BALLUFF

sensors worldwide

Products + News

Best Quality for Efficient Automation
+++ Systems and Service +++ Industrial Networking and Connectivity
+++ Industrial Identification +++ Object Detection
+++ Linear Position Sensing and Measurement +++ Fluid Sensors
+++ Accessories

Products + News
**Top quality for efficient automation**

Balluff North America

Florence, Kentucky USA

Balluff's Florence, Kentucky United States headquarters is located just south of Cincinnati, Ohio. Our customers are in industries such as automotive, machine tool, robotics, injection molding, packaging, material handling, and more.

In addition to sales, marketing, and logistic functions, this facility manufactures Micropulse® magnetostrictive linear position sensors and warehouses over 60,000 products.

Local Premier Distributor Support
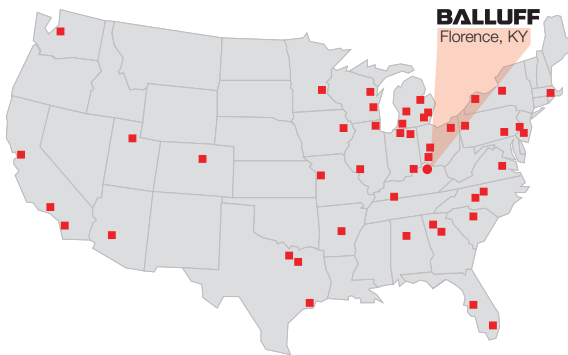
Our premier distributor network can quickly assist with applications and order fulfillment.

For a distributor in your area, visit www.balluff.us

Service

- 24 hour on-call service.
- Complete in-house technical support.
- Comprehensive product selection, cross reference, and application assistance.
- Fast, friendly experienced service – guaranteed!
- Same day shipping – in by 2:00 p.m. EST, out the same day!

Visit us online.
www.balluff.com

E-mail us.
Technical.Support@balluff.com

Give us a call.
1-800-543-8390

⚠ WARNING

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

Balluff, Inc. · www.balluff.com · 1-800-543-8390

Product Highlights
An overview

Services

Services
Customized. According to your specifications. In the best quality.
on page 10

Our Training Philosophy
Investing in people for future success
on page 12

Industrial Identification

Industrial RFID System BIS M
Data carriers read/write
on page 58

Industrial RFID System BIS U
The right data at the right time at the right place
on page 60

4 | **BALLUFF**

NEW

Industrial Networking and Connectivity

Object Detection
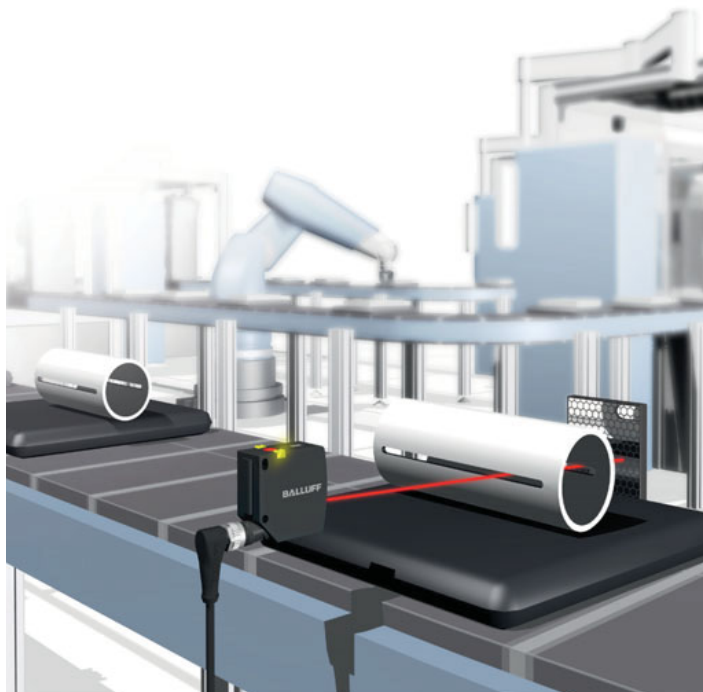
Accessories
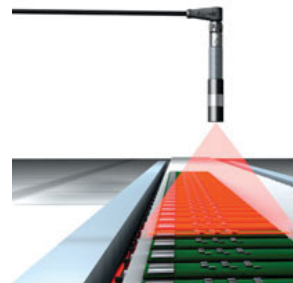
Linear Position Sensing

BML-S1F Magnetic Incremental Linear and Rotary Measurement System
2mm pole spacing for increased tape-to-sensor gap tolerance
on page 88

BML-S1H Magnetic Absolute Linear Measurement System
Compact system for short stroke lengths
on page 92

BML-S1G Magnetic Absolute Linear Measurement System
Resolution to 1 µm, stroke lengths to 48 meters
on page 94
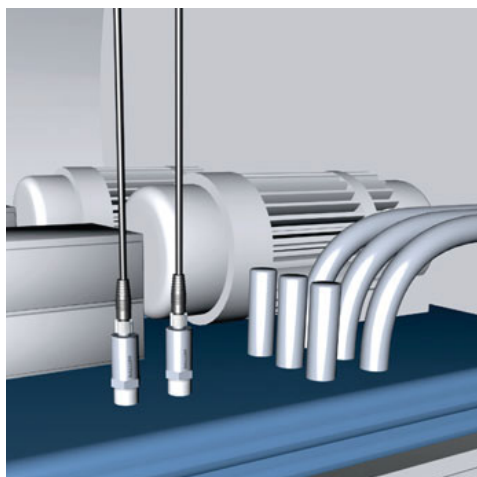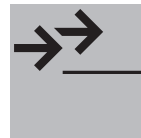
Pressure Transmitter BSP
For a wide variety of applications
in factory automation
on page 106

Fluid Sensors

Conception and planning
Product and application advice
Customized solutions
Targeted training

Services

The right solution

Shorter production cycles

Eliminate errors

STOP

Dramatic ROI
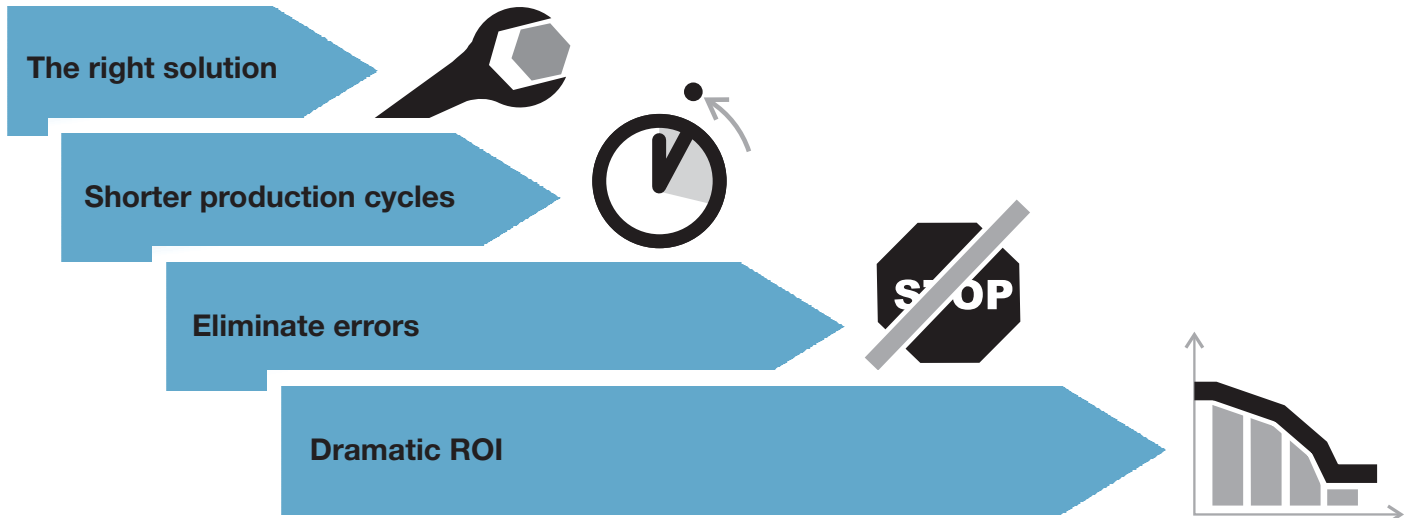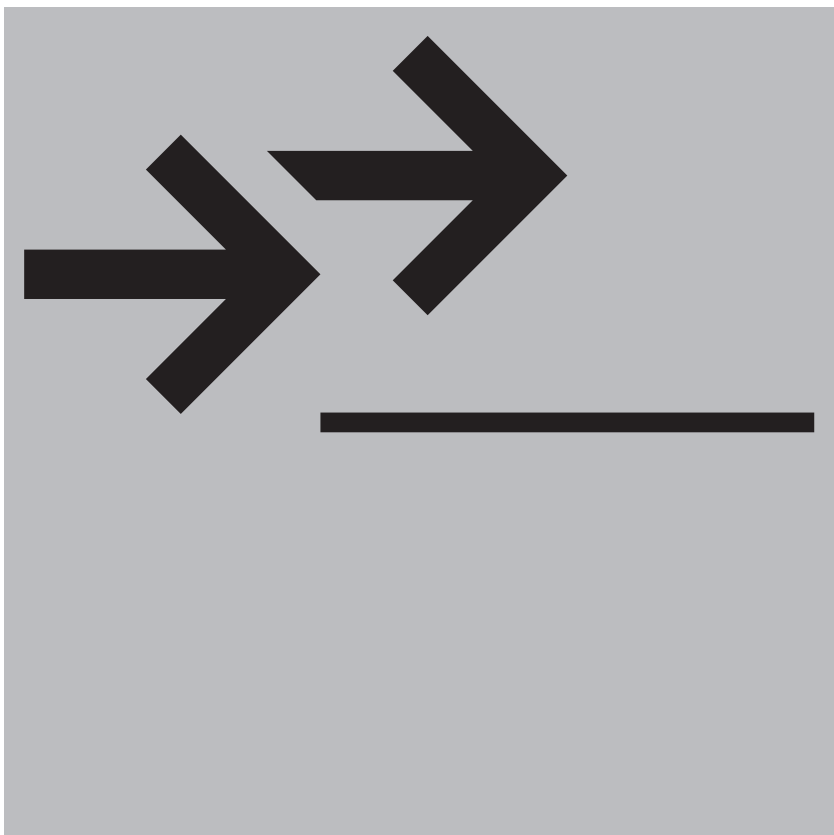
Services
**Customized. According to your specifications. In the best quality.
Individual, fully customized products. Potential modifications.**

	Tell us your task	
Changes to the cabling	Do you need a special cable, a certain cable length, or a special plug? We modify our connection technology to suit your application.	
Adapting mechanical systems	Does your application require special housing designs? Do you need special coatings or specific materials for extreme conditions? Does implementation require special accessories? Tell us what you need. We will take care of production.	
Adapting electronics	A well-functioning system concept requires the best possible design engineering. Only customized electronics matched to the application enable full utilization of technical potential. This is why we make changes to the electronics to meet your requirements. Tell us your task. We offer solutions for implementation.	
Preassembly/Adjustment	We support you with preassembly, accessories combined for a specific application and much more to ensure quick commissioning for you. Almost anything is possible. Contact us!	

Product modifications – a selection	Industrial Networking and Connectivity	Industrial Identification	Object Detection	Linear Position Sensing and Measurement	Condition Monitoring and Fluid Sensors	Accessories
Cable length	■	■	■	■		■
Cable type	■	■	■	■		■
Connector types	■	■	■	■		■
Housing (dimensions, material, coating)		■	■	■		■
Process connection					■	
Special adapters					■	■
High-pressure rated housing			■	■		
Weld spatter-resistant housing			■	■		■
Data carrier in special form		■				
Read head in special form		■				
Special size body				■		■
Special accessories	■	■	■	■	■	■
Firmware/Protocol		■	■	■		
Characteristic				■		
Switching distance/Measuring range			■	■		
Temperature range			■	■		
Read distance		■		■		
Output signals		■	■	■	■	
Special pressure ranges					■	
Antenna adjustment		■				
Holder and sensor/data carrier		■	■	■		
Parameter configuration	■		■	■		
Adjustment			■	■		■
Descriptions of data carriers		■				

Our Training Philosophy
Investing in people for future success

Training is truly an investment in people. But not all training is equal: some training results in knowledge that does not directly translate into better performance on the job. Balluff's courses start with learning objectives: what the students should be able to DO at the end of the lesson. We measure these objectives with exercises and labs throughout the course. This "hands-on" approach means students leave better equipped to do their jobs.

In addition we recognize that not all roles and job requirements are the same: an engineer might not need to have the same skills as a maintenance technician or an integrator. Using a tiered approach we design each class to target a specific audience guaranteeing you will receive training applicable to your specific role.

And finally all our standard courses are developed in a modular fashion to allow you to tailor your training to your company's exact needs and requirements. And if you require customized training specific to your company's implementation and equipment, Balluff is happy to work with you to develop this course as well.

Because we have this philosophy for training, we are sure that your employees will return happy with their experience, with new skills that will help drive the future success or your organization.

The Balluff Training Philosophy

Performance-based			Tiered Approach			Modular		
Actionable Objectives	Hands-on Labs	Acquired Skills	Technicians and Maintenance	Engineers	Integrators and Designers	Standard	Tailored	Customized
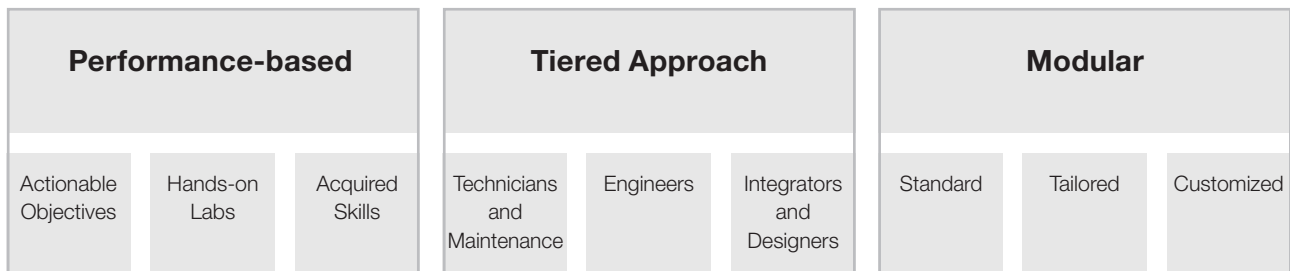
Future Success

Future Success
Three options for training

All Balluff training courses are built in a modular fashion. This enables you to tailor courses to your company's specific needs or requirements. In addition, we can create new custom modules specific to your company's ladder logic, naming conventions, address schemes, etc.

1 Standard Training Courses

Standard courses have the advantage of being ready to deliver right away to meet your training needs. These courses include hands-on activities and job aids. Some standard courses are offered regulary at Balluff offices or the offices of Balluff's authorized distributors.

Standard Class A
- Module 1
- Module 2
- Module 3
- Module 4

Standard Class B ✓
- Module 5
- Module 6

Standard Class C
- Module 7
- Module 8
- Module 9
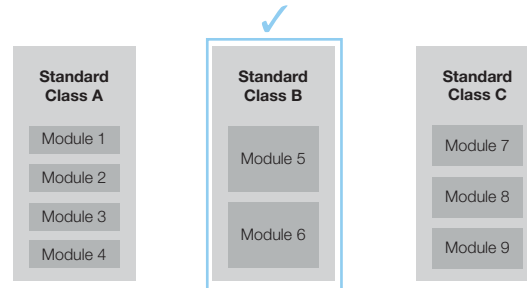
2 Tailored Training Courses

Tailored courses can be quickly prepared and built to your employee's unique skillset or company needs. Selecting modules out of standard courses, a modular course uses existing content and training materials. Here we see modules 3 and 4 from one course added to module 5 of another course to create a tailored course.

Standard Class A
- Module 1
- Module 2
- Module 3
- Module 4

+

Standard Class B
- Module 5
- Module 6

=

Tailored Class A ✓
- Module 5
- Module 3
- Module 4
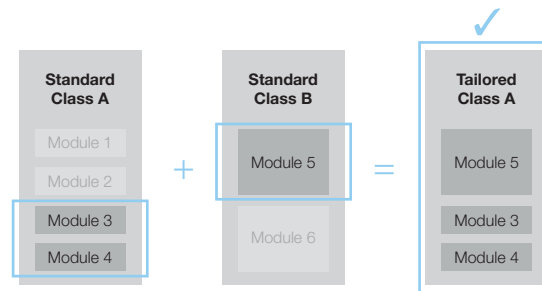
3 Customized Training Course

Custom Courses take time to develop and require discussion about your specific applications and needs. Content will be specific to the way you are using the technology like HMI screens, ladder logic or mounting. In addition, custom courses will typically still include modules from standard classes. Here we see one module from Class A, one module from Class D, and two new modules (specific to one customer) combined into a Custom class.

Standard Class A
- Module 1
- Module 2
- Module 3
- Module 4

+

Standard Class D
- Module 5
- Module 6
- Module 7
- Module 8

+

New Customer Specific Modules
- Module 9
- Module 10

=

Custom Class A ✓
- Module 4
- Module 7
- Module 9
- Module 10
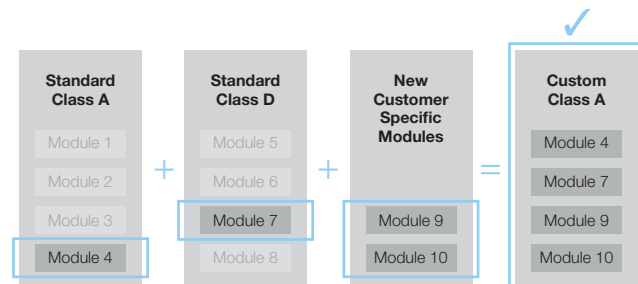
Training for Networking and RFID Systems
EtherNet/IP and RFID Architecture Courses
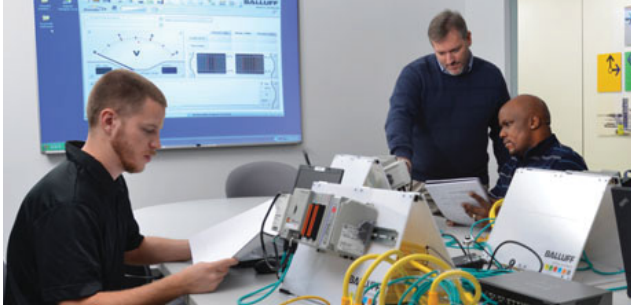
When developing or supporting the backbone of automated equipment it is important for those involved to truly understand how the technology works and integrates into the rest of the machine's design. With this in mind, Balluff has developed core courses aimed at helping those responsible for the success of the data on the network or in an identification system.

Description	Ethernet Fundamentals with EtherNet/IP	RFID Architecture, Hardware Selection
Target audience	Technicians, Engineers	Designers and Integrators
Location	At customer site	At Balluff facility
Minimum students	4	1
Length	4 days	2 days
Ordering code	**BSS0050**	**BSS003Y**
Part number	BSS EDU-O-250-003	BSS EDU-I-260-003

Ethernet Fundamentals with EtherNet/IP
This course is designed to take the learner through the entire process of building an ethernet network from the ground up. The intent is to raise and address questions at each stage in the building process so that there is an immediate understanding of how this information can be applied in a real-world setting. Unlike other courses that are mostly theoretical, this course will be characterized by hands-on learning.

RFID Architecture Development
This course is designed to prepare someone to build a solution to a given RFID application. The first part of the class explains the fundamentals of RFID. The second part of the class emphasizes using specific tools to build the correct solution. The final project in the class is a specific RFID application. Participants will use all of the tools and concepts they have learned to build a solution ready for presentations, including a Visio graphical depiction.

Training and Service for Networking Systems
DeviceNet Fundamentals, DeviceNet Analyzer Training and Service

Some manufacturers today are still selecting DeviceNet as the network of choice for their production lines, and across the globe there are many facilities with large installations of DeviceNet networks. This network is known for being easy to troubleshoot with just a multimeter. But intermittent communication issues are difficult to narrow down and troubleshoot. Sometimes when a component is replaced, the issue gets worse and the technician is unsure how to proceed. By using the Balluff DeviceNet Analyzer, an overall image of the network health can be taken and individual nodes can be analyzed providing help when troubleshooting and suggesting places to look for intermittent communication.

Description	DeviceNet Fundamentals	DeviceNet Analyzer User Training	Service with DeviceNet Analyzer
Target Audience	Technician, Engineer	Technician, Engineer	Technician, Engineer
Location	At customer site	At customer site	At customer site
Minimum students	4	4	n/a
Length	1 day	1 day	by day
Ordering code	**BSS0051**	**BSS004Y**	**BSS004Z**
Part number	BSS EDU-O-250-004	BSS EDU-O-250-002	BSS CSL-O-250-001

DeviceNet Fundamentals
This course is designed to prepare someone to commission devices, add or replace devices on a DeviceNet network, map the devices, and access the data from the devices in a controller. It discusses the basic operating principles of DeviceNet with specific tips on troubleshooting the network.

DeviceNet Analyzer User Training
Customers using this tool have been most successful when they purchased user training along with the device. This one day training course enables someone to use the DeviceNet Analyzer to effectively troubleshoot a DeviceNet network. The course includes continuous hands-on experience with a PLC and multiple nodes. It also includes a student manual for the course plus an additional procedures guide for working in the field. Topics include: basic functionality, applications where it can be used, performing baud rate scan, station scan, on-line measurements, wire test, creating a log file, calculating the quality of a node and how to trouble shoot a network using the analyzer.

Service with DeviceNet Analyzer
Customers not interested in purchasing the Analyzer or the User Training still can get value out of this device. Balluff can send a trained engineer with our equipment to your facility in one day increments and work with your technicians on your networks to take a snapshot of the total health of the network. This total network health can help identify which nodes to work on and where to perform preventative maintenance. In addition, multiple measurements could be made over a number of different hours or days to help give a better picture of effects being felt on the networks in the facility. On-site you will receive a report from the Balluff engineer detailing each network's total health and highlighting poor node health.

Training for Sensors and Accessories
Sensor Fundamentals and Cordset Selection

There is an extensive offering of sensor technologies available for design into automation equipment. Many times the best technology for an application may be unknown to the designer, or a new piece of equipment may come into the facility installed with unfamiliar sensing technologies. To help you stay in touch with the latest technologies and functionality available Balluff has developed the courses below. We can hold these courses at your facility or at a Balluff facility.

Description	Sensor Fundamentals	Sensor Fundamental	Cordset Selection
Target Audience	Technician, Engineer, Designer, Integrator	Technician, Engineer, Designer, Integrator	Designer, Integrator
Location	At customer site	At Balluff facility	At customer site
Minimum students	4	1	4
Length	1 day	1 day	1 day
Ordering code	*	*	*
Part number	*	*	BSS EDU-O-BCC-101

*Contact Technical Support Manager before ordering for details.

The Sensor Fundamentals Course will enable someone to select the correct sensor for a given application. Using a hands-on approach, participants will use a sensor demo which contains a sampling of various sensor types. By the end of the course you will be able to identify six sensor families, describe the basic operating technologies, and match a specific sensor to a specific application.

The Cordset Selection Course will enable someone to select the correct cordset for a given application. Using a hands-on approach, participants will use a cordset demo which contains a sampling of various cordset types. By the end of the course you will be able to identify types of connectors, describe the different styles of connectors available, and select the correct connectors for specific applications.

Tailored and Customized Training
Select the modules you need or build your own training

Meet with our training expert and have us build a course for you based on your company's specific training needs. We will integrate your HMI screens, your ladder logic, your naming conventions, and the specific ways that you are using the technology so that when your employees walk out of the classroom and onto the plant floor, they will be ready to apply their new skills immediately.

Description	Tailored Training	Customized Training
Target Audience	You decide	You decide
Location	You decide	You decide
Minimum students	4	4
Length	Determined by content	Determined by content
Ordering code	*	**BSS003Y***
Part number	BSS EDU-_ _ _	BSS EDU-O-100-001

*Contact Technical Support Manager before ordering for details.

Tailored courses can be quickly prepared and built to your employees' unique skillsets and company's needs. To build a tailored course, simply select only those modules you need out of existing standard courses.

Custom Courses take time to develop and require discussion about your specific applications and needs. Content will be specific to the way you are using the technology like HMI screens, ladder logic or mounting. In addition, custom courses will typically still include modules from standard classes.

Industrial Networking and Connectivity

DeviceNet
Profinet
Ethernet/IP
EtherCAT
IO-Link
Industrial Ethernet
High Durability Cables
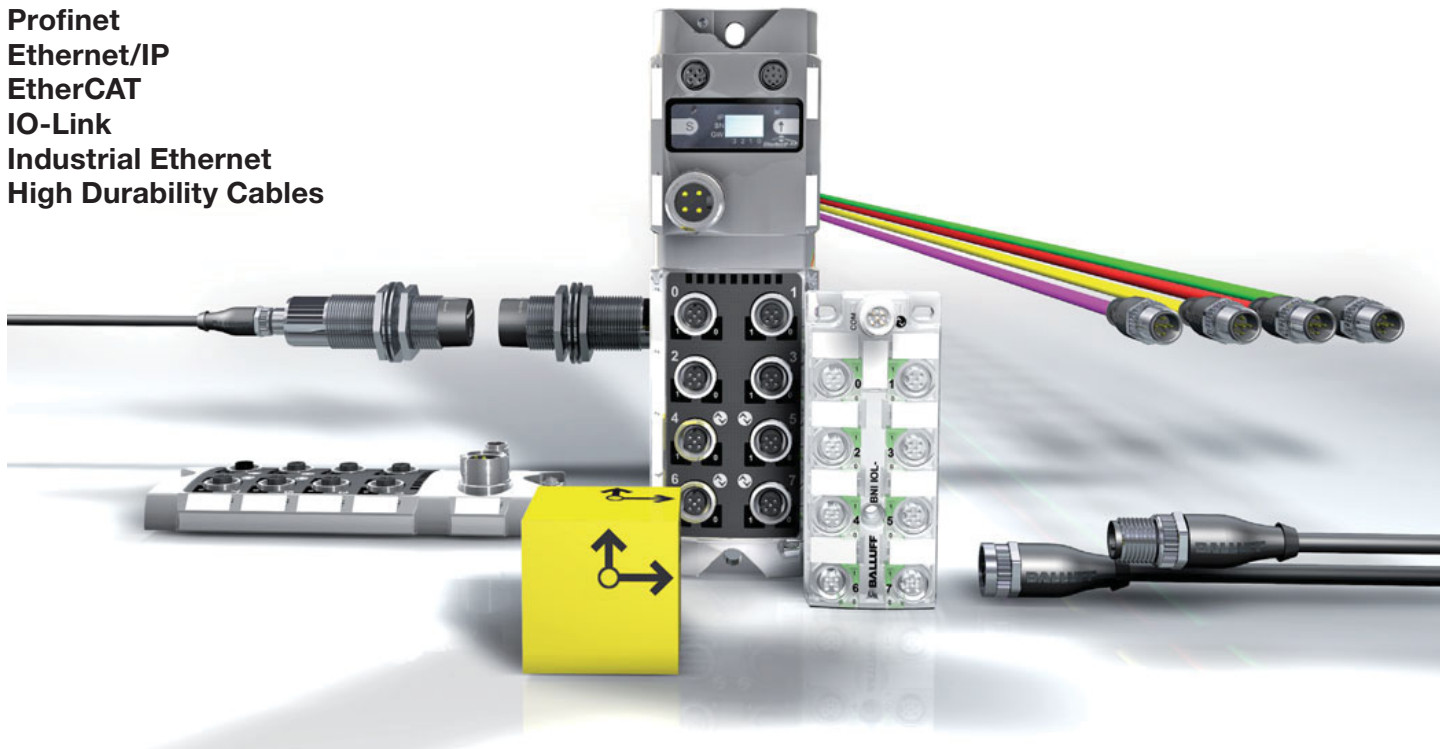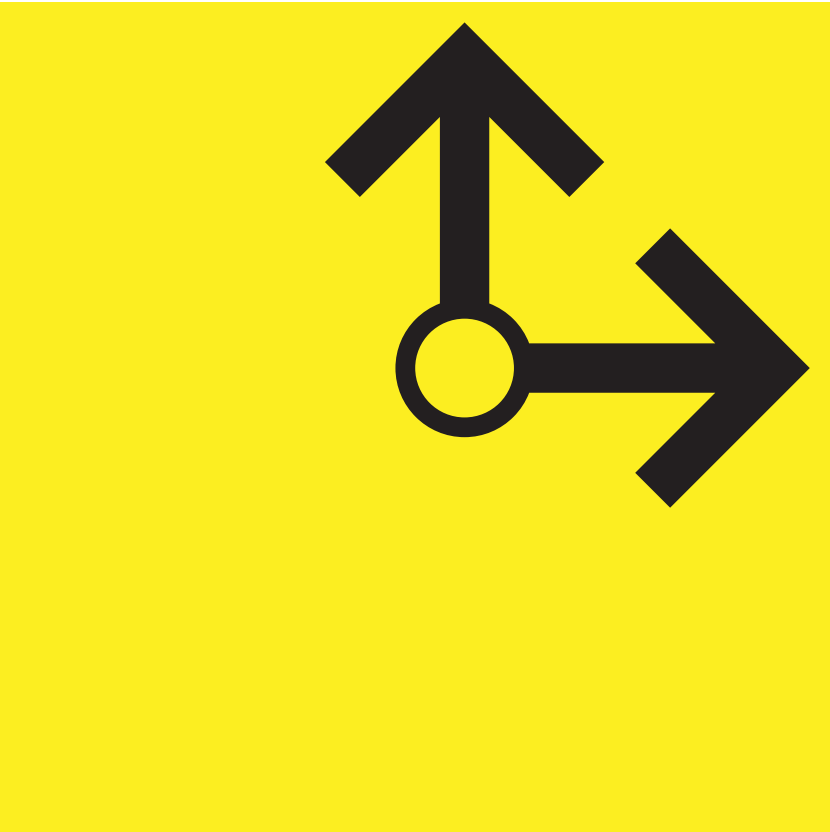
Industrial Networking and Connectivity
System technology networked with intelligence

