A		—	Type A / Type B		



	BNI008Y BNI EIP-104-105-R015	BNI00AN BNI EIP-302-104-R015		BNI008P BNI EIP-302-105-R015			
Principle of operation	Active splitter	Active splitter		Active splitter			
Interface	Ethernet/IP	Ethernet/IP		Ethernet/IP			
Operating voltage U _b	18...30.2 VDC	18...30.2 VDC		18...30.2 VDC			
Connection (COM 1)	M12x1-Female, 4-pole, D-coded	M12x1-Female, 4-pole, D-coded		M12x1-Female, 4-pole, D-coded			
Connection (COM 2)	M12x1-Female, 4-pole, D-coded	M12x1-Female, 4-pole, D-coded		M12x1-Female, 4-pole, D-coded			
Connection (supply voltage IN)	7/8"-Male, 4-pole	7/8"-Male, 4-pole		7/8"-Male, 4-pole			
Connection (supply voltage OUT)	7/8"-Female, 4-pole	7/8"-Female, 4-pole		7/8"-Female, 4-pole			
Connection ports	8x M12x1-Female, 5-pole, A-coded	8x M12x1-Female, 5-pole, A-coded		8x M12x1-Female, 5-pole, A-coded			
Digital inputs	16x PNP, Type 3	16x PNP, Type 3		16x PNP, Type 3			
Digital outputs	—	16x PNP		16x PNP			
Configurable inputs/outputs	no	yes		yes			
Output current max.	—	2 A		2 A			
Current sum US, sensor	9.0 A	9.0 A		9.0 A			
Current sum UA, actuator	—	9.0 A		9.0 A			
Housing material	PPS	PPS		PPS			
Dimension	68 x 42.9 x 226 mm	68 x 42.9 x 226 mm		68 x 42.9 x 226 mm			
Ambient temperature	-5...70 °C	-5...70 °C		-5...70 °C			
Protection degree	IP67	IP67		IP67			
Auxiliary interfaces	—	—		—			
IO-Link version	—	—		—			
Port-class	—	—		—			



	BNI0090 BNI IOL-104-S02-R012	BNI00CH BNI IOL-104-S02-R012-008		BNI0091 BNI IOL-302-S02-R026	BNI00C.J BNI IOL-302-S02-R026-008		
Interface	IO-Link 1.1	IO-Link 1.1		IO-Link 1.1	IO-Link 1.1		
Operating voltage U_b	18...30.2 VDC	18...30.2 VDC		18...30.2 VDC	18...30.2 VDC		
Connection (COM 1)	M12x1-Male, 4-pole, A-coded	M12x1-Male, 4-pole, A-coded		M12x1-Male, 4-pole, A-coded	M12x1-Male, 4-pin, A-coded		
Connection (supply voltage IN)	—	—		7/8"-Male, 4-pole	7/8"-Male, 4-pole		
Connection ports	8x M12x1-Female, 5-pole, A-coded	8x M12x1-Female, 5-pole, A-coded		8x M12x1-Female, 5-pole, A-coded	8x M12x1-Female, 5-pin, A-coded		
Digital inputs	16x PNP, Type 3	16x PNP, Type 3		16x PNP, Type 3	16x PNP, Type 3		
Digital outputs	—	—		16x PNP	16x PNP		
Analog inputs	—	—		—	—		
Configurable inputs/outputs	no	no		yes	yes		
Additional function	Extension port, Single-channel monitoring	Extension port, Single-channel monitoring, alternative process data mapping		Extension port, Single-channel monitoring	Extension port, Single-channel monitoring, alternative process data mapping		
Output current max.	—	—		2 A	2 A		
Housing material	PPS	PPS		PPS	PPS		
Dimension	68 x 36.8 x 183.5 mm	68 x 36.8 x 183.5 mm		68 x 37.6 x 183.5 mm	68 x 37.6 x 183.5 mm		
Ambient temperature	-5...70 °C	-5...70 °C		-5...70 °C	-5...70 °C		
Protection degree	IP67 when threaded in	IP67 when threaded in		IP67 when threaded in	IP67 when threaded in		
Transfer rate	COM2 (38.4 kBaud)	COM2 (38.4 kBaud)		COM2 (38.4 kBaud)	COM2 (38.4 kBaud)		
Process data cycle min.	4.5 ms	4.5 ms		6.0 ms	6.0 ms		
Process data in	4 bytes	4 bytes		6 bytes	6 bytes		
Process data out	—	—		2 bytes	2 bytes		



	BIC007F BIC 1B0-IT1A7-Q40KFU-SM4A4A	BIC007H BIC 2B0-IT1A7-Q40KFU-SM4A5A		BIC007J BIC 1I3-P2A50-Q40KFU-EPX0-002-M4CA	BIC007K BIC 2I3-P2A50-Q40KFU-EPX0-002-M4CA		
Function	IO-Link signal transmission	IO-Link signal transmission		8x PNP signals	8x PNP signals		
Signal type	bi-directional	bi-directional		unidirectional	unidirectional		
Transmission distance	0...5 mm	0...5 mm		0...5 mm	0...5 mm		
Component	Base	Remote		Base	Remote		
Interface	IO-Link 1.1	IO-Link 1.1		9x PNP (In-zone) Outputs	8x PNP Inputs		
Connection	Connector, M12x1 Male, 4-pin	Connector, M12x1 Male, 5-pin		Connector, M12x1, 12-pin, 0.20 m, PUR	Connector, M12x1, 12-pin, 0.20 m, PUR		
Rated operating voltage U _e	24 VDC	—		24 VDC	—		
Output voltage	—	24 VDC		—	24 VDC		
Rated output current	—	1.7 A		—	0.5 A		
Output current max.	—	5 A / 1 ms		—	—		
Housing material	PBTP	PBTP		PBTP	PBTP		
Dimension	40 x 40 x 62 mm	40 x 40 x 60.8 mm		40 x 40 x 52 mm	40 x 40 x 52 mm		
Ambient temperature	-5...55 °C	-5...55 °C		-5...65 °C	-5...65 °C		
Protection degree	IP67	IP67		IP67	IP67		
Transfer rate	COM2 (38.4 kBaud), COM3 (230.4 kBaud)	COM2 (38.4 kBaud), COM3 (230.4 kBaud)		—	—		
Additive cycle time	Device + 2.8 ms	Device + 2.8 ms		—	—		
Process data in	0...32 bytes	0...32 bytes		—	—		
Process data out	0...32 bytes	0...32 bytes		—	—		
SIO mode	no	no		—	—		



	BAM0334 BAM FS-IC-009-Q40-0	BAM0335 BAM FS-IC-010-Q40-0
Dimension	73.25 x 66.5 x 62 mm	73.25 x 66.5 x 62 mm
Material	POM	POM
Use	for inductive couplers Q40, Base	for inductive couplers Q40, Remote
Version	Magnetic holder	Magnetic holder



	BIC0075 BIC 1P0-P25A0-Q120AE-SA3A40	BIC0076 BIC 2P0-P25A0-Q120AE-SA3A40
Function	Power only	Power only
Transmission distance	0...4 mm	0...4 mm
Component	Base	Remote
Connection	Connector, 7/8" Male, 4-pin	Connector, 7/8" Female, 4-pin
Rated operating voltage U _e	24 VDC	—
Output voltage	—	24 VDC
Rated output current	—	5 A
Housing material	Aluminum, black anodized	Aluminum, black anodized
Dimension	120 x 45 x 120 mm	120 x 45 x 120 mm
Ambient temperature	-10...50 °C	-10...50 °C
Protection degree	IP67	IP67



Standardized and tailor-made connection components

CONNECTIVITY

 *innovating automation*

At Balluff, you get everything from a single source including a comprehensive range of connectivity components for every area of automation from a variety of materials, for various requirements and applications. Connectors and double-ended cordsets from Balluff are available for temperatures up to 180 °C or as low as -40 °C. Designs with Ecolab approval or in IP69K are especially suitable for sensitive fields such as the food industry. All products are suited for rugged use in the industrial environment. All are simple to install and have rapid integration for fast startup.

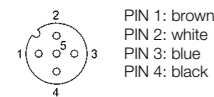
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144	Weld spatter resistant silicone cable 4-conductor M12 female M12 female/M12 male
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150	Weld spark immune torsion resistant 3-conductor 4-conductor 5-conductor M8 female M12 female
154	Weld spark immune silicone-free cable 3-conductor 4-conductor M8 female M12 female
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174	4-conductor M8 female/M8 male M8 female/M12 male
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182	High durability cable splitters
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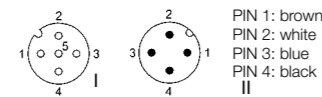


	BCC W415 ...		BCC W425 ...	BCC W415 ... BCC W414 ...	BCC W425 ... BCC W414 ...
Connection	M12 female, A-coded		M12 female, A-coded	M12 female, A-coded/ M12 male, A-coded	M12 female, A-coded/ M12, A-coded, male
Version	straight		angled	straight/straight	angled/straight
Rated voltage	250 V AC/DC		250 V AC/DC	250 V AC/DC	250 V AC/DC
Rated current	4 A		4 A	4 A	4 A
Degree of protection	IP65		IP65	IP65/IP65	IP65/IP65
unshielded, no LED	BCC W415-0000-1A-003-SW0434①-__ _②		BCC W425-0000-1A-003-SW0434①-__ _②	BCC W415-W414-3A-304-SW0434①-__ _②	BCC W425-W414-3A-304-SW0434①-__ _②
unshielded, 3 × PNP-LED	–		–	BCC W415-W414-3A-650-SW0434①-__ _②	BCC W425-W414-3A-650-SW0434①-__ _②
Approval/Conformity	CE, UL, EAC		CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

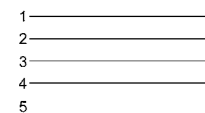
M12 female



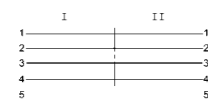
M12 female/M12 male



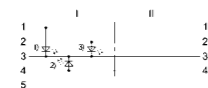
unshielded, no LED



unshielded, no LED



unshielded, 3 × PNP-LED



- * 1) LED green = Power
- 2) LED yellow = Function
- 3) LED red = Function

①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
SW0434	Silicone	Black	4 × 0.34 mm ²	–40...+200 °C	–25...+200 °C

②	Cable length
CONNECTION CABLE	
020	2 m
050	5 m
100	10 m
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!

