BALLUFF

innovating automation

FAST, RELIABLE AND COST-EFFECTIVE PRODUCTION OF ELECTRONIC PRODUCTS

Electronics industry

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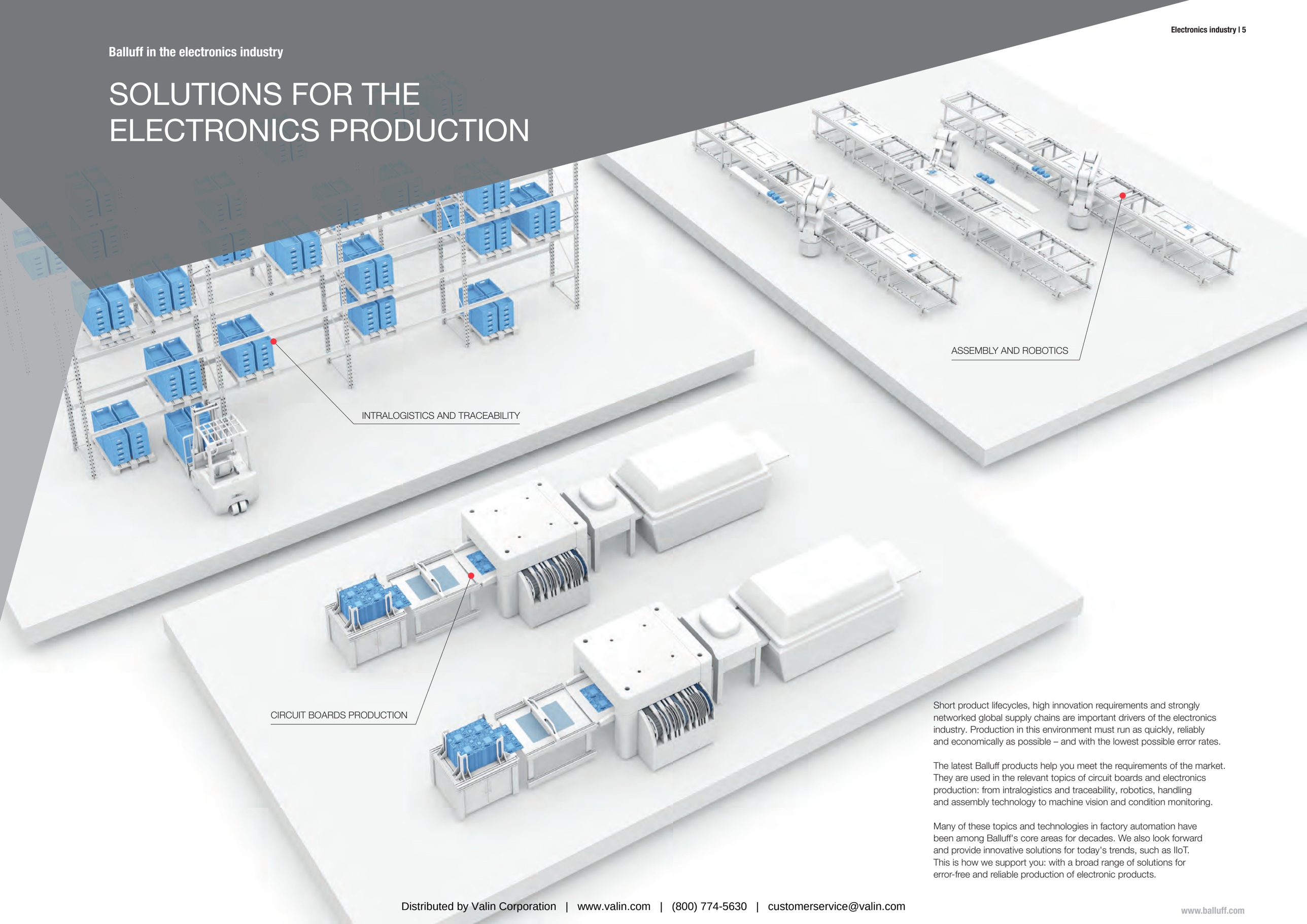
Electronics industry

WE ARE AT HOME IN MANY SECTORS

Balluff in the electronics industry

SOLUTIONS FOR THE ELECTRONICS PRODUCTION



Short product lifecycles, high innovation requirements and strongly networked global supply chains are important drivers of the electronics industry. Production in this environment must run as quickly, reliably and economically as possible – and with the lowest possible error rates.

The latest Balluff products help you meet the requirements of the market. They are used in the relevant topics of circuit boards and electronics production: from intralogistics and traceability, robotics, handling and assembly technology to machine vision and condition monitoring.

Many of these topics and technologies in factory automation have been among Balluff's core areas for decades. We also look forward and provide innovative solutions for today's trends, such as IIoT. This is how we support you: with a broad range of solutions for error-free and reliable production of electronic products.

CONTENTS

Intralogistics and traceability

HIGH SPEED, HIGH TRANSPARENCY – HIGH QUALITY.

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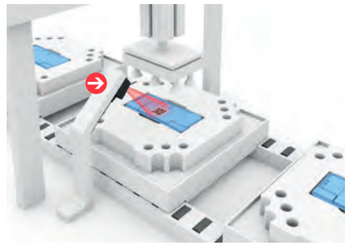
Continuously managing inventory and material movements while reliably avoiding errors is a challenge for companies in almost all industries.

Automated processes allow you to store even large quantities – in a shorter time and with greater precision. Smart sensors and networked systems as part of the Industrial Internet of Things (IIoT) ensure efficient logistics processes. They collect data and prepare them in real time, thus providing the basis for autonomous and controlled processes.

Therefore, dynamic shuttle systems and storage and retrieval units are increasingly replacing manual storage work. They ensure efficient supply with the required goods, provide continuous operation with reliable components and guarantee high throughput. And: Thanks to innovative identification solutions with software-controlled control options, they are not only highly precise, but they also enable traceability in your production – a key factor for greater efficiency.

Solutions for intralogistics and traceability

From raw material procurement and production through to consumption and disposal: In addition to reliable solutions for intralogistics, Balluff offers extremely precise identification solutions for production that is as transparent as possible. With our support, you can optimize your processes, reduce errors, increase efficiency, maintain legal requirements and meet the requirements of manufacturers and buyers.



IDENTIFYING DATA MATRIX CODES ON ELECTRONIC COMPONENTS
BVS coder reader

In the assembly process, all components and assemblies can be uniquely identified by means of attaching 2D codes and tracking them. Using Balluff code readers, you can read even the smallest data matrix codes, e.g. on battery cells or circuit boards – even when the component is in motion.

Features

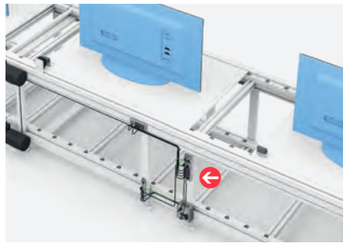
- Simple and self-explanatory operation
- Safe reading of multiple codes at the same time
- Simple connection to PLC via RS232 and Ethernet interface
- Compact design
- Different lenses available
- available with integrated red or infrared light

PARTS TRACKING IN PRODUCTION AND ASSEMBLY
BIS industrial RFID systems

Track the circulation stock of your automatic assembly system with our RFID system. Our flexible BIS V processor unit processes large data volumes with high-speed write/read heads in a very short time. Because they are up to 8-times faster than the worldwide standard ISO 15693, their cycle times are reduced and the yield is increased. For quality assurance purposes, the system also records the entire production process and saves all data.

Features

- Unsurpassed storage capacity of up to 128 kB
- All data available in real time
- RFID and sensors can be combined via integrated IO-Link master



MOVE GOODS ENERGY-EFFICIENTLY
BNI network blocks

Whoever wants to master the complexity of intralogistics processes with confidence is increasingly relying on decentralized concepts. For example, our IO-Link network blocks with 4 A output current can be used to control up to four drives and, thus, operate both conveyor belt motors and electric stoppers on your roller conveyors – precisely when they are needed. This reduces the load on the control system, pre-processes information efficiently, increases productivity, and reduces energy consumption.