PLC

PS

Network I/O Blocks
– distributed I/O
– diagnostics

Hardwired Centralized I/O

Hardwired I/O Junction Blocks
– consolidated I/O

BALLUFF
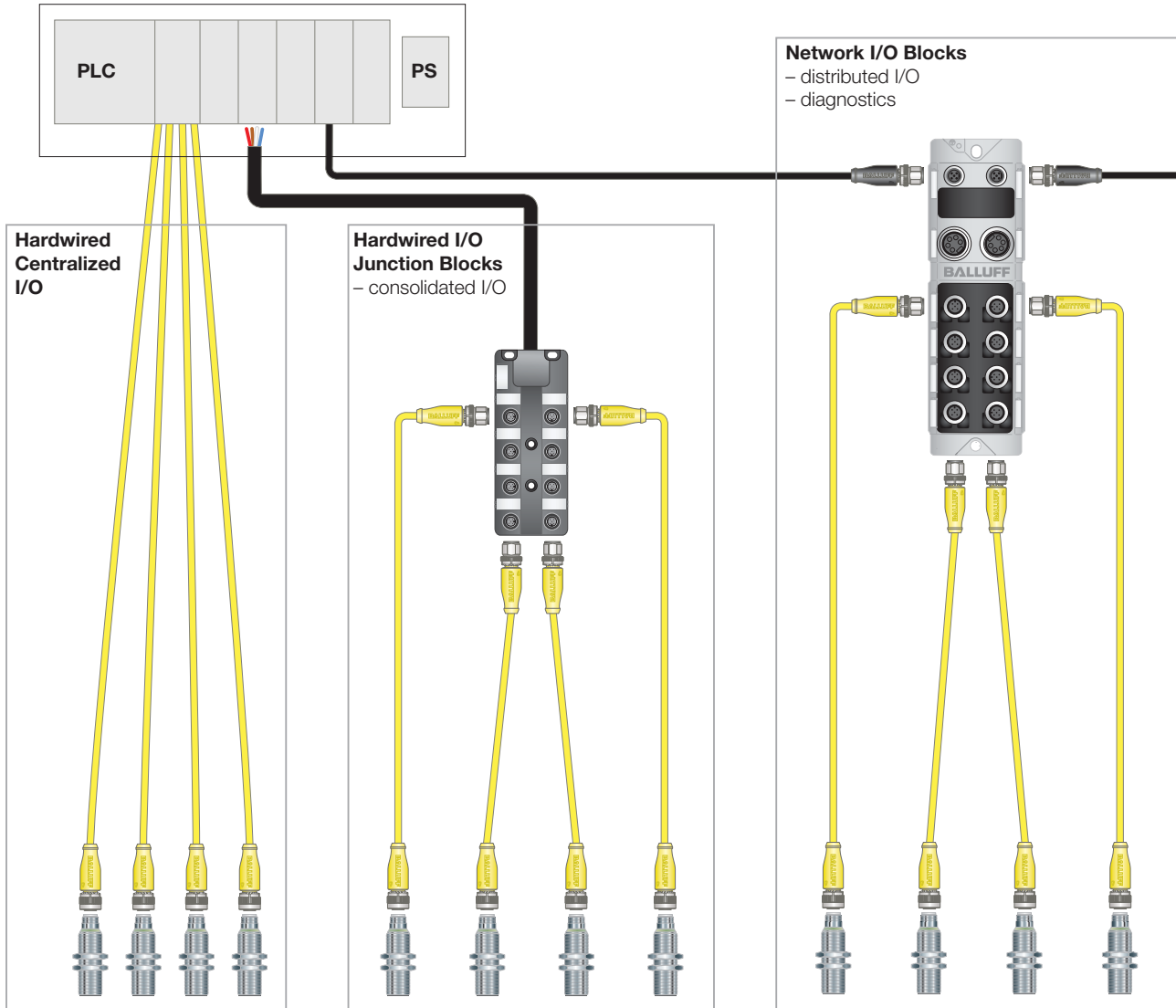
Network Blocks with IO-Link
– distributed I/O
– diagnostics
– scalable
– parameterization

RFID

**Smart
Sensors**
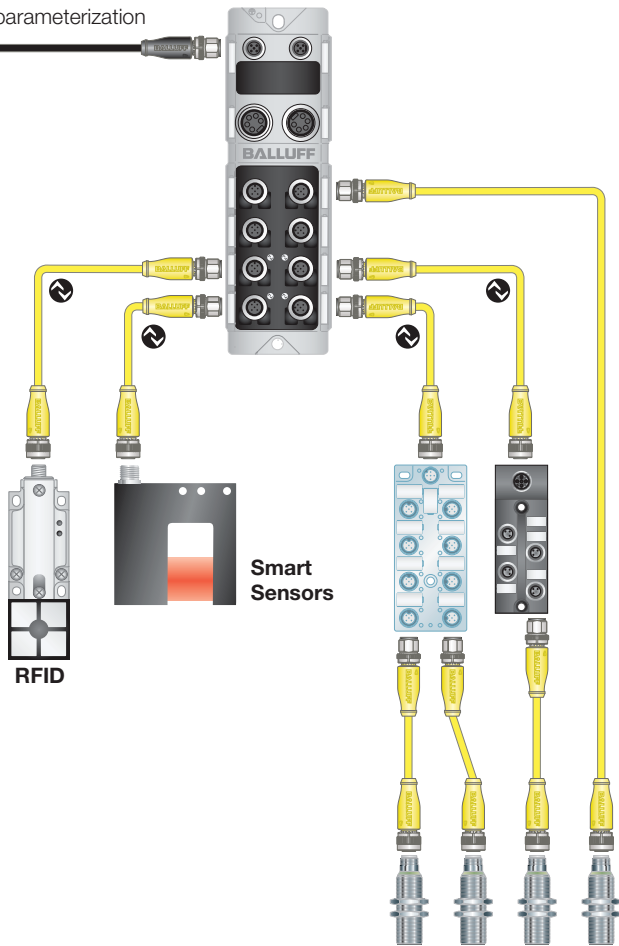
Hardwired Centralized I/O
Advantages
■ Low component cost
■ Basic electrical
   knowledge needed
■ Low MRO costs

Disadvantages
■ No diagnostics
■ Hard to troubleshoot
■ High maintenance cost
■ Large number of cables
   routed to controls cabinet
■ Long sensor cables
■ Long downtime

Hardwired I/O with Junction Blocks
Advantages
■ Low component cost
■ Basic electrical knowledge
   needed
■ Low MRO costs
■ Fewer multi-conductor
   cables back to controls
   cabinet
■ Shorter sensor cables

Disadvantages
■ No diagnostics
■ Hard to troubleshoot
■ High maintenance cost
■ Long downtime

Network I/O Blocks
Advantages
■ Diagnostics
■ Faster troubleshooting
■ One cable back to the
   controls cabinet
■ Lower maintenance cost
■ Shorter sensor cables
■ Higher up time

Disadvantages
■ Higher component
   costs
■ Network knowledge
   needed

IO-Link Modular Network I/O
Advantages
■ Diagnostics
■ Faster troubleshooting
■ One cable back to the
   controls cabinet
■ Lower maintenance cost
■ Shorter sensor cables
■ Higher up time
■ Scalable
■ Parameterization

Disadvantages
■ Higher component costs
■ Network knowledge
   needed

DeviceNet – Second generation with display

In use for years, DeviceNet stands for well-engineered fieldbus technology and reliably supports modern manufacturing. As a full-service provider, Balluff offers a wide range of components for optimum DeviceNet use. Regardless of controller manufacturer, users can choose their ideal solution for efficient field and process communication with simple wiring and fast integration through direct installation in their system and the possibility of fast modifications - even in harsh environments.

The second generation of our DeviceNet module has a more user-friendly display. Station numbers can be set on the block or module information, such as hardware and software status, can be called up. This increases security and simplifies maintenance.

DeviceNet modules with IO-Link functionality

Balluff DeviceNet modules provide IO-Link, so that all the advantages of the high-performance communications standard extend down into the lowest level. IO-Link not only ensures freedom of installation, but also guarantees simplified wiring, integrated diagnostics and central configuration.

System failures can be prevented more reliably and systems restarted more quickly if a failure occurs. Thus DeviceNet with IO-Link supports optimum operation. Users gain time, save costs and incorporate intelligent connection technology to improve process quality.

The four IO-Link master ports are to be configured and used fully independently of one another. This makes four additional, freely configurable standard I/O ports available, which provide a further eight inputs/outputs for standard sensors and actuators.

![IO-Link logo] CE
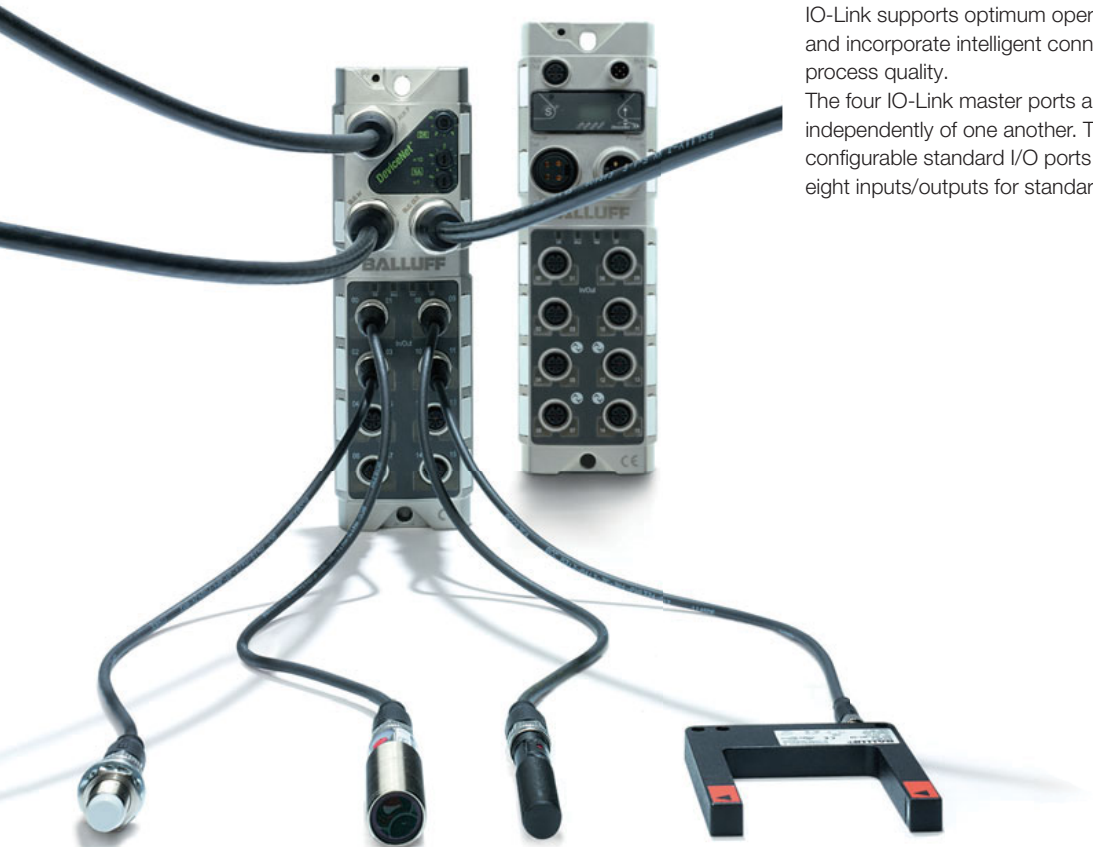
IO-Link

Fieldbus	DeviceNet
Design	4× IO-Link, 16× I/O
Ordering code	**BNI005A**
Part number	BNI DNT-502-100-Z001
Supply voltage U_B	18…30 V DC
Indicators/input	Display/pushbutton
Function indicator	BUS/RUN
Module status indicator: Mod LED	Yes
Network status indicator: Net LED	Yes
Port status indicator	Black, red, yellow
Connection: Fieldbus	M12, B-coded, socket/plug
Connection: AUX power	7/8", male, 5-pin
Connection: I/O ports	M12, A-coded, female
No. of I/O ports	8
Number of inputs	Max. 16
Number of outputs	Max. 16
Configurable inputs/outputs	Yes
Max. load current sensors/channel	200 mA
Max. output load current	1.6 A/2 A
Port status indicator (signal status)	Yellow LED
Port diagnostic indicator (overload)	Red LED
Total current $U_{Actuator}$	< 9 A
Total current U_{Sensor}	< 9 A
Degree of protection as per IEC 60529	IP 67 (when screwed into place)
Operating temperature T_a	–5…+70 °C
Storage temperature	–25…+70 °C
Mounting	2 mounting holes
Dimensions (L×W×H)	225×68×36.9 mm
Housing material	Nickel-plated die-cast zinc

IO-Link Version 1.1

No. of IO-Link master ports		4× master
Operating modes (3-wire)		SIO, COM 1, COM 2, COM 3
Indicators	Communication	Green LED
	Error	Red LED
Max. load current for IO-Link device		1.6 A

8-fold IO-Link Master
Profinet, Ethernet/IP, and EtherCAT fieldbus modules with eight IO-Link ports

128 IOs on a module
Balluff IO-Link solutions save cash money
Until now, at least 8 fieldbus modules had to be used in order to be able to activate 128 IOs. Today, a single Profinet module is sufficient. In connection with our extremely cost-effective sensor/actuator hubs, now up to 128 IO signals can be processed with the most efficiency. In this way, compared to the standard fieldbus modules, there is a high cost savings of 15 to 20% per input. If you add the savings from the fieldbus and power cables to that, you can even achieve a 30 to 40% savings.
A cost-effective M12 BCC standard cable is sufficient to switch on a sensor/actuator hub. Furthermore, sensor hubs need just one bus address so that they can variably group sensor signals together within an area of 20 m and ensure exceptional efficiency.
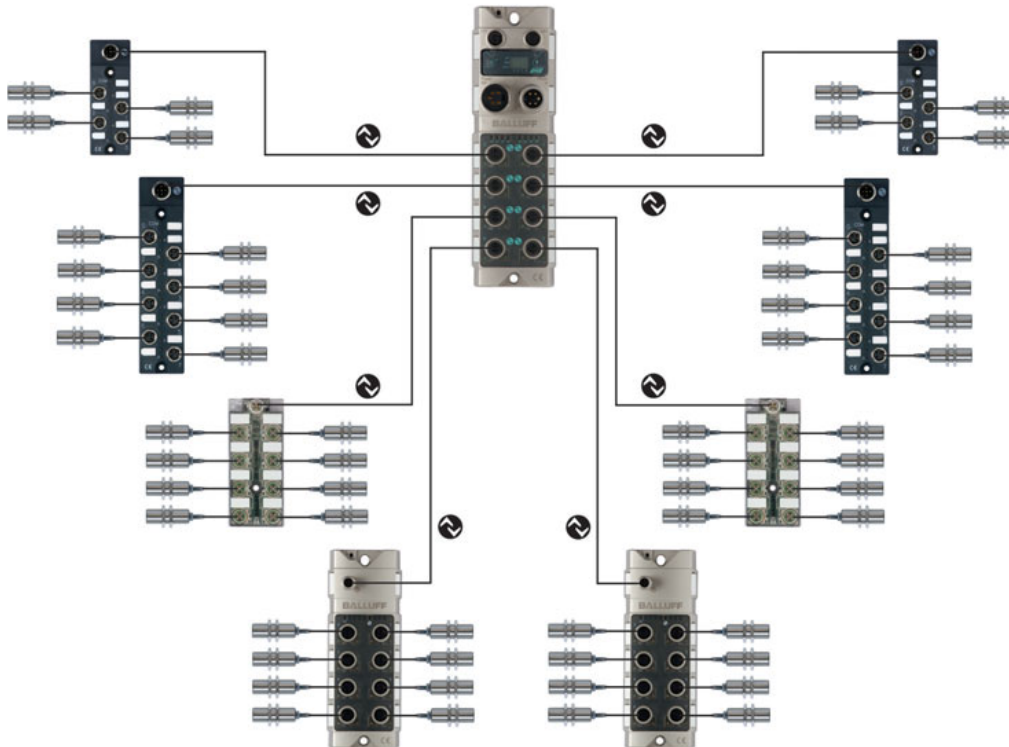
1000 tasks, one module:
The industrial Ethernet modules with eight IO-Link ports
Whether position measurement, object detection, identification, fluid sensor applications, temperature or pressure measurement—IO-Link makes the industrial Ethernet modules module suitable for every job. IO-Link provides nothing but advantages for installing standard sensors; it can also integrate intelligent devices via the same interface. With that, the module provides a uniform interface from the signal to the control level.

There are frequently high costs associated with field installation of intelligent devices, as shielded cable and intelligent interface cards such as analog input cards are used in the controller. IO-Link not only makes error-prone analog inputs unnecessary, it also reduces the wiring, inspection and hardware effort. With simple plug-and-play of unshielded, cost-effective M12 lines, the system is quickly and securely brought into operation.

Measurement sensors

SmartLight

Mechanical I/O Valve manifold control Smart sensors RFID
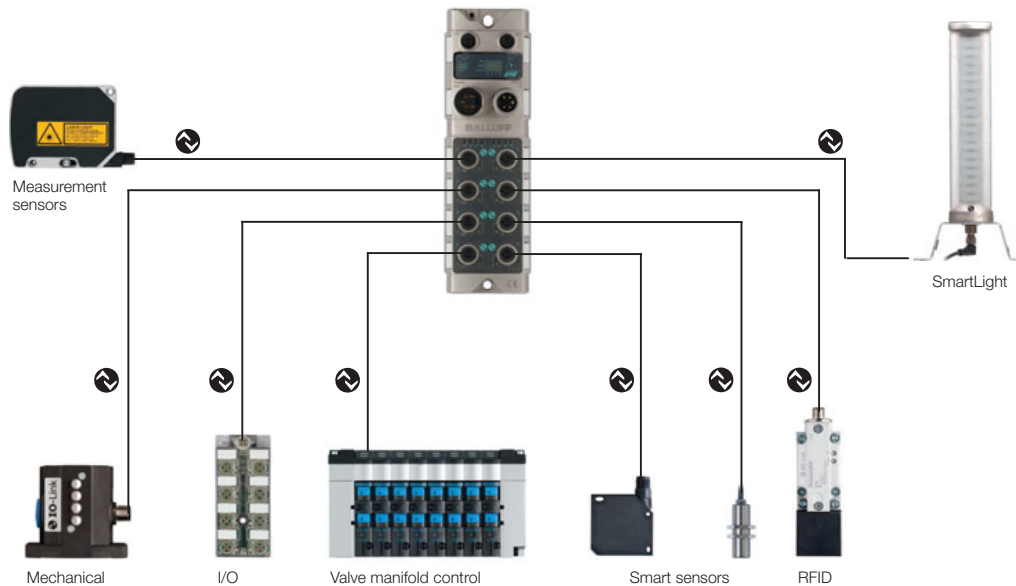
Profinet and Ethernet/IP
Innovations from Balluff

8×
IO-Link

Second generation with display, integrated switch and Web server

Profinet is increasingly becoming the communications medium of the future for mechanical and plant engineering. In some areas, it has already incrementally replaced Profibus. Based on Ethernet, communication over Profinet is significantly faster, and the volume of data is significantly higher than with classic fieldbus systems and allows the connection of time-critical drive technology. Furthermore, Profinet is quick to install and integrates easily into existing networks. In addition to time savings and considerable cost savings comes the added benefit of ease of operation. This is because only Balluff provides Profinet modules with a display that allows IP addresses to be blocked, protecting the modules from accidental changes. This increases security and simplifies maintenance.

IO-Link plays a major role in the second generation of these Profinet modules. The Profinet module with IO-Link functionality has four or eight IO-Link master ports, which the user can configure and use completely independently of one another. In addition to the IO-Link functionality, each port can simultaneously be used as an input or output for standard sensors and actuators.

As a new feature, the second generation of Profinet provides an integrated 2-port Ethernet switch that makes it possible to install a linear topology in the system without an additional external switch.

The integrated Web server is also a new feature of this second product generation.

Fieldbus	Profinet
Design	8× IO-Link, 16× DI/DO
Ordering code	**BNI005H**
Part number	BNI PNT-508-105-Z015
Supply voltage U_S	18...30 V DC
Function indicator	BUS/RUN
Indicators/input	Display/pushbutton
Module current consumption	
AUX input/output power status UO LED	
Module status indicator: Mod LED	Yes
Network status indicator: Net LED	Yes
Port status indicator	Black, red, yellow
Connection: Fieldbus	M12, D-encoded, female
Connection: AUX power	7/8", male, 5-pin
Connection: I/O ports	M12, A-coded, female
No. of I/O ports	8
Number of inputs	Max. 16 PNP
Number of outputs	Max. 16 PNP
Configurable inputs/outputs	Yes
Max. load current sensors/channel	200 mA
Max. output load current	1.2 A/2 A
Port status indicator (signal status)	Yellow LED
Port diagnostic indicator (overload)	Red LED
Total current $U_{Actuator}$	≤ 9 A
Total current U_{Sensor}	≤ 9 A
Degree of protection as per IEC 60529	IP 67 (when screwed into place)
Operating temperature T_a	−5...+70 °C
Storage temperature	−25...+70 °C
Mounting	2 mounting holes
Dimensions (L×W×H)	225×68×36.9 mm
Housing material	Nickel-plated die-cast zinc

IO-Link Version 1.1

|		
No. of IO-Link master ports		8× master
Operating modes (3-wire)		SIO, COM 1, COM 2, COM 3
Indicators	Communication	Green LED
	Error	Red LED
Max. load current for IO-Link device		1.2 A

IO-Link
Version 1.1

EtherNet/IP™

**8×
IO-Link**

	Ethernet/IP
	8× IO-Link, 16 DI/DO PNP
	BNI006A
	BNI EIP-508-105-Z015
	18...30 V DC
	120 mA...130 mA
	US/no
	Yes
	Yes
	Black, red, yellow
	M12, D-encoded, female
	7/8", male, 4-pin
	M12, A-coded, female
	8
	Max. 16 PNP
	Max. 16 PNP
	Yes
	200 mA
	1.6 A/2 A
	Yellow LED
	Red LED
	≤ 9 A
	≤ 9 A
	IP 67 (when screwed into place)
	–5...+70 °C
	–25...+70 °C
	2 mounting holes
	225×68×36.9 mm
	Nickel-plated die-cast zinc

	8× master
	SIO, COM 1, COM 2, COM 3
	Green LED
	Red LED
	1.6 A

Ethernet/IP with IO-Link functionality

Now IO-Link communicates not only with Profibus, Profinet and CC-Link, but now also with Ethernet/IP, so that all the benefits of IO-Link are available right down to the lowest level.

IO-Link not only ensures freedom of installation, but also guarantees simplified wiring, integrated diagnostics and central configuration. System failures can be prevented more reliably and systems restarted more quickly if a failure occurs.

Thus Ethernet/IP with IO-Link supports optimum operation. Users gain time, save costs and incorporate intelligent connection technology to improve process quality.

The Ethernet/IP module with IO-Link includes four or eight IO-Link master ports that can be configured and used fully independently of one another. In addition to the IO-Link functionality, each port can simultaneously be used as an input or output for standard sensors and actuators.

IO-Link
Expanding the value of EtherCAT

When implementing EtherCAT into automation equipment, Balluff adds a unique set of benefits to the existing portfolio in the market. Whether you are in assembly automation, packaging, plastics, research, energy or any other industry, there is a need for tracking and communicating data. Requirements demand flexibility for change down the road, which Balluff brings with linear position monitoring, traceability and distributed modular I/O.

Flexible Topologies

PAC

EtherCAT

1

2

3
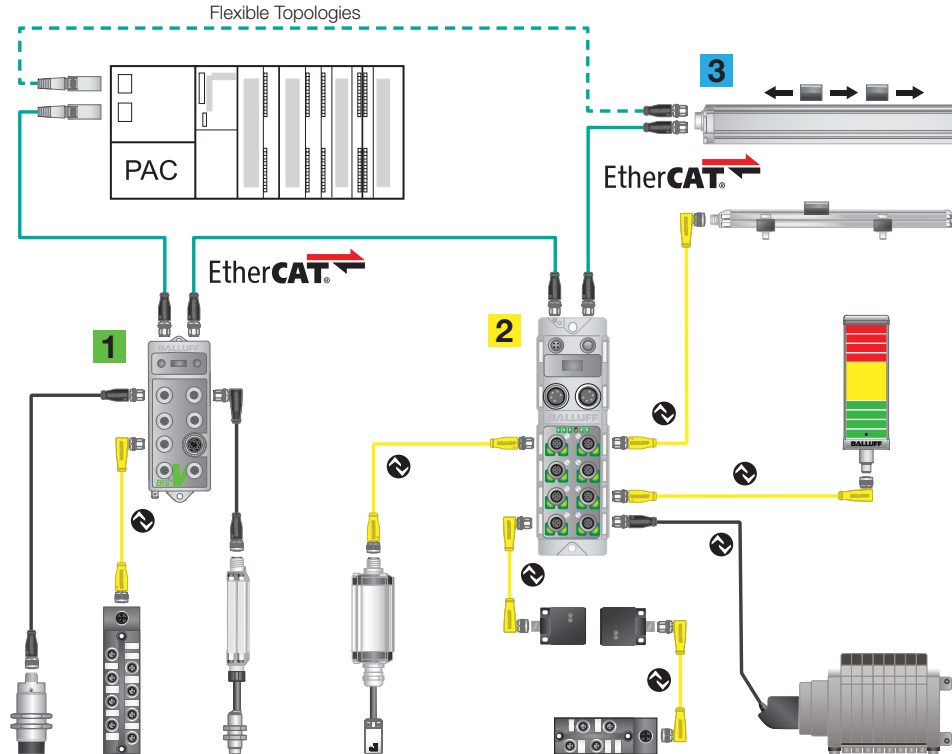
EtherCAT

1
Traceability with EtherCAT
Traceability is the act of documenting every step in a process chain. Manufacturers use this information to gain visibility to achieve on-time delivery, lean manufacturing, enhanced quality and regulatory compliance. It is also used to track assets, logistics and material movement. Traceability can be easily implemented over EtherCAT in a variety of ways. Using RFID systems native on EtherCAT with proven technology from Balluff makes traceability easy to integrate into any system or process.
See page 55.

2
Distributed Modular I/O over EtherCAT
Distributed Modular I/O with IO-Link gives EtherCAT access to many powerful technologies already available on the market from a variety of vendors. The universal, smart and easy IO-Link technology works like USB for industrial automation and is easily configured in the engineering software with simple byte selections. Key Balluff technologies available with IO-Link are: RFID, non-contact couplers, valve manifold connectors, the SmartLight indicator and smart sensors like linear transducers and pressure sensors.

3
Position Monitoring with EtherCAT
Position monitoring is a key technology utilized in automation designs. This is a necessity when working in precise and synchronized applications. EtherCAT is an ideal network for this. Linear transducers can be used to provide closed loop motion control or provide basic position measurement for applications that don't require closed loop control. Balluff offers linear transducers for mounting inside a hydraulic cylinder or externally mounting adjacent to the axis of motion.
See page 98.

EtherCAT

CE

IO-Link

Fieldbus	EtherCAT
Design	8× IO-Link, 16× I/O
Ordering code	**BNI0077**
Part number	BNI ECT-508-105-Z015
Supply voltage U_B	18…30 V DC
Indicators/input	Display/pushbutton
Function indicator	BUS/RUN
Module status indicator: Mod LED	Yes
Network status indicator: Net LED	Yes
Port status indicator	Black, red, yellow
Connection: Fieldbus	M12, D-coded, socket
Connection: AUX power	7/8", male, 5-pin
Connection: I/O ports	M12, A-coded, female
No. of I/O ports	8
Number of inputs	Max. 16
Number of outputs	Max. 16
Configurable inputs/outputs	Yes
Max. load current sensors/channel	200 mA
Max. output load current	1.2 A/2 A
Port status indicator (signal status)	Yellow LED
Port diagnostic indicator (overload)	Red LED
Total current $U_{Actuator}$	< 9 A
Total current U_{Sensor}	< 9 A
Degree of protection as per IEC 60529	IP 67 (when screwed into place)
Operating temperature T_a	–5…+70 °C
Storage temperature	–25…+70 °C
Mounting	2 mounting holes
Dimensions (L×W×H)	225×68×36.9 mm
Housing material	Nickel-plated die-cast zinc

IO-Link Version 1.1

No. of IO-Link master ports		8× master
Operating modes (3-wire)		SIO, COM 1, COM 2, COM 3
Indicators	Communication	Green LED
	Error	Red LED
Max. load current for IO-Link device		1.2 A

IO-Link
Version 1.1

IO-Link
Distributed Modular I/O

Think of a remote "slice" I/O solution. In a typical application, the communication head and the power supply sit on the left hand side and are followed along the backplane by the individual I/O devices, such as discrete 24V input cards or 0-10V analog cards. Usually there are a limited number of slots available in the backplane and individual slices of control components can be inserted.

In a similar fashion, a Distributed Modular I/O system has a communications head that talks over the desired industrial network on one side and acts as a data collector on the right hand side. In lieu of a backplane, each device is connected to an industry standard M12 port utilizing a basic 3-wire sensor cable for communication. With the ability to be installed within a 20 meter radius from the data collector devices can be easily distributed across the machine.