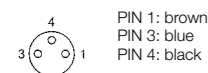
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
SW0434	BCC0HA8	BCC 0000-0000-00-003-SW0434-10X	100 m

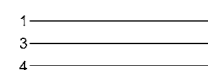


	BCC W313 ... BCC W314 ...		BCC W323 ... BCC W324 ...	BCC W415 ...	BCC W425 ...
Connection	M8 female, A-coded		M8 female, A-coded	M12 female, A-coded	M12 female, A-coded
Version	straight		angled	straight	angled
Rated voltage	No LED 60 V AC/DC		60 V AC/DC	250 V AC/DC	250 V AC/DC
Rated current	4 A		4 A	4 A	4 A
Degree of protection	unshielded IP65		IP65	IP65	IP65
unshielded, no LED, 3-conductor	BCC W313-0000-10-001-TW0334@-__ _@		BCC W323-0000-10-001-TW0334@-__ _@	-	-
unshielded, no LED, 4-conductor	BCC W314-0000-10-003-TW0434@-__ _@		BCC W324-0000-10-003-TW0434@-__ _@	BCC W415-0000-1A-003-TW0434@-__ _@	BCC W425-0000-1A-003-TW0434@-__ _@
Approval/Conformity	CE, UL, EAC		CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

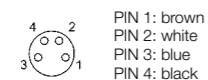
M8 female, 3-conductor



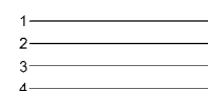
unshielded, no LED



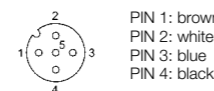
M8 female, 4-conductor



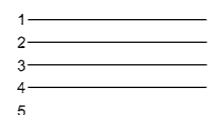
unshielded, no LED



M12 female, 4-conductor



unshielded, no LED



①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
TW0334	FEP (PTFE)	Black	3 × 0.34 mm ²	-100...+200 °C	-
TW0434	FEP (PTFE)	Black	4 × 0.34 mm ²	-100...+200 °C	-

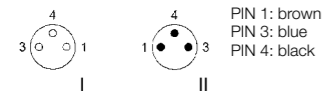
②	Cable length
CONNECTION CABLE	
020	2 m
050	5 m
100	10 m

Other cable lengths on request!

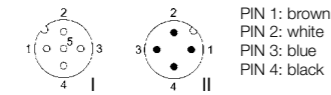


		BCC W313-W313 ...		BCC W415-W414 ...	BCC W425-W414 ...
Connection		M8 female, A-coded/ M8 male, A-coded		M12 female, A-coded/ M12 male, A-coded	M12 female, A-coded/ M12 male, A-coded
Version		straight/straight		straight/straight	angled/straight
Rated voltage	No LED	60 V AC/DC		250 V AC/DC	250 V AC/DC
	with LED	–		30 V DC	30 V DC
Rated current		4 A		4 A	4 A
Degree of protection		unshielded IP65/IP65		IP65/IP65	IP65/IP65
unshielded, no LED, 3-conductor		BCC W313-W313-30-300-TW0334①-__ _②		–	–
unshielded, no LED, 4-conductor		–		BCC W415-W414-3A-304-TW0434①-__ _②	BCC W425-W414-3A-304-TW0434①-__ _②
unshielded, 3 × PNP-LED, 4-conductor		–		BCC W415-W414-3A-650-TW0434①-__ _②	BCC W425-W414-3A-650-TW0434①-__ _②
Approval/Conformity		CE, UL, EAC		CE, UL, EAC	CE, UL, EAC

M8 female/M8 male, 3-wire



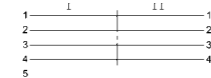
M12 female/M12 male, 4-wire



unshielded, no LED



unshielded, no LED



unshielded, 3 × PNP-LED



* 1) LED green = Power
2) LED yellow = Function
3) LED white = Function

①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
TW0334	FEP	Black	3 × 0.34 mm ²	–100...+200 °C	–
TW0434	FEP	Black	4 × 0.34 mm ²	–100...+200 °C	–

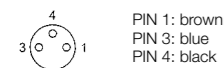
②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!



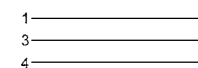
	BCC M313 ... BCC M314 ...		BCC M323 ... BCC M324 ...	BCC M415 ...	BCC M425 ...
Connection	M8 female, A-coded		M8 female, A-coded	M12 female, A-coded	M12 female, A-coded
Version	straight		angled	straight	angled
Rated voltage	No LED	60 V AC/DC	60 V AC/DC	250 V AC/DC	250 V AC/DC
	with LED	-	-	-	30 V DC
Rated current	4 A		4 A	4 A	4 A
Degree of protection	IP67, IP69K		IP67, IP69K	IP67, IP68, IP69K	IP67, IP68, IP69K
unshielded, no LED, 3-conductor	BCC M313-0000-10-001-PW3334@-__@		BCC M323-0000-10-001-PW3334@-__@	-	-
unshielded, no LED, 3-conductor, N.O. signal	-		-	-	BCC M425-0000-1A-001-PW3334@-__@
unshielded, 2 x PNP-LED, 3-conductor, N.O. signal	-		-	-	BCC M425-0000-1A-004-PW3334@-__@
unshielded, no LED, 4-conductor	BCC M314-0000-10-003-PW3434@-__@		BCC M324-0000-10-003-PW3434@-__@	BCC M415-0000-1A-003-PW3434@-__@	BCC M425-0000-1A-003-PW3434@-__@
unshielded, 3 x PNP-LED, 4-conductor	-		-	-	BCC M425-0000-1A-099-PW3434@-__@
unshielded, 3 x PNP-LED, 5-conductor, with PE	-		-	-	BCC M425-0000-1A-100-PW3534@-__@
Approval/Conformity	CE, EAC		CE, EAC	CE, UL, EAC	CE, UL, EAC

M8 female, 3-conductor



PIN 1: brown
PIN 3: blue
PIN 4: black

unshielded, no LED

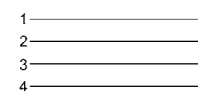


M8 female, 4-conductor

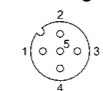


PIN 1: brown
PIN 2: white
PIN 3: blue
PIN 4: black

unshielded, no LED

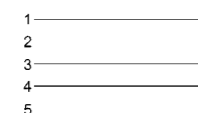


M12 female, 3-conductor, N.O. signal

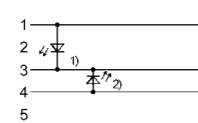


PIN 1: brown
PIN 3: blue
PIN 4: black

unshielded, no LED

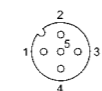


unshielded, 2 x PNP-LED



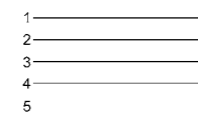
* 1) LED green = Power
2) LED yellow = Function
3) LED red = Function

M12 female, 4-conductor

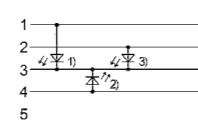


PIN 1: brown
PIN 2: white
PIN 3: blue
PIN 4: black

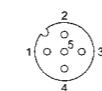
unshielded, no LED



unshielded, 3 x PNP-LED

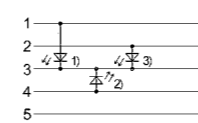


M12 female, 5-conductor, with PE



PIN 1: brown
PIN 2: white
PIN 3: blue
PIN 4: black
PIN 5: green/yellow

unshielded, 3 x PNP-LED



①	Material	Color	Number of conductors x conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PW3334	PUR	Orange	3 x 0.34 mm ²	-50...+90 °C	-25...+90 °C
PW3434	PUR	Orange	4 x 0.34 mm ²	-50...+90 °C	-25...+90 °C
PW3534	PUR	Orange	5 x 0.34 mm ²	-50...+90 °C	-25...+90 °C

②	Cable length
CONNECTION CABLE	
020	2 m
050	5 m
100	10 m

Other cable lengths on request!

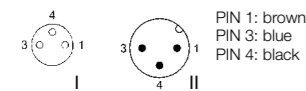
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PW3334	BCC0C1A	BCC 0000-0000-00-000-PW3334-10X	100 m
PW3434	BCC0C19	BCC 0000-0000-00-000-PW3434-10X	100 m
PW3534	BCC0C1F	BCC 0000-0000-00-003-PW3534-10X	100 m

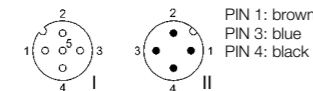


	BCC M323-M413 ...		BCC M415-M414... BCC M415-M415...	BCC M425-M413... BCC M425-M414... BCC M425-M415...
Connection	M8 female, A-coded/ M12 male, A-coded		M12 female, A-coded/ M12 male, A-coded	M12 female, A-coded/ M12 male, A-coded
Version	angled/straight		straight/straight	angled/straight
Rated voltage	No LED	–	250 V AC/DC	250 V AC/DC
	with LED	30 V DC	30 V DC	30 V DC
Rated current	4 A		4 A	4 A
Degree of protection	IP67, IP69K/IP67, IP68, IP69K		IP67, IP68, IP69K/IP67, IP68, IP69K	IP67, IP68, IP69K/IP67, IP68, IP69K
unshielded, 2 × PNP-LED, 3-conductor	BCC M323-M413-3E-602-PW3334①-__ _②		–	–
unshielded, 2 × PNP-LED, 3-conductor, N.O. signal	–		–	BCC M425-M413-3A-602-PW3334①-__ _②
unshielded, no LED, 4-conductor	–		BCC M415-M414-3A-304-PW3434①-__ _②	BCC M425-M414-3A-304-PW3434①-__ _②
unshielded, 3 × PNP-LED, 4-conductor	–			BCC M425-M414-3A-691-PW3434①-__ _②
unshielded, no LED, 5-conductor, with PE	–		BCC M415-M415-3A-313-PW3534①-__ _②	BCC M425-M415-3A-313-PW3534①-__ _②
unshielded, 3 × PNP-LED, 5-conductor, with PE	–		–	BCC M425-M415-3A-692-PW3534①-__ _②
Approval/Conformity	CE, EAC		CE, UL, EAC	CE, UL, EAC

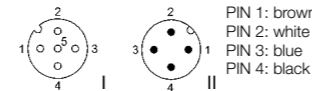
M8 female/M12 male, 3-conductor



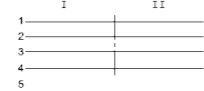
M12 female/M12 male, 3-conductor, N.O. signal



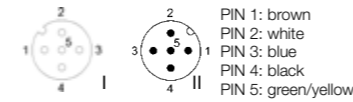
M12 female/M12 male, 4-wire



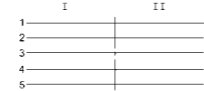
unshielded, no LED



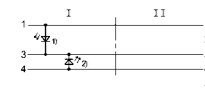
M12 female/M12 male, 5-conductor, with PE



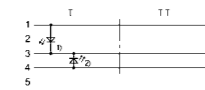
unshielded, no LED



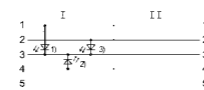
unshielded, 2 × PNP-LED*



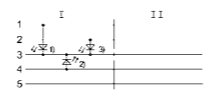
unshielded, 2 × PNP-LED*



unshielded, 3 × PNP-LED*



unshielded, 3 × PNP-LED*



* 1) LED green = Power
2) LED yellow = Function
3) LED red = Function

①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PW3334	PUR	Orange	3 × 0.34 mm ²	–50...+90 °C	–25...+90 °C
PW3434	PUR	Orange	4 × 0.34 mm ²	–50...+90 °C	–25...+90 °C
PW3534	PUR	Orange	5 × 0.34 mm ²	–50...+90 °C	–25...+90 °C

②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!