Features

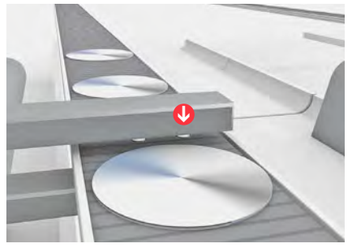
- Robust design
- Quick installation and simple integration
- Separate control of the drives
- Integrated web server for configuring and displaying module information
- Easy module replacement thanks to innovative address plug

MONITOR DRIVERLESS TRANSPORT SYSTEMS (AGV)
BIS industrial RFID systems

RFID systems from Balluff are ideally suited for reliably monitoring driverless transport systems and supporting a smooth flow of goods. For example, they ensure that the AGV drives to the correct storage box and delivers or picks up the correct load there. All information is transferred to the AGV via the data carriers and read out with the read/write head, which is mounted directly in the box.

Features

- Reading and writing of information between AGV and storage box
- Quick commissioning at the push of a button with auto set-up
- Clear visualization of the operating status thanks to function and status LEDs visible all round



RECOGNIZING PRESENCE OF DATA STORAGE DISKS
BES inductive sensors

Simple tracking solutions can be implemented without major effort. Here, the simple querying of binary and measuring sensors is suitable. Because each of these sensors is connected to the controller, all data is automatically flowing there for further processing. We recommend our inductive mini-sensors especially for presence monitoring in the electronics industry, for example for data disk detection in hard disk production.

Features

- Particularly small, space-saving design
- Fully integrated electronics: no external amplifiers required
- Smallest inductive sensors on the market (3 mm, 4 mm and 5 mm, housing length 6 mm)
- Contactless and wear free

SIMULTANEOUSLY USE ALL RFID TECHNOLOGIES
BIS industrial RFID systems

Our robust BIS V processor unit stands for fast data transmission, short cycle times and high data security in all applications. It enables mixed operation of the RFID technologies LF, HF and UHF, so that one type of processor unit is sufficient for all your tasks. For industry-independent use, our high-performer is also available with all common bus systems worldwide.

Features

- Mixed operation of LF, HF and UHF possible
- Four independently parameterizable ports for simultaneous operation of up to four read/write heads
- Integrated IO-Link master port for connecting IO-Link-capable sensors/actuators or sensor hub with up to 16 sensors
- Perfect electromagnetic compatibility
- Rationalized network structure, as sensor data can be bundled in any network technology

MOBILE INDEPENDENT IDENTIFICATION
BVS HS handheld code reader

Optical identification via 1D and 2D barcodes is a proven method of identifying components and objects and controlling systems and processes flawlessly. The robust handheld code readers with IP65 protection from Balluff are predestined for use in industry, where they combine maximum reading performance with high user-friendliness: They quickly and reliably read all common barcodes, e.g. on plastic labels, printed circuit boards or metal parts – and even survive multiple drops onto concrete from a height of up to two meters.

Features

- Reliable reading confirmation via acoustic signal as well as via two green LEDs and projection of a green LED spot onto the read code
- Intuitive targeting system thanks to clearly visible laser marking frame
- Long charge once: reads up to 30,000 times with lithium-ion batteries
- Low weight and ergonomic shape for less work fatigue

ERROR-FREE CONTROL OF MATERIAL FLOW
BIS industrial RFID systems

In warehouses or storage areas with high throughput, many material entries are made with the aim of always knowing exactly which stocks are leaving the warehouse and which items are arriving. Ideally, the recording should be automated. Our stationary RFID gate is the optimal solution for this: it records objects up to a distance of six meters fully automatically and in batches, which saves time and minimizes error rates. For maximum usability, you can also integrate the Balluff SmartLight signal light directly and keep an eye on what is happening at all times without any additional effort.

Features

- Automatic, time-optimized and correct recording of goods movements
- Increased accuracy of inventory figures through synchronization of digital and real goods inventory
- Error minimization, as mistyping or forgetting is ruled out
- SmartLight for process visualization can be integrated

Assembly and robotics

OPTIMIZED DATA FLOW AND PROCESS CONTROL

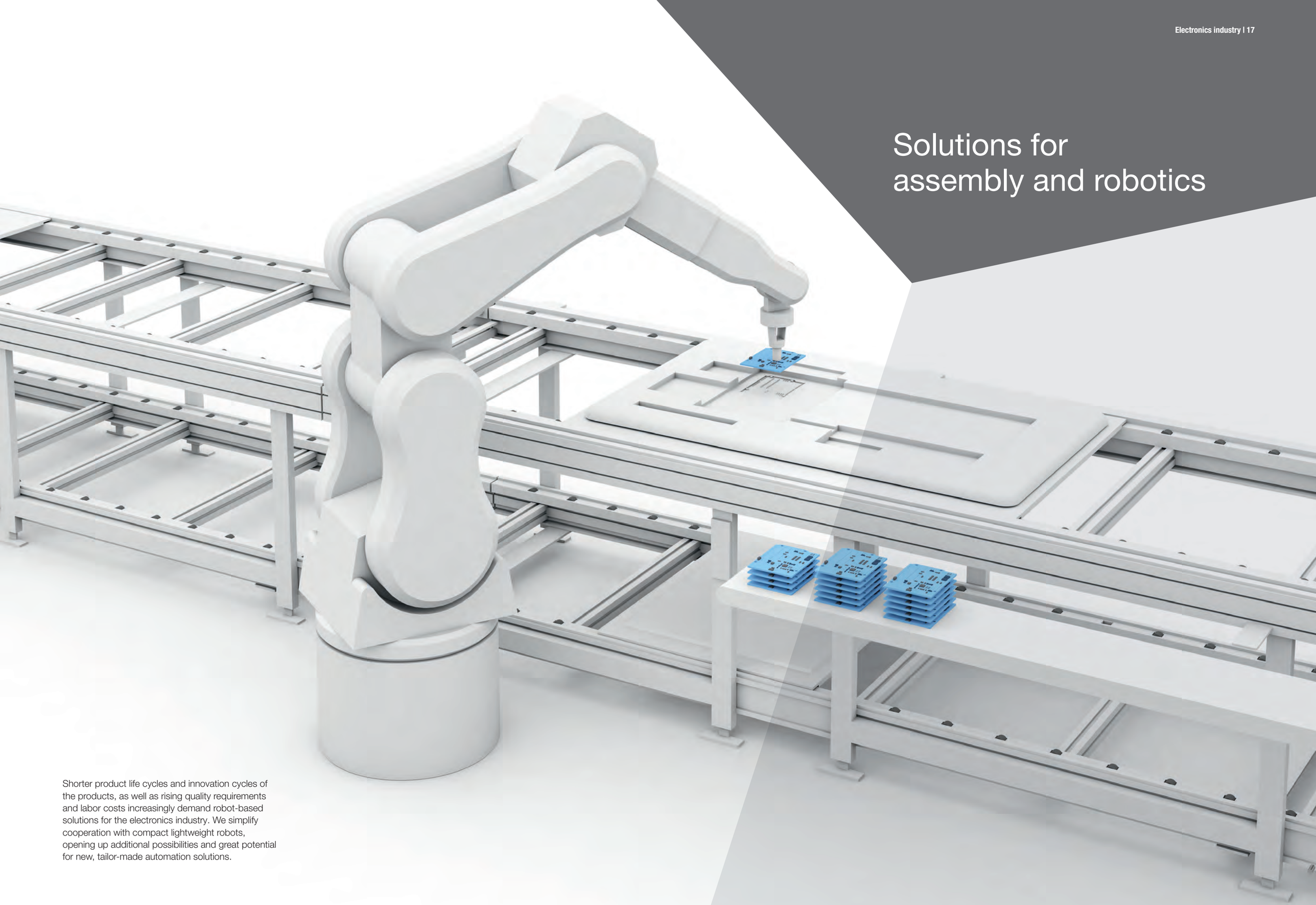
innovating automation

Whether you bundle signals, record and track data from your assembly process, or display operating states to ensure the quality of your assembly, Balluff helps you to perform all these tasks effortlessly.