Power | Communication | Discrete I/O | Discrete I/O | Analog I/O | Outputs | Specialty

EtherNet/IP

PROFINET

PROFIBUS

CC-Link

Power | Discrete I/O

BALLUFF

Discrete I/O | Analog I/O | Valve Manifold Control | RFID or Specialty Devices
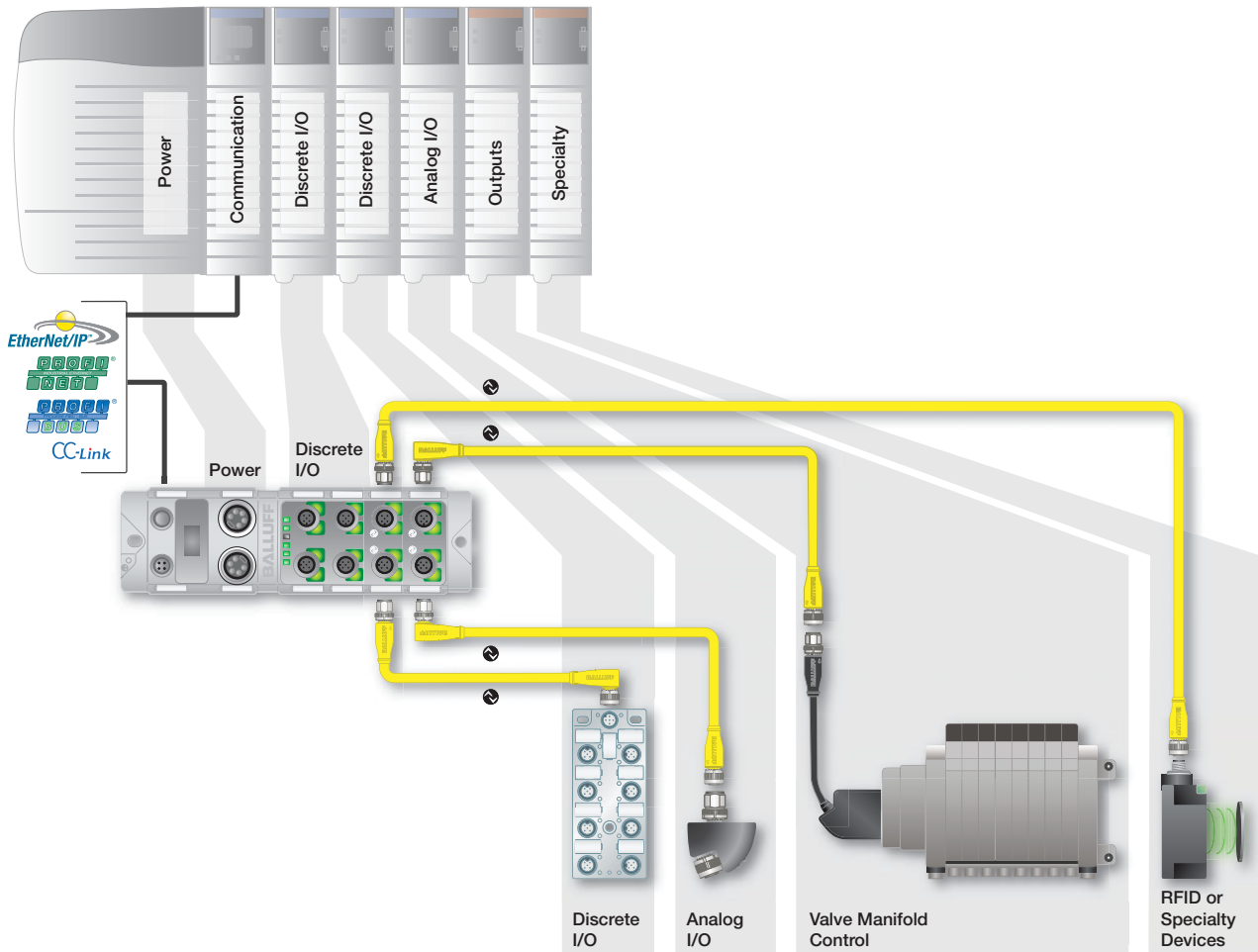
The backplane of Distributed Modular I/O = ⊙ **IO**-Link

Utilizing a widely accepted and open point to point technology, IO-Link, a Distributed Modular I/O system is fieldbus independent, is easily configured and is vendor neutral. Process data shows up as simple packets of bytes in the controller for easy integration. The parameterization data allows the devices to be quickly configured using simple read/write commands, and best of all, there is no "sub-bus" to cause headaches, nor is there some new protocol to be educated on. The digital signal is carried over pin 4 of a standard cable and 24V power is provided to the device in a standard configuration. If required, the IO-Link port can be used for a standard I/O point.

3 Wire or 4 Wire Sensor Cable

20 Meters maximum

L+
1
2   4   C/Q
3
L-

SIO
IO-Link
24V
0V
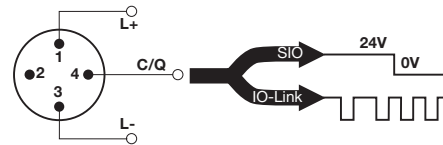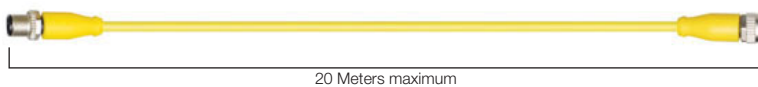
Types of Distributed Modular I/O devices

Discrete I/O	Analog I/O	Valve Manifold Control	Specialty Devices and RFID
M8 ports – *Up to 16 inputs*	**1 channel (14 bit)** – *0-10 V in/out* – *4-20mA in/out* – *PT100 in*	**25 pin D-sub**	**Intelligent sensors**
M12 ports – *Up to* *16 inputs* – *16 outputs* – *16 configurable*	**4 channels (10 bit)** – *0-10 V in* – *4-20mA in* – *plus 8 inputs*	**IP67 & Terminal**	**RFID** – *Read/write* – *Read only*

IP20 terminals
– *Up to 16*
  configurable
			Non-contact connectors
			– *3 bytes to*
			  11 bytes

SmartLight – for signaling operating states

Stack light & visualization functions with one configurable part number

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

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

Stack Light Mode   Level Mode   Run Mode

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

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

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

Stack Light Process Indication

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

Level Visualization

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

CE
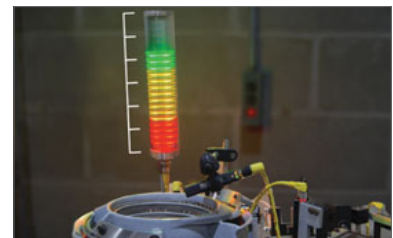
IO-Link

IO-Link	Device	Device
Designation	SmartLight, 1-5 zones	SmartLight, 1-3 zones
Ordering code	**BNI0072**	**BNI007F**
Part number	BNI IOL-802-000-Z036	BNI IOL-801-000-Z036
Supply voltage U_B	18...30 V DC	18...30 V DC
Function indicator IO-Link RUN	Green LED	Green LED
Power-on indicator	Green LED	Green LED
Connection: IO-Link	M12, A-coded, male	M12, A-coded, male
Connection U_A	via IO-Link interface	via IO-Link interface
Configurable	Yes	Yes
Max. load current of actuators	0.35 A	0.35 A
Degree of protection as per IEC 60529	IP 54 (only in plugged-in and screwed-down state)	IP 54 (only in plugged-in and screwed-down state)
Operating temperature T_a	–5…+70 °C	–5…+70 °C
Storage temperature	–25…+70 °C	–25…+70 °C
Mounting	M18 thread	M18 thread
Dimensions (L×W×H)	55×55×295 mm	55×55×213 mm
Housing material	Transparent polycarbonate, nickel-plated die-cast zinc	Transparent polycarbonate, nickel-plated die-cast zinc

IO-Link Version 1.1

Transfer rate		COM 2 (38.4 kBaud)	COM 2 (38.4 kBaud)
Cycle time		5 ms with IO-Link 1.1 Master 20 ms with IO-Link 1.0 Master	5 ms with IO-Link 1.1 Master 20 ms with IO-Link 1.0 Master
Indicators	Communication	Flashing green LED	Flashing green LED
	Power supply	Static green LED	Static green LED
IO-Link process data length		3 byte output	3 byte output

IO-Link
Version 1.1

IO-Link
M12 metal sensor hubs, 16 binary inputs/outputs

The metal sensor hubs in their robust housing are suitable for installation in very harsh industrial environments, such as in machine tools or steel mills. Based on M12 connectors, metal sensor hubs are simple to install and fulfill the requirements for cost-effective installation and maintenance.

Port-specific single-channel monitoring detects short circuits, overloading at the port and offers a unique degree of selective diagnostics for devices with this functionality.

Each input can be programmed as normally closed or normally open using a parameter set. That provides maximum flexibility. Likewise, you can easily connect complementary sensors to the DI-16 sensor hub.

The BNI IOL-302-000/S01-Z013 version combines two modules in one and provides the greatest functionality, which is totally flexible for use. The maximum sensor load current is 500 mA, which is suitable for operating sensors with a high degree of consumption. If configured as an output, up to 2 A is available at the port. This is ideal for the use of hydraulic valves with a high consumption level.

Clearly visible status LEDs
Low-quality LEDs that are often difficult to identify under demanding production conditions perform poorly when used in high-speed applications. In contrast, Balluff status LEDs are large, bright, highly visible and provide maximum assistance. With Balluff modules, you can quickly handle setup and maintenance tasks and reduce downtimes.

Powerful and safe outputs
With an output current of up to **2 amps**, Balluff output modules are capable of driving almost any load. Each output also offers an overload protection with LED indicator and a memory feature for easy trouble-shooting.

Robust, solid metal housing
The fully encapsulated housing can withstand impacts, debris, corrosive fluids, incorrect assembly as well as people treading on it.

Inputs with high density
All Balluff input blocks offer two input points for each plug connector, accessed via a V splitter.

Innovative housing design
The extra-flat profile reduces potential dangers posed by cables. Rounded corners offer highly visible locations for channel markers and two mounting points are sufficient to secure the robust metal housing.

CE

 IO-Link

IO-Link	Device	Device
Design	16× DI	16× DI
Ordering code	**BNI0063**	**BNI0074**
Part number	BNI IOL-106-000-Z012	BNI IOL-106-000-K006
Supply voltage U_B	18...30 V DC	18...30 V
Function indicator IO-Link RUN	Green LED	Green LED
Power-on indicator	Green LED	Green LED
Connection: IO-Link	M12, A-coded, male	M12, A-coded, male
Connection: I/O ports	M12, A-coded, female	M12, A-coded, female
Connection U_S	via IO-Link interface	
No. of I/O ports	8	8
Number of inputs	16	16
Number of outputs	0	
Configurable	No	NC/NO
Single-channel monitoring	Yes	
Max. load current sensors/channel	100 mA	200 mA
Port status indicator	Yellow/red LED	Yellow LED
Total current U_S	< 1.4 A	< 1.2 A
Degree of protection as per IEC 60529	IP 67 (when screwed into place)	IP 67 (when screwed into place)
Operating temperature T_a	−5...+70 °C	−5...+55 °C
Storage temperature	−25...+70 °C	−25...+85 °C
Mounting	2 mounting holes	3 mounting holes
Dimensions (L×W×H)	181×68×36.9 mm	115×50×31 mm
Housing material	Nickel-plated die-cast zinc	PA6

IO-Link Version 1.1

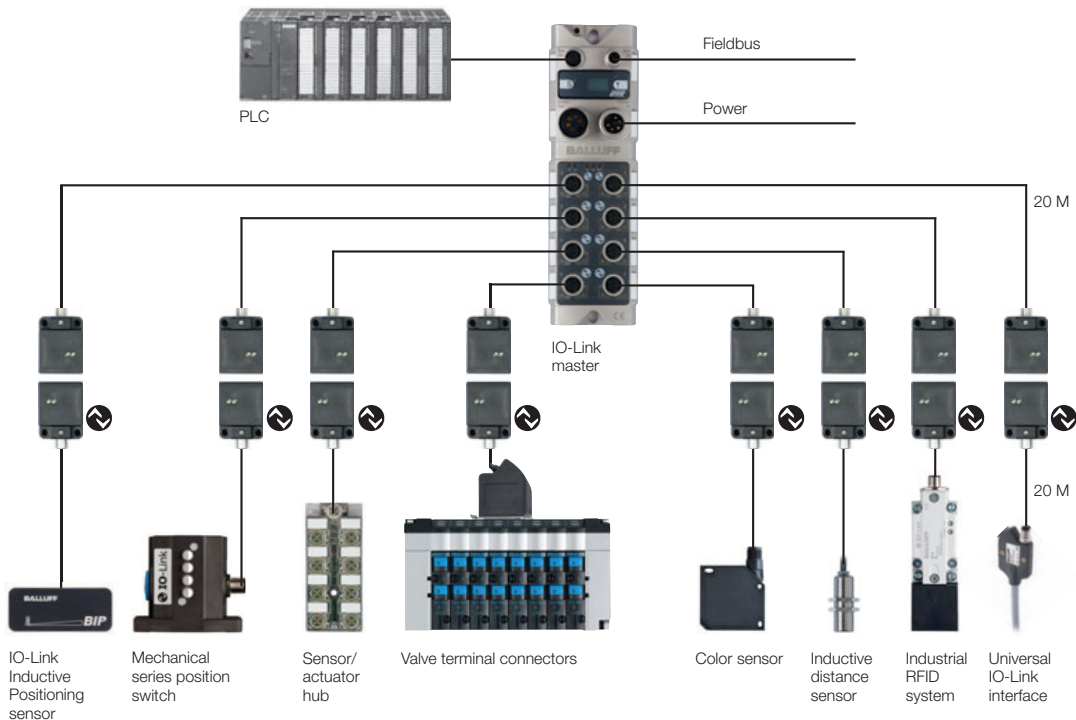| Max. cycle time		10 ms	
IO-Link process data length		4 byte input	
Indicators	Communication	Green LED, pulsing	Green LED
	Error	Red LED	Red LED
Max. load current			< 1.2 A
Parameters			NC/NO per input

IO-Link
BIC Q40 bidirectional

Inductive couplers make mechanical plug-in contacts unnecessary, because energy and data can be transmitted without contact via an air gap. And it does this in both directions if the new bidirectional coupling system in the 40×40 Unicompact housing with IO-Link is used.

The contactless data transmission with IO-Link standard has a transparent structure. This means the BIC system behaves "invisibly" and can be incorporated between master and device without configuring via plug-and-play.
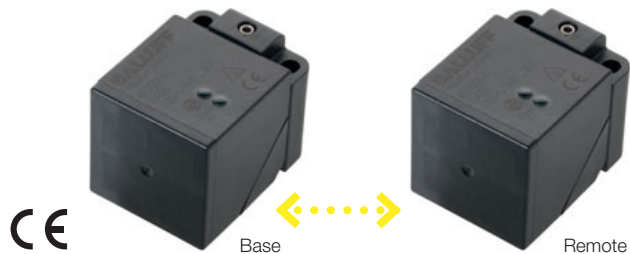
Regardless of the IO-Link revision status, the system has a full-fledged IO-Link interface. Events, parameter data and process data are directly exchanged between master and device.

Mechanically disconnected and electrically connected: BIC bidirectional – the contactless IO-Link interface

- Simultaneous activation of actuators and collection of sensor signals
- AUX power for actuators can be switched on and off
- Simplest installation via plug-and-play
- IO-Link functionality up to the device
- Flexible process data length
- 20 meters can be run on either side for a possible 40 meter run

PLC

Fieldbus

Power

20 M

IO-Link master

20 M

| IO-Link Inductive Positioning sensor | Mechanical series position switch | Sensor/ actuator hub | Valve terminal connectors | Color sensor | Inductive distance sensor | Industrial RFID system | Universal IO-Link interface |

The new BIC Q40 bidirectional establishes a contactless connection between each IO-Link device and the master.

CE

Base   Remote

Size	**40×40×63 mm**	40×40×63 mm
Working range	1...5 mm	1...5 mm
Ordering code	**BIC0070**	**BIC0071**
Part number	BIC 1B0-ITA50-Q40KFU-SM4A4A	BIC 2B0-ITA50-Q40KFU-SM4A5A
Supply voltage U_S, including residual ripple	24 V DC ±10%	
Rated operating current I_e	1 A	
No-load supply current I_0 max.	100 mA	
Short-circuit protected	Yes	Yes
Remote output voltage		24 V DC ±5%
Power supply, continuous output current		500 mA
Ambient temperature T_a	–5...+55 °C	–5...+55 °C
Storage temperature	–25...+70 °C	–25...+70 °C
Transmission distance	0...5 mm	0...5 mm
Permitted offset	Max. 5 mm	Max. 5 mm
Function/Power-on indicator	Yes/Yes	Yes/Yes
Weight	Approx. 160 g	Approx. 160 g
Degree of protection as per IEC 60529	IP 67	IP 67
Housing material	PBTP	PBTP
Material of sensing surface	PBTP	PBTP
Connection	M12 connector, male 4-pin, A-coded	M12 connector, female 5-pin, A-coded

IO-Link Version 1.1

|		
Transfer rate	COM 1...2	COM 1...2
Cycle time min.	depends on IO-Link device	depends on IO-Link device
IO-Link process data length	1...32 byte	1...32 byte
SIO MODE	No	No

Ethernet
Unmanaged Switches
Ethernet-based network systems are gaining more and more importance in industrial automation. Balluff provides a wide variety of Ethernet-based systems and network components such as Profinet or Ethernet/IP for machine and plant equipment.

Balluff now offers a complete system so that you can easily link Ethernet system components with the Ethernet.

With the switch, it is now possible to connect Ethernet devices in a Star Topology. The RJ45 ports and the 10 and 100 Mbps transmission rates support this. The transfer speed is automatically set via the auto-negotiation function. Wiring errors are reliably ruled out by the autocrossing function. This is because the module identifies on its own what type of cable is being used.
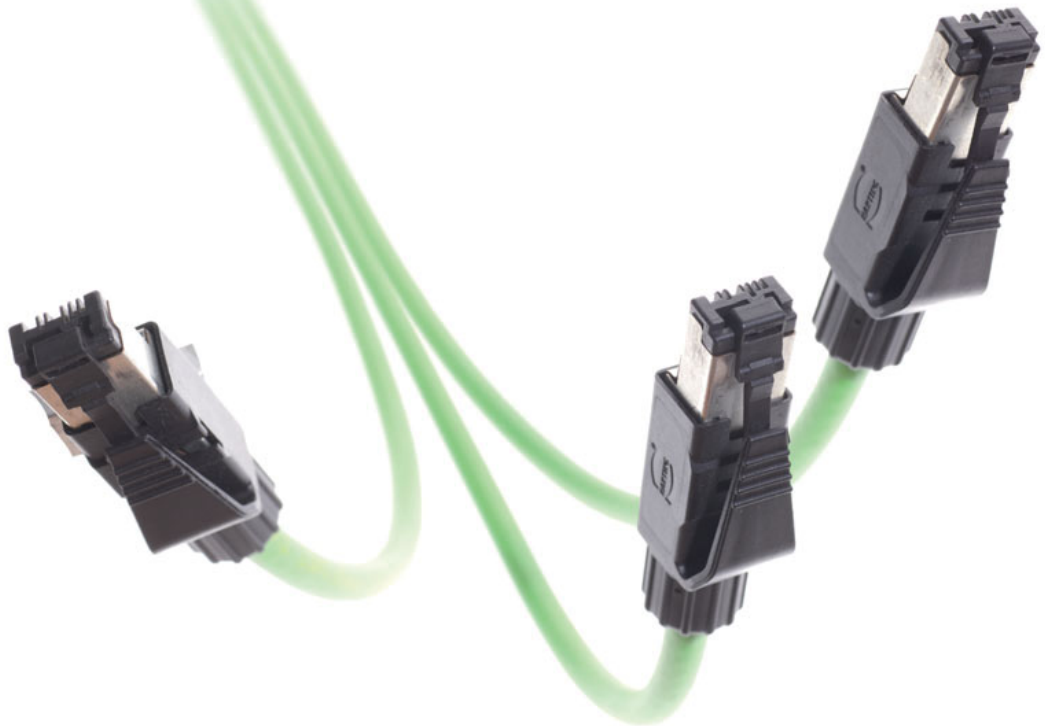
Communication	Ethernet	Ethernet	Ethernet
Version	Ethernet unmanaged switch	Ethernet unmanaged switch	Ethernet unmanaged switch
Ordering code	**BNI005E**	**BNI0067**	**BNI000F**
Part number	BNI TCP-951-000-E028	BNI TCP-952-000-E029	BNI EIP-950-000-Z009
Ports	5×RJ45 Spring force clamp	8×RJ45 Spring force clamp	9xM12 D-coded
System power supply	0,2...2,5 mm²	0,2...2,5 mm²	7/8 4 pole
Supply voltage U_B	12...48 V DC	2×12…30 V DC redundant	18 V...30.2 V
Transfer rate	10/100 Mbps full duplex Auto crossing	10/100 Mbps full duplex Auto crossing	10/100 Mps Auto crossing
Operating modes	Auto negotiation	Auto negotiation	Auto negotiation
Communication status	Link/run LED, (yellow/green)	Link/run LED, (yellow/green)	Link/run LED, (yellow/green)
Supply voltage	LED (green), power	LED (green), power	LED (green), power
Degree of protection	IP 20	IP 20	IP 67
Housing	Black plastic	Black plastic	GD-ZN nickel plated
Temperature range	−10...+60 °C (storage temperature −25...+70 °C)	−10...+60 °C (storage temperature −25...+70 °C)	−5...+55 °C
Mounting type	Snaps onto support rail TH35 (EN60715)	Snaps onto support rail TH35 (EN60715)	2 hole screw/mounting

Cable Type	Conductor	Jacket	Ratings	M12 Straight to M12 Straight	
Unshielded, UTP 2 pair	Stranded	TPE	600V, CMX, Flex 10mio,ODVA	BCC M414-M414-6D-366-EX64N9-_ _ _	
Shielded , STP 2pair	Stranded	PVC	Riser, CMR, ODVA	BCC M414-M414-6D-338-VS64N8-_ _ _	
		TPE	Flex 5mio, ODVA	BCC M414-M414-6D-338-ES64N9-_ _ _	
Shielded Starquad	Stranded	PUR	Profinet	BCC M414-M414-6D-331-PS54T2-_ _ _	

*Contact factory for availability
Standard lengths available:

006 = 0.6 m	100 = 10.0 m	400 = 40.0 m
010 = 1.0 m	150 = 15.0 m	500 = 50.0 m
020 = 2.0 m	200 = 20.0 m	600 = 60.0 m
050 = 5.0 m	300 = 30.0 m	

Field Attachables	
Order Code	**Description**
BCC03WZ	M12, D-coded, Straight Male
BCC03Y0	M12, D-coded, Right-Angle Male
BCC03Y1	M12, D-coded, Straight Female
BCC03Y2	M12, D-coded, Right-Angle Female
BCC06FH	RJ45, Straight Male, 8-position, 4wire

M12 Straight to RJ45	RJ45 to RJ45	Bulk Cable (100m)
BCC M414-E894-8G-695-EX64N9-_ _ _	BCC E894-E894-90-367-EX64N9-_ _ _	**BCC0CN3**
BCC M414-E894-8G-672-VS64N8-_ _ _	BCC E894-E894-90-339-VS64N8-_ _ _	**BCC0AZ9 - BCC0EZ8**
BCC M414-E894-8G-672-ES64N9-_ _ _	BCC E894-E894-90-339-ES64N9-_ _ _	**BCC0AUJ**
BCC M414-E834-8G-668-PS54T2-_ _ _	BCC E834-E834-90-334-PS54T2-_ _ _	

Receptacles and Bulkheads

Order Code	Description
BCC03WP	M12-RJ45 Receptacle, 2m, industrial Ethernet
BCC06YP	M12-M12 Female Bulkhead
BCC085F	M12-RJ45 Straight Bulkhead
BCC085H	M12-RJ45 Right Angle Bulkhead

High Durability Cables
Cordsets for use in extreme conditions in manufacturing

Every manufacturer has challenges, but typically one of the most frustrating problems is when a connector or a cable causes downtime. In addition, cable failures can be difficult to diagnose due to their installation and finding the exact failure. This can cause extended downtime due to replacement of long cable runs through cable trays and rafters. Sometimes cable failures just cause short repetitive downtime with constant replacement.

In the most extreme conditions in manufacturing, downtime is usually caused by one of these situations:
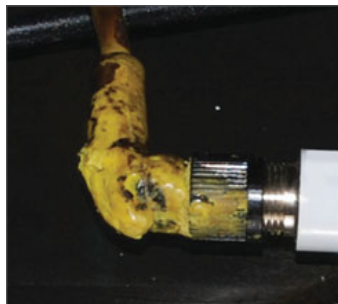
Physical
- Constant contact with loaded components causes physical failure
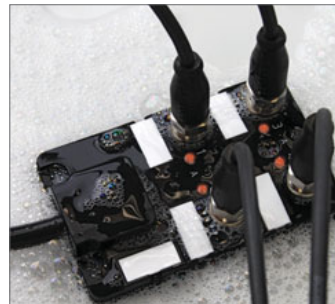- Buildup of excess material can physically tear the connector apart

Washdown
- Cleaning chemicals can eat through standard materials
- High pressure washdown can destroy components

Temperature
- Extreme swings in temperature age materials prematurely
- Constant high-temperatures can melt standard materials

Weld Slag
- Hot weld sparks burn, melt and destroy cables and connectors
- Buildup of damage over time can cause shorts and failures

Physical Problems

■ Constant contact with loaded
  components causes physical failure
■ Buildup of excess material can physically
  tear the connector apart

Solution

■ Abrasion resistant
■ High mechanical durability

Solution

■ Crush resistant
■ High mechanical durability

	Stainless steel braid	PVC coated steel armor (flexible conduit)
Type	Stainless steel braid	PVC coated steel armor (flexible conduit)
Jacket Temperature	-25…80 °C	-40…105 °C
Operational Temperature Fixed	-50…80 °C	-40…105 °C
Operational Temperature Moving	-25…80 °C	
Voltage Rating	250 V	300 V
Amperage	4 A	4 A
Single-Ended		
M12 Female, 4-wire, Straight		BCC M415-0000-1A-003-MX04T2-_ _ _
7/8" Female, 4-wire, Straight		BCC A314-0000-10-072-MX04W6-_ _ _
M12 Double-Ended		
M12 Female Straight - M12 Male Straight, 4 wire	BCC W415-W414-3A-304-MW8434-_ _ _	BCC M415-M414-3A-304-MX04T2-_ _ _
M12 Female Right Angle - M12 Male Straight, 4 wire	BCC W425-W414-3A-304-MW8434-_ _ _	
7/8" Double-Ended		
7/8" Female Straight - 7/8" Male Straight, 4 wire	BCC B314-B314-30-304-MW8434-_ _ _	BCC A314-A314-30-346-MX04W6-_ _ _
7/8" Female Right Angle - 7/8" Male Straight, 4 wire	BCC B324-B314-30-304-MW8434-_ _ _	

Note: M8 versions not possible

Single-ended
Standard Lengths Available:
010 = 1 m
020 = 2 m
050 = 5 m
100 = 10 m

Double-ended
Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m
010 = 1 m
020 = 2 m

High Durability Cables
Washdown and Temperature

Washdown Problems

- Cleaning chemicals can eat through standard materials
- High-pressure washdown can destroy components

Solution

- Survived ECOLAB tests
- Caustic resistant

Solution

- Washdown rated
- Withstands high-pressure steam cleaning

Type	ECOLAB, Stainless	IP69K rated, 1.4404 Stainless
Configuration	Stainless Nut, PUR Cable	Stainless Nut, PVC Cable
Operational Temperature	-25...80 °C	-5...105 °C (PVC)
Voltage Rating	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12)	60 V (M8 3-wire), 30 V (M8 4-wire), 250 V (M12)
Amperage	4 A	4 A
M8 Single-Ended		
M8 Female, 3-wire, Right Angle	BCC S323-0000-10-001-PX8334-_ _ _-C002	BCC S323-0000-10-001-VX43T2-_ _ _
M8 Female, 4-wire, Right Angle	BCC S324-0000-10-003-PX8434-_ _ _-C002	BCC S324-0000-10-003-VX44T2-_ _ _
M12 Single-Ended		
M12 Female, 4-wire, Straight	BCC S415-0000-10-003-PX8434-_ _ _-C002	BCC S415-0000-1A-003-_ _ _ _ _ _ _-_ _ _
M12 Female, 4-wire, Right Angle	BCC S425-0000-10-003-PX8434-_ _ _-C002	BCC S425-0000-1A-003-_ _ _ _ _ _ _-_ _ _
M12 Female, 5-wire, Straight	BCC S415-0000-10-017-PX8534-_ _ _-C002	
M12 Female, 5-wire, Right Angle	BCC S425-0000-10-017-PX8534-_ _ _-C002	
M12 Female, 5-wire, Straight, Braided Shield	BCC S415-0000-10-017-PS8534-_ _ _-C002	
M12 Female, 5-wire, Right Angle, Braided Shield	BCC S425-0000-10-017-PS8534-_ _ _-C002	
M12 Female, 8-wire, Straight, Braided Shield	BCC S418-0000-10-069-PS8834-_ _ _-C002	
M12 Double-Ended		
M12 Female Straight - M12 Male Straight, 4-wire	BCC S415-S414-3A-304-PX8434-_ _ _-C002	BCC S415-S414-3A-304-_ _ _ _ _ _ _-_ _ _
M12 Female Right Angle - M12 Male Straight, 4-wire	BCC S425-S414-3A-304-PX8434-_ _ _-C002	BCC S425-S414-3A-304-_ _ _ _ _ _ _-_ _ _
M12 Female Straight - M12 Male Right Angle, 4-wire		BCC S415-S424-3A-304-_ _ _ _ _ _ _-_ _ _
M12 Female Right Angle - M12 Male Right Angle, 4-wire		BCC S425-S424-3A-304-_ _ _ _ _ _ _-_ _ _