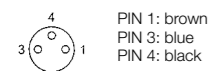
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PW3334	BCC0C1A	BCC 0000-0000-00-000-PW3334-10X	100 m
PW3434	BCC0C19	BCC 0000-0000-00-000-PW3434-10X	100 m
PW3534	BCC0C1F	BCC 0000-0000-00-003-PW3534-10X	100 m

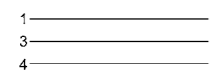


	BCC W313 ... BCC W314 ...		BCC W323 ... BCC W324 ...	BCC W415 ...	BCC W425 ...
Connection	M8 female, A-coded		M8 female, A-coded	M12 female, A-coded	M12 female, A-coded
Version	straight		angled	straight	angled
Rated voltage	60 V AC/DC		60 V AC/DC	250 V AC/DC	250 V AC/DC
Rated current	4 A		4 A	4 A	4 A
Degree of protection	IP65		IP65	IP65	IP65
unshielded, no LED, 3-conductor	BCC W313-0000-10-001-BW8334①-__ _②		BCC W323-0000-10-001-BW8334①-__ _②	-	-
unshielded, no LED, 4-conductor	BCC W314-0000-10-003-BW8434①-__ _②		BCC W324-0000-10-003-BW8434①-__ _②	BCC W415-0000-1A-003-BW8434①-__ _②	BCC W425-0000-1A-003-BW8434①-__ _②
Approval/Conformity	CE, UL, EAC		CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

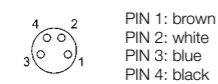
M8 female, 3-conductor



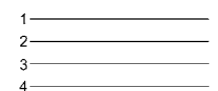
unshielded, no LED



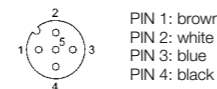
M8 female, 4-conductor



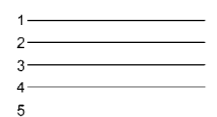
unshielded, no LED



M12 female, 4-conductor



unshielded, no LED



①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
BW8334	TPE	Gray	3 × 0.34 mm ²	-50...+130 °C	-40...+125 °C
BW8434	TPE	Gray	4 × 0.34 mm ²	-50...+130 °C	-40...+125 °C

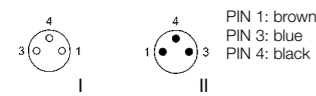
②	Cable length
CONNECTION CABLE	
020	2 m
050	5 m

Other cable lengths on request!



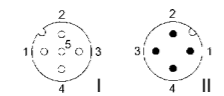
	BCC W313-W313 ...		BCC W415-W414 ...	BCC W425-W414 ...
Connection	M8 female, A-coded/ M8 male, A-coded		M12 female, A-coded/ M12 male, A-coded	M12 female, A-coded/ M12 male, A-coded
Version	straight/straight		straight/straight	angled/straight
Rated voltage	60 V AC/DC		250 V AC/DC	250 V AC/DC
Rated current	4 A		4 A	4 A
Degree of protection	IP65/IP65		IP65/IP65	IP65/IP65
unshielded, no LED, 3-conductor	BCC W313-W313-30-300-BW8334①-__ _ ②		-	-
unshielded, no LED, 4-conductor	-		BCC W415-W414-3A-304-BW8434①-__ _ ②	BCC W425-W414-3A-304-BW8434①-__ _ ②
Approval/Conformity	CE, UL, EAC		CE, UL, EAC	CE, UL, EAC

M8 female/M8 male, 3-wire



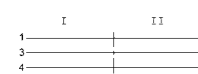
PIN 1: brown
PIN 3: blue
PIN 4: black

M12 female/M12 male, 4-wire



PIN 1: brown
PIN 2: white
PIN 3: blue
PIN 4: black

unshielded, no LED



unshielded, no LED



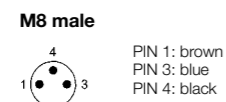
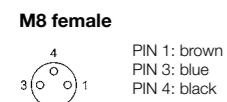
①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
BW8334	TPE	Gray	3 × 0.34 mm ²	-50...+130 °C	-40...+125 °C
BW8434	TPE	Gray	4 × 0.34 mm ²	-50...+130 °C	-40...+125 °C

②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

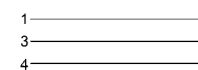
Other cable lengths on request!



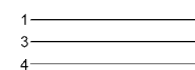
	BCC M313 ...	BCC M313 ...	BCC M323 ...	BCC M323 ...
Connection	M8 female, A-coded	M8 male, A-coded	M8 female, A-coded	M8 male, A-coded
Version	straight	straight	angled	angled
Rated voltage	No LED	60 V AC/DC	60 V AC/DC	60 V AC/DC
	with LED	30 V DC	–	30 V DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	unshielded	IP67, IP69K	IP67, IP69K	IP67, IP69K
	shielded	IP67		IP67
unshielded, no LED	BCC M313-0000-10-001-_____①-___②	BCC M313-0000-20-001-_____①-___②	BCC M323-0000-10-001-_____①-___②	BCC M323-0000-20-001-_____①-___②
unshielded, 2 × PNP-LED	BCC M313-0000-10-004-_____①-___②	–	BCC M323-0000-10-004-_____①-___②	–
unshielded, 2 × NPN-LED	–	–	BCC M323-0000-10-006-_____①-___②	–
shielded, no LED	BCC M313-0000-10-036-_____①-___②	–	BCC M323-0000-10-036-_____①-___②	–
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC



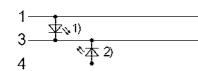
unshielded, no LED



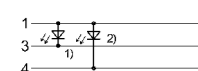
unshielded, no LED



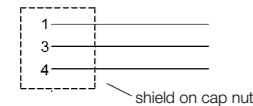
unshielded, 2 × PNP-LED*



unshielded, 2 × NPN-LED*



shielded, no LED



* ¹⁾ LED green = Power
²⁾ LED yellow = Function

①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0334	PUR	Black	3 × 0.34 mm ²	–50...+90 °C	–25...+90 °C
EX43T2	TPE	Yellow	3 × 22 AWG	–50...+105 °C	–25...+105 °C
SHIELDED					
PS0334	PUR	Black	3 × 0.34 mm ²	–50...+90 °C	–25...+90 °C

②	Cable length
CONNECTION CABLE	
020	2 m
050	5 m
100	10 m

Other cable lengths on request!

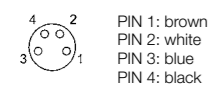
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0334	BCC0AC7	BCC 0000-0000-00-000-PX0334-10X	100 m
EX43T2	BCC0AEC	BCC 0000-0000-00-001-EX43T2-10X	100 m



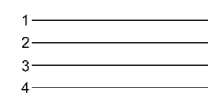
	BCC M314 ...	BCC M314 ...	BCC M324 ...	BCC M324 ...
Connection	M8 female, A-coded	M8 male, A-coded	M8 female, A-coded	M8 male, A-coded
Version	straight	straight	angled	angled
Rated voltage	No LED	60 V AC/DC	60 V AC/DC	60 V AC/DC
	with LED	-	-	30 V DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	unshielded	IP67, IP69K	IP67, IP69K	IP67, IP69K
	shielded	IP67	-	IP67
unshielded, no LED	BCC M314-0000-10-003-_____①-___②	BCC M314-0000-20-003-_____①-___②	BCC M324-0000-10-003-_____①-___②	BCC M324-0000-20-003-_____①-___②
unshielded, 2 × PNP-LED	-	-	BCC M324-0000-10-008-_____①-___②	-
shielded, no LED	BCC M314-0000-10-014-_____①-___②	-	BCC M324-0000-10-014-_____①-___②	-
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

M8 female

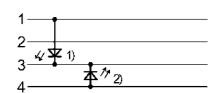


PIN 1: brown
PIN 2: white
PIN 3: blue
PIN 4: black

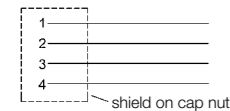
unshielded, no LED



unshielded, 2 × PNP-LED*

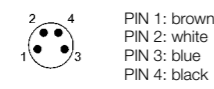


shielded, no LED



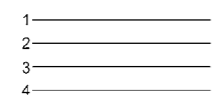
* 1) LED green = Power
2) LED yellow = Function

M8 male



PIN 1: brown
PIN 2: white
PIN 3: blue
PIN 4: black

unshielded, no LED



①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0434	PUR	Black	4 × 0.34 mm ²	-50...+90 °C	-25...+90 °C
EX44T2	TPE	Yellow	4 × 22 AWG	-50...+105 °C	-25...+105 °C
SHIELDED					
PS0434	PUR	Black	4 × 0.34 mm ²	-50...+90 °C	-25...+90 °C

②	Cable length
CONNECTION CABLE	
020	2 m
050	5 m
100	10 m

Other cable lengths on request!

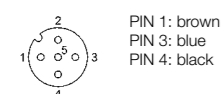
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0434	BCC0AC8	BCC 0000-0000-00-000-PX0434-10X	100 m
EX44T2	BCC0AEE	BCC 0000-0000-00-003-EX44T2-10X	100 m

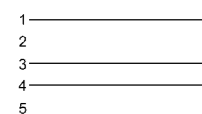


	BCC M415 ...	BCC M413 ...	BCC M425 ...	BCC M413 ...
Connection	M12 female, A-coded	M12 male, A-coded	M12 female, A-coded	M12 male, A-coded
Version	straight	straight	angled	angled
Rated voltage	No LED	250 V AC/DC	250 V AC/DC	250 V AC/DC
	with LED	30 V DC	-	30 V DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	unshielded	IP67, IP68, IP69K	IP67, IP68, IP69K	IP67, IP68, IP69K
	shielded	IP67	IP67	IP67
unshielded, no LED, N.O. signal	BCC M415-0000-1A-001-_____①-___②	BCC M413-0000-2A-001-_____①-___②	BCC M425-0000-1A-001-_____①-___②	BCC M423-0000-2A-001-_____①-___②
unshielded, 2 × PNP-LED, N.O. signal	BCC M415-0000-1A-004-_____①-___②	-	BCC M425-0000-1A-004-_____①-___②	-
unshielded, 2 × NPN-LED, N.O. signal	-	-	BCC M425-0000-1A-006-_____①-___②	-
shielded, no LED, N.O. signal	BCC M415-0000-1A-036-_____①-___②	BCC M413-0000-2A-036-_____①-___②	BCC M425-0000-1A-036-_____①-___②	BCC M423-0000-2A-036-_____①-___②
unshielded, no LED, N.C. signal	BCC M415-0000-1A-002-_____①-___②	BCC M413-0000-2A-002-_____①-___②	BCC M425-0000-1A-002-_____①-___②	-
unshielded, 2 × PNP-LED, N.C. signal	BCC M415-0000-1A-005-_____①-___②	-	BCC M425-0000-1A-005-_____①-___②	-
shielded, no LED, N.C. signal	BCC M415-0000-1A-037-_____①-___②	BCC M413-0000-2A-037-_____①-___②	BCC M425-0000-1A-037-_____①-___②	-
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