Our network blocks, for example, are designed for a decentralized system architecture outside the cabinet and as data compressors reduce the number of network nodes to an absolute minimum. With IO-Link, you use an established standard in automation for integrating a wide variety of devices. Furthermore, you are also ideally equipped for IIoT and the factory of the future.

In the innovative field of robotics, we help you to maximize efficiency and ensure high product quality with solutions that replace complex cabling, enable fast mold changes and facilitate interaction between man and machine.

Solutions for assembly and robotics



Shorter product life cycles and innovation cycles of the products, as well as rising quality requirements and labor costs increasingly demand robot-based solutions for the electronics industry. We simplify cooperation with compact lightweight robots, opening up additional possibilities and great potential for new, tailor-made automation solutions.

TRANSPORT DATA OVER ALL LEVELS
BNI network blocks for Ethernet/IP*

Ever faster, more flexible, more efficient, and more adaptable production requires seamless communication from the sensor to the Internet. As a result, the volume of data within manufacturing processes is growing. Here, components are needed that make this information available – and an infrastructure that transports it across all levels. This is exactly what our network modules are ideally suited for.

Features

- 4 A output current on some ports for simultaneous operation of conveyor belt motor and electric stoppers
- Fast installation and simple integration
- Integrated web server for configuration and display of module information
- Easy module exchange through innovative address plug
- Clear display

*other Ethernet interfaces on request

VISUALIZE PRODUCTION PROCESSES FLEXIBLY
BNI SmartLight

If you want to flexibly visualize the production process directly on the production line, our LED signal lamp SmartLight is the perfect solution. It can be used to display progressions and trends so you can continuously check different stages. It can be adjusted during operation without the need for mechanical conversion. Thanks to this flexibility, you can optimize cycle times and know at an early stage whether there are bottlenecks or maintenance tasks.

Features

- Colors and zones can be individually parameterized in terms of number, size and color definition
- Mode change (chaser, segment and level mode) possible during operation
- Easy connection and quick installation with three-core sensor cable
- Available in three sizes, also with acoustic signaling function

RS232 INTERFACES SIMPLY INTEGRATED
BAE signal converters

Contrary to common assumptions, serial RS232 communication is still used in many industrial applications. A typical example is the use of handheld code readers. However, integrating RS232 interfaces into the existing control architecture involves effort, which prevents many from switching to IO-Link. With signal converters from Balluff, RS232 devices can be easily connected to a port – and subsequently benefit from all the advantages of the modern communication standard.

Features

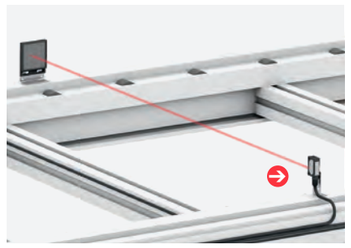
- For bidirectional communication between RS232 and IO-Link
- High-quality and robust IP67 stainless steel housing
- Two digital inputs
- Simple diagnostic options through status LEDs

TRANSPORT SIGNALS EFFICIENTLY
BNI IO-Link sensor/actuator hubs

IO-Link sensor/actuator hubs from Balluff with their robust housings are ideally suited for use in harsh industrial environments. The I/O modules connect binary and analog sensors and actuators to the control level. The use of the modules significantly reduces the number of cables. They are based on M12 or M8 connectors and are easy and economical to install and maintain. The port-specific individual channel monitoring detects short circuits and overloads as well as cable breaks at the port – a degree of selective diagnostics that is unique for I/O modules.

Features

- Easy, cost-saving installation and maintenance
- Continuous diagnostic option
- Individual solutions possible due to different designs and connection technologies



RELIABLE DETECTION AND CONTROL OF OBJECTS
BOS photoelectric sensors

Photoelectric sensors reliably detect the presence of objects. They check shape, color, distance, or thickness just as reliably and precisely. Compared to proximity switches with inductive or capacitive technology, they offer a significantly higher detection range. For maximum flexibility, Balluff offers sensors with different types of light, from red light to infrared to laser, and in a wide variety of designs.

Features

- Reliable inspection of shape, color, distance, thickness, and much more
- Wide range of light types for many applications
- Very large detection distances and high accuracy
- Can be used for almost any material, including glass, metal, plastic, wood, liquids

PROVIDE POWER SUPPLY IN DEMANDING APPLICATIONS
BAE Heartbeat® power supplies with IO-Link interface

Balluff Heartbeat® power supplies with IO-Link interface have been specially developed for critical applications with high demands on quality, durability and diagnostic capability. There, they ensure a reliable and efficient power supply for sensors, actuators, controllers and HMIs. To ensure that they do this in the long term, alarm, stress level and lifetime are output via the digital outputs. You can call up detailed diagnostic and status information via IO-Link. This enables you to perform predictive maintenance and condition-based servicing of your power supply.

Features

- Further processing of the information in the higher-level control and diagnostic system via IO-Link
- IO-Link communication and power supply galvanically isolated
- LEDs for information on the load situation, device wear level, and remaining lifetime of the power supply

DIGITALIZE KANBAN SYSTEM
BIS industrial RFID systems

Our solutions for e-Kanban systems automate the flow of materials and enable efficient, demand-oriented material supply on the production line. By using RFID (UHF), kanban cards become superfluous and the manual scanning of barcodes is eliminated. This also eliminates operating errors during material supply, as RFID enables continuous communication between the merchandise management system and the company logistics.

Features

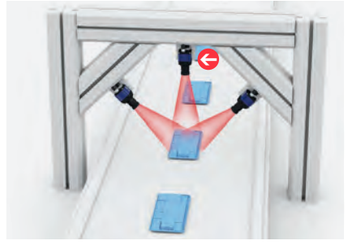
- Easy configuration via web server using drag-and-drop
- Automated recording instead of manual scanning
- Error detection in the event of incorrect feeding and visualization

PAPERLESS PICKING
BNI SmartLight indicators

The SmartLight light from Balluff means the end for endless picking lists: The SmartLight Indicator mounted on the picking tray simply shows you in color which item is to be picked. This helps avoid picking errors and ensures process quality. The LED signal towers can also display the fill level of the storage compartment and other information.

Features

- Various applications with six independent, extremely bright, multicolor LED segments
- IIoT-capable thanks to IO-Link
- Time-of-flight (runtime method): diffuse detects hand movements



CHECK ASSEMBLY RESULT
BVS industrial cameras

Balluff industrial cameras permit the best results in quality assurance. In the electronics production area, for example, it is possible to check whether all the components of a device have been correctly mounted. You can also read bar and data matrix codes with which each part can be identified. Furthermore, the cameras are easy to integrate into conveyor systems where they enable 100 % inline control of parts and assemblies.

Features

- Enables fast and reliable inspection of parts and assemblies
- User-friendly user interface
- Standardized data interfaces

BUNDLE SIGNALS IN AUTOMATION AND ROBOTICS
BNI network blocks

For robot-based automation tasks, we enable you to use a simple and economical network topology: IO-Link sensor hubs collect the sensor signals in the gripper and pass them on to the controller. If you connect the hubs to a single 16-way IO-Link network module, it can bundle and forward the signals from up to 272 sensors. This reduces the amount of wiring required, cuts weight and lowers your costs.

Features

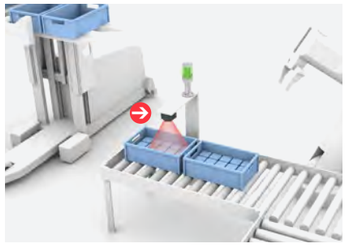
- Simple installation with three-core standard cables
- Centralized parameterization of the IO-Link devices via the controller
- Continuous diagnostics
- Significant savings in time and money
- High system availability

ENERGY AND DATA TRANSMITTED TO CHANGE GRIPPER WITHOUT CONTACT
BIC inductive couplers

Inductive couplers from Balluff are the right choice for automating gripper changes. They transmit signals and energy contactlessly via an air gap, eliminating the need for mechanical contacting of (dirt-)sensitive connectors. The signal transmission is not even disturbed by paraffin-containing release agents. Thanks to these properties of our couplers, your robot is continuously given a 360-degree range of motion.