Standard Lengths Available:
100 = 10 m
200 = 20 m
250 = 25 m

Standard Lengths Available:
020 = 2 m
050 = 5 m
100 = 10 m

Jacket Materials:
Yellow PVC = VX44T2
Grey PVC = VX8434
Black PUR = PX0434

Temperature Problems

■ Extreme swings in temperature ages materials prematurely
■ Constant high temperatures can melt standard materials

Solution

■ High temperature jacket
■ Non-flammable, nonfraying

Solution

■ Good for basic applications
■ UV, ozone, and thermal shock resistant

Type	Fiberglass jacket cable	Thermoplast
Jacket Temperature	-60...400 °C	
Operational Temperature Fixed	-50...80 °C	-50...130 °C
Operational Temperature Moving	-25...80 °C	-40…125 °C
Voltage Rating	250 V	250 V
Amperage	4 A	4 A
M12 Single-Ended		
M12 Female, 4-wire, Straight	BCC W415-0000-1A-003-FW9434-_ _ _	BCC W415-0000-1A-003-BW8434-_ _ _
M12 Female, 4-wire, Right Angle	BCC W425-0000-1A-003-FW9434-_ _ _	BCC W425-0000-1A-003-BW8434-_ _ _
M8 - M12 Double-Ended		
M8 Female Straight - M12 Male Straight, 3 wire	BCC W313-W413-3E-300-FW9334-_ _ _	BCC W313-W413-3E-300-BW8334-_ _ _
M12 Double-Ended		
M12 Female Straight - M12 Male Straight, 4 wire	BCC W415-W414-3A-304-FW9434-_ _ _	BCC W415-W414-3A-304-BW8434-_ _ _
M12 Female Right Angle - M12 Male Straight, 4 wire	BCC W425-W414-3A-304-FW9434-_ _ _	BCC W425-W414-3A-304-BW8434-_ _ _
M12 Splitters		
M12 Male Straight - 2 x M12 Female Straight	BCC W414-W415-W415-U2045-_ _ _	BCC W414-W415-W415-U2044-_ _ _
M12 Male Straight - 2 x M12 Female Right Angle	BCC W414-W425-W425-U2045-_ _ _	BCC W414-W425-W425-U2044-_ _ _

Note: More versions available

Single-ended
Standard Lengths Available:
006 = 0.6 m
010 = 1 m
020 = 2 m

Double-ended
Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m
010 = 1 m
015 = 1.5 m
020 = 2 m

Splitter
Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m

High Durability Cables
Weld Slag

Weld Slag Problems

- Hot weld sparks burn, melt and destroy cable and connector
- Buildup of damage over time can cause shorts and failures

Solution

- Abrasion and mechanical resistant
- Thermal shock resistant

Solution

- Sealed tube, resistant to ingress
- Slag resistance on nut

Type	Silicone cable	Molded silicone tube	
Jacket Temperature		-60…180 °C	
Operational Temperature Fixed	-40...200 °C	-50…80 °C	
Operational Temperature Moving	-25...200 °C	-25…80 °C	
Voltage Rating	250 V	250 V	
Amperage	4 A	4 A	
M12 Single-Ended			
M12 Female, 4-wire, Straight	BCC W415-0000-1A-003-SW0434-_ _ _	BCC W415-0000-1A-003-NW0434-_ _ _	
M12 Female, 4-wire, Right Angle	BCC W425-0000-1A-003-SW0434-_ _ _	BCC W425-0000-1A-003-NW0434-_ _ _	
M8 Double-Ended			
M8 Female Straight - M8 Male Straight, 4 wire	BCC W314-W314-30-304-SW0434-_ _ _		
M8 Female Straight - M12 Male Straight, 3 wire	BCC W313-W413-3E-300-SW0334-_ _ _		
M8 Female Straight - M12 Male Straight, 4 wire	BCC W314-W414-3E-304-SW0434-_ _ _		
M12 Double-Ended			
M12 Female Straight - M12 Male Straight, 4 wire	BCC W415-W414-3A-304-SW0434-_ _ _	BCC W415-W414-3A-304-NW0434-_ _ _	
M12 Female Right Angle - M12 Male Straight, 4 wire	BCC W425-W415-3A-304-SW0434-_ _ _	BCC W425-W414-3A-304-NW0434-_ _ _	
M12 Splitters			
M12 Male Straight - 2 x M12 Female Straight	BCC W414-W415-W415-U2046-_ _ _		
M12 Male Straight - 2 x M12 Female, Right Angle	BCC W414-W425-W425-U2046-_ _ _		

Double-ended
Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m
010 = 1 m
015 = 1.5 m
020 = 2 m
050 = 5 m

Single-ended
Standard Lengths Available:
003 = 0.3 m
006 = 0.6 m
010 = 1 m
015 = 1.5 m
020 = 2 m
050 = 5 m

Splitter
Standard Lengths Available::
003 = 0.3 m
006 = 0.6 m

Note: M8 versions not possible
Max 2 m

Solution

- Low friction, high temperature
- Resistant to caustic agents

Silicone Free

Solution

- M8 and 3 meter versions
- Protection over the overmold

Solution

- Repair damaged cables
- Strengthen vulnerable areas

Weld*Repel*® Silicone Wrap

BAM0183	1" wide x 12 ft Clear wrap
BAM0182	2" wide x 36 ft Clear wrap

- Protect wider areas from damage
- Protect manifolds, I/O and terminations

Weld*Repel*® Silicone Area Protection

BAM0179	3 ft x custom length in ft
BAM017A	3 ft x 3 ft sheet

PTFE	Extended silicone tube
	-60…260 °C
-65...200 °C	-50…105 °C
-65...200 °C	-40…105 °C
250 V	125 V
4 A	4 A

BCC W415-0000-1A-003-TW0434-_ _ _	
BCC W425-0000-1A-003-TW0434-_ _ _	
	BCC M314-M314-30-304-EX44T2-_ _ _-C008
BCC W313-W413-3E-300-TW0334-_ _ _	BCC M313-M413-3E-300-EX43T2-_ _ _-C008
	BCC M314-M414-3E-304-EX44T2-_ _ _-C008
BCC W415-W414-3A-304-TW0434-_ _ _	BCC M415-M414-3A-304-EX44T2-030-C008
BCC W425-W414-3A-304-TW0434-_ _ _	BCC M425-M414-3A-304-EX44T2-030-C008
BCC W414-W415-W415-U2048-_ _ _	BCC M414-M415-M415-U2002-_ _ _-C008
BCC W414-W425-W425-U2048-_ _ _	

- Protect hydraulic and pneumatic lines
- Protect standard sensor cables

| Weld*Repel*® Silicone Jacket		M8	M12
BAM017E	Clear tubing, 1/4" dia. x 50 ft (15 m)		
BAM017H	Clear tubing, 3/8" dia. x 50 ft (15 m)	SE*	
BAM017L	Clear tubing, 1/2" dia. x 50 ft (15 m)	DE**	SE*
BAM017N	Clear tubing, 5/8" dia. x 50 ft (15 m)		DE**
BAM017R	Clear tubing, 3/4" dia. x 50 ft (15 m)		
BAM017U	Clear tubing, 1.5" dia. x 25 ft (7.5 m)		
BAM017Z	Clear tubing, 2" dia. x 25 ft (7.5 m)		

* Recommended for single-ended cables
** Recommended for double-ended cables

Industrial Identification

Vision Sensors
Industrial RFID systems
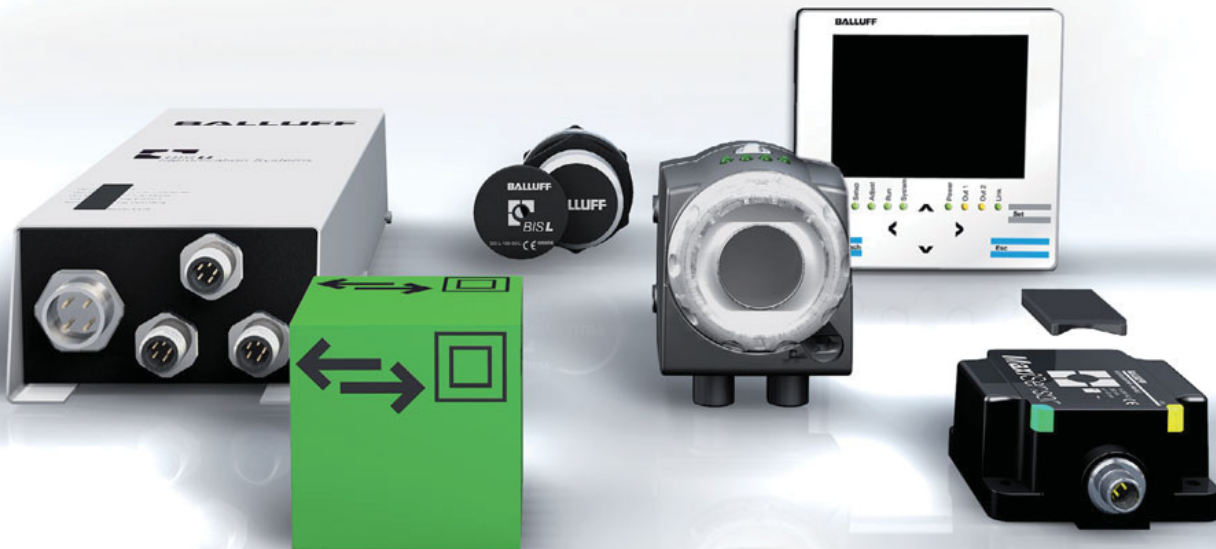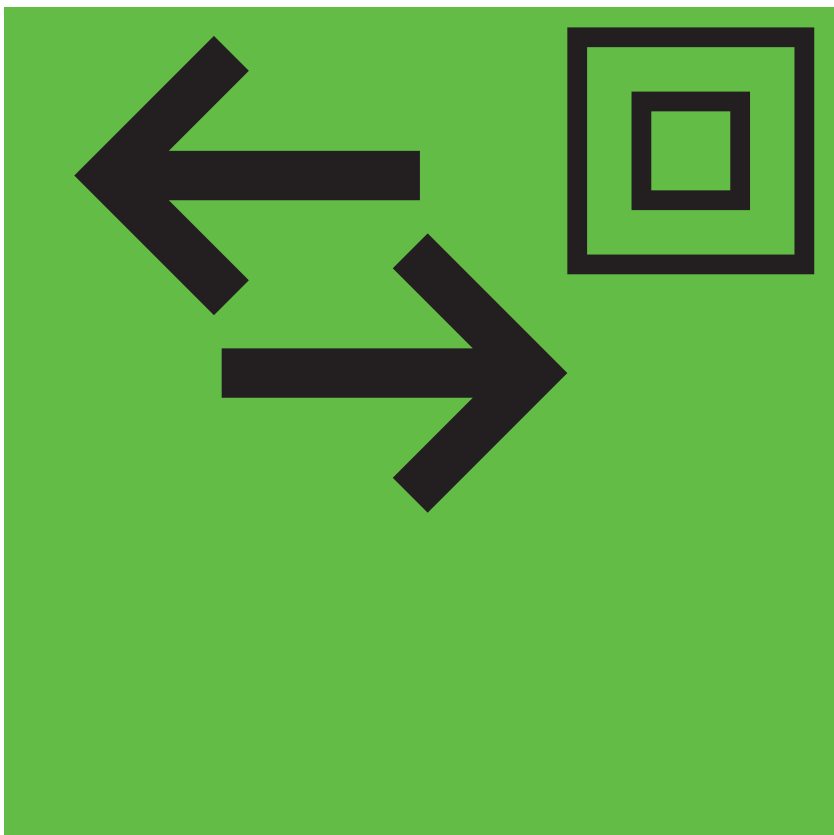
Universal Vision Sensors BVS-E
Bar code and measurement in one

Series			
Lens, focal length			
Red light	PNP	**Ordering code**	
		Part number	
Infrared	PNP	**Ordering code**	
		Part number	
Supply voltage U_S			
Interface			
Typ. detection rate			
Working range			
Working distance,			
Field of view (horizontal×vertical)			
Illumination			
Eye safety acc. to IEC 62471			
Degree of protection as per IEC 60529			
Connection			

In addition to the standard functions of the BVS-E, the universal vision sensor also monitors the rotational position. It can detect objects regardless of the location and position. Production can be monitored more efficiently through shorter process times and the option of using logical functions to combine individual checks.

- The most versatile functionality – lowers user stock requirements.
- Contour based analysis – precisely locate and verify your part
- Ethernet TCP/IP, RS232 interface – part position and checking results for more process information
- Fast code location and verification – reliably identify your parts at higher part rates.

The application range of the BVS Universal includes part presence checks, reading and verifying codes to demanding part positioning applications.

The new powerful 360° contour match tools allow for the locating, verifying and counting of rotated parts in your application. The detected part location can then be transmitted to a PLC or Robot using the built in communication interface.

Up to 40 linear and Data Matrix codes per second can be reliably located and verified, providing outstanding performance for this class of vision sensor.

BVS-E **Universal** Standard lens, **6 mm**	BVS-E **Universal** Standard lens, **8 mm**	BVS-E **Universal** Telephoto lens, **12 mm**
BVS001L	**BVS001M**	**BVS001N**
BVS UR-3-005-E	BVS UR-3-001-E	BVS UR-3-003-E
BVS001F	**BVS001H**	**BVS001J**
BVS UR-3-105-E	BVS UR-3-101-E	BVS UR-3-103-E
24 V DC ±10%	24 V DC ±10%	24 V DC ±10%
RS232, Ethernet TCP/IP	RS232, Ethernet TCP/IP	RS232, Ethernet TCP/IP
3...40 Hz (depending on evaluation function)	3...40 Hz (depending on evaluation function)	3...40 Hz (depending on evaluation function)
50...1000 mm	50...1000 mm	50...1000 mm
50 mm, 34×25 mm 1000 mm, 676×507 mm	50 mm, 24×18 mm 1000 mm, 480×360 mm	50 mm, 16×12 mm 1000 mm, 320×240 mm
LED, can be disengaged	LED, can be disengaged	LED, can be disengaged
Free group	Free group	Free group
IP 54	IP 54	IP 54
2 M12 connectors (8 and 4-pin)	2 M12 connectors (8 and 4-pin)	2 M12 connectors (8 and 4-pin)

Balluff Vision Sensor Kits
Sensors and accessories – all in one case

Ever experienced this?
You ordered the Vision Sensor BVS with connecting cable. During initial operation, however, you determine that the parameterization cables and mounting brackets are still missing.

This is why we have integrated the Vision Sensor BVS with accessories for you in a package. You only have to order one item and you have everything you need to operate the sensor.
An Added-Value Kit contains a Vision Sensor in a design of your choice, including software CD and operating instructions, mounting bracket and installation accessories, supply and parameterization cables, which means you only have to connect a 24-V power supply unit. If you do not happen to have a power supply unit, needless to say we can also supply you with one.

Description			Added-value kit with vision sensor BVS	
			Includes red light sensor	**Includes infrared sensor**
Standard series	6-mm lens	**Ordering code**	**SET012P**	**SET0121**
		Part number	BAV BP-PH-00022-01	BAV BP-PH-00068-01
	8-mm lens	**Ordering code**	**SET012M**	**SET0122**
		Part number	BAV BP-PH-00020-01	BAV BP-PH-00069-01
	12-mm lens	**Ordering code**	**SET012N**	**SET0123**
		Part number	BAV BP-PH-00021-01	BAV BP-PH-00070-01
Advanced series	6-mm lens	**Ordering code**	**SET012U**	**SET0124**
		Part number	BAV BP-PH-00025-01	BAV BP-PH-00071-01
	8-mm lens	**Ordering code**	**SET012R**	**SET0125**
		Part number	BAV BP-PH-00023-01	BAV BP-PH-00073-01
	12-mm lens	**Ordering code**	**SET012T**	**SET0126**
		Part number	BAV BP-PH-00024-01	BAV BP-PH-00074-01
Identification series	6-mm lens	**Ordering code**		**SET0128**
		Part number		BAV BP-PH-00076-01
	8-mm lens	**Ordering code**	**SET012J**	**SET0129**
		Part number	BAV BP-PH-00017-01	BAV BP-PH-00077-01
	12-mm lens	**Ordering code**	**SET012K**	**SET012A**
		Part number	BAV BP-PH-00018-01	BAV BP-PH-00078-01
Universal series	6-mm lens	**Ordering code**	**SET014U**	**SET0150**
		Part number	BAV BP-PH-00092-03	BAV BP-PH-00092-07
	8-mm lens	**Ordering code**	**SET014R**	**SET014Y**
		Part number	BAV BP-PH-00092-01	BAV BP-PH-00092-05
	12-mm lens	**Ordering code**	**SET014T**	**SET014Z**
		Part number	BAV BP-PH-00092-02	BAV BP-PH-00092-06
Contents			Vision sensor, mounting bracket, installation accessories, connector, software CD and operating instructions	

Industrial RFID System BIS V
The new generation for more efficiency

A new generation system for more flexible RFID:
Combine up to four low and high frequency read/write heads
with I/O in one device.

The BIS V Radio Frequency Identification (RFID) system is founded on a new generation of RFID processors that maximize your flexibility by providing a single device for both low frequency 125Khz and high frequency 13.56Mhz read/write heads with an IO-Link master port. Combining up to four heads on either frequency with local analog, valve manifold or I/O access/control provides a solution you can apply to many types of RFID applications.This can save cost and time using a single processor platform across your application installation base. The BIS V system also allows you to draw on a single processor family with a wide array of read/write head and RFID tag options for both manufacturing and logistics solutions.

The BIS V RFID system offers a higher level of performance than other systems to solve today's industrial applications. Designed to maximize performance while improving usability out on the line, the BIS V processor provides a functional display and LED's making status and setup easier. And a USB service interface makes connection for setup to today's PC's simple. The BIS V offers these additional functions:

■ Four asynchronous 125Khz and 13.56Mhz read/write antenna channels.
■ LCD display with control buttons for setting and displaying the Profibus address and data carrier/tags UID.
■ An integrated IO-Link master port for connecting discrete or analog I/O, or valve manifolds.
■ Intelligent power plug option for saving parameters on the device.
■ Industrial IP rated metal housing for any application environment.
■ Flexible mounting options for hard-point or DIN rail.

|	
Cancel control button	Enter control button
Display	
	Status LEDs
Read/write head connection 1	Read/write head connection 2
Read/write head connection 3	Read/write head connection 4
USB and IO-Link connection	7/8" power plug
Bus out	Bus in

PROFIBUS

EtherCAT.

CC-Link

EtherNet/IP™

CE

Description		BIS V RFID processor
PROFIBUS	**Ordering code**	**BIS00T3**
	Part number	BIS V-6102-019-C001
EtherCAT	**Ordering code**	**BIS00U9**
	Part number	BIS V-6110-063-C002
CC-Link	**Ordering code**	**BIS010P**
	Part number	BIS V-6111-073-C003
EtherNet/IP	**Ordering code**	**BIS0122**
	Part number	BIS V-6106-034-C004
Power supply		24 V DC ±10% LPS Class 2
Residual ripple		≤ 10%
Power supply		≤ 2 A
Ambient temperature T_a		0...+60 °C
Degree of protection as per IEC 60529		IP 65
Housing material		Cast zinc
Weight		800 g
Connection H1…H4		M12 socket, 5-pin, A-coded
Power connection		7/8" plug, 5-pin power (EtherNet/IP 4-pin power)
Application interface		IO-Link 1.1, USB 2.0
Application with read/write heads		BIS VM-3… and BIS VL-3…
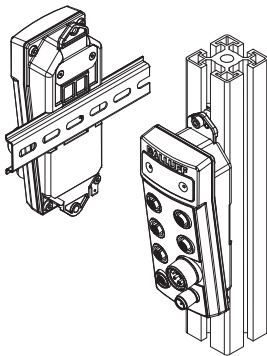
The compact EMC-protected metal housing with small dimensions (170×60×40 mm) is perfectly integrated and simple to mount. In control cabinets or in the field up to IP 65, on a top-hat rail, or on a profile.

The new generation for more efficiency

CE
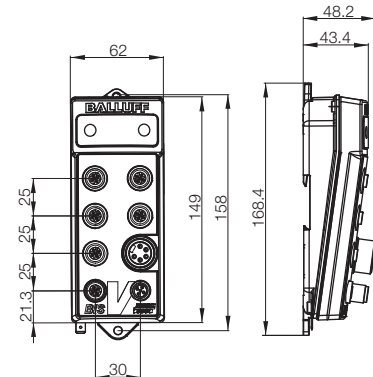
Description	HF read/write head BIS VM	HF read/write head BIS VM	HF read/write head BIS VM	
Dimensions	**M30×1.5**	**80×80×40 mm**	**80×80×40 mm**	
Mounting in steel	Non metal	Non-flush on steel	Non-flush on steel	
Antenna type	Circular	Circular	Rod	
Ordering code	**BIS00RF**	**BIS00T0**	**BIS00T2**	
Part number	BIS VM-300-001-S4	BIS VM-301-001-S4	BIS VM-351-001-S4	
Power supply	≤ 150 mA	≤ 150 mA	≤ 150 mA	
Power supply	18…30 V DC	18…30 V DC	18…30 V DC	
Residual ripple	≤ 1.3 V_{ss}	≤ 1.3 V_{ss}	≤ 1.3 V_{ss}	
Ambient temperature T_a	−25...+55 °C	−25...+55 °C	−25...+55 °C	
Degree of protection as per IEC 60529	IP 67 (with connector)	IP 67 (with connector)	IP 67 (with connector)	
Function indicator	Yes	Yes	Yes	
Housing material	Nickel-plated CuZn	PBT	PBT	
Weight	100 g	190 g	360 g	
Connection	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	

Please take the corresponding write/read distance from the Industrial Identification catalog, Chapter BIS M (BIS VM-300... corresponds to BIS M-300...).
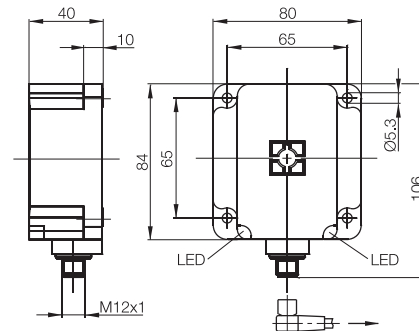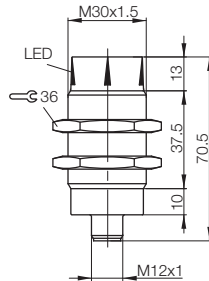
Securing clamp included in the scope of delivery.

Please order matching plug connectors separately.

(Unshielded cable can be used only for lengths up to 3 m. Cable lengths over 3 m have to be shielded.)

Plug side	Socket side	Cable material	Color	BCC039H	BCC039R	BCC03A8	BCC03AJ	BCC039J	BCC039T	BCC03A9	BCC03AK	BCC039K	BCC039U	BCC03AA	BCC03AL	BCC039L	BCC039W	BCC03AC	BCC03AM	BCC039M	BCC039Y	BCC03AE	BCC03AN
				0.3 m				0.6 m				1 m				1.5 m				2 m			
Straight	Straight	PUR	Black	■				■				■				■				■			
Straight	Angled	PUR	Black		■				■				■				■				■		
Angled	Straight	PUR	Black			■				■				■				■				■	
Angled	Angled	PUR	Black				■				■				■				■				■

	HF read/write head BIS VM	HF read/write head BIS VM	HF read/write head BIS VM	HF read/write head BIS VM
	25x50x10 mm	**M12×1**	**M18×1**	**25×50×10 mm**
	Non metal	Non metal	Non metal	Non-flush on steel
	Circular	Circular	Circular	Rod
	BIS00T9	**BIS00T7**	**BIS00T8**	**BIS00T6**
	BIS VM-305-001-S4	BIS VM-306-001-S4	BIS VM-307-001-S4	BIS VM-352-001-S4
	≤ 150 mA	≤ 150 mA	≤ 150 mA	≤ 150 mA
	18…30 V DC	18…30 V DC	18…30 V DC	18…30 V DC
	≤ 1.3 V_{ss}	≤ 1.3 V_{ss}	≤ 1.3 V_{ss}	≤ 1.3 V_{ss}
	−25...+55 °C	−25...+55 °C	−25...+55 °C	−25...+55 °C
	IP 67 (with connector)	IP 67 (with connector)	IP 67 (with connector)	IP 67 (with connector)
	Yes	Yes	Yes	Yes
	AlMgSi 0.5/ABS-GF16	AlMgSi 0.5/nickel-plated CuZn	AlMgSi 0.5/nickel-plated CuZn	AlMgSi 0.5/ABS-GF16
	200 g	190 g	220 g	370 g
	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
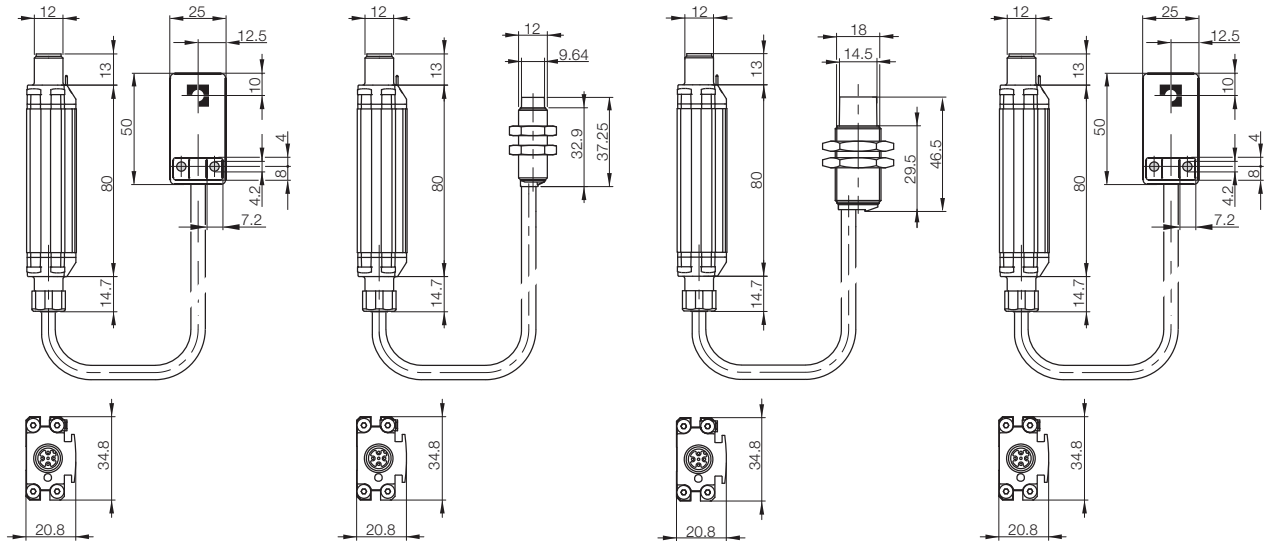
Industrial RFID System BIS M
Data carriers read/write

For greatest flexibility
Data carriers are available in various formats: as a disc, cylinder, cube or in a handy credit card size. They guarantee a broad range of applications.

For reliable traceability
All data carriers have a 4-byte unique ID contained in the read/write memory. This number is read-only.

CE

Dimension	**M8**	
Housing material	Steel-coated, PA 12 (fiberglass-reinforced)	
Weight	16 g	

BIS M read/write

8192 bytes	**Ordering code**	**BIS0119**	
(only with BIS VM heads)	Part number	BIS M-142-20/A-M8-GY*	
Operating temperature		−25...+70 °C	
Storage temperature		−25...+95 °C	
Degree of protection as per IEC 60529		IP 68/x9K	

Suitable read/write head with max. read/write distance

Assembly			
BIS VM-300	0...17 mm		
BIS VM-301			
BIS VM-305			
BIS VM-307	0...13 mm		
BIS VM-341	0...40 mm		
BIS VM-351			

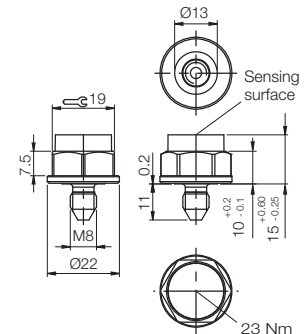**Please observe mounting instructions prior to installation.**

Supported standard
*ISO 15693

Installation:

⬛ Flush in steel

⬛ Non-flush on steel

⬛ Non-metal

Antenna type:
⬛ Rod

⬛ Circular

Ø13

Sensing surface

19

7.5

11

0.2

M8

Ø22

10 $^{+0.2}_{-0.1}$

15 $^{+0.60}_{-0.25}$

23 Nm

52×32×11 mm	40×22×9.5 mm	40×22×9.5 mm	80×40×22 mm
PBT	PPS (fiberglass-reinforced)	PPS (fiberglass-reinforced)	POM
< 27 g	9 g	9 g	95 g

BIS0111	BIS0117	BIS0112	BIS010R
BIS M-108-20/A*	BIS M-155-20/A*	BIS M-156-20/A*	BIS M-153-20/A*
–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+85 °C
–25...+85 °C	-25...+130 °C	-25...+130 °C	–25...+85 °C
IP 67	IP 67	IP 67	IP 68

0...16 mm	0...30 mm			
	0...45 mm			
0...10 mm	0...18 mm			
0...12 mm	0...20 mm			
0...50 mm	20...60 mm			
		0...65 mm	0...65 mm	0...100 mm
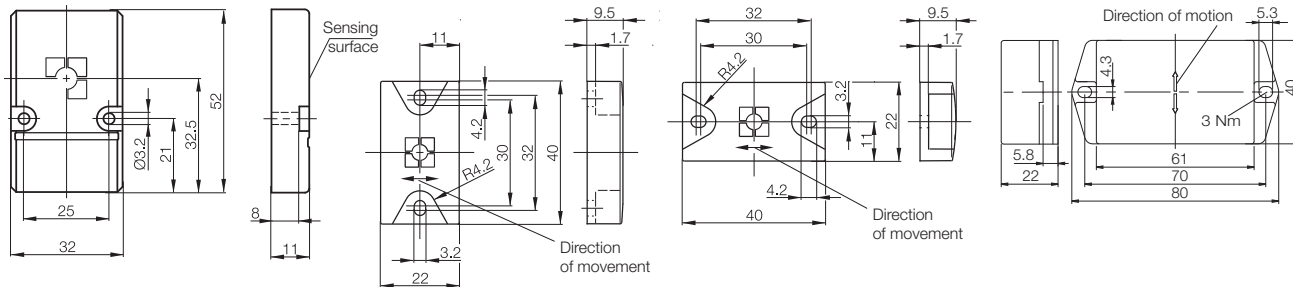
Sensing surface

Direction of movement

Direction of movement

Direction of motion

3 Nm

For 100% quality and maximum reliability – even at long distances

The Industrial RFID BIS U ensures fast read/write cycles and flexible communication. Even for large data quantities and in highly dynamic applications. The BIS U thereby ensures 100% quality and, with an operating range of 6 m, bridges even long distances.