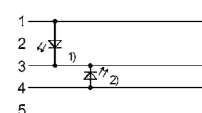
M12 female, N.O. signal



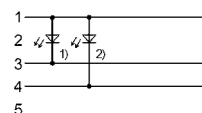
unshielded, no LED



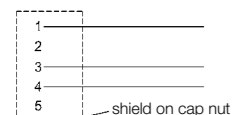
unshielded, 2 × PNP-LED*



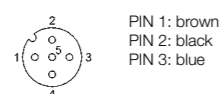
unshielded, 2 × NPN-LED*



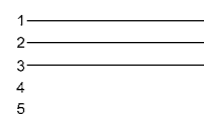
shielded, no LED



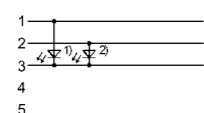
M12 female, N.C. signal



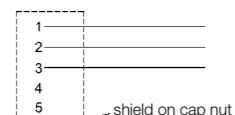
unshielded, no LED



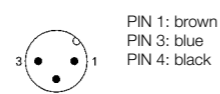
unshielded, 2 × PNP-LED*



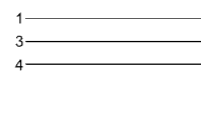
shielded, no LED



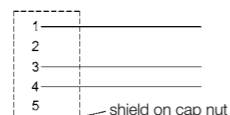
M12 male, N.O. signal



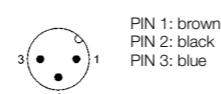
unshielded, no LED



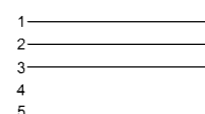
shielded, no LED



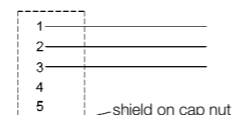
M12 male, N.C. signal



unshielded, no LED



shielded, no LED



* ¹⁾ LED green = Power
²⁾ LED yellow = Function

①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0334	PUR	Black	3 × 0.34 mm ²	-50...+90 °C	-25...+90 °C
EX43T2	TPE	Yellow	3 × 22 AWG	-50...+105 °C	-25...+105 °C
SHIELDED					
PS0334	PUR	Black	3 × 0.34 mm ²	-50...+90 °C	-25...+90 °C

②	Cable length
CONNECTION CABLE	
020	2 m
050	5 m
100	10 m

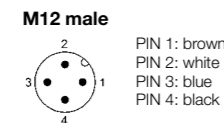
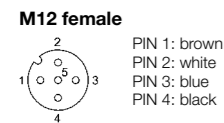
Other cable lengths on request!

AVAILABLE AS BULK CABLE

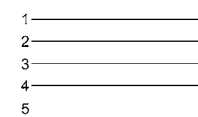
	Order code	Part number	Cable length
PX0334	BCC0AC7	BCC 0000-0000-00-000-PX0334-10X	100 m
EX43T2	BCC0AEC	BCC 0000-0000-00-001-EX43T2-10X	100 m



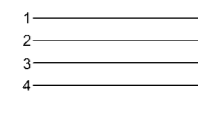
	BCC M415 ...	BCC M414 ...	BCC M425 ...	BCC M424 ...
Connection	M12 female, A-coded	M12 male, A-coded	M12 female, A-coded	M12 female, A-coded
Version	straight	straight	angled	angled
Rated voltage	No LED	250 V AC/DC	250 V AC/DC	250 V AC/DC
	with LED	30 V DC	–	30 V DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	unshielded	IP67, IP68, IP69K	IP67, IP68, IP69K	IP67, IP68, IP69K
	shielded	IP67	IP67	IP67
unshielded, no LED	BCC M415-0000-1A-003-_____①-___②	BCC M414-0000-2A-003-_____①-___②	BCC M425-0000-1A-003-_____①-___②	BCC M424-0000-2A-003-_____①-___②
unshielded, 2 × PNP-LED	BCC M415-0000-1A-008-_____①-___②	–	BCC M425-0000-1A-008-_____①-___②	BCC M424-0000-2A-008-_____①-___②
unshielded, 3 × PNP-LED	BCC M415-0000-1A-010-_____①-___②	–	BCC M425-0000-1A-010-_____①-___②	–
shielded, no LED	BCC M415-0000-1A-014-_____①-___②	BCC M414-0000-2A-014-_____①-___②	BCC M425-0000-1A-014-_____①-___②	BCC M424-0000-2A-014-_____①-___②
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC



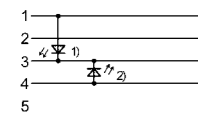
unshielded, no LED



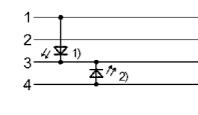
unshielded, no LED



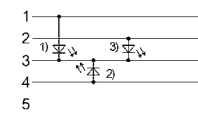
unshielded, 2 × PNP-LED*



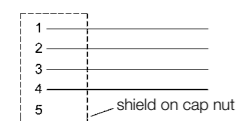
unshielded, 2 × PNP-LED*



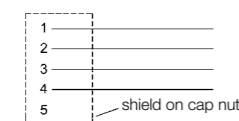
unshielded, 3 × PNP-LED*



shielded, no LED



shielded, no LED



* 1) LED green = Power
2) LED yellow = Function
3) LED white = Function

①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0434	PUR	Black	4 × 0.34 mm ²	–50...+90 °C	–25...+90 °C
EX44T2	TPE	Yellow	4 × 22 AWG	–50...+105 °C	–25...+105 °C
SHIELDED					
PS0434	PUR	Black	4 × 0.34 mm ²	–50...+90 °C	–25...+90 °C

②	Cable length
CONNECTION CABLE	
020	2 m
050	5 m
100	10 m

Other cable lengths on request!

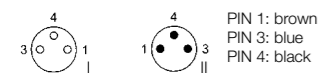
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0434	BCC0AC8	BCC 0000-0000-00-000-PX0434-10X	100 m
EX44T2	BCC0AEE	BCC 0000-0000-00-003-EX44T2-10X	100 m



	BCC M313-M313 ...	BCC M313-M323 ...	BCC M313-M413 ...	BCC M313-M423 ...
Connection	M8 female, A-coded/ M8 male, A-coded	M8 female, A-coded/ M8 male, A-coded	M8 female, A-coded/ M12 male, A-coded	M8 female, A-coded/ M12 male, A-coded
Version	straight/straight	straight/angled	straight/straight	straight/angled
Rated voltage	60 V AC/DC	60 V AC/DC	60 V AC/DC	60 V AC/DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	IP67, IP69K/IP67, IP69K	IP67, IP69K/IP67, IP69K	IP67, IP69K/IP67, IP68, IP69K	IP67, IP69K/IP67, IP68, IP69K
unshielded, no LED	BCC M313-M313-30-300-_____①-___②	BCC M313-M323-30-300-_____①-___②	-	-
unshielded, no LED, N.O. signal	-	-	BCC M313-M413-3E-300-_____①-___②	BCC M313-M423-3E-300-_____①-___②
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

M8 female/M8 male



M8 female/M12 male, N.O. signal



unshielded, no LED



unshielded, no LED



①	Material	Color	Number of conductors x conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0334	PUR	Black	3 x 0.34 mm ²	-50...+90 °C	-25...+90 °C
EX43T2	TPE	Yellow	3 x 22 AWG	-50...+105 °C	-25...+105 °C

②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!

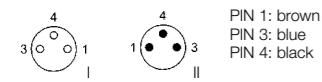
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0334	BCC0AC7	BCC 0000-0000-00-000-PX0334-10X	100 m
EX43T2	BCC0AEC	BCC 0000-0000-00-001-EX43T2-10X	100 m

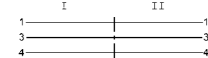


	BCC M323-M313 ...	BCC M323-M323 ...	BCC M323-M413 ...	BCC M323-M423 ...
Connection	M8 female, A-coded/ M8 male, A-coded	M8 female, A-coded/ M8 male, A-coded	M8 female, A-coded/ M12 male, A-coded	M8 female, A-coded/ M12 male, A-coded
Version	angled/straight	angled/angled	angled/straight	angled/angled
Rated voltage	No LED	60 V AC/DC	60 V AC/DC	60 V AC/DC
	with LED	30 V DC	–	30 V DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	IP67, IP69K/IP67, IP69K	IP67, IP69K/IP67, IP69K	IP67, IP69K/IP67, IP68, IP69K	IP67, IP69K/IP67, IP68, IP69K
unshielded, no LED	BCC M323-M313-30-300-_____①-___②	BCC M323-M323-30-300-_____①-___②	–	–
unshielded, 2 × PNP-LED	BCC M323-M313-30-602-_____①-___②	–	–	–
unshielded, no LED, N.O. signal	–	–	BCC M323-M413-3E-300-_____①-___②	BCC M323-M423-3E-300-_____①-___②
unshielded, PNP-LED, N.O. signal	–	–	BCC M323-M413-3E-602-_____①-___②	–
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

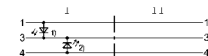
M8 female/M8 male



unshielded, no LED

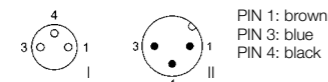


unshielded, 2 × PNP-LED*



* 1) LED green = Power
2) LED yellow = Function

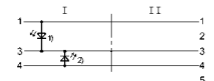
M8 female/M12 male, N.O. signal



unshielded, no LED



unshielded, 2 × PNP-LED*



①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0334	PUR	Black	3 × 0.34 mm ²	–50...+90 °C	–25...+90 °C
EX43T2	TPE	Yellow	3 × 22 AWG	–50...+105 °C	–25...+105 °C

②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!

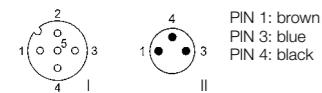
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0334	BCC0AC7	BCC 0000-0000-00-000-PX0334-10X	100 m
EX43T2	BCC0AEC	BCC 0000-0000-00-001-EX43T2-10X	100 m

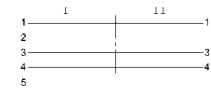


	BCC M415-M313 ...	BCC M415-M323 ...	BCC M415-M413 ...	BCC M415-M423 ...
Connection	M12 female, A-coded/ M8 male, A-coded	M12 female, A-coded/ M8 male, A-coded	M12 female, A-coded/ M12 male, A-coded	M12 female, A-coded/ M12 male, A-coded
Version	straight/straight	straight/angled	straight/straight	straight/angled
Rated voltage	60 V AC/DC	60 V AC/DC	250 V AC/DC	250 V AC/DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	IP67, IP68, IP69K/IP67, IP69K	IP67, IP68, IP69K/IP67, IP69K	IP67, IP68, IP69K/IP67, IP68, IP69K	IP67, IP68, IP69K/IP67, IP68, IP69K
unshielded, no LED, N.O. signal	BCC M415-M313-3F-300-_____①-___②	BCC M415-M323-3F-300-_____①-___②	BCC M415-M413-3A-300-_____①-___②	BCC M415-M423-3A-300-_____①-___②
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

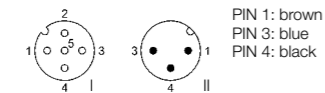
**M12 female/M8 male,
N.O. signal**



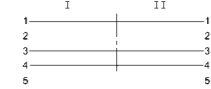
unshielded, no LED



**M12 female/M12 male,
N.O. signal**



unshielded, no LED



①	Material	Color	Number of conductors x conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0334	PUR	Black	3 x 0.34 mm ²	-50...+90 °C	-25...+90 °C
EX43T2	TPE	Yellow	3 x 22 AWG	-50...+105 °C	-25...+105 °C

②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!