Features

- Easy installation via plug-and-play
- Maintenance-free transmission without mechanical wear
- Short set-up times thanks to automated gripper changes
- Increased function queries even in previously inaccessible places
- Easy network connection with IO-Link



QUALITY IN COMMISSIONING PROCESSES VIA VISUAL INSPECTION
BVS industrial cameras

Our portfolio for industrial image processing opens up almost unlimited possibilities for visual inspection in commissioning processes – whether for checking the position, size, alignment and distance of objects or for completeness checks, data tracing and quality checks.

Features

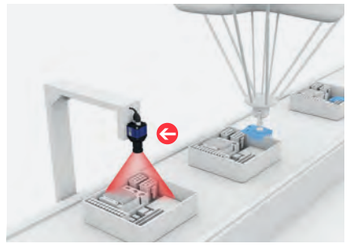
- Software, image processing and manuals available
- Diagnostic functionflexible interfaces
- Easy access via web browser, operating software and user management
- Flexible data exchange

PRECISE ROBOT CONTROL IN
PICK AND PLACE APPLICATIONS
BVS industrial cameras

Our industrial cameras give your robots a sense of sight. This facilitates easier part handling, more precise positioning of the robot arm, targeted gripping of parts, and more precise position control. The familiar use of your robot, thus, becomes safer as it also results in completely new possible application fields.

Features

- Robust design for high accelerations with high resolutions and image repeat rates
- Permit three-dimensional object entry for items like bulk material and two-dimensional for items like screws, trays and displays
- Basis for secure robot guidance

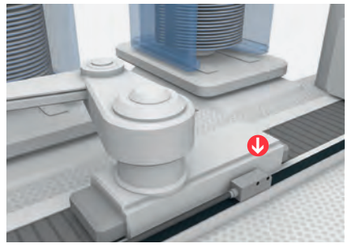


ROBOT CONTROL FOR
PERFORMANCE CRITICAL PARTS
BVS industrial cameras

When installing mobile devices, robots must be controlled particularly precisely in the case of performance-critical parts such as batteries, cameras or microphones during final assembly. Industrial image processing enables high accuracy during object acquisition and fault-free installation of device modules.

Features

- Robust design for high accelerations with high resolutions and image repeat rates
- Enables two-dimensional object acquisition and thus highly-precise robot control system
- Fast movements thanks to short layers



RECORD ROBOT POSITION
BML magnetic encoder systems

With our high-precision magnetically-coded position measuring systems, you can always monitor the movement of your robot units reliably and precisely. Because the magnetic tape can be individually shortened, you can use the system flexibly and adapted to your individual application.

Features

- Continuous monitoring of the robot position
- Contactless, eliminating friction or splitting
- Flexible use of 48 m magnetic tape

MONITOR ROTATION OF ROBOT
BML magnetic encoder systems

Our magnetically-coded angle measuring systems are ideal for absolutely precise positioning of the grippers of the robot. They check the rotary movements of the robot hinges that transport the gripper, move it into its end position and finally deposit the component.

Features

- Easily integrated, small sensor head
- Perfect for robotics thanks to low weight
- Large distance between sensor and ring: simple installation and high operating reliability

RECORD AND OPTIMALLY
MANAGE TOOL DATA WITH RFID
Connected Mold-ID

The automatic documentation of mold usage via RFID enables optimal utilization and high availability of your injection molds. A separate shot counter records all production cycles for this purpose and the system provides you with all data on a data carrier directly on the mold or on the multi-coupler. With the associated software, you can now take your mold management to the next level: In the browser application, you always have an overview of your mold inventory, all mold details, the entire usage history in the machine park, and the maintenance status.

Features

- End-to-end process monitoring and planning reliability
- Mobile readout of data with RFID handheld
- High data security optimal mold changes through visualization of the inspection intervals (on the system and in the software)

MONITOR THE CONDITION OF
THE PRODUCTION LINE WITH IO-LINK
Software

With IO-Link devices from Balluff, you realize continuous condition monitoring in your production line, avoid downtimes, perform predictive maintenance and increase overall equipment effectiveness (OEE). All relevant information is available to you always, everywhere and directly – visualized by the colored LED display directly on the device or on dashboards for further analysis. In combination with our powerful network technology and cloud computing, smart manufacturing and the IIoT become reality.

Features

- Data on the production status available always and everywhere
- Visualization via LEDs directly on the device or on dashboards
- Display in the form of graphs, diagrams or reports possible
- Basis for analysis and predictive maintenance

Circuit boards production

PRECISION AND EFFICIENCY FOR THE CORE OF ELECTRONICS.

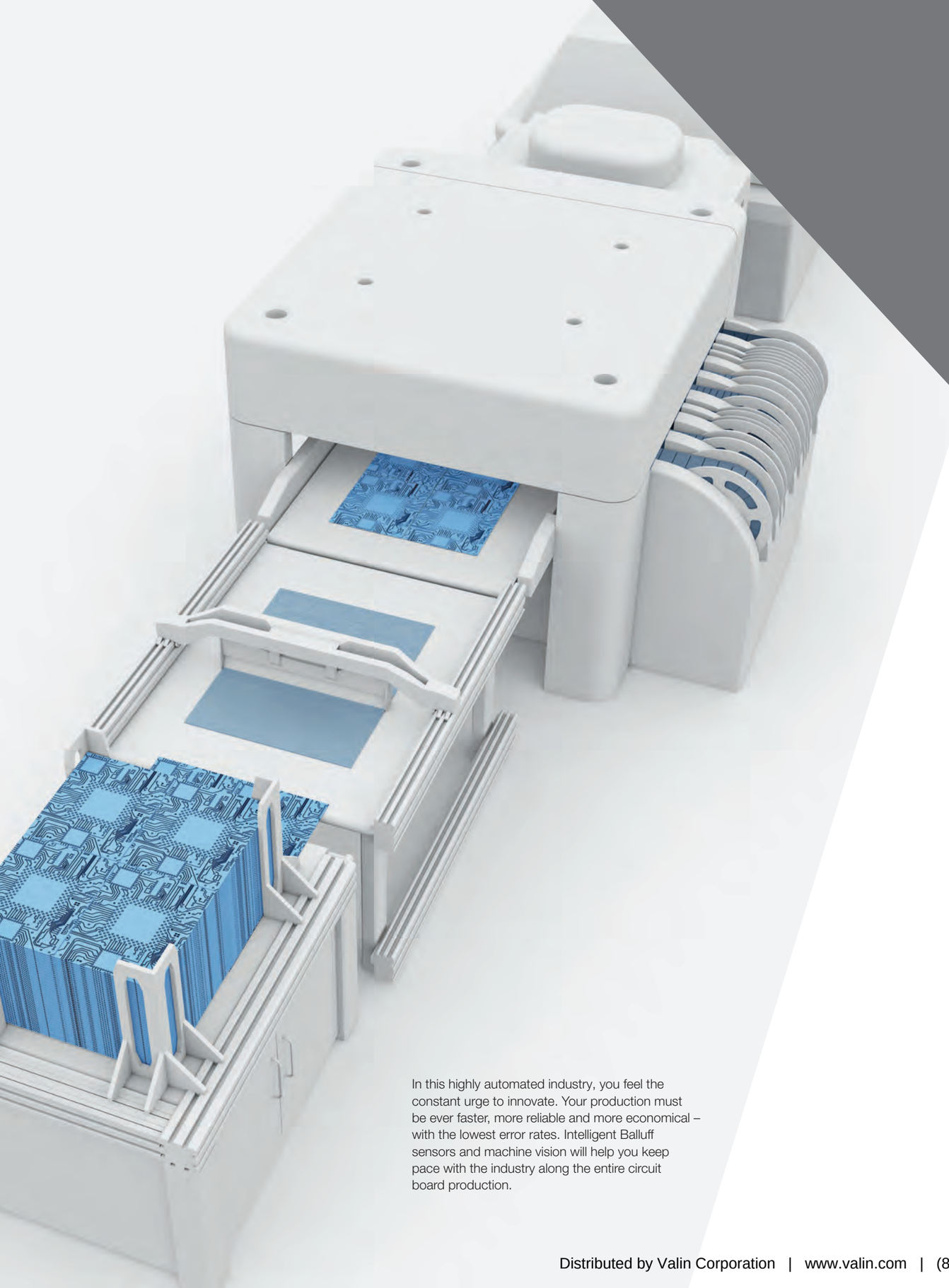
innovating automation

From smartphone, laptops and TVs to vacuum cleaners, today, there is hardly any terminal device that can still be used without electronics and isn't equipped with printed circuit boards. These must be treated with great care as a core element during production. Our industrial cameras provide you with reliable quality inspections to maintain the performance of your production over the long term.