Our rugged BIS U systems are simple to integrate into host controller systems: worldwide standards are not only the newest technology, they also bring investment security.

Traceability for production and material flow

Traceability means recording every step of a process chain so that it can be traced. The production history of all production parts and all of the materials and equipment used here are automatically documented for this purpose—with time, place, and process.

You have real-time access to all information, enabling you to make corrections even during the process. Traceability creates lean manufacturing processes, simplifies just-in-time deliveries (JIT), aids legal certainty and ensures product quality.
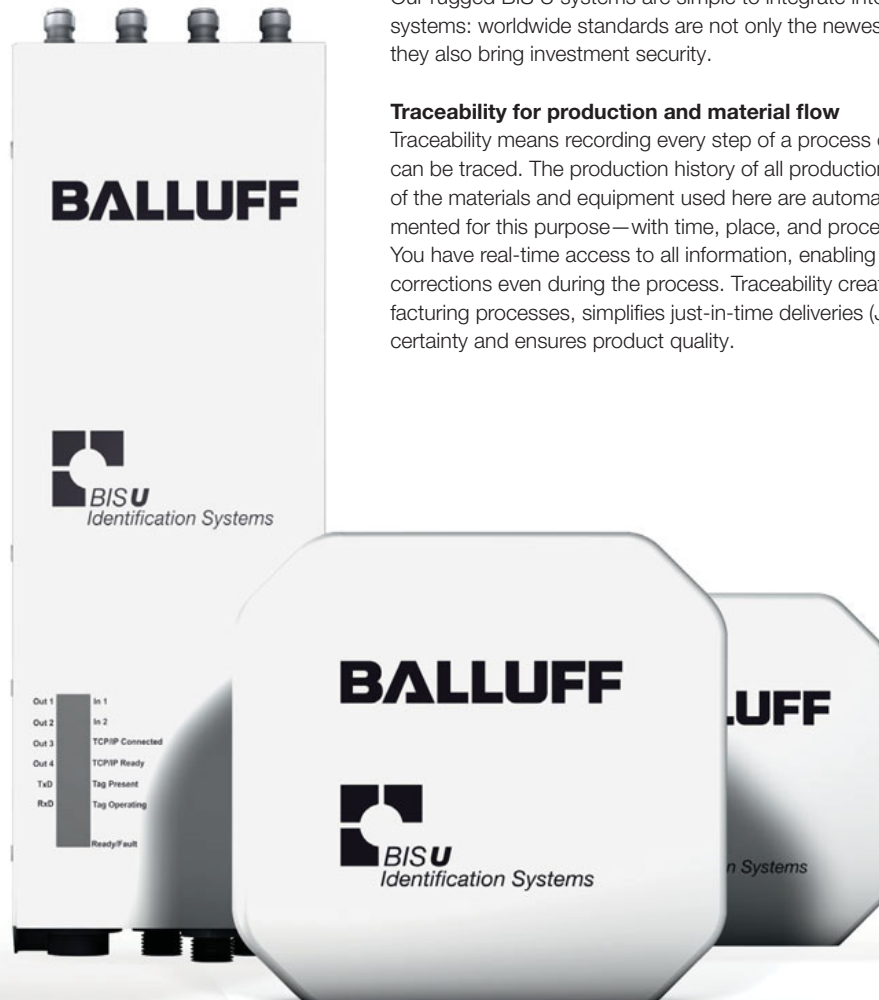
Reader BIS U-6028

- UHF technology
- Read/write distance up to 6 m
  (depending on the ambient conditions)
- Reliable detection of one tag
- Connection option for 4 antennas
- Profinet interfaces; additionally RS232 as service interface,
  M12 connection
- Rugged metal housing
- Control indicators for communication and the status of ports
- Power supply: 24 V ±20%, residual ripple ≤ 10%, 7/8" connection
- Version with push-pull connector
  in accordance with AIDA standard*

Ultra-high frequency (UHF) Industrial Identification BIS U

- 865 (EU)/915 (US) MHz
- Read area up to 6 m
- 512-bit user memory

Benefits

- Worldwide standard EPC Class 1 Gen 2
- ISO 18000-6C
- Highest data rate
- Tags for high temperatures (up to 220 °C)

Typical applications

- Container tracking
- Supply chain management
- Production control
- Asset tracking

Model	BIS U-6028
Description	4 head processor
Ordering code	**BIS00ZW**
Part number	BIS U-6028-048-114-06-ST28
Frequency	902...928 MHz
Antenna ports	4
Interfaces	Profinet
Approvals	FCC
Standards	EPC Class 1 Gen 2, ISO 18000-6C

* AIDA = Automation Initiative of German Domestic Automobile Manufacturers

Object Detection

Inductive sensors
Photoelectric sensors
Capacitive sensors

Inductive Sensors
Mini Block Sensors—now available in a metal housing!
Small – precise – rugged

The BES R04 inductive sensor family has demonstrated reliability and precision in many applications. Balluff is very excited to expand the product family with a metal housing design. This robust metal-housed inductive sensor is ideal for extreme applications where everyday hostilities can challenge standard sensor life. The sensor also offers a ceramic sensing face making it an excellent choice for applications with weld spatter, metal debris, and vibration; and with its small size and low profile it is a perfect choice where space is a concern.

Features
■ Robust metal housing with ceramic sensing face
■ Flush installation
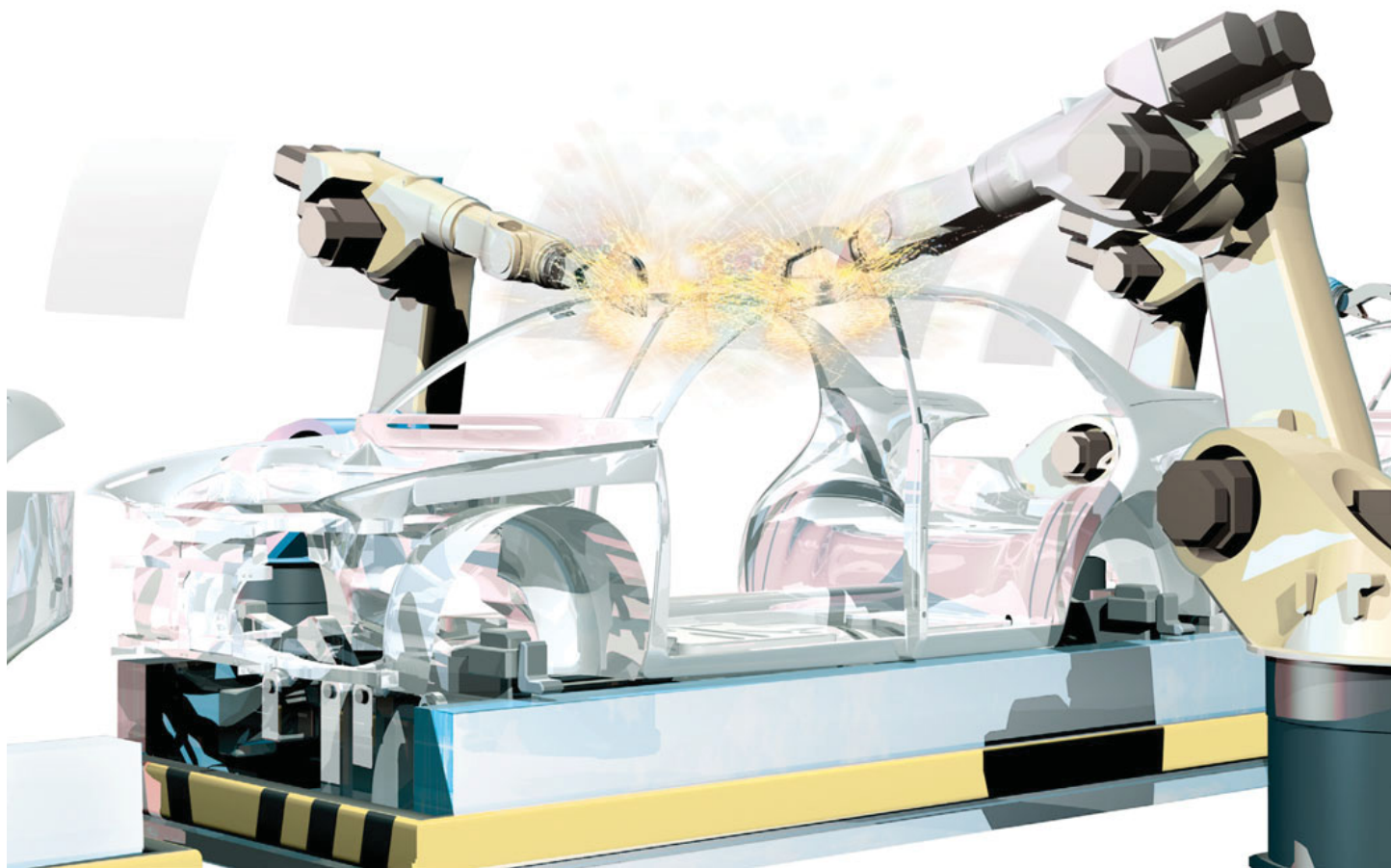■ Pigtail and cable out variants

Size		**8×16×4.7 mm**	**8×16×4.7 mm**
Rated switching distance s_a		2 mm	2 mm
PNP, NO	**Ordering code**	**BES04F6**	**BES04FA**
	Part number	BES R04MC-PSC20B-EP02-106	BES R04MC-PSC20B-EP00.3-GS49-106
PNP, normally	**Ordering code**	**BES04F5**	**BES04F8**
closed	Part number	BES R04MC-POC20B-EP02-106	BES R04MC-POC20B-EP00.3-GS49-106
NPN, NO	**Ordering code**	**BES04F4**	**BES04F9**
	Part number	BES R04MC-NSC20B-EP02-106	BES R04MC-NSC20B-EP00.3-GS49-106
NPN, NC	**Ordering code**	**BES04F3**	**BES04F7**
	Part number	BES R04MC-NOC20B-EP02-106	BES R04MC-NOC20B-EP00.3-GS49-106
Supply voltage U_S		10...30 V DC	10...30 V DC
Voltage drop U_d at I_e max.		2.5 V	2.5 V
Rated insulation voltage U_i		75 V DC	75 V DC
Rated operating current I_e		100 mA	100 mA
Polarity reversal protected/transposition protected/Short-circuit protected		Yes/Yes/Yes	Yes/Yes/Yes
Ambient temperature T_a		–25...70 °C	–25...70 °C
Switching frequency f max.		5000 Hz	5000 Hz
Degree of protection as per IEC 60529		IP 67	IP 67
Approvals		CE, cULus	CE, cULus
Material	Housing	Brass, coated	Brass, coated
	Sensing surface	Ceramic	Ceramic
Connection		2 m PUR cable, 26 AWG	0.3 m PUR cable with M8 connector, 3-pin

Weld Immune Factor 1 Sensors
SteelFace™ with weld resistant coating

Balluff SteelFace™ sensors are designed and built tough to survive longer in your most abusive applications. For applications that require something more compact than a tubular sensor, Balluff is pleased to offer the all new flatpack SteelFace sensors. The one piece stainless steel housing offers a robust operating face for the most demanding applications. Add our all new patent pending coating and you have the ideal sensor for extreme applications.

Features
- One piece stainless steel housing
- 5 mm operating distance
- Factor 1 (all metal detection)
- Weld slag resistant W51 coating
- Weld Field Immune
- Round corner housing

STEEL*FACE*®

W51 ceramic coating

Size		20×32×8 mm	20×32×8 mm
Mounting type		Flush	Flush
Rated switching distance s_n		**5 mm**	**5 mm**
PNP, NO	**Ordering code**	**BES04AH**	**BES049Y**
	Part number	BES R01EC-PSC50A-BP00,3-GS04-W50	BES R01EC-PSC50A-BP00,3-GS04-W51
Supply voltage U_B		10...30 V DC	10...30 V DC
Rated operating current I_e		200 mA	200 mA
Polarity reversal/short-circuit protected		Yes/Yes	Yes/Yes
Ambient temperature range		0...+50 °C	0...+50 °C
Switching frequency f		20 Hz	20 Hz
Degree of protection as per IEC 60529		IP 65	IP 65
Approvals		CE, cULus	CE, cULus
Material	Housing	Stainless steel	Stainless steel
	Sensing surface	Stainless steel	Stainless steel with W51 ceramic coating
Connection		0.3 m PUR cable with silicone sheath and M12 connector, 3-pin with LED	0.3 m PUR cable with silicone sheath and M12 connector, 3-pin with LED

The extremely high-quality coating has a PTFE and ceramic base. It prevents the deposition of weld splatter, increasing the life of the sensor.

Before

Weld spatter after one shift of production

After

Sensor cleaned after one shift production

Application areas
- Welding
- Stamp and die
- Automotive industry
- Automated assembly
- Conveyor technology

For Extreme Applications up to +160 °C (320 °F)
## Ultra-high temperature inductive sensors

CE

+160 °C
High temperature range!

+160 °C
High temperature range!

Size		**M12×1**	**M12×1**	
Mounting type		Flush	Non-flush	
Rated switching distance s_n		**2 mm**	**4 mm**	
PNP, NO	**Ordering code**	**BES04CK**	**BES04CL**	
	Part number	BES 515-325-SA74-D-TF-02	BES 515-356-SA35-D-TF-02	
Supply voltage U_B		10...30 V DC	10...30 V DC	
Voltage drop U_d at I_e		2.5 V	2.5 V	
Rated operating current I_e		200 mA	200 mA	
Ambient temperature range		**−25...+160 °C**	**−25...+160 °C**	
Switching frequency f		200 Hz	200 Hz	
Degree of protection as per IEC 60529		IP 69K	IP 69K	
Material	Housing	Stainless steel 1.4571	Stainless steel 1.4571	
	Sensing surface	PEEK	PEEK	
Connection		2 m FEP cable, 22 AWG	2 m FEP cable, 22 AWG	

■ Reduction in maintenance costs
■ Increase in process quality

The ultra-high temperature-resistant inductive sensors can be used in temperature ranges up to +160 °C. Balluff ultra-high temperature sensors are ideally suited to harsh environments in the steel industry, in plastic injection molding machines and in forging and foundry processes.

Rated operating current

I_e

200

50

−25 °C   +40 °C   +160 °C
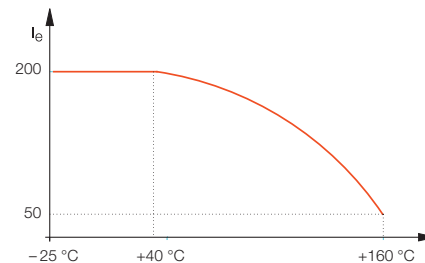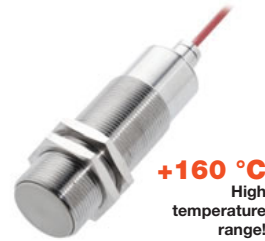
M18×1	M18×1	M30×1.5	M30×1.5
Flush	Non-flush	Flush	Non-flush
5 mm	**8 mm**	**10 mm**	**15 mm**
BES043T	**BES043U**	**BES043W**	**BES043Y**
BES 515-326-SA49-D-TF-02	BES 515-360-SA13-D-TF-02	BES 515-327-SA22-D-TF-02	BES 515-362-SA4-D-TF-02
10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
2.5 V	2.5 V	2.5 V	2.5 V
200 mA	200 mA	200 mA	200 mA
–25...+160 °C	**–25...+160 °C**	**–25...+160 °C**	**–25...+160 °C**
200 Hz	200 Hz	200 Hz	200 Hz
IP 69K	IP 69K	IP 69K	IP 69K
Stainless steel 1.4571	Stainless steel 1.4571	Stainless steel 1.4571	Stainless steel 1.4571
PEEK	PEEK	PEEK	PEEK
2 m FEP cable, 22 AWG	2 m FEP cable, 22 AWG	2 m FEP cable, 22 AWG	2 m FEP cable, 22 AWG

+160 °C High temperature range!
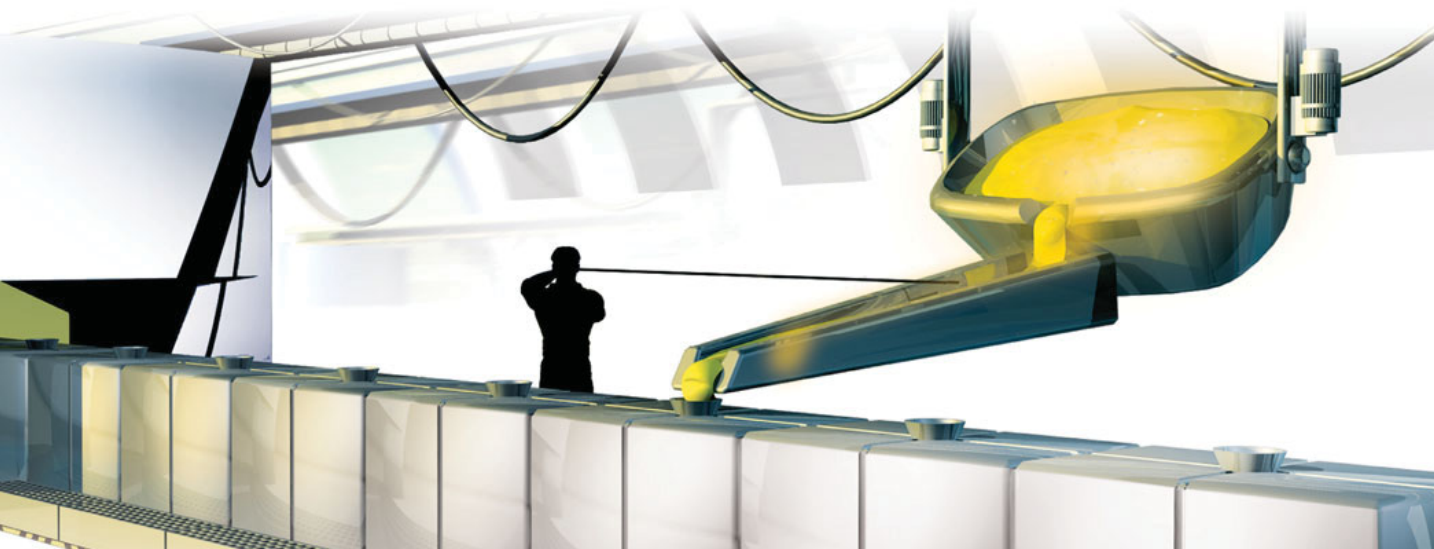
Inductive PTFE Sensor for Aggressive Environments
Ideally suited for caustic applications

- Non-metal PTFE housing
- PTFE connection cable
- PTFE-encapsulated function indicator (red)
- Large switching distance for reliable detection

Inductive sensors made from PTFE are ideal for extreme conditions commonly found in the chemical industry. In addition, they can be used in a metal-free environment, for example, in the semiconductor industry.

They are also well suited in wet areas where metal contamination needs to be prevented with a full PTFE housing and cable.

Size		M18×1
Mounting type		Non-flush
Rated switching distance s_n		**16 mm**
NPN, NO	**Ordering code**	**BES049C**
	Part number	BES M18TI2-NSC16F-AT05
Supply voltage U_B		10...30 V DC
Voltage drop U_d at I_e		1.5 V
Rated operating current I_e		200 mA
Polarity reversal/short-circuit protected		Yes/Yes
Ambient temperature T_a		−25...70 °C
Switching frequency f		600 Hz
Approvals/conformity		CE, cULus
Degree of protection		IP 67
Material	Housing	PTFE
	Sensing surface	PTFE
Connection		5 m PTFE cable

The display for the switching state is encapsulated in the housing while still remaining easily visible.

Laser Retroreflective Sensor BOS Q08M
Extreme accuracy in a compact, high-performance design
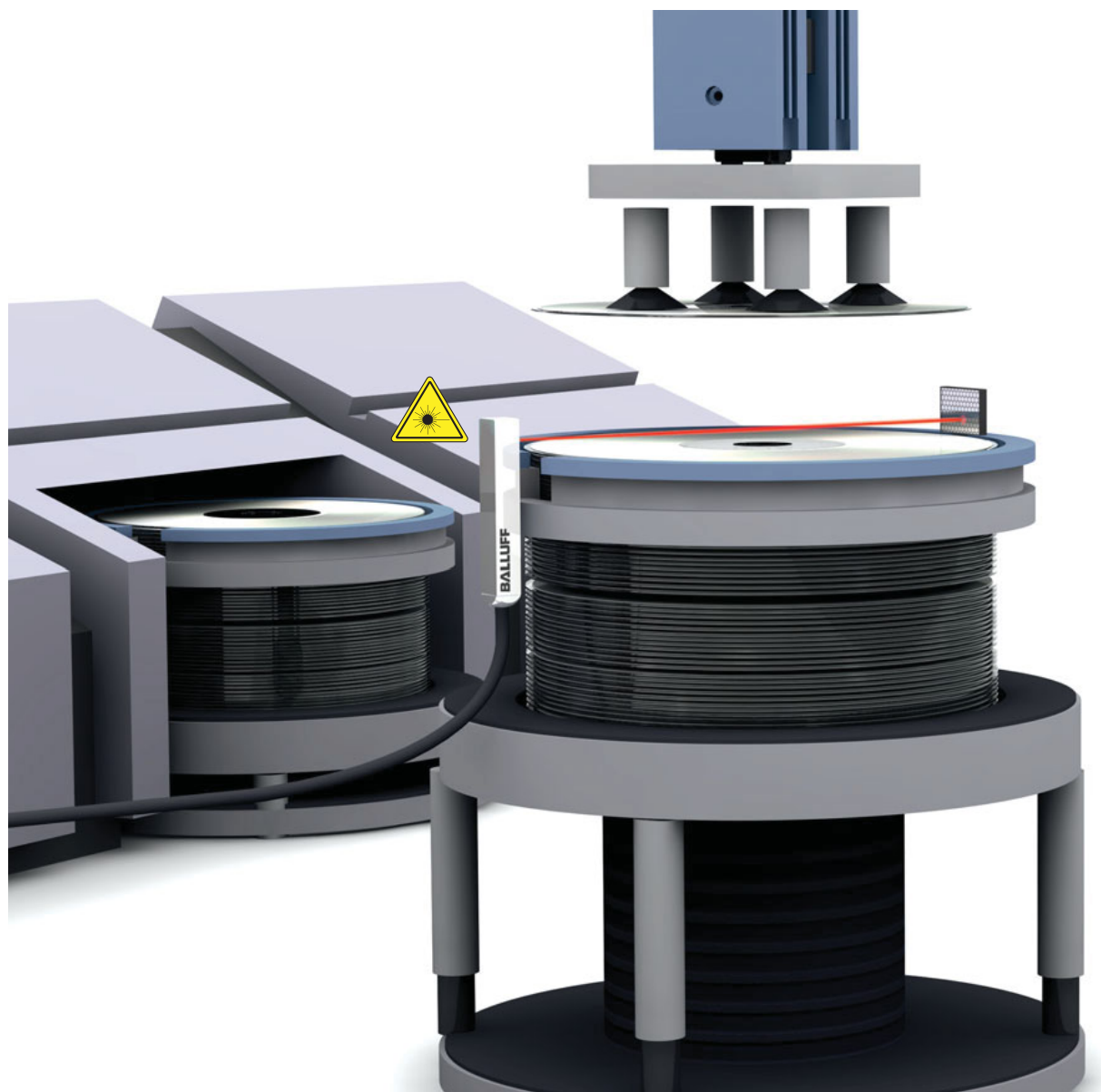
- Compact design for installation in small of spaces
- Rugged metal housing with threaded holes
- Reliable detection of small parts down to 0.3 mm
- Uses a patented mounting concept for Bosch profiles that allows quick, precise positioning

Reliably detect the smallest parts

Small size – big performance. The advantages of our photoelectric sensor BOS Q08M family also apply to its newest member, a laser retroreflective sensor with very high accuracy. These sensors are recommended when space is limited. Their excellent, fine light beam also detects the smallest objects with absolute reliability and can even be aligned with high precision amidst tightly packed parts.

CE

■ **Ordering code**
■ Part number

		Retroreflective sensor				
		BOS01MP / BOS Q08M-PS-LR20-S49	BOS01MU / BOS Q08M-PS-LR20-00-2-S49	BOS01MZ / BOS Q08M-PS-LR20-02	BOS01MR / BOS Q08M-PO-LR20-S49	BOS01MW / BOS Q08M-PO-LR20-00-2-S49
Switching output	PNP	■	■	■	■	■
	NPN	On request				
Switching type	NO	■	■	■		
	NC				■	■
Connection	M8 connector, 3-pin	■			■	
	Cable with M8 connector, 3-pin		■			■
	Cable			■		
Range		0...1 m				
Light type		Laser (laser class 1)				
Switching frequency		400 Hz				
Smallest detectable part		Up to 0.3 mm				
Degree of protection		IP 67				
Material	Housing	Nickel-plated die-cast zinc				
	Optical surface	PMMA				

- Extremely long range – resulting in reliable function in dirty environments
- Invisible light – does not irritate personnel
- Through-beam sensor with test input for function check
- Wide range of assembly accessories

Sensors with infrared light are vital for tasks involving object detection in dirty or harsh environments. With a range of more than 100 meters, the high power version of the through-beam sensor makes a dramatic impression under these conditions, especially since it leaves other sensors of this size in the dust.

		Through-beam sensor					
Ordering code ⬛ Part number ⬛		BOS01F3 BOS 18M-PA-IE20-S4	BOS01F4 BOS 18M-NA-IE20-S4	BOS01HT BOS 18M-X-IS24-S4	BOS01HU BOS 18M-XT-IS24-S4		
Detection range		Up to 100 m		100 m			
Light type	PNP	⬛					
	NPN		⬛				
Switching output	Complementary	⬛	⬛				
	Emitter			⬛	⬛		
	Test input				⬛		
Supply voltage U_B		10...30 V DC					
Switching frequency		400 Hz					
Housing material		Nickel-plated brass					
Optical surface		Glass					
Type of protection (IEC 60529)		IP 67					
Ambient temperature T_a		–5...+55 °C					

c(UL)us LISTED CE

Accessories
– Clamping block BOS 18.0-KB-1, with ball joint, plastic (ordering code: **BAM00T3**)
– Mounting cuff BES 18.0-BS-1, plastic (ordering code: **BAM00F2**)
– Mounting bracket BES 18-HW-1, bracket for 90° surface mounting, aluminum (ordering code: **BAM00EY**)
– Sensor holder BMS CS-P-D12-AD18-00, for Balluff assembly system, 90° angle, plastic (ordering code: **BAM002P**)
– Sensor holder BMS CS-M-D12-ID18-01, for Balluff assembly system, 90° angle, stainless steel (ordering code: **BAM0032**)
– Connector BCC M415-0000-1A-003-PX44T2-050, M12 straight, 2 m PUR cable (ordering code: **BCC05FE**)
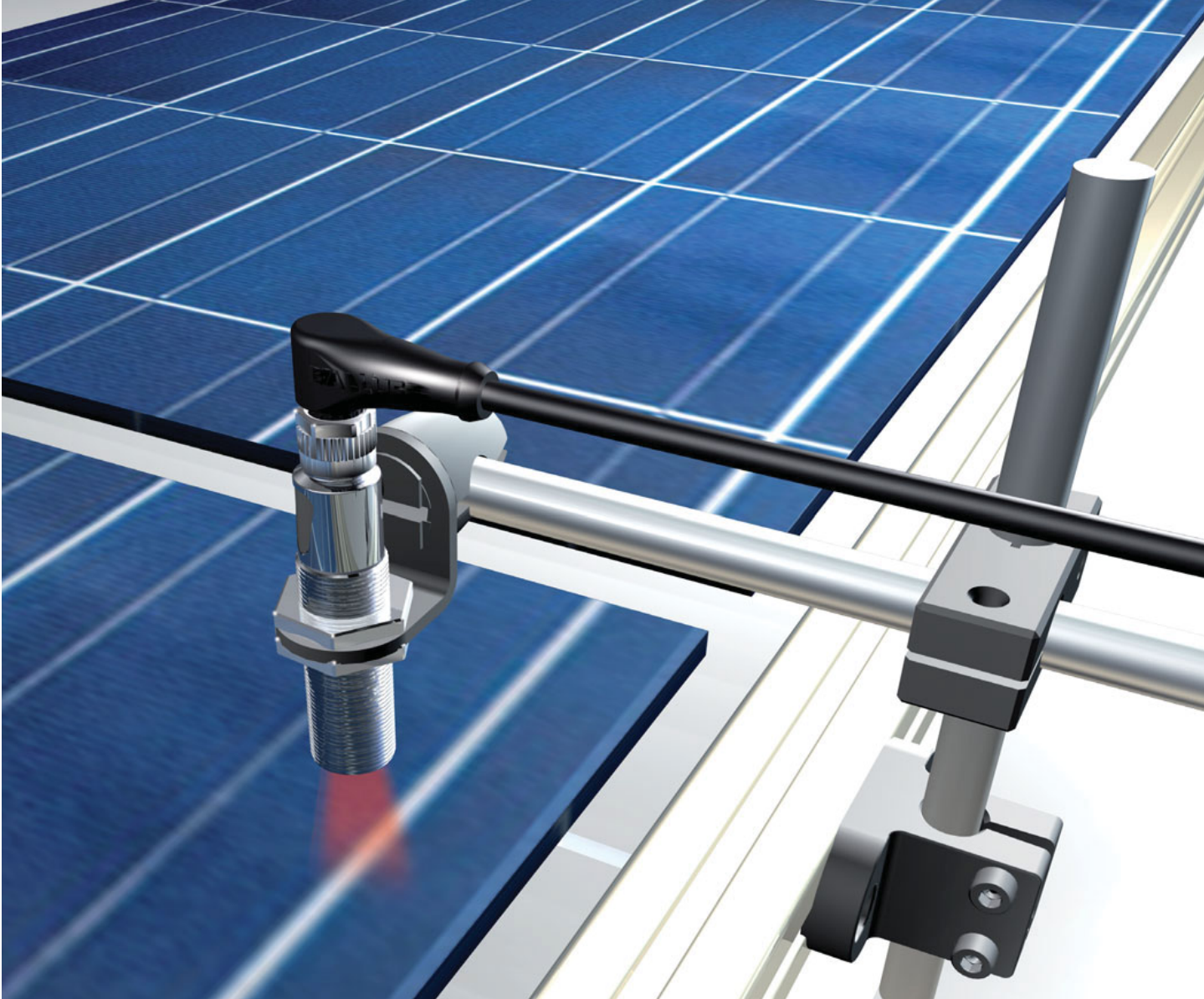Further accessories upon request.