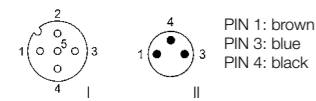
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0334	BCC0AC7	BCC 0000-0000-00-000-PX0334-10X	100 m
EX43T2	BCC0AEC	BCC 0000-0000-00-001-EX43T2-10X	100 m

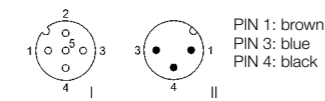


	BCC M425-M313 ...	BCC M425-M323 ...	BCC M425-M413 ...	BCC M425-M423 ...
Connection	M12 female, A-coded/ M8 male, A-coded	M12 female, A-coded/ M8 male, A-coded	M12 female, A-coded/ M12 male, A-coded	M12 female, A-coded/ M12 male, A-coded
Version	angled/straight	angled/angled	angled/straight	angled/angled
Rated voltage	No LED	60 V AC/DC	60 V AC/DC	250 V AC/DC
	with LED	30 V DC	30 V DC	30 V DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	IP67, IP68, IP69K/IP67, IP69K	IP67, IP68, IP69K/IP67, IP69K	IP67, IP68, IP69K/IP67, IP68, IP69K	IP67, IP68, IP69K/IP67, IP68, IP69K
unshielded, no LED, N.O. signal	BCC M425-M313-3F-300-_____①-___②	BCC M425-M323-3F-300-_____①-___②	BCC M425-M413-3A-300-_____①-___②	BCC M425-M423-3A-300-_____①-___②
unshielded, 2 × PNP-LED, N.O. signal	BCC M425-M313-3F-602-_____①-___②	BCC M425-M323-3F-602-_____①-___②	BCC M425-M413-3A-602-_____①-___②	-
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

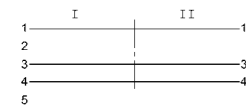
M12 female/M8 male, N.O. signal



M12 female/M12 male, N.O. signal



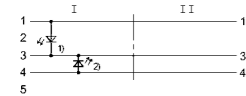
unshielded, no LED



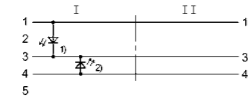
unshielded, no LED



unshielded, 2 × PNP-LED*



unshielded, 2 × PNP-LED*



* 1) LED green = Power
2) LED yellow = Function

①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0334	PUR	Black	3 × 0.34 mm ²	-50...+90 °C	-25...+90 °C
EX43T2	TPE	Yellow	3 × 22 AWG	-50...+105 °C	-25...+105 °C

②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!

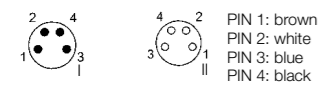
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0334	BCC0AC7	BCC 0000-0000-00-000-PX0334-10X	100 m
EX43T2	BCC0AEC	BCC 0000-0000-00-001-EX43T2-10X	100 m

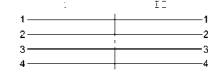


	BCC M324-M314 ...	BCC M324-M324 ...	BCC M324-M414 ...	BCC M324-M424 ...
Connection	M8 female, A-coded/ M8 male, A-coded	M8 female, A-coded/ M8 male, A-coded	M8 female, A-coded/ M12 male, A-coded	M8 female, A-coded/ M12 male, A-coded
Version	angled/straight	angled/angled	angled/straight	angled/angled
Rated voltage	60 V AC/DC	60 V AC/DC	60 V AC/DC	60 V AC/DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	IP67, IP69K/IP67, IP69K	IP67, IP69K/IP67, IP69K	IP67, IP69K/IP67, IP68, IP69K	IP67, IP69K/IP67, IP68, IP69K
unshielded, no LED	BCC M324-M314-30-304-_____①-___②	BCC M324-M324-30-304-_____①-___②	BCC M324-M414-3E-304-_____①-___②	BCC M324-M424-3E-304-_____①-___②
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

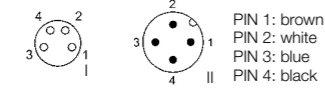
M8 female/M8 male



unshielded, no LED



M8 female/M12 male



unshielded, no LED



①	Material	Color	Number of conductors x conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0434	PUR	Black	4 x 0.34 mm ²	-50...+90 °C	-25...+90 °C
EX44T2	TPE	Yellow	4 x 22 AWG	-50...+105 °C	-25...+105 °C

②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!

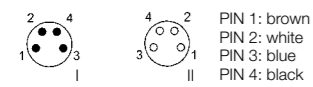
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0434	BCC0AC8	BCC 0000-0000-00-000-PX0434-10X	100 m
EX44T2	BCC0AEE	BCC 0000-0000-00-003-EX44T2-10X	100 m



	BCC M314-M314 ...	BCC M314-M324 ...	BCC M314-M414 ...	BCC M314-M424 ...
Connection	M8 female, A-coded/ M8 male, A-coded	M8 female, A-coded/ M8 male, A-coded	M8 female, A-coded/ M12 male, A-coded	M8 female, A-coded/ M12 male, A-coded
Version	straight/straight	straight/angled	straight/straight	straight/angled
Rated voltage	60 V AC/DC	60 V AC/DC	60 V AC/DC	60 V AC/DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	IP67, IP69K/IP67, IP69K	IP67, IP69K/IP67, IP69K	IP67, IP69K/IP67, IP68, IP69K	IP67, IP69K/IP67, IP68, IP69K
unshielded, no LED	BCC M314-M314-30-304-_____①-___②	BCC M314-M324-30-304-_____①-___②	BCC M314-M414-3E-304-_____①-___②	BCC M314-M424-3E-304-_____①-___②
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

M8 female/M8 male

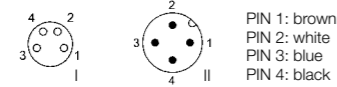


PIN 1: brown
PIN 2: white
PIN 3: blue
PIN 4: black

unshielded, no LED

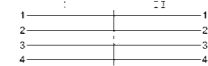


M8 female/M12 male



PIN 1: brown
PIN 2: white
PIN 3: blue
PIN 4: black

unshielded, no LED



①	Material	Color	Number of conductors x conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0434	PUR	Black	4 x 0.34 mm ²	-50...+90 °C	-25...+90 °C
EX44T2	TPE	Yellow	4 x 22 AWG	-50...+105 °C	-25...+105 °C

②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!

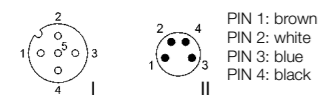
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0434	BCC0AC8	BCC 0000-0000-00-000-PX0434-10X	100 m
EX44T2	BCC0AEE	BCC 0000-0000-00-003-EX44T2-10X	100 m

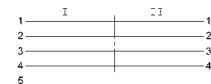


		BCC M415-M314 ...		BCC M415-M324 ...	BCC M415-M414 ...	BCC M415-M424 ...
Connection		M12 female, A-coded/ M8 male, A-coded		M12 female, A-coded/ M8 male, A-coded	M12 female, A-coded/ M12 male, A-coded	M12 female, A-coded/ M12 male, A-coded
Version		straight/straight		straight/angled	straight/straight	straight/angled
Rated voltage	No LED	60 V AC/DC		60 V AC/DC	250 V AC/DC	250 V AC/DC
	with LED	–		–	30 V DC	–
Rated current		4 A		4 A	4 A	4 A
Degree of protection	unshielded	IP67, IP68, IP69K/IP67, IP69K		IP67, IP68, IP69K/IP67, IP69K	IP67, IP68, IP69K/IP67, IP68, IP69K	IP67, IP68, IP69K/IP67, IP68, IP69K
	shielded	–		–	IP67/IP67	–
unshielded, no LED		BCC M415-M314-3F-304-_____①-___②		BCC M415-M324-3F-304-_____①-___②	BCC M415-M414-3A-304-_____①-___②	BCC M415-M424-3A-304-_____①-___②
unshielded, 2 × PNP-LED		–		–	BCC M415-M414-3A-606-_____①-___②	–
shielded, no LED		–		–	BCC M415-M414-3A-305-PS0434①-___②	–
Approval/Conformity		CE, UL, EAC		CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

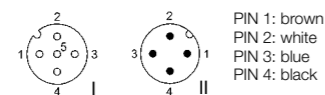
M12 female/M8 male



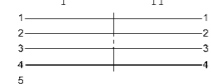
unshielded, no LED



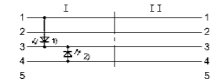
M12 female/M12 male



unshielded, no LED

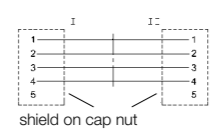


unshielded, 2 × PNP-LED*



* 1) LED green = Power
2) LED yellow = Function

shielded, no LED



①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0434	PUR	Black	4 × 0.34 mm ²	–50...+90 °C	–25...+90 °C
EX44T2	TPE	Yellow	4 × 22 AWG	–50...+105 °C	–25...+105 °C
SHIELDED					
PS0434	PUR	Black	4 × 0.34 mm ²	–50...+90 °C	–25...+90 °C

②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!

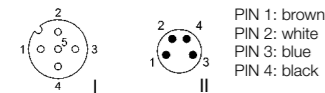
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0434	BCC0AC8	BCC 0000-0000-00-000-PX0434-10X	100 m
EX44T2	BCC0AEE	BCC 0000-0000-00-003-EX44T2-10X	100 m

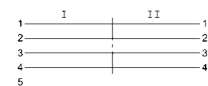


	BCC M425-M314 ...	BCC M425-M324 ...	BCC M425-M414 ...	BCC M425-M424 ...
Connection	M12 female, A-coded/ M8 male, A-coded	M12 female, A-coded/ M8 male, A-coded	M12 female, A-coded/ M12 male, A-coded	M12 female, A-coded/ M12 male, A-coded
Version	angled/straight	angled/angled	angled/straight	angled/angled
Rated voltage	No LED	60 V AC/DC	60 V AC/DC	250 V AC/DC
	with LED	–	–	30 V DC
Rated current	4 A	4 A	4 A	4 A
Degree of protection	IP67, IP68, IP69K/IP67, IP69K	IP67, IP68, IP69K/IP67, IP69K	IP67, IP68, IP69K/IP67, IP68, IP69K	IP67, IP68, IP69K/IP67, IP68, IP69K
unshielded, no LED	BCC M425-M314-3F-304-_____①-___②	BCC M425-M324-3F-304-_____①-___②	BCC M425-M414-3A-304-_____①-___②	BCC M425-M424-3A-304-_____①-___②
unshielded, 2 × PNP-LED	–	–	BCC M425-M414-3A-606-_____①-___②	–
Approval/Conformity	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

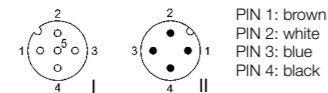
M12 female/M8 male



unshielded, no LED



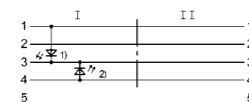
M12 female/M12 male



unshielded, no LED



unshielded, 2 × PNP-LED*



* 1) LED green = Power
2) LED yellow = Function

①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX0434	PUR	Black	4 × 0.34 mm ²	–50...+90 °C	–25...+90 °C
EX44T2	TPE	Yellow	4 × 22 AWG	–50...+105 °C	–25...+105 °C

②	Cable length
CABLE	
003	0.3 m
006	0.6 m
010	1 m
015	1.5 m
020	2 m
050	5 m

Other cable lengths on request!

AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX0434	BCC0AC8	BCC 0000-0000-00-000-PX0434-10X	100 m
EX44T2	BCC0AEE	BCC 0000-0000-00-003-EX44T2-10X	100 m



	BCC W314-W313-W313...		BCC W314-W323-W323...		BCC W414-W313-W313 ...
Connection	M8 male, M8 female, M8 female		M8 male, M8 female, M8 female		M12 male, M8 female, M8 female
Version	straight/straight/straight		straight/angled/angled		straight/straight/straight
Rated voltage	60 V AC/DC		60 V AC/DC		60 V AC/DC
Rated current	4.0 A		4.0 A		4.0 A
Degree of protection	IP67/IP67/IP67		IP67/IP67/IP67		IP67/IP67/IP67
Material cover nut	PTFE coated Brass		PTFE coated Brass		PTFE coated Brass
Material grip	PUR special		PUR special		PUR special
Silicone Black	BCC W314-W313-W313-U2050①-_-_-②		BCC W314-W323-W323-U2050①-_-_-①		BCC W414-W313-W313-U2049①-_-_-②

①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed	Approval / Conformity
CABLE						
U2049	Silicone	Black	3 x 0.34 mm ²	-40...200 °C	-25...200 °C	CE, EAC, WEEE
U2050	Silicone	Black	3 x 0.34 mm ²	-40...200 °C	-25...200 °C	CE, EAC, WEEE

②	Cable length
CABLE	
003	0.3 m
006	0.6 m

Other cable lengths on request!



	BCC W414-W323-W323...		BCC W414-W415-W415...		BCC W414-W425-W425...
Connection	M12 male, M8 female, M8 female		M12 male, M12 female, M12 female		M12 male, M12 female, M12 female
Version	straight/angled/angled		straight/straight/straight		straight/angled/angled
Rated voltage	60 V AC/DC		250 V AC/DC		250 V AC/DC
Rated current	4.0 A		4.0 A		4.0 A
Degree of protection	IP67/IP67/IP67		IP67/IP67/IP67		IP67/IP67/IP67
Material cover nut	PTFE coated Brass		PTFE coated Brass		PTFE coated Brass
Material grip	PUR special		PUR special		PUR special
Silicone Black	BCC W414-W323-W323-U2049①-__②		BCC W414-W415-W415-U2046①-__②		BCC W414-W425-W425-U2046①-__②
FEP (PTFE)	-		BCC W414-W415-W415-U2048①-__②		BCC W414-W425-W425-U2048①-__②
Glass fiber	-		BCC W414-W415-W415-U2045①-__②		BCC W414-W425-W425-U2045①-__②
gray TPE-150°C	-		BCC W414-W415-W415-U2044①-__②		BCC W414-W425-W425-U2044①-__②

①	Material	Color	Number of conductors x conductor cross-section	Cable temperature fixed in place	Cable temperature flexed	Approval / Conformity
CABLE						
U2044	TPE-150°C	Gray	3 x 0.34 mm ²	-50...130 °C	-40...125 °C	EAC, WEEE
U2045	Glass fiber	white	3 x 0.34 mm ²	-60...400 °C	not recommended	EAC, WEEE
U2046	Silicone	Black	3 x 0.34 mm ²	-40...200 °C	-25...200 °C	EAC, WEEE
U2048	FEP (PTFE)	Black	3 x 0.34 mm ²	-100...200 °C	not recommended	EAC, WEEE
U2049	Silicone	Black	3 x 0.34 mm ²	-40...200 °C	-25...200 °C	CE, EAC, WEEE

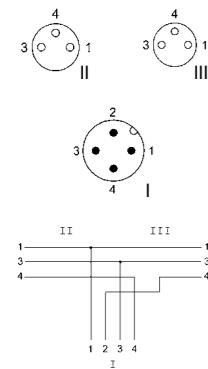
②	Cable length
CABLE	
003	0.3 m
006	0.6 m

Other cable lengths on request!

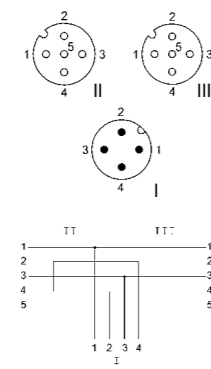


	BCC M414-M313-M313 ...		BCC M414-M323-M323 ...	BCC M414-M415-M415 ...	BCC M414-M425-M425 ...
Connection	M12 male, A-coded/ M8 female, A-coded/ M8 female, A-coded		M12 male, A-coded/ M8 female, A-coded/ M8 female, A-coded	M12 male, A-coded/ M12 female, A-coded/ M12 female, A-coded	M12 male, A-coded/ M12 female, A-coded/ M12 female, A-coded
Version	straight/straight/straight		straight/angled/angled	straight/straight/straight	straight/angled/angled
Rated voltage	60 V AC/DC		60 V AC/DC	250 V AC/DC	250 V AC/DC
Rated current	4 A		4 A	4 A	4 A
Degree of protection	IP67/IP67, IP69K/IP67, IP69K		IP67/IP67, IP69K/IP67, IP69K	IP67/IP67, IP68, IP69K/IP67, IP68, IP69K	IP67/IP67, IP68, IP69K/IP67, IP68, IP69K
PUR, black	BCC M414-M313-M313-U2026-__ _ ②		BCC M414-M323-M323-U2026-__ _ ②	BCC M414-M415-M415-U2028-__ _ ②	BCC M414-M425-M425-U2028-__ _ ②
TPE, yellow	-		-	BCC M414-M415-M415-U2002-__ _ ②	BCC M414-M425-M425-U2002-__ _ ②
Approval/Conformity	CE, EAC		CE, EAC	EAC	EAC

**M12 male/
M8 female/
M8 female**



**M12 male/
M12 female/
M12 female**



Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED				
PUR	Black	3 × 0.34 mm ²	-50...+90 °C	-25...+90 °C
TPE	Yellow	3 × 22 AWG	-50...+90 °C	-25...+105 °C

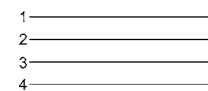
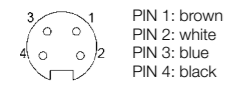
②	Cable length
003	0.3 m
006	0.6 m
010	1 m
020	2 m
050	5 m

Other cable lengths on request!

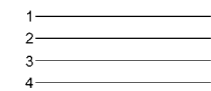
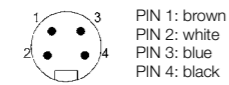


	BCC A314...		BCC A314 ...		BCC A324 ...		BCC A324 ...
Connection	7/8" female		7/8" male		7/8" female		7/8" male
Version	straight		straight		angled		angled
Rated voltage	300 V AC/DC		300 V AC/DC		300 V AC/DC		300 V AC/DC
Rated current	10 A		10 A		10 A		10 A
Degree of protection	IP67, IP68		IP67, IP68		IP67, IP68		IP67, IP68
unshielded	BCC A314-0000-10-003-_____①-____②		BCC A314-0000-20-003-_____①-____②		BCC A324-0000-10-003-_____①-____②		BCC A324-0000-20-003-_____①-____②
Approval/Conformity	CE, UL, EAC		CE, UL, EAC		CE, UL, EAC		CE, UL, EAC

7/8" female



7/8" male



①	Material	Color	Number of conductors × conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX04A5	PUR	Black	4 × 1.5 mm ²	-40...+80 °C	-20...+80 °C
EX44W6	TPE	Yellow	4 × AWG16	-50...+105 °C	-

②	Cable length
CONNECTION CABLE	
020	2 m
050	5 m
100	10 m

Other cable lengths on request!

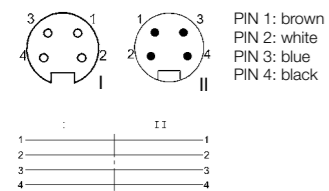
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX04A5	BCC0ACF	BCC 0000-0000-00-000-PX04A5-10X	100 m
EX44W6	BCC0APC	BCC 0000-0000-00-003-EX44W6-10X	100 m



	BCC A314-A314...		BCC A314-A324...	BCC A324-A314 ...	BCC A324-A324 ...
Connection	7/8" female/ 7/8" male		7/8" female/ 7/8" male	7/8" female/ 7/8" male	7/8" female/ 7/8" male
Version	straight/straight		straight/angled	angled/straight	angled/angled
Rated voltage	300 V AC/DC		300 V AC/DC	300 V AC/DC	300 V AC/DC
Rated current	10 A		10 A	10 A	10 A
Degree of protection	IP67, IP68		IP67, IP68	IP67, IP68	IP67, IP68
unshielded	BCC A314-A314-30-304-_____①-___②		BCC A314-A324-30-304-_____①-___②	BCC A324-A314-30-304-_____①-___②	BCC A324-A324-30-304-_____①-___②
Approval/Conformity	CE, UL, EAC		CE, UL, EAC	CE, UL, EAC	CE, UL, EAC

7/8" female/7/8" male



①	Material	Color	Number of conductors x conductor cross-section	Cable temperature fixed in place	Cable temperature flexed
UNSHIELDED					
PX04A5	PUR	Black	4 x 1.5 mm ²	-40...+80 °C	-20...+80 °C
EX44W6	TPE	Yellow	4 x AWG16	-50...+105 °C	-

②	Cable length
CABLE	
006	0.6 m
020	2 m
050	5 m
100	10 m

Other cable lengths on request!

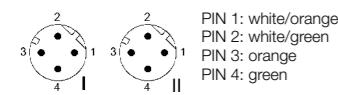
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PX04A5	BCC0ACF	BCC 0000-0000-00-000-PX04A5-10X	100 m
EX44W6	BCC0APC	BCC 0000-0000-00-003-EX44W6-10X	100 m

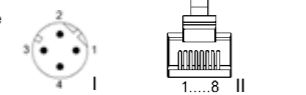


	BCC M414-M414...		BCC M414-M424...		BCC M424-M424...
Connection	M12 male, D-coded/ M12 male, D-coded		M12 male, D-coded/ M12 male, D-coded		M12 male, D-coded/ M12 male, D-coded
Version	straight/straight		straight/angled		angled/angled
Cable Construction	250 V AC/DC		250 V AC/DC		250 V AC/DC
Rated voltage max.	4.0 A		4.0 A		4.0 A
Degree of protection	IP67, IP68, IP69K		IP67, IP68, IP69K		IP67, IP68, IP69K
shielded Profinet	BCC M414-M414-6D-331-PS54N2①-__ _②		BCC M414-M424-6D-331-PS54N2①-__ _②		BCC M424-M424-6D-331-PS54N2①-__ _②
shielded Ethernet, CAT 5E	BCC M414-M414-6D-338-__ _ _ _①-__ _②		BCC M414-M424-6D-338-ES64N9①-__ _②		BCC M424-M424-6D-338-ES64N9①-006
unshielded Ethernet, CAT 5E	BCC M414-M414-6D-366-__ _ _ _①-__ _②		BCC M414-M424-6D-366-EX64N9①-__ _②		BCC M424-M424-6D-366-EX64N9①-003
Approval/Conformity	UL, EAC		UL, EAC		UL, EAC

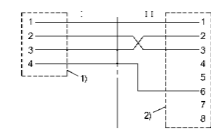
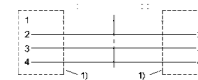
M12 male/M12 male



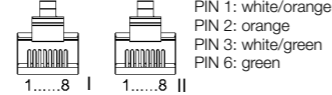
M12 male/RJ45 male



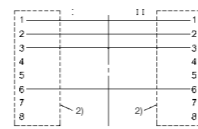
PIN 1: white/orange
PIN 2: white/green
PIN 3: orange
PIN 4: green



RJ45 male/RJ45 male



PIN 1: white/orange
PIN 2: orange
PIN 3: white/green
PIN 6: green



¹⁾ Shield on cover nut
²⁾ Shield on housing

①	Material	Color	Number of conductors x conductor cross-section	Applications	Cable temperature flexed
SHIELDED PROFINET					
PS54N2	PUR	Green	4 x 22 AWG Starquad	Profinet, CAT 5E	-40...80 °C
SHIELDED ETHERNET CAT 5E					
ES34N9	TPE	Orange	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...80 °C
ES24N9	TPE	Red	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...80 °C
ES64N9	TPE	Teal	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...80 °C
ES64N9...-C046	TPE	Royal Blue	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...80 °C
UNSHIELDED ETHERNET CAT 5E					
EX64N9	TPE	Teal	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...105 °C
EX64N9...-C046	TPE	Royal Blue	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...105 °C

②	Cable length
CABLE	
006	0.6 m
010	1 m
020	2 m
050	5 m
100	10 m

*also available typically in lengths of 15 meters to 50 meters in 5 meter steps. Additional lengths available in each series.