The short product life cycles in the industry require particularly adaptable production lines. Our intelligent sensors, with additional functions, such as diagnostic capability, make a decisive contribution to increasing efficiency and flexibility.

The ongoing miniaturization also plays an increasingly important role in the electronics industry. High performance and integration density in confined spaces is a must – even for printed circuit boards. This requires extremely precise sensors and camera systems in your production line. Both are found at Balluff to meet the requirements of the market.

Solutions for printed circuit board manufacturing



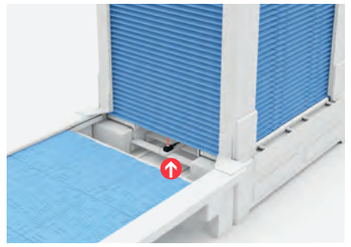
In this highly automated industry, you feel the constant urge to innovate. Your production must be ever faster, more reliable and more economical – with the lowest error rates. Intelligent Balluff sensors and machine vision will help you keep pace with the industry along the entire circuit board production.

IDENTIFY COMPONENT ROLLERS
BVS-HS handheld code reader

For smooth processes on SMT placement machines, it is essential that component rolls are always reliably detected. Optical identification of 1D and 2D barcodes has proven successful here. Our robust hand-held code readers with protection class IP65 read all common codes quickly and reliably, and can even handle multiple falls onto concrete from a height of up to two meters.

Features

- Intuitive target system with clearly visible laser marking frame
- Read confirmation by an acoustic signal, as well as via two green LEDs and projection of a green LED spot on the read code
- Charge and read up to 30,000 times with lithium ion batteries
- Installation-free operation thanks to low weight and ergonomic shape

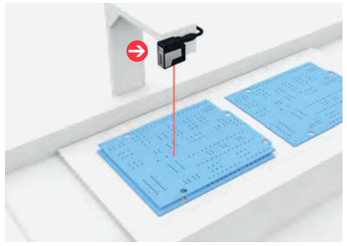


CHECK PRESENCE OF PRINTED CIRCUIT BOARDS IN THE MAGAZINE
BUS ultrasonic sensors

Our ultrasonic sensors reliably detect the circuit boards in the buffer magazine. Here, they cannot be influenced by objects above the boards or on different-colored surfaces or mirror electronic components. This allows you to ensure that adequate boards are always available in the magazine and prevent unscheduled shutdowns. Alternatively, this task can also be solved using our photoelectric sensors.

Features

- Absolutely reliable, even in case of external influences such as mirroring components
- Fast assembly, flexible use

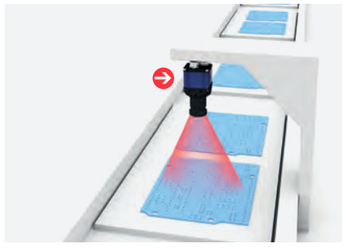


DETECT DOUBLE LAYERS OF PRINTED CIRCUIT BOARDS
BOD photoelectric distance sensors

Errors in the handling system can cause circuit boards to land incorrectly on the conveyor belt – one above the other in the worst case. Unrecognised this can lead to cost-intensive consequential faults. Our photoelectronic distance sensors are the solution here: It measures the distance from the sensor to the cirquit board and warn at a double position via the switching output.

Features

- High-precision, stable measurements
- Simple and intuitive operation
- Long service life thanks to robust housing
- Mini variant for confined installation conditions



INSPECT EMPTY CIRCUIT BOARDS
BVS industrial cameras

Our user-friendly industrial cameras ensure reliable quality control. Delivering sharp images which can be flexibly adapted to your application, the cameras can be used to reliably check the empty circuit board as well as contours and bores ensuring the correct blank has been inserted. You can also discover any damage at an early stage by using Balluff's cameras.

Features

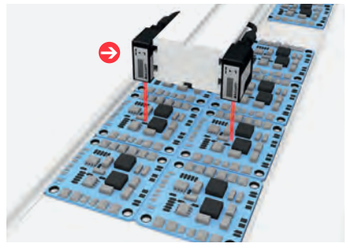
- Standardized data interfaces
- Convenient programming interface
- Fast image recording and transmission

INSPECT SOLDER PASTE
BVS industrial cameras

Solder paste printing errors are the most common cause of defects that are only detected after reflow soldering. Balluff industrial cameras enable a quick and precise inspection of the smallest solder paste structures to prevent this. You achieve high print qualities and save the cost of rework.

Features

- Simple and fast integration thanks to comprehensive, standardised programming interface
- High resolution and short layering: Basis for precise 3D measuring systems
- High stability without image losses for reliable quality control



CHECK THE HEIGHT OF COMPONENTS OR SUBSTRATES
BOD photoelectric distance sensors

Minimizing soldering defects is always a goal in circcuit board manufacturing. Precise height control of critical components helps you achieve this. This is exactly where our distance sensors score: they resolve down to the µm range, e.g. to detect missing parts or to measure the substrate application.

Features

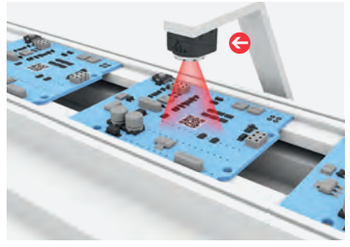
- High resolution and precise measurement in close-range
- High flexibility thanks to extensive parameterization options
- Simplified commissioning thanks to IO-Link interface
- Integrated IO-Link diagnostic functions for preventive measures

INSPECT AND TRACE CIRCUIT BOARDS
BVS industrial cameras and code reader

In the printed circuit board industry, there are a wide variety of inspection tasks in addition to identification tasks. Our Vision Solutions can do both: While our code readers clearly identify products at any time and thus enable the traceability of all production steps, our industrial cameras quickly transmit razor-sharp images for reliable quality control.

Features

- User-friendly interface
- Easy to set-up and operate
- Fast image rate
- High resolutions
- Efficient color management

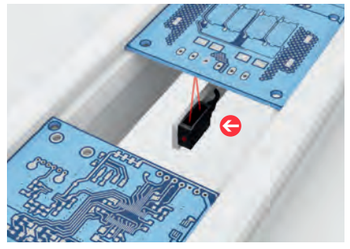


IDENTIFY CIRCUIT BOARDS
BVS code reader

Our code readers clearly identify the circuit board – whether by 1D or 2D codes, and even with low-contrast codes or bright surfaces. Position deviations also do not matter. Thanks to its compact housing, the reader can be used in machines with confined installation space.

Features

- Suitable for confined installation situations
- Reliable code reading for quality control



DETECTING PRINTED CIRCUIT BOARD EDGES
BOS photoelectric sensors

Photoelectric mini sensors from Balluff are ideal for precise object recognition in many applications. Even under difficult installation conditions, the sensors can be used flexibly and always master their tasks reliably, e.g. the detection of printed circuit boards or their edges on the conveyor belt or in the PCB magazine.

Features

- Suitable for confined installation situations
- Flexible use

Step by step into the digital world

IIOT CAPABLE WITH IO-LINK

innovating automation

Balluff accompanies you step by step into the digital world. Today, we already offer you a wide range of solutions that contribute to simpler and ever faster processes, increase the efficiency of your materials management and support you in remaining competitive.

Thus, with our intelligent solutions, we are competently at your side to reliably manage the growing volume of data. Consistent communication via IO-Link is the key to this. IO-Link ensures transparency and enables a powerful infrastructure to network processes. The digital communication standard thus makes your internal enterprise resource planning IIoT-capable. Find out below how easy it is to use IO-Link.