- Special optics for glass detection – small blind zones and high ambient light security
- Reliable detection of solar modules in production (typical distance 2…25 mm)
- Scanning glass detection (typical distance 2…40 mm)
- Reliable detection of high-gloss surfaces over a wide angular range.
- Suppression of objects in the background starting at 250 mm

Glass detection represents a particular challenge for photoelectric sensors, a challenge that can be solved with infrared light.
Thus, our diffuse sensors use special optics to ensure that even transparent, reflective or high-gloss surfaces – such as occur on solar modules – are reliably detected. Another advantage: high-gloss objects can be reliably detected from every direction across a wide angular range.

Diffuse sensor (energetic)

■ **Ordering code**
■ Part number
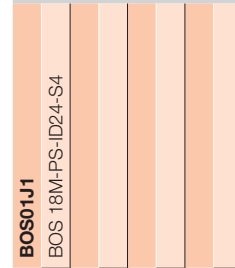
		BOS01J1 / BOS 18M-PS-ID24-S4
Switching output	PNP NO	■
Sensing range	Glass	2...40 mm
	Solar module	2...25 mm
	Gray card 90%	2...80 mm
Switching frequency		200 Hz
Setting		None
Light type		Infrared
Housing material		Nickel-plated brass
Optical surface		PMMA
Connection		M12 connector, 4-pin
Ambient temperature T_a		−5...+55 °C

Accessories
– Clamping block BOS 18.0-KB-1, with ball joint, plastic (ordering code: **BAM00T3**)
– Mounting cuff BES 18.0-BS-1, plastic (ordering code: **BAM00F2**)
– Mounting bracket BES 18-HW-1, bracket for 90° surface mounting, aluminum (ordering code: **BAM00EY**)
– Sensor holder BMS CS-P-D12-AD18-00, for Balluff assembly system, 90° angle, plastic (ordering code: **BAM002P**)
– Sensor holder BMS CS-M-D12-ID18-01, for Balluff assembly system, 90° angle, stainless steel (ordering code: **BAM0032**)
– Connector BCC M415-0000-1A-003-PX44T2-050, M12 straight, 2 m PUR cable (ordering code: **BCC05FE**)
Further accessories upon request.

Laser Retroreflective Sensor with Autocollimation
BOS 23K—ideal for detecting small parts

NEW

The BOS 23K laser retroreflective sensor is a high-performance product for demanding applications. The autocollimation offers a small, round beam profile, since emitter and receiver operate with a shared lens. Without a dead zone, it enables excellent detection of small parts.
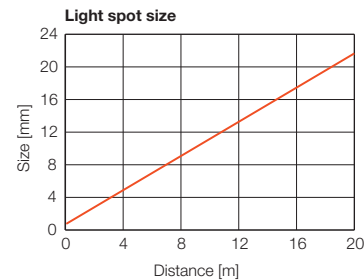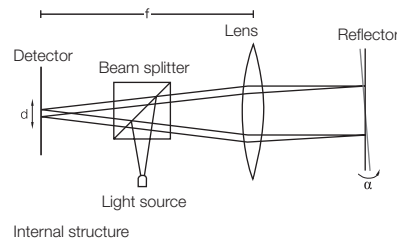
- 20 m range on standard laser reflector
- Reliable detection of objects as small as just 1 mm over a distance of 10 m
- Laser class 1 requires no additional protective measures
- Only one optical axis through autocollimation
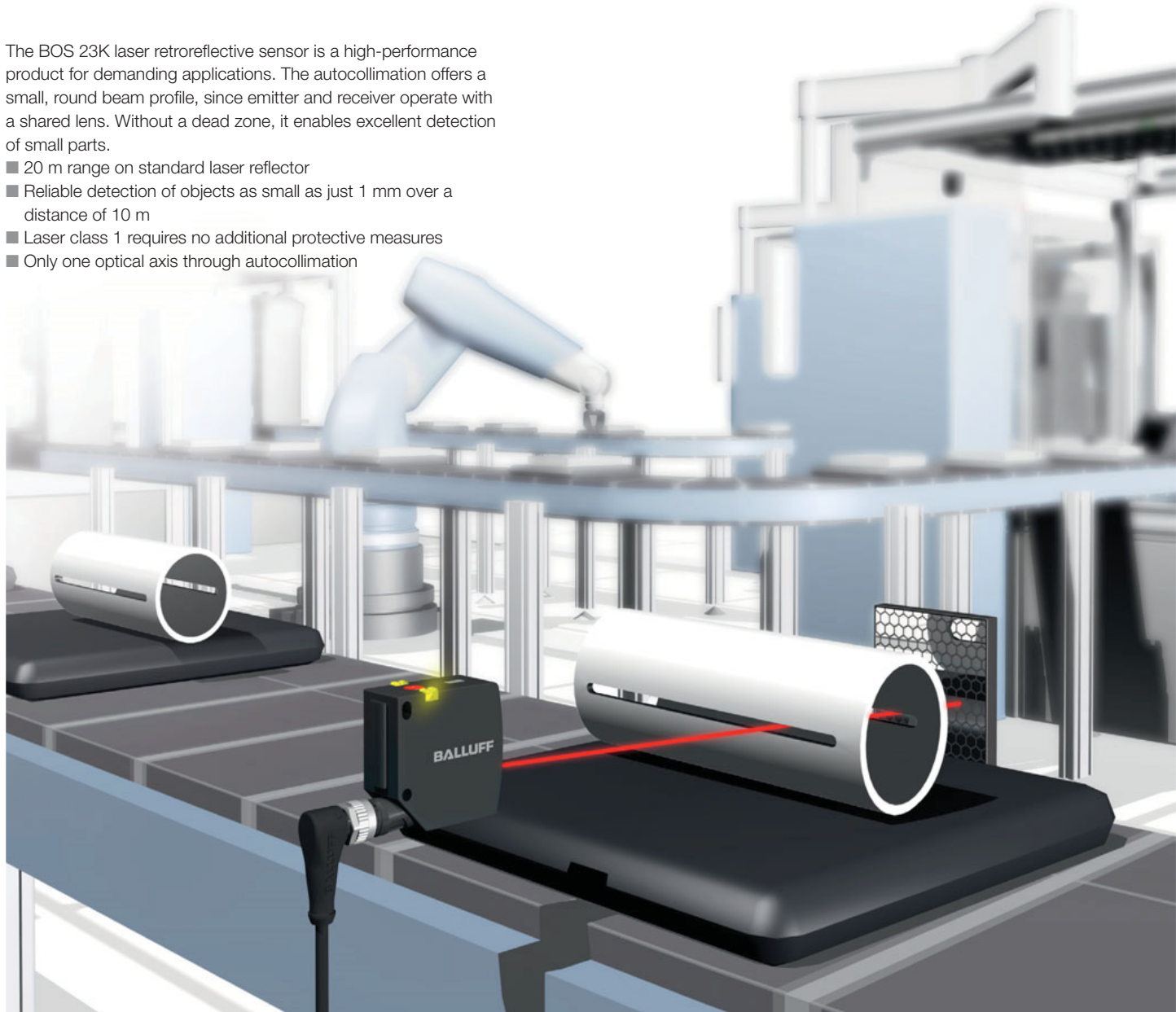
ECOLAB **CE**
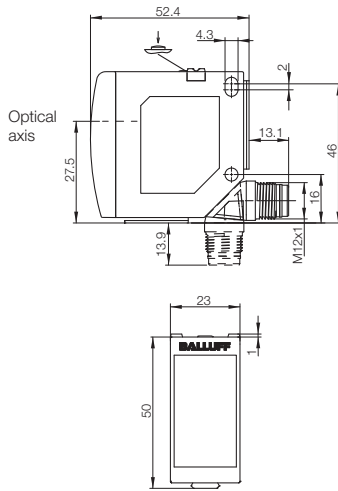
Type		**Retroreflective sensor**
Detection range		**0.1...20 m**
2×PNP complementary	**Ordering code**	**BOS01NC**
	Part number	BOS 23K-PA-LK10-S4
Supply voltage U_S		10...30 V DC
Output current		100 mA
No-load supply current I_0 max.		≤ 30 mA
Switching type		Light/dark
Polarity reversal/short-circuit protected		Yes/Yes
Settings		Teach-in button / control input
Emitter, light type		Laser, red light
Wavelength		655 Nm
Laser class		1
Power-on indicator		Green LED
Output function indicator		Yellow LED
Stability indicator		Flashing yellow LED
Response time		0.2 ms
Switching frequency f		2.5 kHz
Degree of protection as per IEC 60529/DIN 40050		IP 67/IP 69K
Ambient temperature T_a		-20...+60 °C
Permissible ambient light		EN 60947-5-2
Material	Housing	PC-ABS
	Optical surface	PMMA
Connection		M12 connector, 4-pin
Reference reflector		BOS R-22

Optical axis

52.4
4.3
2
13.1
27.5
46
13.9
16
M12x1

23
BALLUFF
1
50

Detector
Beam splitter
Lens
Reflector
Light source
f
d
α

Internal structure

Light spot size

Size [mm]

24
20
16
12
8
4
0

0   4   8   12   16   20

Distance [m]

The New AC/DC Sensor
Universal voltage sensor BOS 64K

The new photoelectric sensor family BOS 64K is suitable for being connected directly to AC or DC power. The relay output makes it possible to directly switch loads up to 3 A. The housing with IP 67 degree of protection is made of fiberglass-reinforced plastic.

For a wide variety of applications you can get diffuse sensors, diffuse sensors with background suppression (BGS), retroreflective sensors and through-beam sensors.

The diffuse, retroreflective and through-beam sensors can be conveniently adjusted using a 240° potentiometer. The diffuse sensor with background suppression is precisely adapted to applications via a 7-turn potentiometer. Numerous special functions such as On and Off delay or One-Shot with an adjustable time are also available.

Applications
- Monitoring of doors and gates
- Scanning the loading of pallets
- Detecting vehicles on a ramp
- With applications requiring a high range
- If no power supply is available

Wiring chamber

Type		
Detection range		
Time function	**Ordering code**	
	Part number	
Time function	**Ordering code**	
Polarizing filter, red light	Part number	
Time function	**Ordering code**	
Receiver	Part number	
Time function	**Ordering code**	
Emitter	Part number	
Supply voltage AC U_S		
Supply voltage DC U_S		
Switching type		
Light type		
Settings		
Power-on indicator		
Output function indicator		
Stability indicator		
Response time		
Switching frequency f		
Degree of protection as per IEC 60529		
Ambient temperature T_a		
Permissible ambient light		
Material	Housing	
	Optical surface	
Connection		

Reference object: white, 90% reflection, 200×200 mm
Reference reflector: BOS R-1

Receiver

Emitter

	Diffuse sensor with background suppression 0.2...2 m	Diffuse sensor 0.05...2 m	Retroreflective sensors 0.1...10 m	Through-beam sensor 0...50 m	Through-beam sensor 0...50 m
	BOS01K1	**BOS01K2**			
	BOS 64K-AA-IH12-TG	BOS 64K-AA-ID10-TG			
			BOS01K3		
			BOS 64K-AA-PR10-TG		
				BOS01K4	
				BOS 64K-AA-IE10-TG	
					BOS01K5
					BOS 64K-AA-IS10-TG
	24...240 V AC	24...240 V AC	24...240 V AC	24...240 V AC	24...240 V AC
	24...60 V DC	24...60 V DC	24...60 V DC	24...60 V DC	24...60 V DC
	Light and dark (switchable)	Light and dark (switchable)	Light and dark (switchable)	Light and dark (switchable)	
	Infrared	Infrared	Red light	Infrared	Infrared
	Potentiometer, 7-turn	Potentiometer, 240°	Potentiometer, 240°	Potentiometer, 240°	
					Green LED
	Yellow LED	Yellow LED	Yellow LED	Yellow LED	
	Green LED	Green LED	Green LED	Green LED	
	25 ms	25 ms	25 ms	25 ms	
	20 Hz	20 Hz	20 Hz	20 Hz	
	IP 67	IP 67	IP 67	IP 67	IP 67
	−25...+55 °C	−25...+55 °C	−25...+55 °C	−25...+55 °C	−25...+55 °C
	as per EN 60947-5-2	as per EN 60947-5-2	as per EN 60947-5-2	as per EN 60947-5-2	
	PBT (fiberglass-reinforced)	PBT (fiberglass-reinforced)	PBT (fiberglass-reinforced)	PBT (fiberglass-reinforced)	PBT (fiberglass-reinforced)
	PC	PC	PC	PC	PC
	Screw terminal	Screw terminal	Screw terminal	Screw terminal	Screw terminal

A Capacitive Sensor for Harsh Environments
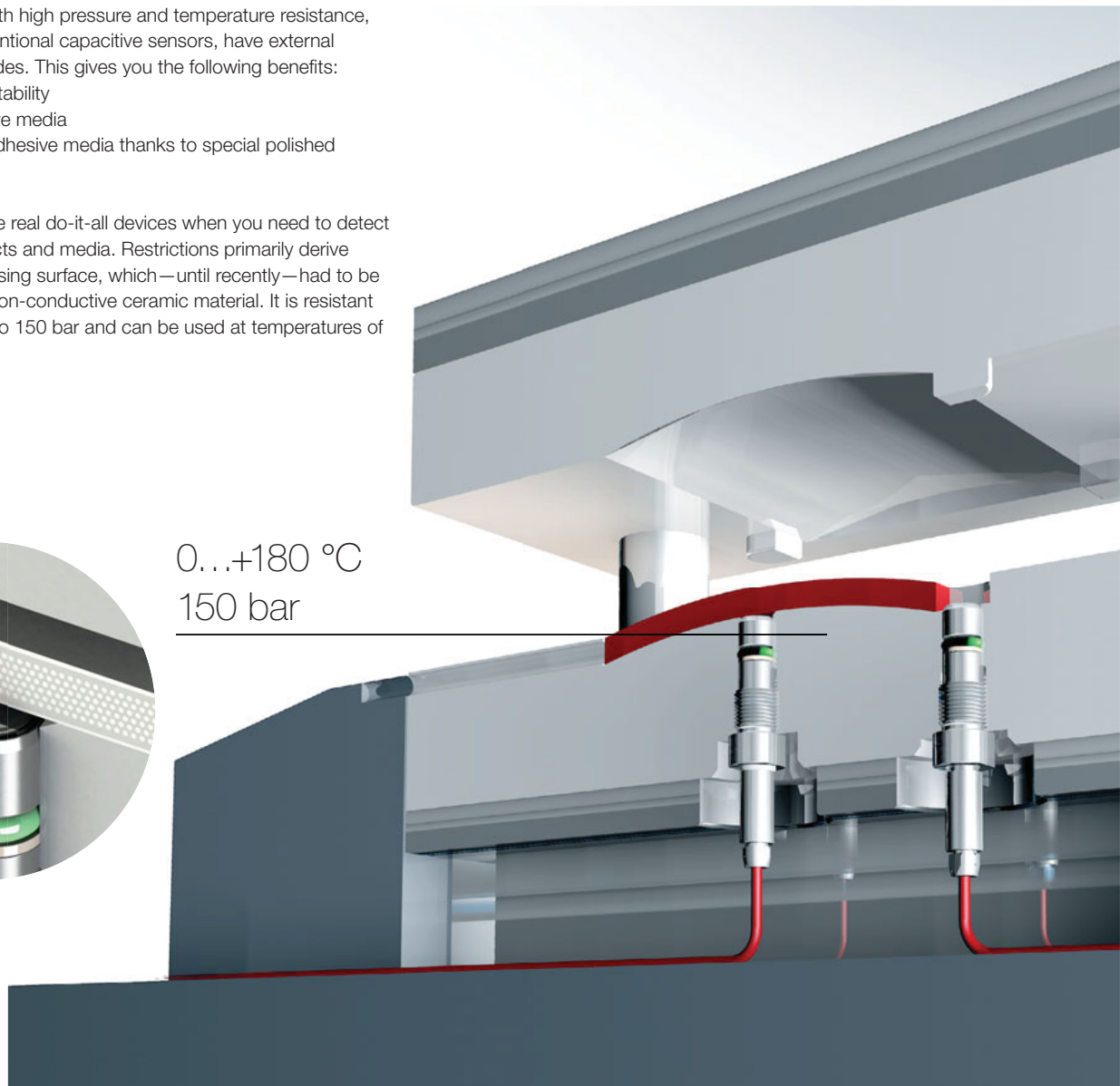## High-pressure and high-temperature resistant

Capacitive sensors with high pressure and temperature resistance, in contrast with conventional capacitive sensors, have external stainless steel electrodes. This gives you the following benefits:
- Great mechanical stability
- Resistant to abrasive media
- Poor adhesion of adhesive media thanks to special polished surface

Capacitive sensors are real do-it-all devices when you need to detect a wide variety of objects and media. Restrictions primarily derive from the sensor's sensing surface, which—until recently—had to be made of plastic or a non-conductive ceramic material. It is resistant to high pressures up to 150 bar and can be used at temperatures of up to 180 °C.

0…+180 °C
150 bar
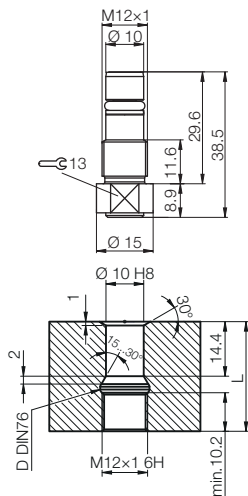
150 bar
Pressure-resistant

+180 °C
High
temperature
range!

Size		**M12×1**
Mounting type		Flush
Rated switching distance s$_n$		**0…2 mm**
With sensor amplifier	**Ordering code**	**BCS00TC**
	Part number	BCS S104407-XXS20D-SZ02-T09
Supply voltage U$_B$		4…8 V DC
Ambient temperature T$_a$		**0…+180 °C**
Degree of protection as per IEC 60529		IP68/IP54 at the plug connector
Material	Housing	Stainless steel
	Sensing surface	Stainless steel, EP
Connection		Triax sensor cable
Pressure rating		150 bar

Sensor amplifiers for capacitive high temperature rated sensors and wiring diagrams can be found in the Object Detection catalog .

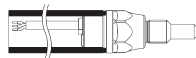| Description	**Plug connectors for high temperature-resistant and pressure-resistant sensors**
Ordering code	**BCC04JW**
Part number	BCC Z003-020
Ambient temperature T$_a$	See drawing
Degree of protection as per IEC 60529	IP 54
Connection	2 m FEP Triax
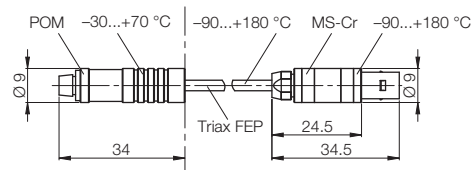
MicroLevel Sensors BCS
Progress in level detection

The special highlight of the second generation of capacitive MicroLevel sensors is a one-piece PEEK housing in contact with the material. This allows the new capacitive MicroLevel sensors to withstand pressures up to 6 bar and tolerate a media temperature up to a maximum of 105 °C.

CE
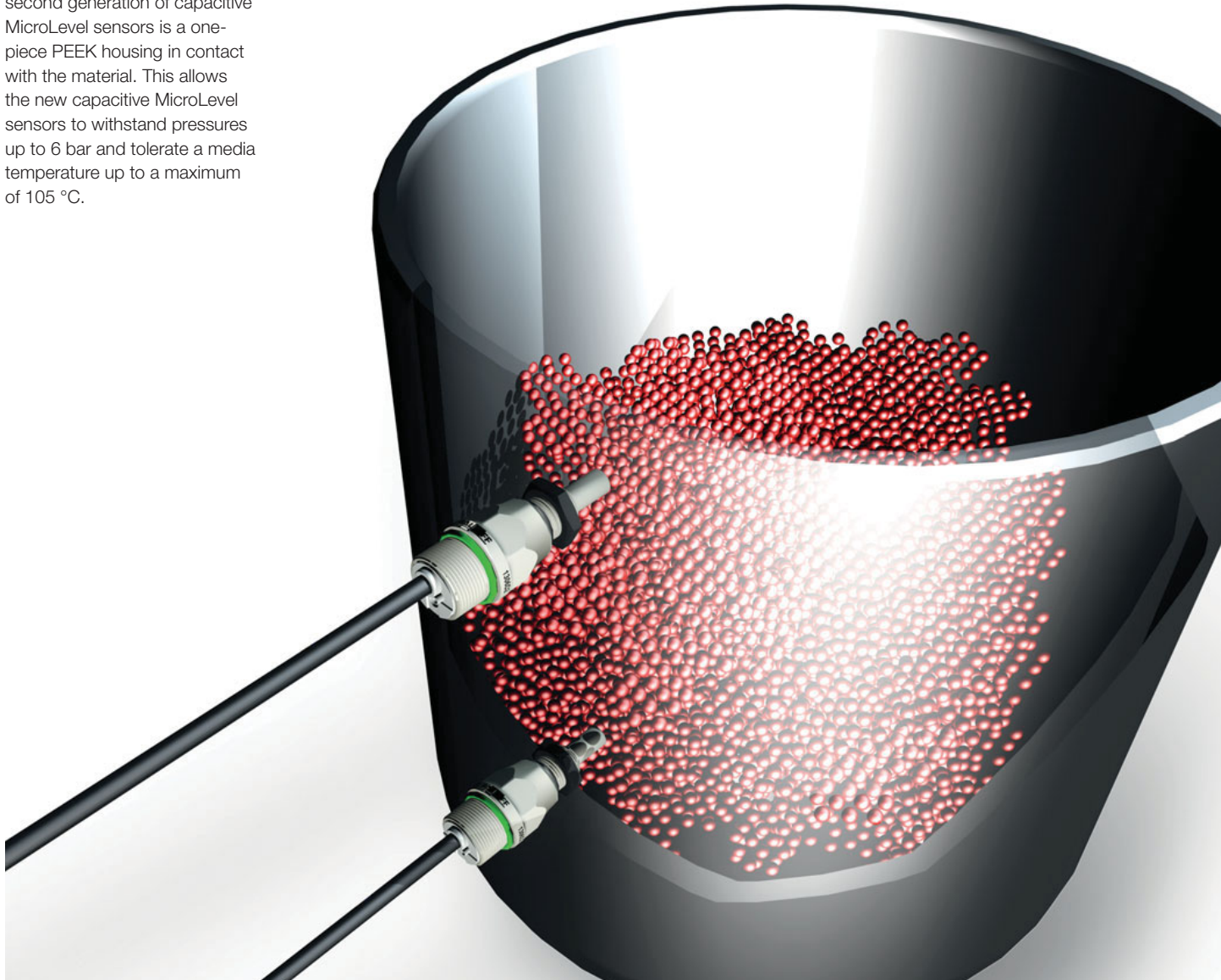
| Size		M12×1
Mounting type		Not flush
Rated switching distance s_n		**Level adjustable**
PNP/NPN and	**Ordering code**	**BCS0102**
NO/NC user selectable	Part number	BCS S44KK01-GPCFNG-EP02
Supply voltage U_S		10…30 V DC
Voltage drop U_d at I_e		≤ 2 V
Rated insulation voltage U_i		75 V DC
Output current max.		50 mA
No-load supply current I_0 max.		< 11 mA
Polarity reversal/short-circuit protected		Yes/Yes
Ambient temperature T_a		−5…+105 °C (sensing surface)
Switching frequency f		10 Hz
Supply voltage/output function indicator		Green LED/Yellow LED
Degree of protection as per IEC 60529		IP 67/sensing surface IP 68
Material	Housing	PEEK
	Sensing surface	PEEK
	Cover	PA 12
Connection		2 m PUR cable, 22 AWG

Reverse mounting in a tube of any desired length
for fashioning "point-switching" rod sensors.
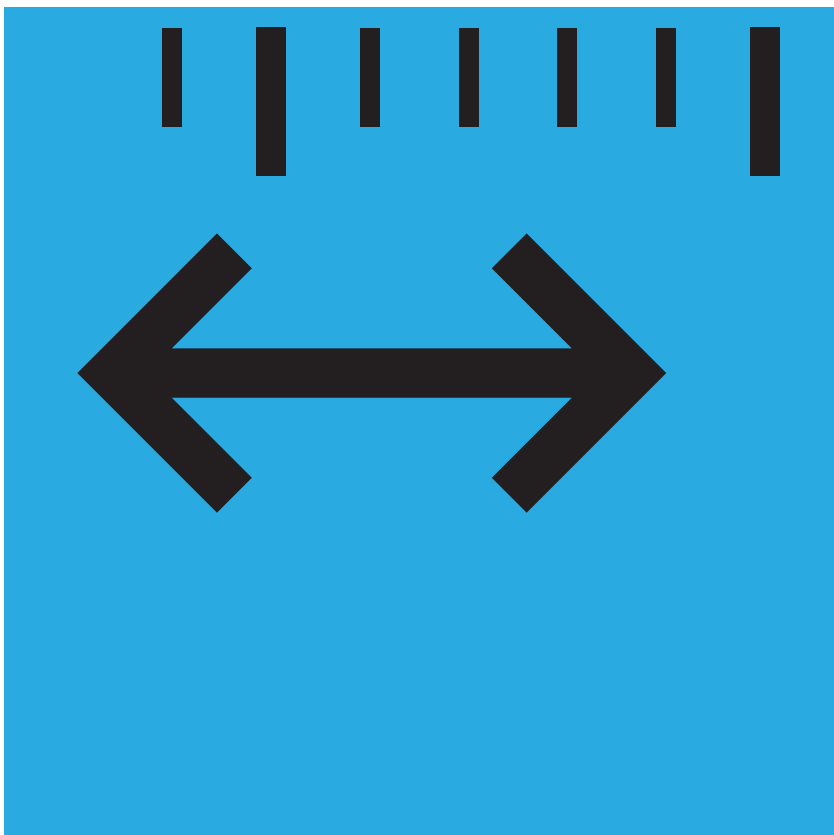The sealing can be done with an O-ring or with a
flat seal.

Linear Position Sensing and Measurement

Magnetic incremental linear and rotary measurement system
Micropulse transducers
Photoelectric distance sensors
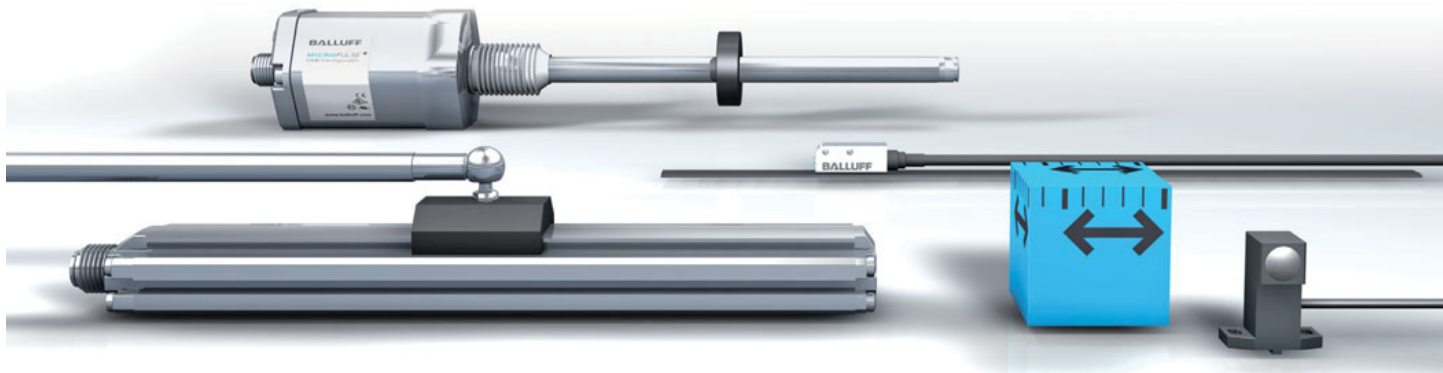
BML-S1F Magnetic Incremental Linear and Rotary Measurement System
2mm pole spacing for increased tape-to-sensor gap tolerance

The BML S1F-series now includes a version with 2 mm magnetic pole spacing which allows increased usable distance between the magnetic tape and the sensor head. This allows increased application versatility and less stringent mechanical tolerances.