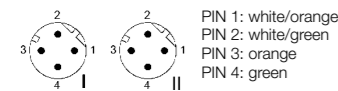
AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PS54N2	BCC0AC6	BCC 0000-0000-00-000-PS54N2-10X	100 m
PS54N2	BCC0H4U	BCC 0000-0000-00-000-PS54N2-20X	200 m
ES24N9	BCC0HTM	BCC 0000-0000-00-168-ES24N9-10X	100 m
ES64N9	BCC0AUJ	BCC 0000-0000-00-168-ES64N9-10X	100 m
EX64N9	BCC0CN3	BCC 0000-0000-00-102-EX64N9-10X	100 m

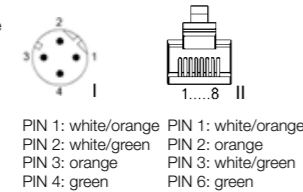


	BCC M414-E834... BCC M414-E894...		BCC M424-E894...	BCC E834-E834... BCC E894-E894...
Connection	"M12 male, D-coded/ RJ45, male"		"M12 male, D-coded/ RJ45, male"	"RJ45, male/ RJ45, male"
Version	straight/straight		angled/straight	straight/straight
Cable Construction	30 V AC / 42 V DC		30 V AC / 42 V DC	30 V AC / 42 V DC
Rated voltage max.	1.0 A		1.0 A	1.0 A
Degree of protection	IP67, IP68, IP69K / IP20		IP67, IP68, IP69K / IP20	IP20 / IP20
shielded Profinet	BCC M414-E834-8G-668-PS54N2①-_-_-②		-	BCC E834-E834-90-334-PS54N2①-_-_-②
shielded Ethernet, CAT 5E	BCC M414-E894-8G-672-_-_-_-①-_-_-②		BCC M424-E894-8G-672-ES64N9①-_-_-②	BCC E894-E894-90-339-_-_-_-①-_-_-②
unshielded Ethernet, CAT 5E	BCC M414-E894-8G-695-_-_-_-①-_-_-②		BCC M424-E894-8G-695-EX64N9①-_-_-②	BCC E894-E894-90-367-EX64N9①-_-_-②
Approval/Conformity	CE, EAC		CE, EAC	CE, EAC

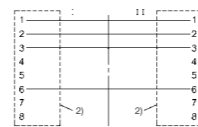
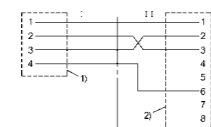
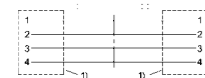
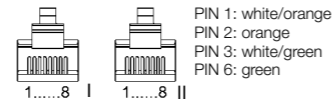
M12 male/M12 male



**M12 male/
RJ45 male**



**RJ45 male/
RJ45 male**



¹⁾ Shield on cover nut
²⁾ Shield on housing

①	Material	Color	Number of conductors x conductor cross-section	Applications	Cable temperature flexed
SHIELDED PROFINET					
PS54N2	PUR	Green	4 x 22 AWG Star- quad	Profinet, CAT 5E	-40...80 °C
SHIELDED ETHERNET CAT 5E					
ES34N9	TPE	Orange	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...80 °C
ES24N9	TPE	Red	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...80 °C
ES64N9	TPE	Teal	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...80 °C
ES64N9...-C046	TPE	Royal Blue	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...80 °C
UNSHIELDED ETHERNET CAT 5E					
EX64N9	TPE	Teal	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...105 °C
EX64N9...-C046	TPE	Royal Blue	2 x 2 24 AWG	EtherNet/IP, CAT 5E	-40...105 °C

②	Cable length
CABLE	
006	0.6 m
010	1 m
020	2 m
050	5 m
100	10 m

*also available typically in lengths of 15 meters to 50 meters in 5 meter steps.
Additional lengths available in each series.

AVAILABLE AS BULK CABLE

	Order code	Part number	Cable length
PS54N2	BCC0AC6	BCC 0000-0000-00-000-PS54N2-10X	100 m
PS54N2	BCC0H4U	BCC 0000-0000-00-000-PS54N2-20X	200 m
ES24N9	BCC0HTM	BCC 0000-0000-00-168-ES24N9-10X	100 m
ES64N9	BCC0AUJ	BCC 0000-0000-00-168-ES64N9-10X	100 m
EX64N9	BCC0CN3	BCC 0000-0000-00-102-EX64N9-10X	100 m



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- 198 Universal brackets
- 200 Proximity sensor mounts with positive stops
- 202 Protective housing
- 204 Protective caps and port covers
- 206 Protective tubes for cables



	BAM0269 BAM MC-XA-027-D08,0-1	BAM0218 BAM MC-XA-027-D12,0-1		BAM0219 BAM MC-XA-027-D18,0-1	BAM01U0 BAM MC-XA-017-D30,0-1	BAM00JY BES Q40-HW-2	BAM00NK BES R01-SH-4-A
Version	Mounting clamp	Mounting clamp		Mounting clamp	Mounting clamp	Mounting block	Mounting bracket
Use	for sensors Ø8 mm, For M8 sensors	for sensors Ø12 mm, For M12 sensors		for sensors Ø18 mm, For M18 sensors	for sensors Ø30 mm, For M30 sensors	for capacitive sensors BCS Q40, for inductive sensors BES Q40, for inductive couplers BIC Q40	for inductive sensors BES R01, for inductive sensors BES
Material	Anodized aluminum	Anodized aluminum		Anodized aluminum	Anodized aluminum	Die-cast zinc	Aluminum
Dimension	12 x 15 x 27 mm	12 x 20 x 32 mm		12 x 26 x 36 mm	15 x 46 x 64 mm	40 x 25 x 40 mm	61.5 x 6 x 38.1 mm
Mounting	Screws, clamps	Screws, clamps		Screws, clamps	Screws, clamps	Screws, clamps	Screw M3



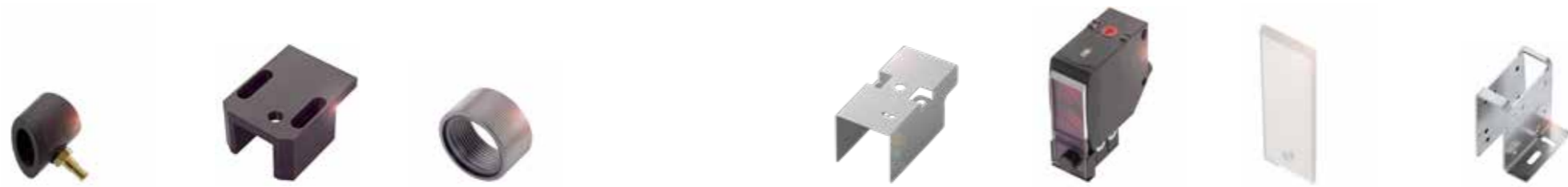
	BAM00NL BES R01-SH-4-B	BAM00A4 BES 08,0-KB-10/W		BAM00C6 BES 12,0-KB-10/W	BAM00F5 BES 18,0-KB-10/W	BAM00HR BES 30,0-KB-10/W	
Version	Mounting bracket	Mounting block		Mounting block	Mounting block	Mounting block	
Use	for inductive sensors BES R01, for inductive sensors BES	for sensors Ø8 mm, For M08 sensors		for sensors Ø12 mm, For M12 sensors	for sensors Ø18 mm, For M12 sensors	for sensors Ø30 mm, For M30 sensors	
Material	Aluminum	Galvanized steel, copper plated		Galvanized steel, copper plated	Galvanized steel, copper plated	Galvanized steel, copper plated	
Dimension	61.5 x 9.5 x 38.1 mm	35 x 12.7 x 28.6 mm		38.1 x 19 x 34.9 mm	38.1 x 25.4 x 38.1 mm	44.5 x 38.1 x 60 mm	
Mounting	Screw M3	Screws, clamps		Screws, clamps	Screws, clamps	Screws, clamps	



	BAM0312 BAM MC-XA-023-D08,0-2-FS/W	BAM00AC BES 08,0-KH-11S/W		BAM0247 BAM MC-XA-023-D12,0-2-FM/W	BAM024E BAM MC-XA-024-D12,0-2-FM/W	BAM024F BAM MC-XA-024-D12,0-2-FXL/W	BAM00CW BES 12,0-KH-11S/W
Use	For M08 sensors, for sensors Ø8 mm, fastening length 28mm and longer	for sensors Ø8 mm, For M08 sensors, fastening length 36mm and longer		for sensors Ø12 mm, For M12 sensors, fastening length 36mm and longer	for sensors Ø12 mm, For M12 sensors, fastening length 40mm and longer	for sensors Ø12 mm, For M12 sensors, fastening length 50mm and longer	for sensors Ø12 mm, For M12 sensors, fastening length 36mm and longer
Material	Brass, PTFE coated	Steel, PTFE coated		Brass, PTFE coated	Brass, PTFE coated	Brass, PTFE coated	Steel, PTFE coated
Dimension	Ø 19.5 x 28 mm	Ø 17 x 33 mm		Ø 23 x 34 mm	Ø 23 x 38 mm	Ø 23 x 48.5 mm	Ø 22 x 37 mm
Mounting	Screws, clamps	Screws, clamps		Screws, clamps	Screws, clamps	Screws, clamps	Screws, clamps
Additional features	Weld immune	Weld immune		Weld immune	Weld immune	Weld immune	Weld immune