Modular control concepts

WHY IO-LINK IS IN THE PASSING LANE.

innovating automation

From parallel wiring to the fieldbus protocol

Replacing parallel wiring with the use of fieldbuses was an enormous step. The fieldbus protocol has successfully eliminated the immense installation effort associated with copper cables and substantially reduced the costs. It is not just that the fieldbus reduces the working time because a bus cable replaces numerous parallel strands of wire. Because fewer conductors are needed, material and space are also conserved. Simultaneously, the bus cable connects the components of different levels. Now you can construct a system without a control cabinet.

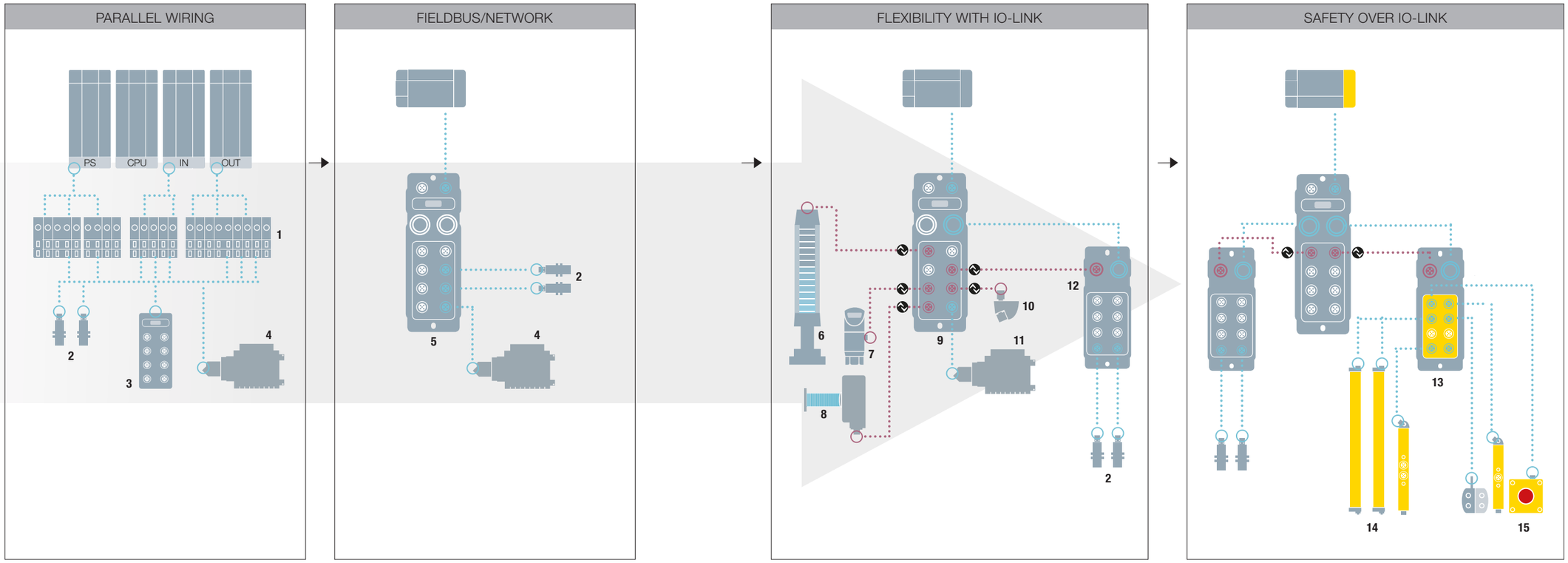
Pitfalls of the fieldbus protocol

However, even fieldbus cables are not without problems, although their protocol is no longer electrical and the cabling expense goes down by orders of magnitude. Fieldbus cables have a low signal level and are noise-susceptible. Additionally, they don't like to be bent and because of the shield they are expensive.

Universal, simple and flexible: IO-Link!

The weaknesses of the fieldbus protocol are no longer an issue thanks to IO-Link. The unshielded, three- or four-conductor standard industrial cables are highly flexible and suitable for many bending cycles. They are easy to connect, highly economical, and are standardized with M5, M8 or M12 connectors. Therefore, with IO-Link you can rely on an established standard for connecting the widest possible variety of devices. IO-Link ensures extremely flexible control concepts. This versatility, simplicity and performance capability mean IO-Link can be considered a universal interface – like USB – in automation.

But with IO-Link the flexibility is even greater. With Safety over IO-Link Balluff offers you the first safety solution to be integrated with IO-Link for combining safety and automation technology in one system. Safety over IO-Link provides both sensor/actuator details as well as safety information, so that you can benefit from the best of both worlds with our safety concept.



1 Terminal strip
2 Sensors
3 Junction blocks
4 Valve interfaces
5 Fieldbus module
6 IO-Link SmartLight
7 IO-Link pressure sensor
8 Industrial RFID system
9 IO-Link master
10 IO-Link analog converter
11 IO-Link valve interfaces
12 IO-Link sensor hubs
13 IO-Link safety hubs
14 Opto-electronic protective devices
15 Emergency stop device

More efficiency, lower costs

IO-LINK SAVES TIME AND MONEY

innovating automation

Easy to install

To install this universal interface all you need is an IO-Link master and an industry standard three- or four-wire standard cable. You can then quickly integrated this intelligent communication standard into the fieldbus world and easily incorporate even complex devices. One special feature: the digital communication ensures noise immunity even without the use of expensive shielded cabling. Analog signals are digitized with no conversion losses.

Highest machine availability

IO-Link enables quick, error-free sensor replacement and prompt commissioning. You can significantly reduce downtimes since the parameters of a replaced IO-Link sensor are automatically written from the IO-Link master to the new sensor. Commissioning processes, format changes and recipe changes are handled centrally via the controller's function modules. This saves time and minimizes the potential for mistakes. Another advantage to you: IO-Link devices cannot be mixed up, since they are automatically identifiable via IO-Link.