Features
- Tape-to-sensor gap ≤ 0.8 mm
- Resolution down to 2 µm
- ± 20 µm system accuracy
- ± 1 increment repeat accuracy
- TTL and sinusoidal (1 Vpp) versions
- Ultra compact sensor housing
- Parallel or perpendicular orientation
- Rugged metal housing

Ordering example: sensor head with digital square-wave signal RS422

BML-S1F_-A62Z-M5_0-90-_ _ _ _ (with analog output signal sin/cos)
BML-S1F_-Q61_-M5_0-_0-_ _ _ _ (with digital square-wave signal RS422)

Approach direction	Resolution	Reference signal	Min. Edge separation	Connection
1 Parallel	E 2 µm	0 None	G 1 µs	KA05 PUR cable 5 m
2 Perpendicular				

Other configurations available, consult Balluff.

Preferred models
- **BML-S1F1-A62Z-M500-90-KA05 (BML04EP):**
  Installed parallel to tape, analog output sin/cos, 5 m cable

- **BML-S1F1-Q61E-M500-G0-KA05 (BML04ER):**
 Installed parallel to tape, digital signal RS422, 5 m cable, 2 µm resolution, 1 µs edge separation
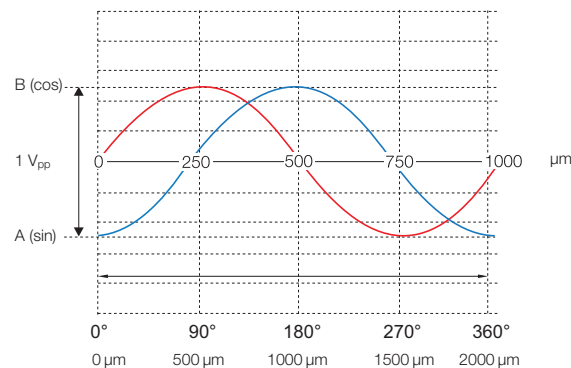
Increased gap tolerance

Model	**BML-S1F_-Q...**	**BML-S1F_-A...**
Output signal	Digital square wave signals RS422	Sinusoidal analog signals sin/cos
Resolution		processing-dependent
Part number	BML-S1F_-Q61_-M5_ 0-_0-_ _ _ _	BML-S1F_-A62Z-M5_ 0-90-_ _ _ _
Output voltage (A/B/Z)	RS422 per DIN 66259	1 V_{pp}
Overall system accuracy	±20 µm	±20 µm
Supply voltage	5 V ±5%	5 V ±5%
Current consumption at 5 V operating voltage	< 50 mA + current draw of the controller (depending on internal resistance)	< 50 mA + current draw of the controller (depending on internal resistance)
Max. read distance sensor/tape	≤ 0.8 mm	≤ 0.8 mm
Traverse speed max.	20 m/s	20 m/s
Operating temperature	-20...+80 °C	-20...+80 °C
Housing material	Al	Al
Degree of protection	IP 67	IP 67

All specifications in conjunction with tape
BML-...-I34...
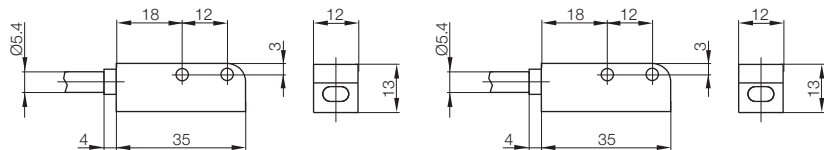
Sinusoidal analog signals 1 V_{pp}
- Sinusoidal voltage signals with inversion
- Signal period 360°, electrical = 2000 µm
- Terminating resistor ≥ 120 ohms
  (integrated in the processor unit)

BML-S1F Magnetic Incremental Linear and Rotary Measurement System
2mm pole spacing for increased tape-to-sensor gap tolerance

**Fabricated magnetic tape, pole width 1 mm**

BML-M_ _-I5_-A_-M_ _ _-_ _ _ _ _

Design	**Accuracy class**	**Cover strip**	**Length in cm**	**Reference point positions**
02 1.55 mm thick, with adhesive strip	5 18 μm, overall accuracy ±20 μm	3 With cover strip (thickness 0.15 mm)	Order length, max. 4800 = 48 m	R0000 None or pole-periodic
03 1.35 mm thick, without adhesive strip		0 18 μm, overall accuracy ±20 μm		

Ordering example: Magnetic tape by the roll, pole width 1 mm

BML-M02-I5_-A0-T_ _ _ _-R0000

| **Accuracy class**	**Length**
5 18 μm, overall accuracy ±20 μm	0500 5 m
	1000 10 m
	2400 24 m
	4800 48 m
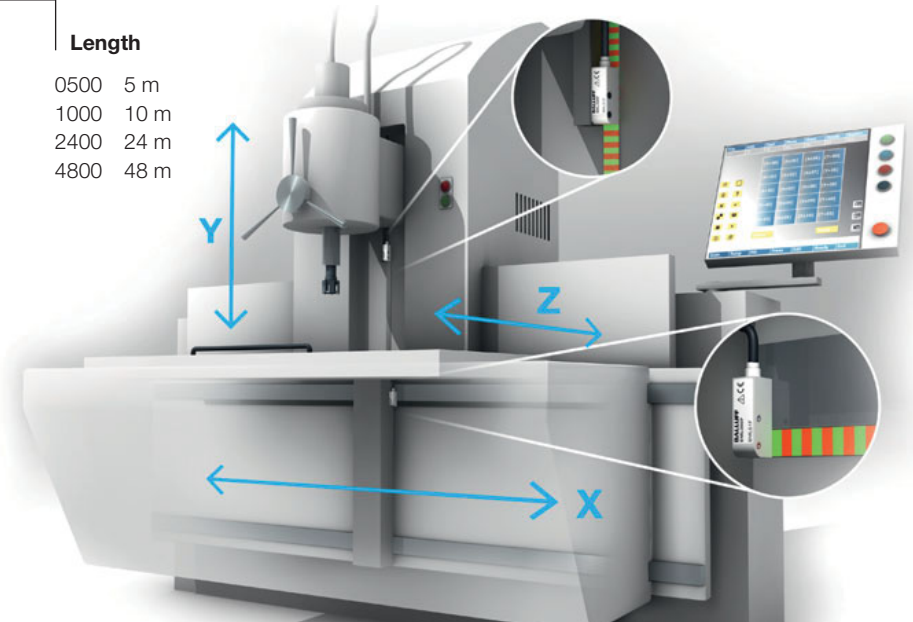
Positioning of the X, Y and Z-axis for a universal milling machine

NEW Increased gap tolerance

Model	Sensor family F	Sensor family F
Ordering code		
Part number	BML-M31-I50-A0-M075/060-R0	BML-M30-I50-A0-M122/090-R0
Number of poles	119	192
Pole width	2 mm	2 mm
With reference mark	No	No
Material	Elastomer on steel ring with fit H7	Elastomer on steel ring with fit H7

60
75.4
10

90
122
10
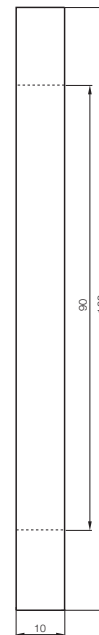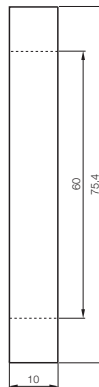
Absolute

- Absolute measuring system for short strokes
- With BiSS-C or SSI interface
- High system accuracy and resolution
- Mounted parallel or perpendicular to tape
- Ultra compact design in a robust metal housing

Inaccuracy and tolerances in the drive train negatively affect the product quality, however, direct measuring systems provide a solution. They determine the current position directly on the slide or the load support.

The new magnetically encoded position and angle measurement system BML-S1H measures highly dynamic applications precisely and absolutely. It works contactlessly and wear-free. Even external factors such as dirt and temperature do not pose a problem.

Quickly holds the welding tool on point and with micrometer precision.

BML-S1H Magnetic Absolute Linear Measurement System

Compact system for short stroke lengths

CE

Model	BML-S1H...		BML-S1H...
Output signal	Absolute: SSI interface, Analog signal: sin/cos, 1 V_{pp}		Absolute: SSI interface, Analog signal: sin/cos, 1 V_{pp}
Data format	16-bit		18-bit
Max. measuring length	64 mm		256 mm
Parallel	**Ordering code**	**BML0391**	**BML0393**
orientation	Part number	BML-S1H1-S6QC-M3AA-D0-KA00.3-S284	BML-S1H1-S6QC-M3CA-D0-KA00.3-S284
Perpendicular	**Ordering code**	**BML0392**	**BML0394**
orientation	Part number	BML-S1H2-S6QC-M3AA-D0-KA00.3-S284	BML-S1H2-S6QC-M3CA-D0-KA00.3-S284
Resolution	1/1.024 µm per LSB		1/1.024 µm per LSB
Repeat accuracy	≤ 1 µm		≤ 1 µm
System accuracy	±7 µm		±7 µm
Supply voltage	5 V ±5%		5 V ±5%
Current consumption	< 90 mA + Controller current consumption, at 120 Ω load resistance		< 90 mA + Controller current consumption, at 120 Ω load resistance
Tape pole pitch	1 mm		1 mm
Max. read distance, sensor head/tape	0.35 mm (without cover strip)		0.35 mm (without cover strip)
Traverse speed max.	5 m/s		5 m/s
Sampling rate	$f_{Standard}$ = up to 50 kHz (SSI), $f_{Standard}$ = 10 MHz (BiSS-C)		$f_{Standard}$ = up to 50 kHz (SSI), $f_{Standard}$ = 10 MHz (BiSS-C)
Operating temperature	-20...+80 °C		-20...+80 °C
Housing material	Al, stainless steel		Al, stainless steel
Degree of protection as per IEC 60529	IP 67		IP 67

Model	Magnetic Tape	Magnetic Tape
Output signal	for BML-S1H with 64 mm measuring length	for BML-S1H with 256 mm measuring length
Ordering code	**BML039J**	**BML039K**
Part number	BML-M02-A33-A3-M0009-A	BML-M02-A33-A3-M0028-C
Length	90 mm	280 mm
Measuring length	64 mm	256 mm
Magnetic tape material	Rubber - ferrite	Rubber - ferrite
Cover strip and tape carrier material	Stainless steel	Stainless steel

BML-S1G Magnetic Absolute Linear Measurement System
Resolution to 1 µm, stroke lengths to 48 meters

■ Absolute measuring system for lengths up to 48 m
■ Easy installation thanks to multicolored LED and
  large installation tolerance
■ With BiSS-C or SSI interface
■ High system accuracy and resolution
■ Rugged metal housing

The absolute coded position measuring system BML-S1G offers
high resolutions at large measuring lengths.
The rugged metal housing with stainless steel-encapsulated floor
protects against EMC and allows for reliable operation even in
heavily contaminated environments. With the absolute coding, the
position value is available immediately after the system is switched
on. The installation tolerances and the LED feedback make it very
easy to set up and install the system. The diagnostic function
enables fast error detection and thus provides for short downtimes
during setup and when errors arise.

**Available in the first half of 2014.
Consult Balluff for availability.**

Stroke lengths to 48 meters

Model		**BML-S1G...**
Output signal		Absolute: SSI or BiSS-C, additional real-time signal sin/cos, 1 V_{pp} or RS422
Data format		24, 25, 26 or 32 bit
Resolution		1, 2, 5 or 10 µm
SSI	**Ordering code**	**BML041H**
interface	Part number	BML-S1G0-S7ED-M5EA-D0-S284
BiSS-C	**Ordering code**	**BML042T**
interface	Part number	BML-S1G0-B7ED-M5EZ-90-S284
Repeat accuracy		±1 increment
Overall system accuracy		±20 µm
Supply voltage		5 V ±5 % and 10...28 V DC
Current draw at 5 V operating voltage		< 70 mA at 24 V DC supply voltage
Max. read distance sensor/tape		0.8 mm (without cover strip)
Max. measuring length		48 m
Signal period, fine interpolation track		2 mm
Traverse speed max.		10 m/s
Sampling rate		$f_{Standard}$ = 50 kHz (SSI), $f_{Standard}$ = 10 MHz (BiSS-C)
Operating temperature		–20...+70 °C
Storage temperature		–25...+85 °C
Housing material		Zn, surface-finished, and stainless steel
Degree of protection as per IEC 60529		IP 67
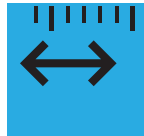
All specifications in conjunction with tape BML-M02-A55...

Absolutcode 10+0.2
1.55±0.1 (BML-M02…)
1.35±0.1 (BML-M03…)
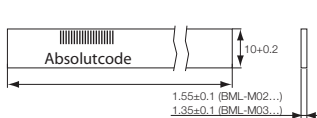
Accessories	**Magnetic Tape**
Model	for BML-S1G
Ordering code	
Part number	BML-M02-A55-A0-Mxxxx-E
Length	max. 48 m
Measuring length	Order in cm
Magnetic tape material	Rubber - ferrite
Cover strip and tape carrier material	Stainless steel

Accessories		M12 connection cable, 12-pin, straight socket
Model		BML-S1G...-S284
Length	**Ordering code**	**BCC09MY**
5 m	Part number	BCC M41C-0000-1A-169-PS0C08-050-C009
Material		PUR with molded plug, black
Description/additional data		■ Cable: Ø 4.9 mm, 12×0.08 mm²
		■ Bending radius: 15×D (dynamic), 7.5×D (static)
		■ Temperature range: –25 °C to +70 °C

PF IO-Link Profile for Micropulse Transducer BTL6
Simple to configure, time-saving to install and bring into operation

Non-contact position measurement technology with IO-Link
The Micropulse PF IO-Link is an absolute and non-contact position measuring system that continuously provides measurements in µm in the 1-ms cycle. These measured values are directly transferred digitally via IO-Link.

IO-Link is a point-to-point connection within any number of networks. An IO-Link system consists of an IO-Link device such as a sensor or actuator, an IO-Link master and the wiring. The IO-Link master is either an integrated/modular IP20 module for central operation in the control cabinet or as a remote I/O module in IP 65/67 form of protection for hard usage directly in the field. Master modules are available with all current field bus protocols. The Micropulse PF IO-Link device is coupled to the master via a maximum 20 m long standard sensor/actuator line. The Micropulse PF IO-Link works with the communication speed COM3 (230kB), which achieves a process data cycle of 1 ms with a 1.1 master. Data transmission between the master and the device utilizes three-conductor physics well-known in the world of standard sensor/actuators. A standard UART protocol is used. The exact nature of the data packets defines the IO-Link protocol. Via IO-Link, the user interface can be mapped based on an IODD (IO Device Description) in the engineering system. Due to the continuous flow of information, all data are centrally and consistently saved, so that a configuration is possible and reproducible at any time.

- Simple configuration, time-saving installation and startup
- OTF, automatic configuration in running operation (on the fly)
- Continuous monitoring and diagnostics
- High transfer rate, quick process data cycle
- Cost-effective wiring with standard, unshielded M12 cable plug connector
- Simple control integration via standard IO-Link modules
- For use in rough industrial environments, with IP-67 IO-Link master modules from Balluff
- Process data 32 bit signed integer
- Output resolution 1 µm/digit
- Diagnostics + error value recognition

Additional information
About IO-Link: www.io-link.com

You can find the compact IO-Link product line in the Balluff Industrial Networking and Connectivity Catalog.

Industrial Ethernet

Profibus, DeviceNet, CANopen...

MICRO*PULSE*®
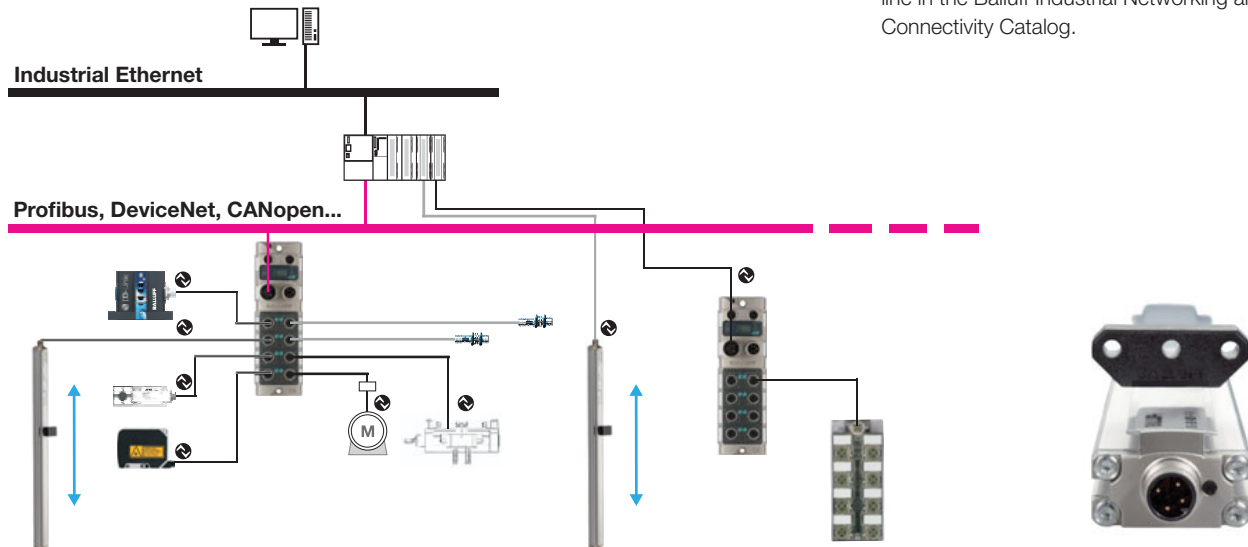
Series	**Profile PF BTL6**
Output signal	IO-Link V1.1
Transducer interface	U110
Part number	BTL6-U110-M_ _ _ _-PF-S4
System resolution	5 µm
Repeat accuracy	≤ 30 µm
Sampling rate	$f_{STANDARD}$ = 1 kHz (< 1300 mm)
Linearity deviation	≤ ±200 µm up to 500 mm nominal stroke, ±0.04 %
Supply voltage	18...30 V DC
Current consumption	≤ 150 mA
Polarity reversal protected	yes
Operating temperature	–25...+70 °C
Storage temperature	–40...+100 °C
Mode	COM 3
Transmission rate	230.4 kbaud
Process data cycle	1 ms
Process data	Position value in µm
Parameters	Measuring range, zero point
Diagnostics	Magnet in the measuring range, below, above, no magnet

Please enter the code for the nominal stroke in the part number.

Scope of delivery
- Transducer
- Mounting clamps with insulating sleeves and screws
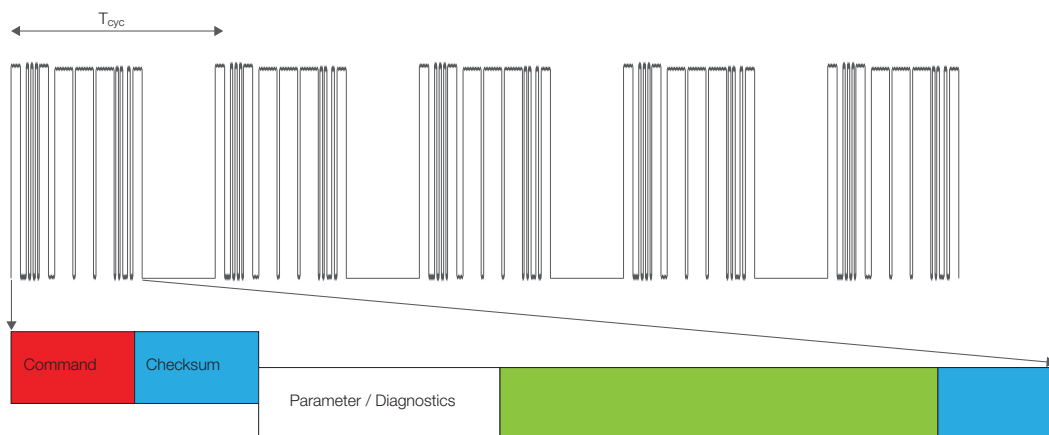- Quick start instructions

Please order separately: Magnet, see Balluff Transducer Catalog

Ordering example:
BTL6-U110-M_ _ _ _-PF-S4

　　　　　　　Standard
　　　　　　　nominal stroke [mm]

　　　　　　0050...4572 mm

T_{cyc}

Command	Checksum

| Parameter / Diagnostics | | |

Double-ended Mating Cables

Ordering code	Part number	Description
BCC05LH	BCC M415-M413-3A-300-VX43T2-010	Molded cordset, M12 male, straight to M12 female, straight, PVC jacket, 1-meter length
BCC0AFN	BCC M415-M413-3A-300-VX43T2-020	Molded cordset, M12 male, straight to M12 female, straight, PVC jacket, 2-meter length
BCC0AFR	BCC M415-M413-3A-300-VX43T2-050	Molded cordset, M12 male, straight to M12 female, straight, PVC jacket, 5-meter length
BCC0AFT	BCC M415-M413-3A-300-VX43T2-100	Molded cordset, M12 male, straight to M12 female, straight, PVC jacket, 10-meter length

For additional cable and connector options, refer to the Balluff Industrial Networking and Connectivity catalog.

**Cost-effective EtherCAT solutions for hydraulic cylinder feedback**

Micropulse linear position transducers in a rod style housing are designed for use in hydraulic cylinders. Optimal control quality of the hydraulic axes is achieved through dynamic, highly-repeatable position measurement.

Integrated EtherCAT interface

The BTL6 single-connector system allows direct connection to existing EtherCAT installations. The BTL6 rod style is ideal for position monitoring applications that do not require closed-loop control

Features:
- Non-contact measurement principle
- Pressure resistant to 600 bar (8700 psi)
- IP67
- Absolute output signal
- Stroke lengths to 4012 mm (158")
- Direct connection to Beckhoff EtherCAT masters
- Single connector solution lowers system cost
- Connector adapter allows connection of SIGNAL and POWER
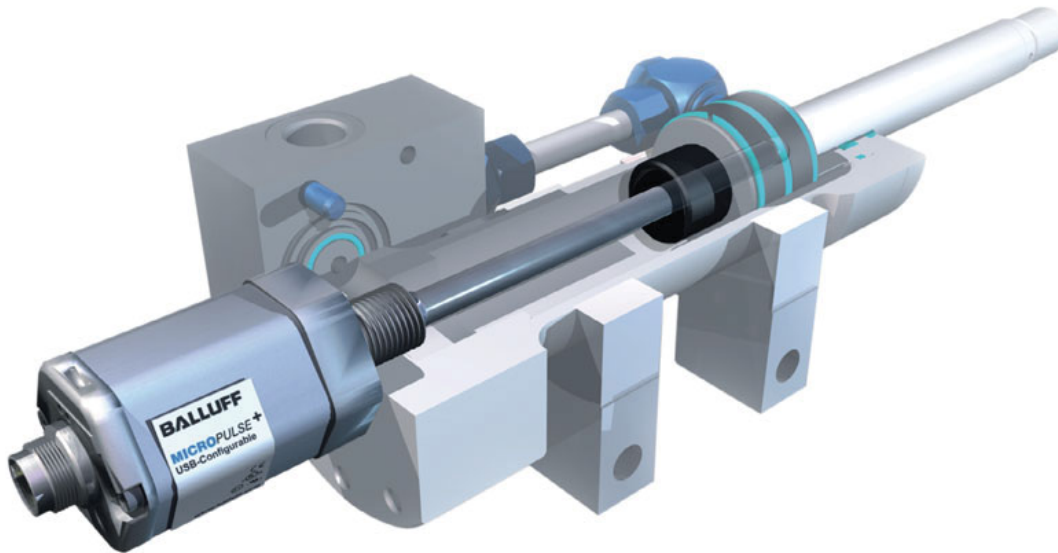
MICRO*PULSE*®

Additional Information

For more information on EtherCAT, go to http://www.ethercat.org

EtherCAT.

Series	**Rod BTL6**
Output signal	EtherCAT®
Transducer interface	**V11E**
Customer device interface	EtherCAT®
Part number	BTL-**V**11E-M_ _ _ _-B-S115
System resolution	≤ 10 µm
Repeat accuracy	≤ 30 µm
Sampling rate	$f_{STANDARD}$ = 1 kHz (< 850 mm)
Linearity deviation	≤ ±200 µm up to 500 mm nominal stroke
	±0.04%
	500...1500 mm nominal stroke
Supply voltage	20...28 V DC
Current consumption	≤ 100 mA
Polarity reversal protected	yes
Operating temperature	0...+70 °C
Storage temperature	−40...+100 °C

Scope of delivery
■ Transducer
■ Quick start instructions

Please order separately:
Magnets/floats,Mounting nuts, Plug
connector; see Balluff Transducer Catalog

Ordering example:

BTL6-V11E - M_ _ _ _ - Z – S115

Interface

V11E EtherCAT

**Standard
nominal stroke [mm]**

0025...4012 mm
in 1 mm
increments

Design

Z = Standard, 3/4"-16 UNF mounting threads
B = Metric, M18x1.5 mounting threads

Connection

S115   Connector,
8-pole, M12
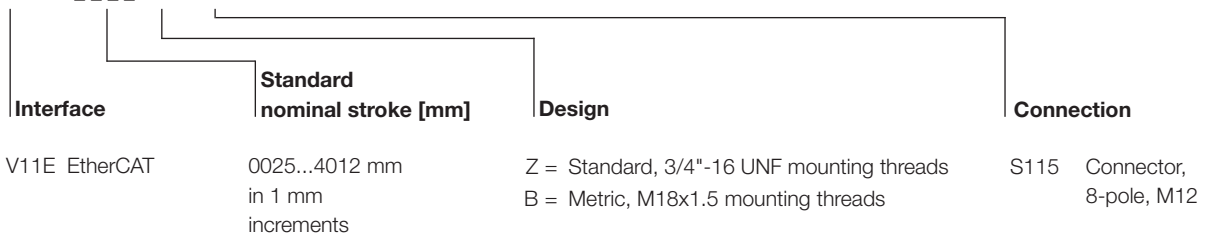
Commonly specified stroke lengths:

mm	inches	mm	inches	mm	inches
0051	2	0610	24	2134	84
0102	4	0762	30	2438	96
0152	6	0914	36	2743	108
0203	8	1067	42	3048	120
0254	10	1220	48	3353	132
0305	12	1372	54	3658	144
0407	16	1524	60	3962	156
0508	20	1829	72		

Additional stroke lengths available
Inch to millimeter conversion: Inches x 25.4 = millimeters

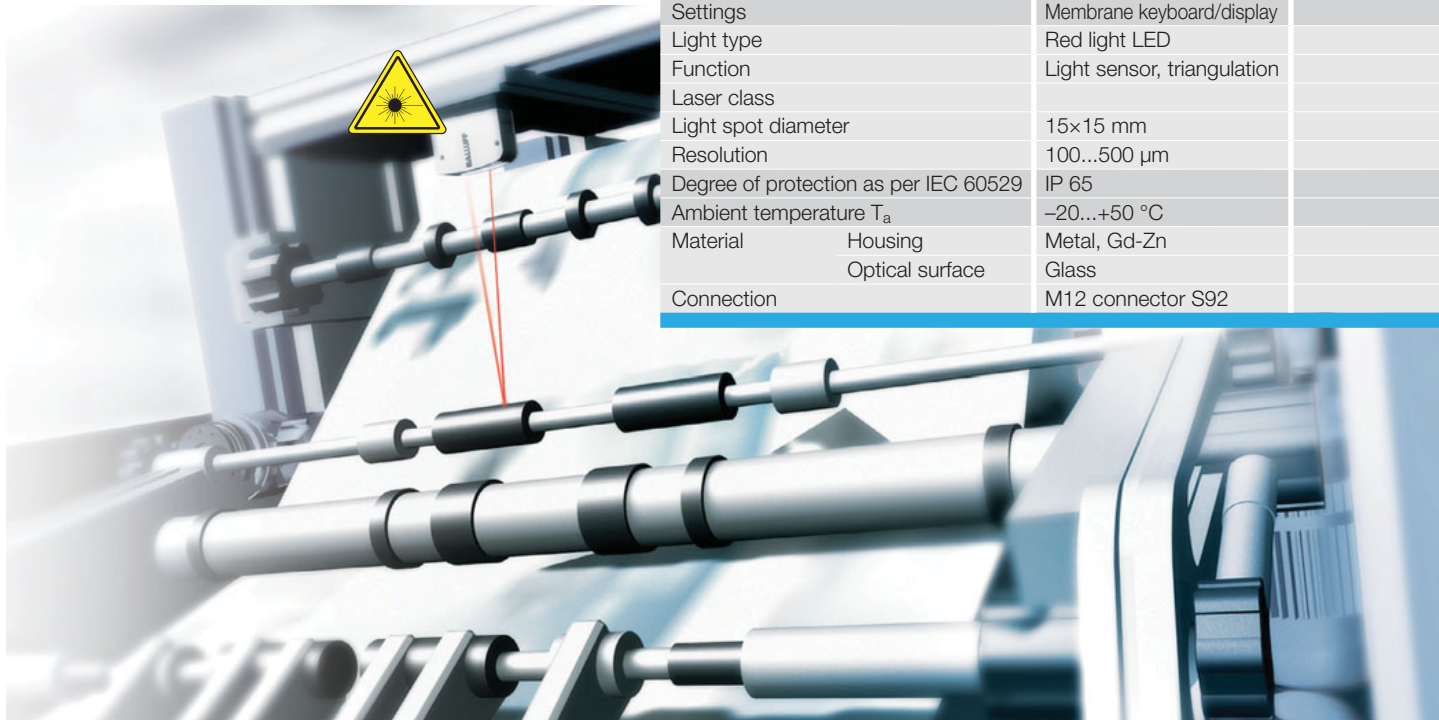# New Generation of the Optical Distance Sensor Family BOD 66M
More precise and higher-performance – for highly dynamic applications

The new generation of photoelectric distance sensors BOD 66M impress with their higher resolution and improved switching frequency as well as their extensive parameterization options via display and membrane keyboard. Thanks to the extended working ranges, the new sensors are ideal for different tasks: from material handling all the way to robotics applications.