	BAM022F BAM MC-XA-023-D18,0-2-FXS/W	BAM00FM BES 18,0-KH-11S/W		BAM024C BAM MC-XA-023-D30,0-2-FXL/W			
Use	for sensors Ø18 mm, For M18 sensors, fastening length 36mm and longer	for sensors Ø18 mm, For M18 sensors, fastening length 36mm and longer		for sensors Ø30 mm, For M30 sensors, fastening length 60mm and longer			
Material	Brass, PTFE coated	Steel, PTFE coated		Brass, PTFE coated			
Dimension	Ø 32 x 30 mm	Ø 30 x 37 mm		Ø 45 x 58 mm			
Mounting	Screws, clamps	Screws, clamps		Screws, clamps			
Additional features	Weld immune	Weld immune		Weld immune			



	BAM00R9 BOS 18-LT-1	BAM00K1 BES Q40-SH-2	BAM01NC BAM PC-X0-005-18M-4		BAM00K0 BES Q40-SH-1	BAM01L8 BAM PC-X0-006-23K-1	BAM01YL BAM PC-X0-006-23K-G/RK	BAM01FM BAM MB-X0-007-B05-4
Short description	air tube / cooling	Protective cover	Protective nut		—	Protective cover for optics	Protective cover for optics	Mounting brackets, 1 adjustable axis
Use	for photoelectric sensors BOS 18K, for photoelectric sensors BOS 18M	for Unicomcompact sensors	for photoelectric sensors BOS 18M		for Unicomcompact sensors	for photoelectric sensors BOS 23K	for protection cover optics BOS 23K	for photoelectric sensors BOS 23K
Material	Aluminum, black anodized	PA 6	Stainless steel Glass		Anodized aluminum	Anodized aluminum Glass	Glass	Stainless steel (1.4301)
Protection sheet material	—	—	—		—	—	—	—
Dimension	Ø 22 x 30 mm	95 x 50 x 72 mm	Ø 22 x 13 mm		41.4 x 38 x 85 mm	22.5 x 59.3 x 34.3 mm	58 x 3 x 19.9 mm	44.3 x 58 x 65 mm
Mounting	Thread M18x1	Screws	Screws		—	Screws	Screws	Screws
Ambient temperature	—	—	—		—	—	—	—
Approval/Conformity	—	—	—		—	—	—	—



	BAM02WW BAM PC-XA-031-M8-3/W	BAM02R5 BAM PC-XE-028-M8-9	BAM009Z BES 08-SM-1		BAM00A0 BES 08-SM-1F	BAM02WY BAM PC-XA-031-M12-3/W	BAM02R6 BAM PC-XE-028-M12-9	BAM00C2 BES 12-SM-2	BAM00C3 BES 12-SM-4
Short description	Protective ring	Protective cap	Protective cap		Protective cap	Protective ring	Protective cap	Protective cap	Sensor cap
Use	for inductive sensors BES M8	For M08 sensors	For M08 sensors		For M08 sensors	for inductive sensors BES M12	For M12 sensors	For M12 sensors	For M12 sensors, for inductive sensors BES M12, for inductive sensors BES
Material	Stainless steel (1.4401), weld spatter resistant	Ceramic	PTFE		PTFE	Stainless steel (1.4401), weld spatter resistant	Ceramic	POM	PTFE
Dimension	Ø 15 x 8 mm	Ø 38 x 20 mm	Ø 10 x 5 mm		Ø 10 x 9 mm	Ø 19.05 x 8 mm	Ø 38 x 20 mm	Ø 16 x 10 mm	Ø 14.7 x 8.9 mm
Mounting	M8x1	M8x1	M8x1		M8x1	M12x1	M12x1	M12x1	M12x1



	BAM02WZ BAM PC-XA-031-M18-3/W	BAM02R7 BAM PC-XE-028-M18-9	BAM00RM BOS 18-SM-2-A		BAM0321 BAM PC-XA-031-M30-3/W	BAM02R8 BAM PC-XE-028-M30-9	BES02YW BES R01ZC-TC		
Short description	Protective ring	Protective cap	Sensor cap		Protective ring	Protective cap	Sensor cap		
Use	for inductive sensors BES M18	for front-flush sensors M18, for inductive sensors BES M18	for photoelectric sensors BOS 18K, for photoelectric sensors BOS 18M		For inductive sensors M30 sensors	for front-flush sensors M30	for inductive sensors BES R		
Material	Stainless steel (1.4401), weld spatter resistant	Ceramic	POM		Stainless steel (1.4401), weld spatter resistant	Ceramic	PTFE		
Dimension	Ø 25 x 8 mm	Ø 38 x 20 mm	Ø 22.2 x 25.4 mm		Ø 37 x 8 mm	Ø 38 x 20 mm	35.9 x 9 x 24.4 mm		
Mounting	M18x1	M18x1	18x1		M30x1.5	M30x1.5	Clamps		



	BAM0183 BKS-PW-26/20-SI-TR-03,5	BAM0182 BKS-PW-51/30-SI-TR-11	BAM021E BAM PT-XA-005-260-T-R20		BAM021F BAM PT-XA-005-510-T-R20				
Short description	Silicone vulcanising wrap	Silicone vulcanising wrap	Silicone strip		Silicone strip				
Use	for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection		for cable guard, for weld protection				
Material	Silicone 60 white, translucent	Silicone 60 white, translucent	Silicone 60 white, translucent		Silicone 60 white, translucent				
Dimension	1.6 x 26 x 3658 mm	1.6 x 51 x 10970 mm	1.6 x 26 x 20000 mm		1.6 x 51 x 20000 mm				
Ambient temperature	-65...260 °C	-65...260 °C	-40...180 °C		-40...180 °C				

* Contains silicone



	BAM02E1 BAM PT-XA-006-M91-T-00,3	BAM02E3 BAM PT-XA-006-M91-T-00,9	BAM02E9 BAM PT-XA-006-M91-T-04,8		BAM02EA BAM PT-XA-006-M91-T-06	BAM02ET BAM PT-XA-006-M91-T-10			
Short description	Silicone sheet	Silicone sheet	Silicone sheet		Silicone sheet	Silicone sheet			
Use	for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection		for cable guard, for weld protection	for cable guard, for weld protection			
Material	Silicone	Silicone	Silicone		Silicone	Silicone			
Dimension	1.6 x 914 x 304 mm	1.6 x 914 x 914 mm	1.6 x 914 x 4877 mm		1.6 x 914 x 6096 mm	1.6 x 914 x 10000 mm			
Ambient temperature	-65...233 °C	-65...233 °C	-65...233 °C		-65...233 °C	-65...233 °C			



	BAM022Z BAM PT-XA-002-100-2-R15	BAM0230 BAM PT-XA-002-130-2-R15	BAM01R2 BAM PT-XA-002-127-2-30		BAM0231 BAM PT-XA-002-190-2-R15	BAM01UY BAM PT-XA-002-190-2-30	BAM0232 BAM PT-XA-002-380-2-R15	BAM0233 BAM PT-XA-002-500-2-R15	
Short description	Silicone-fiberglass tube	Silicone-fiberglass tube	Silicone-fiberglass tube		Silicone-fiberglass tube	Silicone-fiberglass tube	Silicone-fiberglass tube	Silicone-fiberglass tube	
Use	for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection		for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection	
Material	Glass fiber jacketed Silicone rubber, red	Glass fiber jacketed Silicone rubber, red	Glass fiber jacketed Silicone rubber, red		Glass fiber jacketed Silicone rubber, red	Glass fiber jacketed Silicone rubber, red	Glass fiber jacketed Silicone rubber, red	Glass fiber jacketed Silicone rubber, red	
Dimension	Ø 17 x 15000 mm	Ø 20 x 15000 mm	Ø 20.7 x 30480 mm		Ø 26 x 15000 mm	Ø 27.1 x 30480 mm	Ø 45 x 15000 mm	Ø 57 x 15000 mm	
Inside Diameter	10.0 mm	12.7 mm	13.0 mm		19.0 mm	19.1 mm	38.0 mm	50.0 mm	
Ambient temperature	-40...250 °C	-40...250 °C	-55...260 °C		-40...250 °C	-55...260 °C	-40...250 °C	-40...250 °C	



	BAM0181 BKS-PT-8/16-SI-15	BAM017K BKS-PT-11/16-SI-15	BAM017E BKS-PT-07/16-SI-15		BAM0212 BAM PT-XA-004-070-T-R16	BAM017H BKS-PT-10/16-SI-15	BAM0213 BAM PT-XA-004-100-T-R16	BAM017L BKS-PT-13/16-SI-15	
Short description	Silicone tube	Silicone tube	Silicone tube		Silicone tube	Silicone tube	Silicone tube	Silicone tube	
Use	for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection		for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection	
Material	Silicone 60 white, translucent	Silicone 60 white, translucent	Silicone 60 white, translucent		Silicone 60 white, translucent	Silicone 60 white, translucent	Silicone 60 white, translucent	Silicone 60 white, translucent	
Dimension	Ø 11.2 x 15000 mm	Ø 14.2 x 15000 mm	Ø 10.2 x 15000 mm		Ø 10.2 x 16000 mm	Ø 13.2 x 15000 mm	Ø 13.2 x 16000 mm	Ø 16.2 x 15000 mm	
Inside Diameter	8.0 mm	11.0 mm	7.0 mm		7.0 mm	10.0 mm	10.0 mm	13.0 mm	
Ambient temperature	-60...260 °C	-60...260 °C	-60...260 °C		-40...200 °C	-60...260 °C	-40...200 °C	-60...260 °C	



	BAM0214 BAM PT-XA-004-130-T-R16	BAM017N BKS-PT-16/16-SI-15	BAM0215 BAM PT-XA-004-160-T-R16		BAM0216 BAM PT-XA-004-190-T-R16	BAM017R BKS-PT-19/16-SI-15	BAM017U BKS-PT-38/16-SI-07.5	BAM017Z BKS-PT-50/16-SI-07.5	BAM0217 BAM PT-XA-004-500-T-R16
Short description	Silicone tube	Silicone tube	Silicone tube		Silicone tube	Silicone tube	Silicone tube	Silicone tube	Silicone tube
Use	for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection		for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection	for cable guard, for weld protection
Material	Silicone 60 white, translucent	Silicone 60 white, translucent	Silicone 60 white, translucent		Silicone 60 white, translucent	Silicone 60 white, translucent	Silicone 60 white, translucent	Silicone 60 white, translucent	Silicone 60 white, translucent
Dimension	Ø 16.2 x 16000 mm	Ø 19.2 x 15000 mm	Ø 19.2 x 16000 mm		Ø 21.2 x 16000 mm	Ø 22.2 x 15000 mm	Ø 41.2 x 7500 mm	Ø 53.2 x 7500 mm	Ø 53.2 x 16000 mm
Inside Diameter	13.0 mm	16.0 mm	16.0 mm		19.0 mm	19.0 mm	38.0 mm	50.0 mm	50.0 mm
Ambient temperature	-40...200 °C	-60...260 °C	-40...200 °C		-40...200 °C	-60...260 °C	-60...260 °C	-60...260 °C	-40...200 °C

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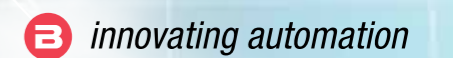
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A man in a light blue shirt is looking out a window at an industrial facility at dusk. The facility features a prominent red and white tower and several buildings with lights. The scene is reflected in the water. A hand-drawn diagram with red dots and white lines is overlaid on the image, connecting the man's hand to the industrial facility.

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