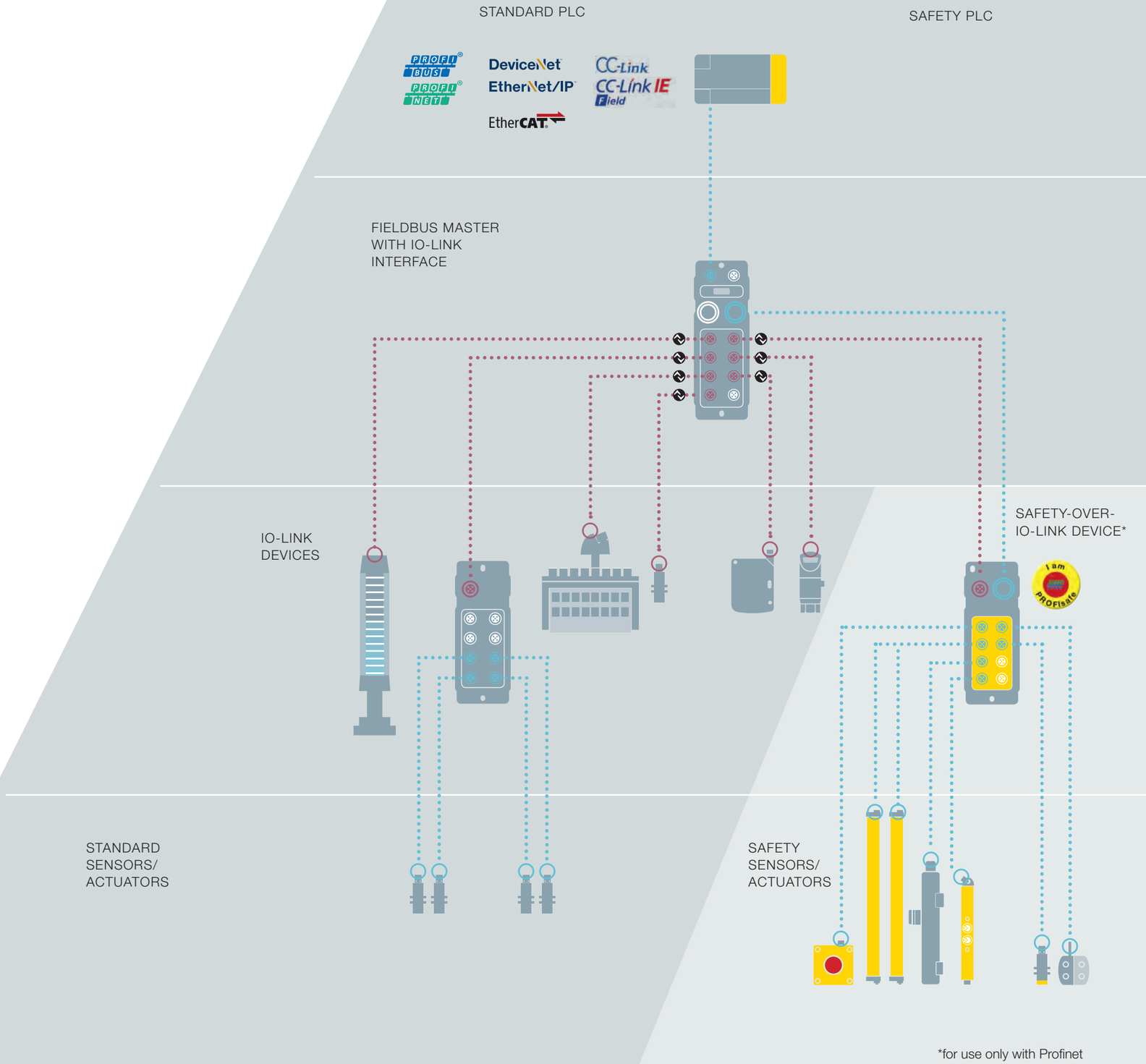
Requirements-based maintenance

Continuous diagnostic data for the entire process extends your service intervals, since automatic readjustment via IO-Link means you need to maintain equipment and machines much less often. Now, even predictive error detection is possible because complete process parameters are consistently displayed in the controller.

More efficient operation

With IO-Link you can position sensors in the machine just as the process requires, since accessibility of the sensors is no longer a factor. Process monitoring, configuration and error analysis of the IO-Link devices now takes place in the controller. This optimizes process time considerably. Signal delays and distortions are also reliably eliminated because digital transmission of data also ensures high signal quality.

A wide range of application requirements can be easily met with IO-Link. Because you can use both binary and analog standard devices at the same time along with IO-Link sensors/actuators.



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INNOVATIVE SOLUTIONS FOR ALL REQUIREMENTS

PRODUCT OVERVIEW

innovating automation

Application	Products	Example	Functions, interfaces and features
INTRALOGISTICS AND TRACEABILITY			
Identifying data matrix codes on electronic components	BVS coder reader	BVS0001	Ethernet-based base T, RS232 (9.6...115.2 kBaud), LED red light, CMOS image sensor black-white, range 50...1000 mm, M12 connector, 8-pin, A-coded, housing 51.5 × 70 × 40 mm
Parts tracking in production and assembly	BIS industrial RFID systems HF (13.56 MHz)	BIS0186	Universal processor unit, Ethernet TCP/IP, USB, for high-memory and high-speed data carrier
		BIS0133	Read/write head, 40 × 15 × 105 mm, round antenna, DIN ISO 15693 (high memory), 0...70 °C
		BIS0045	Data carrier, Ø 30 × 2.8 mm, read/write 2000 bytes, 25...85 °C, installation: metal-free (free zone)
Move goods enegy-efficiently	BNI network blocks	BNI005H	Profinet I/O, 16 × digital inputs, PNP type 3, 16 × digital outputs PNP, 8 × IO-Link
Monitor driverless transport systems (AGV)	BIS industrial RFID systems UHF (860...960 MHz)	BIS013U	Processor unit, 172 × 48 × 62 mm, IP65, 4 × RFID ports, IO-Link master port, working temperature max. +60 °C, zinc die-casting, various fieldbus variants
		BIS0174	Data carrier, 25 × 12.85 × 110 mm, memory type EEPROM, ambient temperature –40...85 °C
		BIS015Z	Read/write head, 130 × 50.5 × 130 mm, ambient temperature –20...55 °C
Recognizing presence of data storage disks	BES inductive sensors	BES0548	Inductive sensor, M5 × 0.5, Ø 5 × 27 mm, flush installation, reach 1.5 mm, 5000 Hz, stainless steel housing, –25...70 °C
Simultaneously use all RFID technologies	BIS industrial RFID systems	BIS V…*	BIS-V processor unit for HF/LF/UHF, various fieldbus variants available
Mobile independent identification	BVS HS handheld code reader	BVS001Y	Handheld code reader for all common 2D, 1D and stacked codes, data transmission via Bluetooth 2.0, LED white light lighting, industrial-grade housing
Error-free control of material flow	BIS industrial RFID systems UHF (860...960 MHz)	BIS0193	Processor unit, Linux controller, Ethernet TCP/IP, OPC UA, 4 antenna ports, IO-Link master port, integrated Secure element
		BIS01AW	Write/read head, 300 × 49 × 300 mm, available for Europe, patchant, IP67, different frequency ranges for other regions of the world
		BIS0167, BIS0168, BIS0169, BIS00NL	Label, various versions
		BIS016H, BIS0174, BIS0173	Data carrier, various versions

Application	Products	Example	Functions, interfaces and features
ASSEMBLY AND ROBOTICS			
Transport data over all levels	BNI network blocks for Ethernet/IP	BNI00H7	8 × ports, IO-Link 1.1, max. 16/16 digital inputs/outputs, configurable, IP67, zinc die-casting, 4 A output current possible
Visualize production processes flexibly	BNI SmartLight	BNI0072	5 segments, without signal tone, PC, operating temperature –5...+50 °C, IP65, IO-Link 1.1, different designs available
RS232 interfaces simply integrated	BAE signal converters	BNI00C1	RS232 converter, IO-Link 1.1, 18...30.2 V DC, Ø 18 × 118 mm, connection 1: M12 plug, 4-pole, connection 2: M12 socket, 8-pin, –5...+55 °C, 4 × PNP, IP67, stainless steel
Transport signals efficiently	BNI IO-Link sensor/actuator hubs	BNI00CP	8 × ports, IO-Link 1.1, max. 16/16 digital inputs/outputs, configurable, M12 connection, power supply IN 7/8" connection, IP67, zinc die-casting, 68 × 32.4 × 181.5 mm, –5...+55 °C, extension port (Port 7)
		BNI007Z	8 × ports, IO-Link 1.1, max. 16/16 digital inputs/outputs, M12 connection, IP67, plastic, 50 × 30.8 × 115 mm, –5...+55 °C
		BNI0093	8 × ports, IO-Link 1.1, max. 8/8 digital inputs/outputs, M8 connection, IP67, zinc die-casting, 30 × 32.5 × 132 mm, –5...+70 °C
		BNI00AU	16 × ports, IO-Link 1.1, max. 16/16 digital inputs/outputs, M8 connection, IP67, zinc die-casting, 30 × 32.8 × 220 mm, –5...+70 °C, extension port (Port 15)
Reliable detection and control of objects	BOS photoelectric sensors	BOS012E	Retroreflective, 10.8 × 43.5 × 19.5 mm, PNP NO, LED red light, range 0…4 m, M8 connector, 10…30 V DC
		BAM00WL	Relfector, 54 × 61 × 8 mm
	BFS color sensor	BFS000M	Color sensor, diffuse sensor, 21 × 50.3 × 58 mm, IO-Link 1.1, 2 × NO contact, M8 connector
	BLA light band	BLA0003	Collimated light band, width 54 mm, CCD technology, 100 × 27 × 93 mm, IO-Link 1.1, laser red light, M12 connector, 18...30 V DC
Provide power supply in demanding applications	BAE Heartbeat® power supplies with IO-Link interface	BAE PS-XA…*	IO-Link, IP20 or IP67, cap rail mounting or flange mounting, input 100…240 V AC, output 24 V DC, 3.8 A, 5 A, 8 A, 10 A, 20 A, output 91,2 W, 192 W, 480 W, 720 W
Digitalize kanban system	BIS industrial RFID systems HF (13.56 MHz)	BIS0186	Universal processor unit, Ethernet TCP/IP, USB, for high-memory and high-speed data carrier
		BIS0130	Read/write head, high memory, 80 × 40 × 84.5 mm, round antenna
		BIS0046	Data carrier, FRAM, 2000 bytes
Paperless picking	BNI SmartLight indicators	BNI00E0	Six segments (yellow, green, blue, red, orange, configurable), running light mode, level mode, segment mode, colour circle mode
Check assembly result	BVS industrial cameras	BVS CA …*	Industrial camera, GigE vision/USB 3.0 interface, resolutions up to 31.5 MP, net data rates of up to 1245 MB/s
Bundle signals in automation and robotics	BNI network blocks	BNI0077	EtherCAT, 8 × M12 ports, 8 × IO-Link, 16 × inputs/outputs PNP, configurable, IP67, other fieldbus variants available
Energy and data transmitted to change gripper without contact	BIC inductive couplers	BIC0070, BIC0071	40 × 40 mm, bidirectional design, working range 1...5 mm, IO-Link

* Please contact our sales department to configure your product.

You can find more products on our website at: **www.balluff.de/go/product-finder**

Application	Products	Example	Functions, interfaces and features
Quality in commissioning processes via visual inspection	BVS industrial cameras	BVS CA …*	Industrial camera, GigE vision/USB-3.0 interface, resolutions up to 31.5 MP, net data rates of up to 1245 MB/s
Precise robot control in pick and place applications	BVS industrial cameras	BVS CA …*	Industrial camera, GigE vision/USB-3.0 interface, resolutions up to 31.5 MP, net data rates of up to 1245 MB/s
Robot control for performance critical parts	BVS industrial cameras	BVS CA …*	Industrial camera, GigE vision/USB-3.0 interface, resolutions up to 31.5 MP, net data rates of up to 1245 MB/s
Record robot position	BML magnetic encoder systems	BML05WT	16 × 18.5 × 80.3 mm, interface SSI/Analog Sin/Cos (1 Vpp), resolution ≤ 1 µm, up to 8 m
		BML-M02/03-A55-AX-M...-E*	Suitable measuring tape up to 48 m
Monitor rotation of robot	BML magnetic encoder systems	BML07PY	12 × 13.1 × 35 mm, digital A/B interface (RS422), resolution 1 µm, for rotative applications
		BML002K	Suitable measuring ring, pole number 228, pole width 1 mm, without reference mark, housing material hart ferrite
Record and optimally manage tool data with RFID	Connected Mold-ID	BAI CMI-…*	Management software for managing the Mold-ID data, licenses for managing 10, 100, 250, 500, 1000 molds
Monitor the condition of the production line with IO-Link	Software		Further information for your IIoT solutions can be found at: www.balluff.de/go/**architects-of-smart-manufacturing**

CIRCUIT BOARDS PRODUCTION

Application	Products	Example	Functions, interfaces and features
Identify component rollers	BVS-HS handheld code reader	BVS0021	Handheld code reader for all common 2D, 1D and stacked codes, data transmission via Bluetooth 3.0, LED white light lighting, industrial-grade housing
Check presence of printed circuit boards in the magazine	BUS ultrasonic sensors	BUS0059	Ultrasonic sensor, block-style, 20.1 × 42.5 × 18 mm, PNP NO/NC, range 120...1000 mm, M8 connector, 4-pole, –25....70 °C
		BOS01KW	Light sensor, 12 × 41.5 × 21.6 mm, PNP NO/NC, LED red light, range 1...200 mm, light spot 5 × 5 mm
Detect double layers of printed circuit boards	BOD photoelectric distance sensors	BOD002N	Distance sensor, block-style, 50 × 21 × 50 mm, laser red light, IO-Link 1.1, analogue, voltage 0…10 V/current 4…20 mA, 2 × PNP/NPN NO/NC, range 50…650 mm, resolution < 100 µm
Inspect empty circuit boards	BVS industrial cameras	BVS CA …*	Industrial camera, GigE vision/USB-3.0 interface, resolutions up to 31.5 MP, net data rates of up to 1245 MB/s
Inspect solder paste	BVS industrial cameras	BVS CA …*	Industrial camera, GigE vision/USB-3.0 interface, resolutions up to 31.5 MP, n et data rates of up to 1245 MB/s
Check the height of components or substrates	BOD photoelectric distance sensors	BOD002M	Distance sensor, block-style, 50 × 21 × 50 mm, laser red light, IO-Link 1.1, analogue, voltage 0…10V/ current 4…20 mA, 2 × PNP/NPN NO/NC, range 50...100 mm, resolution < 10 µm

Application	Products	Example	Functions, interfaces and features
Inspect and trace circuit boards	BVS industrial cameras	BVS CA …*	Industrial camera, GigE vision/USB-3.0 interface, resolutions up to 31.5 MP, net data rates of up to 1245 MB/s
	BVS code reader	BVS0001	Ethernet-based base T, RS232 (9.6...115.2 kBaud), LED red light, CMOS image sensor black-white, reach 50...1000 mm, M12 connector, 8-pin, A-coded, housing 51.5 × 70 × 40 mm
Identify circuit boards	BVS code reader	BVS001R	RS232 (5.6...115,2 kBaud), 3 × PNP NO, LED red light, CMOS image sensor black-white, reach 50...1000 mm, view field 34 × 25 to 676 × 507 mm, M12 connector, 8-pin, A-coded, housing 51.5 × 70 × 40 mm
Detecting printed circuit board edges	BOS photoelectric sensors	BOS01KW	Diffuse sensor, 12 × 41.5 × 21.6 mm, PNP NO/NC, LED red light, reach 1...200 mm, 5 × 5 mm light spot

* Please contact our sales department to configure your product.

You can find more products on our website at: **www.balluff.de/go/product-finder**

#B_IIoT

SEIZE THE OPPORTUNITIES OF THE INDUSTRIAL INTERNET OF THINGS WITH BALLUFF

The future of automation is digital and networked. As your automation partner, Balluff accompanies you step by step on the path to the smart factory. And we keep you competitive. Build on our expertise and experience, so we can master the Industrial Internet of Things (IIoT) together.

For higher productivity, more efficiency and transparent manufacturing

When it comes to generating and transporting data we have many years of experience with outstanding success. It is on this basis that Balluff provides you with a constantly growing portfolio of smart devices. Through the use of software we add value for your production environment. And in conjunction with our individual services, you get holistic automation solutions – all with the goal of technological advancement.

Utilize the potential of the Industrial Internet of Things – together with Balluff

Our portfolio ranges from the IIoT-capable hardware and middleware, to software and systems solutions, to a custom tailored total IIoT package. By using standardized interfaces and protocols we ensure that you can run our solutions in your existing IIoT infrastructure and on common platforms. We make use of the communication standard IO-Link because IO-Link is ideally suited for IIoT.

All this makes Balluff an enabler and systems provider for the Industrial Internet of Things.

Questions? Our experts are eager and ready to assist you.

Balluff

OPENING UP NEW PERSPECTIVES

Balluff is a leading provider of high-value sensor, identification and image processing solutions including networking technology and software for any automation requirement. Family owned for more than 100 years, Balluff currently employs around 3600 persons in 38 subsidiaries with sales, production and development facilities around the world to ensure your success. Together with our representatives we guarantee the highest quality standards in 68 countries so that you always get the best.

We perform top services for innovative solutions that increase your competitive ability. We deliver a consistent digital focus, manufacturing expertise, and high personal dedication.

We adhere to our motto "Innovating Automation" as pacesetters of automation, refiners and new developers, and technological trailblazers. In open exchange with associations, universities and research institutes, as well as in close contact with our customers, we create new industrial sector solutions for automation.
As a future-looking company we keep our eye not only on the traditional areas of automation, but also devote ourselves to the development of holistic applications for an increasingly digital and networked world.

We have the future firmly in view in everything we do. With a sophisticated environmental management system, we protect the environment and handle our resources with care. This also creates for you the best prerequisites for sustained action.

You can always rely on us, our products and our adherence to delivery dates and schedule – all in the name of mutually beneficial partnership.

Acknowledgement:
Title, page 6 and page 31: **Gorodenkoff/Adobe Stock**
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