- Even more precise than the first generation and extremely fast
- Easier commissioning and configuration than for the first generation thanks to intuitive menu guidance and display
- Display of current measured values
- Maximum performance by setting the appropriate work mode, working ranges and switching points

Series		**BOD 66M**	
Working range		**100...600 mm**	
Measuring range		**600 mm, adjustable**	
PNP/NPN,	**Ordering code**	**BOD001H**	
NO/NC	Part number	BOD 66M-RA11-S92	
Supply voltage U$_B$		18...30 V DC	
Analog output		**1...10 V**	
Output signal		Push-pull PNP/NPN	
Switching type		Light/dark switching	
Settings		Membrane keyboard/display	
Light type		Red light LED	
Function		Light sensor, triangulation	
Laser class			
Light spot diameter		15×15 mm	
Resolution		100...500 µm	
Degree of protection as per IEC 60529		IP 65	
Ambient temperature T$_a$		−20...+50 °C	
Material	Housing	Metal, Gd-Zn	
	Optical surface	Glass	
Connection		M12 connector S92	

BOD 66M	BOD 66M	BOD 66M	BOD 66M	BOD 66M
100...600 mm	**150...800 mm**	**150...800 mm**	**150...2000 mm**	**150...2000 mm**
600 mm, adjustable	**0.8 m, adjustable**	**0.8 m, adjustable**	**2 m, adjustable**	**2 m, adjustable**
BOD001C	**BOD001J**	**BOD001K**	**BOD001E**	**BOD001F**
BOD 66M-RB11-S92	BOD 66M-LA12-S92	BOD 66M-LB12-S92	BOD 66M-LA14-S92	BOD 66M-LB14-S92
18...30 V DC	18...30 V DC	18...30 V DC	18...30 V DC	18...30 V DC
4...20 mA	**1...10 V**	**4...20 mA**	**1...10 V**	**4...20 mA**
Push-pull PNP/NPN	Push-pull PNP/NPN	Push-pull PNP/NPN	Push-pull PNP/NPN	Push-pull PNP/NPN
Light/dark switching	Light/dark switching	Light/dark switching	Light/dark switching	Light/dark switching
Membrane keyboard/display	Membrane keyboard/display	Membrane keyboard/display	Membrane keyboard/display	Membrane keyboard/display
Red light LED	Red light laser	Red light laser	Red light laser	Red light laser
Light sensor, triangulation	Light sensor, triangulation 2	Light sensor, triangulation 2	Light sensor, triangulation 2	Light sensor, triangulation 2
15×15 mm	Ø 1 mm	Ø 1 mm	2×6 mm	2×6 mm
100...500 µm	100...800 µm	100...800 µm	1...3 mm	1...3 mm
IP 65	IP 65	IP 65	IP 65	IP 65
−20...+50 °C	−20...+50 °C	−20...+50 °C	−20...+50 °C	−20...+50 °C
Metal, Gd-Zn	Metal, Gd-Zn	Metal, Gd-Zn	Metal, Gd-Zn	Metal, Gd-Zn
Glass	Glass	Glass	Glass	Glass
M12 connector S92	M12 connector S92	M12 connector S92	M12 connector S92	M12 connector S92

Connector orientation
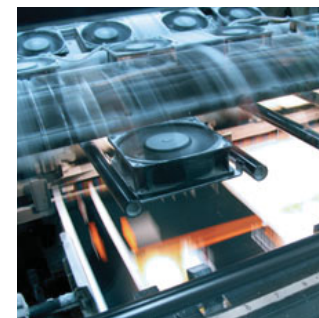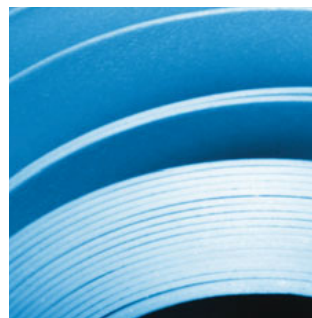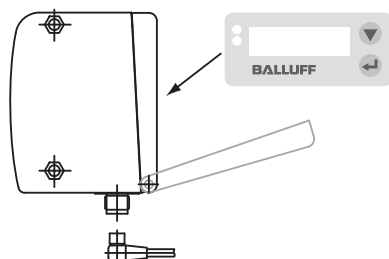
Condition Monitoring and Fluid Sensors

Pressure sensors
Capacitive sensors for level detection

Pressure Sensor with IO-Link
Easily configure sensors to guard against production losses

IO-Link pressure sensors monitor process media

Pressure sensors are best suited for monitoring process media such as coolants, lubricants, hydraulic fluids and pneumatic components. Using IO-Link, you continuously relay your measured values and data to the controller and let it provide precise readjustment.

Highest machine availability

IO-Link pressure sensors enable quick, error-free sensor replacement and prompt commissioning. Downtimes are significantly reduced since the parameters for a replaced IO-Link sensor are written to the new sensor automatically from the IO-Link master. Commissioning processes, format changes or recipe changes are processed centrally over the controller's functional components. This saves time and reduces the potential for errors to a minimum.

More efficient operation

Using IO-Link, sensors in the machine can be positioned in relation to the process because the sensor's accessibility no longer plays a role. Process monitoring, configuration and error analysis of the IO-Link devices now take place in the controller. This makes machine processes time-optimized. Signal delays and distortions are reliably eliminated. The digital transmission of data also ensures high signal quality.

- Reduced downtimes
  Simple sensor replacement with plug-and-play
- Maximum flexibility
  System conversion during ongoing operation
- Simple commissioning
  Complete parameter sets can be duplicated using IO-Link
- In-process diagnostics
  Process data and errors are reported directly
 to the controller via IO-Link

Pressure ranges		–1…2 bar to 0…600 bar	–1…2 bar to 0…600 bar	–1…2 bar to 0…600 bar
Interface, output signal		**IO-Link 1.1 with two switching outputs**	**IO-Link 1.1 with one switching output and analog 0…10 V output**	**IO-Link 1.1 with one switching output and analog 4…20 mA output**
Supply voltage U_B		18...36 V DC	18...36 V DC	18...36 V DC
Accuracy		0.5% FSO BFSL	0.5% FSO BFSL	0.5% FSO BFSL
Temperature error		0.3% FSO/10 K	0.3% FSO/10 K	0.3% FSO/10 K
Ambient/media temperature		–25…+85 °C or –25...+125 °C (optional –40 °C)	–25…+85 °C or –25...+125 °C (optional –40 °C)	–25…+85 °C or –25...+125 °C (optional –40 °C)
Degree of protection as per IEC 60529		IP 67	IP 67	IP 67
Material	Housing	Stainless steel	Stainless steel	Stainless steel
	Membranes	Ceramic	Ceramic	Ceramic
	Seal	Fluoroelastomer	Fluoroelastomer	Fluoroelastomer
Connection	Connectors	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	Process connection	G 1/4"	G 1/4"	G 1/4"
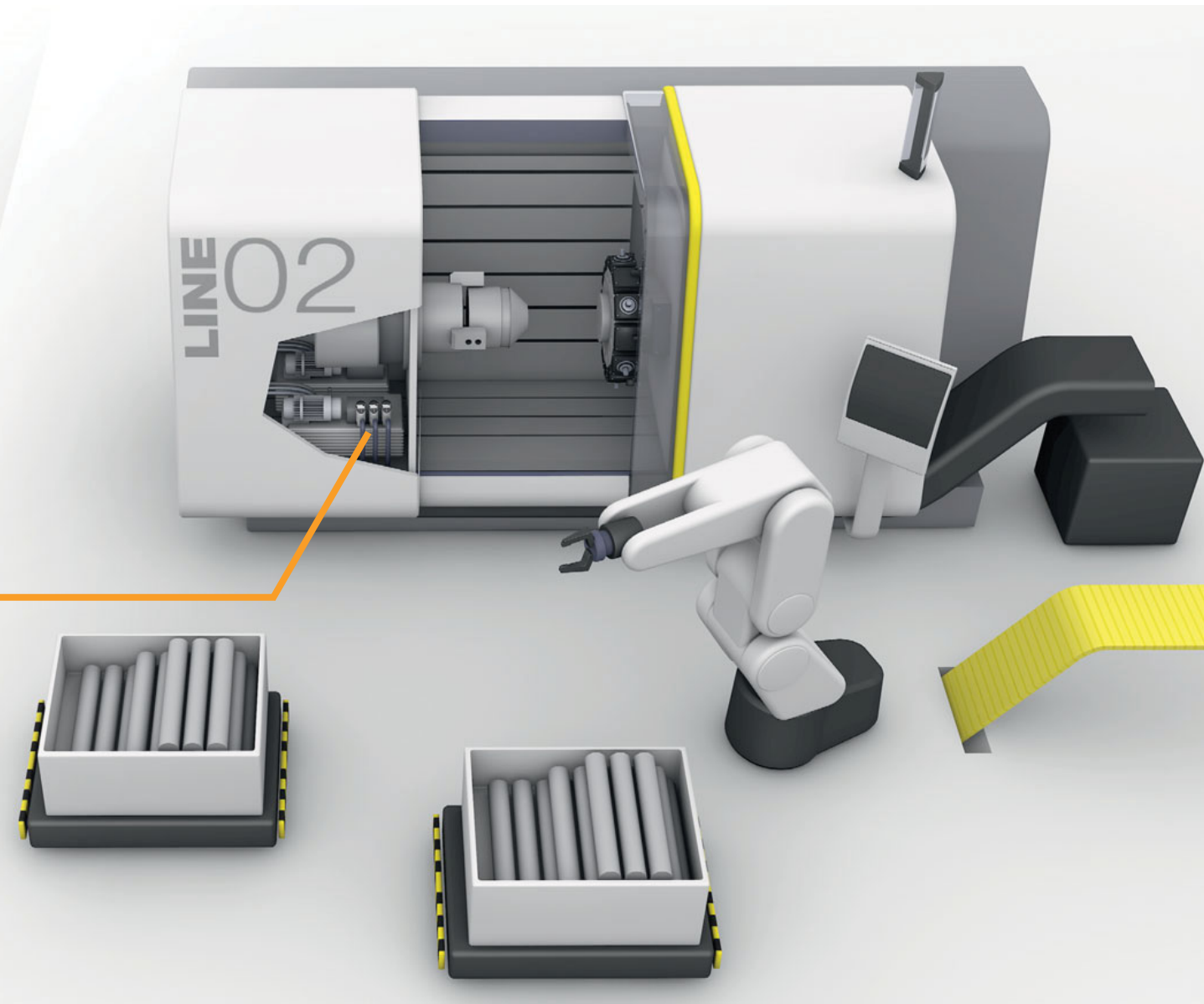
Pressure transmitter BSP
For a wide variety of applications in factory automation

Pressure sensors are found in many mechanical engineering applications. These ensure continuously reliable pressure measurement. Compact pressure transmitters save space. This means they can be installed right where the action is.
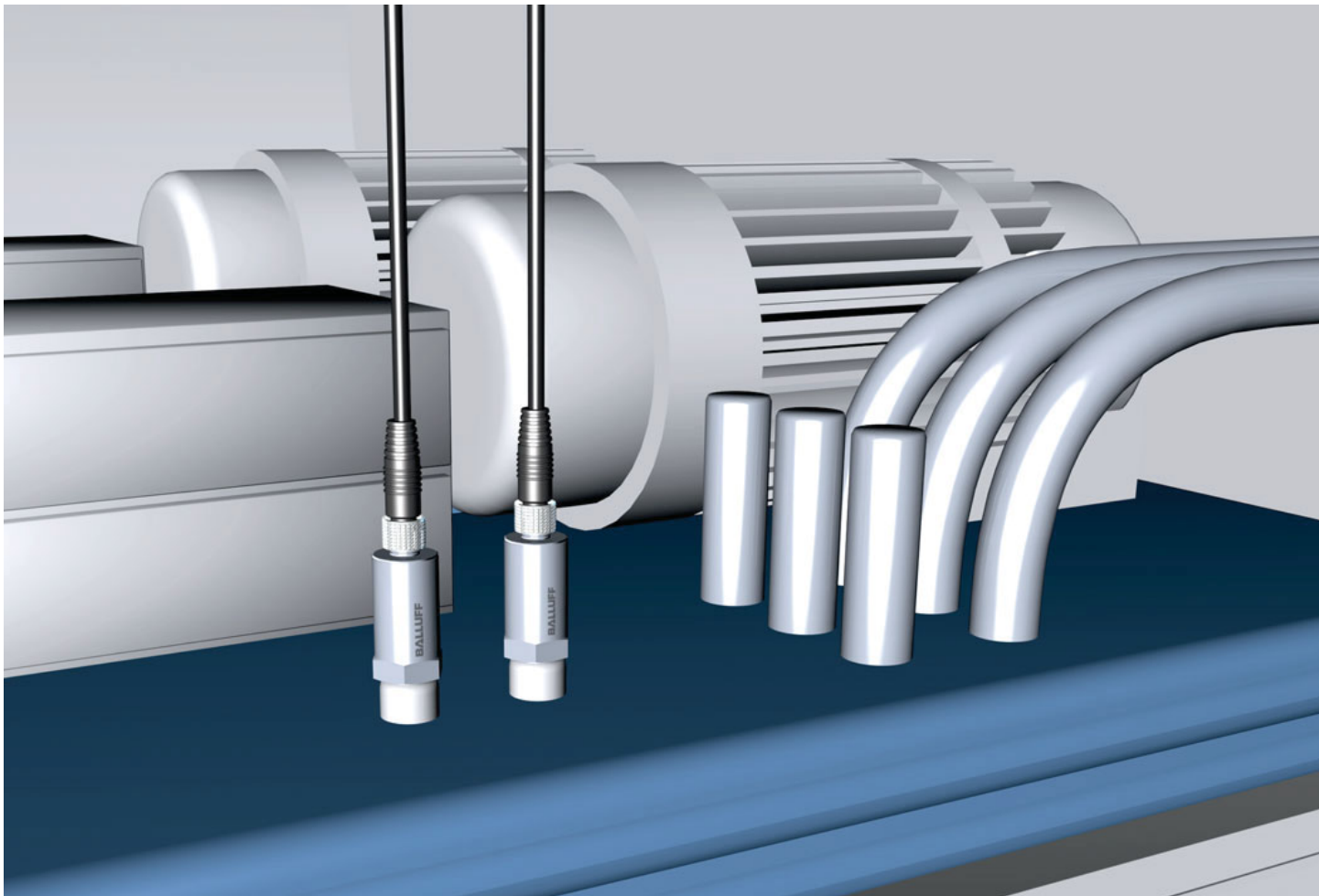
Balluff pressure sensors offer an impressive price/performance ratio and are suitable for a wide variety of applications in factory automation.
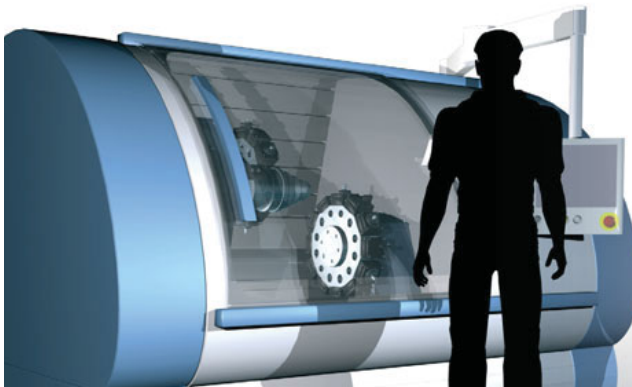
The rugged design, reliable measurement technology and large temperature range provide for reliable operation and a long service life.

Different pressure ranges, variations with voltage or current output and different process connections, allow you to choose the right sensor for your application:

■ Complete stainless steel housing
■ Temperature range from –40 °C to 125 °C
■ Wide product selection

Applications
■ Machine tools
■ Hydraulics and pneumatics
■ Pumps and compressors

Pressure ranges		**–1...2 bar, 0...600 bar**	**–1...2 bar, 0...600 bar**
Output signal		4...20 mA	0...10 V
Supply voltage U_S		8...32 V	14...30 V
Accuracy		≤ ±0.5 % FSO BFSL	≤ ±0.5 % FSO BFSL
Temperature error		≤ ±0.3 % FSO/10 K	≤ ±0.3 % FSO/10 K
Ambient/media temperature		**–40…+85 °C/–40...+125 °C**	**–40…+85 °C/–40...+125 °C**
Degree of protection as per IEC 60529		IP 67	IP 67
Housing material		304 Stainless steel	304 Stainless steel
Connection	Plug connector	M12 connector, 4-pin	M12 connector, 4-pin
	Process connection	G 1/4", NPT 1/4", R 1/4" and more	G 1/4", NPT 1/4", R 1/4" and more

MicroLevel Sensors BCS
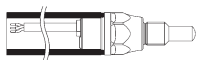**Progress in SmartLevel technology**

- Measure all conductive liquid media
- Foam and adhesion compensation
- Can be used in many standard applications with its factory defaults

The second generation of capacitive SmartLevel sensors in the new MicroLevel housing substantially expands the range of applications. The highlight is the one-piece PEEK housing in contact with the material. This allows the new capacitive SmartLevel sensors to be installed in pressures up to 6 bar and tolerate a media temperature up to a maximum of 105 °C.

CE

Size		M12×1
Mounting type		Not flush
Rated switching distance s_n		**Media-dependent**
PNP/NPN and	**Ordering code**	**BCS010L**
NO/NC user selectable	Part number	BCS S44KK01-GPCFAG-EP02
Supply voltage U_S		10…30 V DC
Voltage drop U_d at I_e		≤ 2 V
Rated insulation voltage U_i		75 V DC
Output current max.		50 mA
No-load supply current I_0 max.		< 12 mA
Polarity reversal/short-circuit protected		Yes/Yes
Ambient temperature T_a		−5…+105 °C (sensing surface)
Switching frequency f		5 Hz
Supply voltage/output function indicator		Green LED/Yellow LED
Degree of protection as per IEC 60529		IP 67/sensing surface IP 68
Material	Housing	PEEK
	Sensing surface	PEEK
	Cover	PA 12
Connection		2 m PUR cable, 22 AWG

Reverse mounting in a tube of any desired length for fashioning "point-switching" rod sensors. The sealing can be done with an O-ring or with a flat seal.
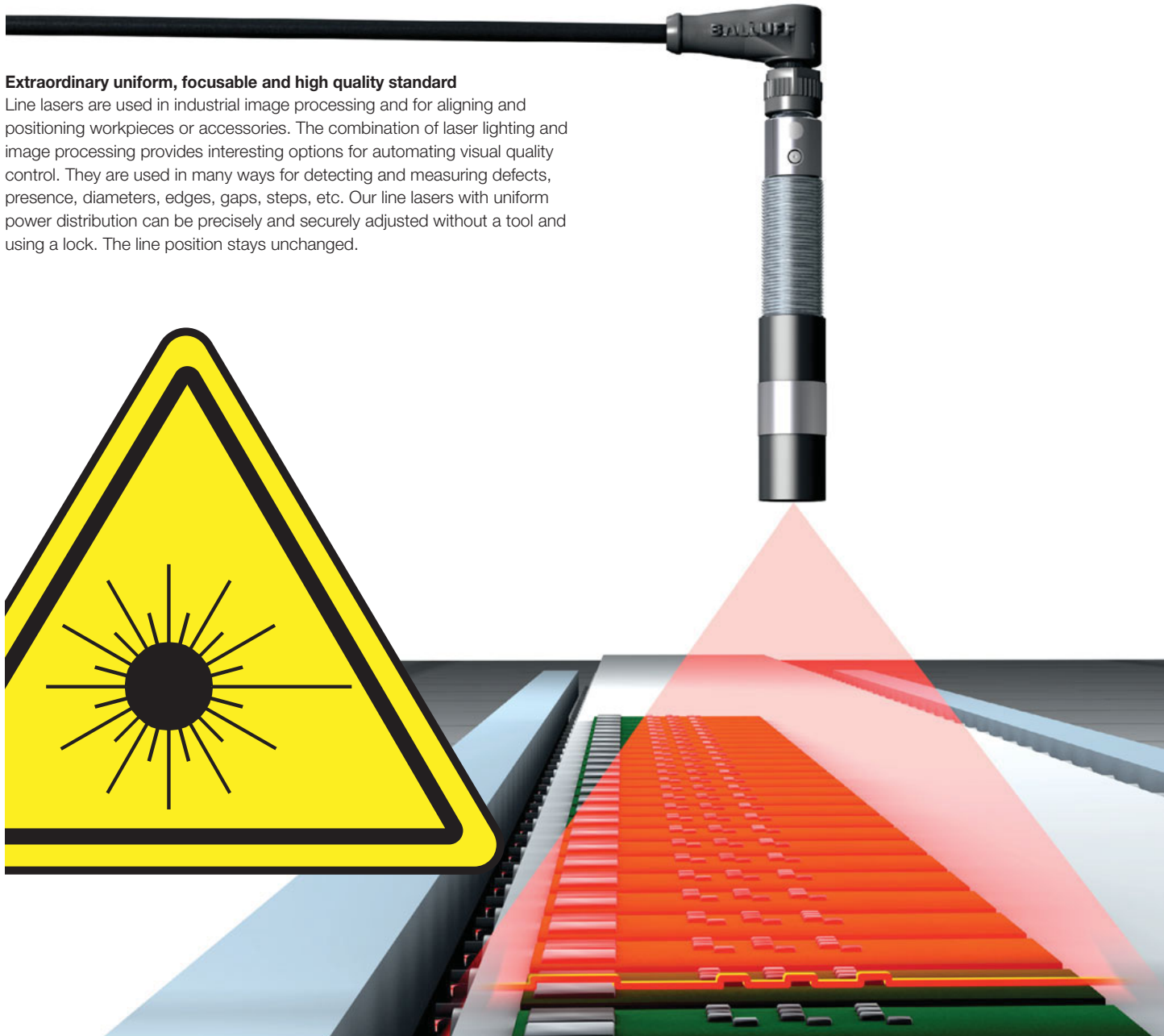
Accessories

Line lasers

Line Lasers
Uniform performance even under adverse conditions
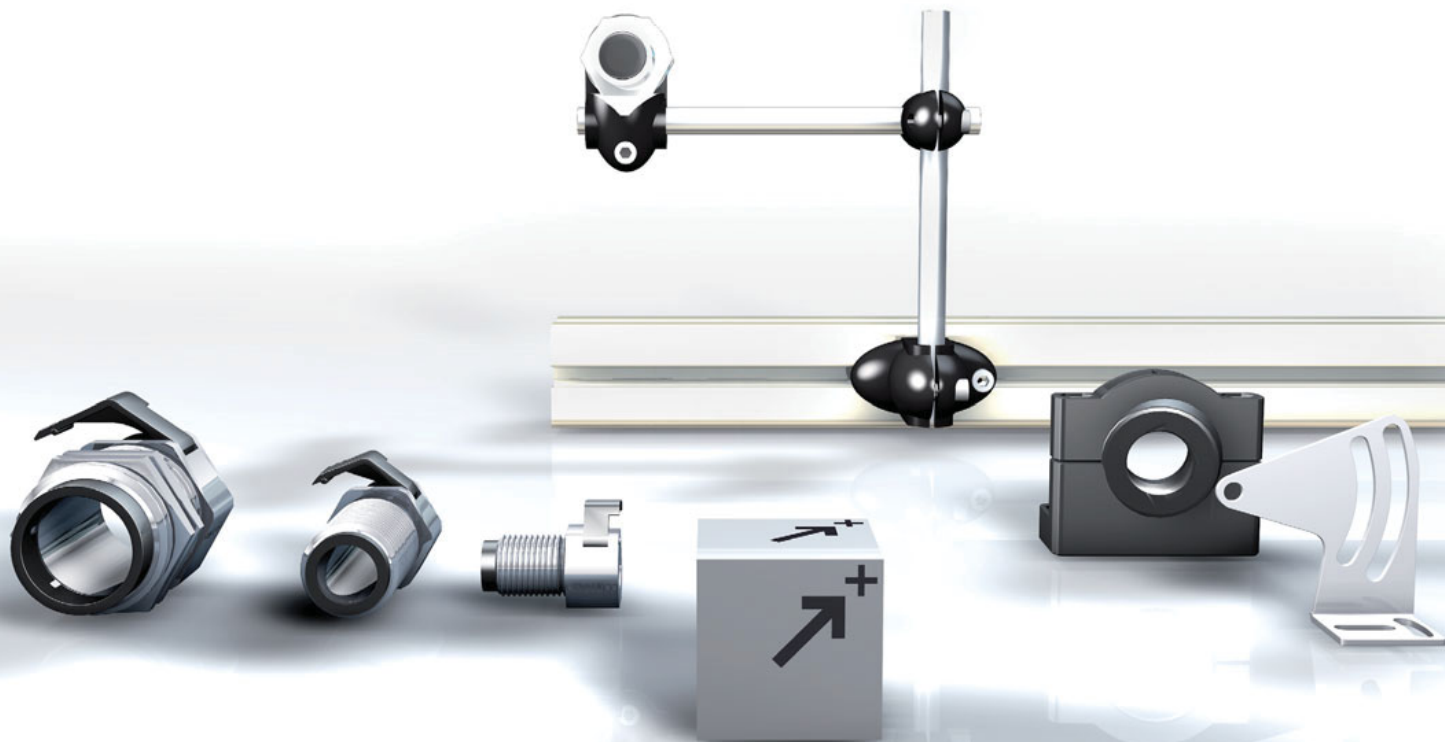
Extraordinary uniform, focusable and high quality standard

Line lasers are used in industrial image processing and for aligning and positioning workpieces or accessories. The combination of laser lighting and image processing provides interesting options for automating visual quality control. They are used in many ways for detecting and measuring defects, presence, diameters, edges, gaps, steps, etc. Our line lasers with uniform power distribution can be precisely and securely adjusted without a tool and using a lock. The line position stays unchanged.

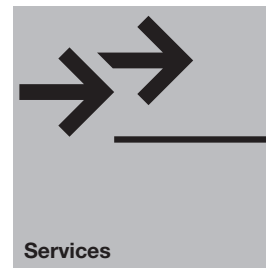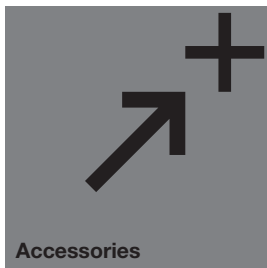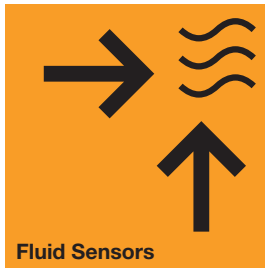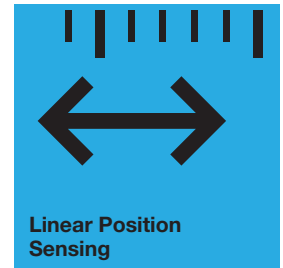| Model	BAE LX-XO	BAE LX-XO
Design	**Line laser**	**Line laser**
Light type	Red light	Red light
Ordering code	**BAE00KE**	**BAE00KZ**
Part number	BAE LX-XO-PL018-L1-S4	BAE LX-XO-PL018-L2-S4
Supply voltage U_s	5...30 V DC	5...30 V DC
Operating current	30 mA	30 mA
Trigger	Yes	Yes
Line width/ 100 mm distance	77 µm/82 mm	73 µm/30 mm
line length 500 mm distance	170 µm/420 mm	107 µm/60 mm
1000 mm distance	320 µm/840 mm	189 µm/300 mm
2000 mm distance	677 µm/1650 mm	360 µm/600 mm
Emitter, light type	Laser, red light	Laser, red light
Wavelength	640 Nm	635 Nm
Dimension	Ø 20×128 mm	Ø 20×108 mm
Connection	M12 connector, 4-pin	M12 connector, 4-pin
Housing material	Coated brass and anodized aluminum	Coated brass and anodized aluminum
Optical surface	Glass	Glass
Weight	66 g	56 g
Degree of protection as per IEC 60529	IP 67	IP 67
Laser class per IEC 60825-1	2M	1M
Polarity reversal/short-circuit protected	Yes/Yes	Yes/Yes
Ambient temperature T_a	−10…+50 °C	−10…+50 °C
Storage temperature	−10…+80 °C	−10…+80 °C

Caution
Do not view laser radiation directly with optical
instruments (magnifiers, microscopes, etc.).
Laser class 1M and 2M (DIN EN 60825-1: 2008)
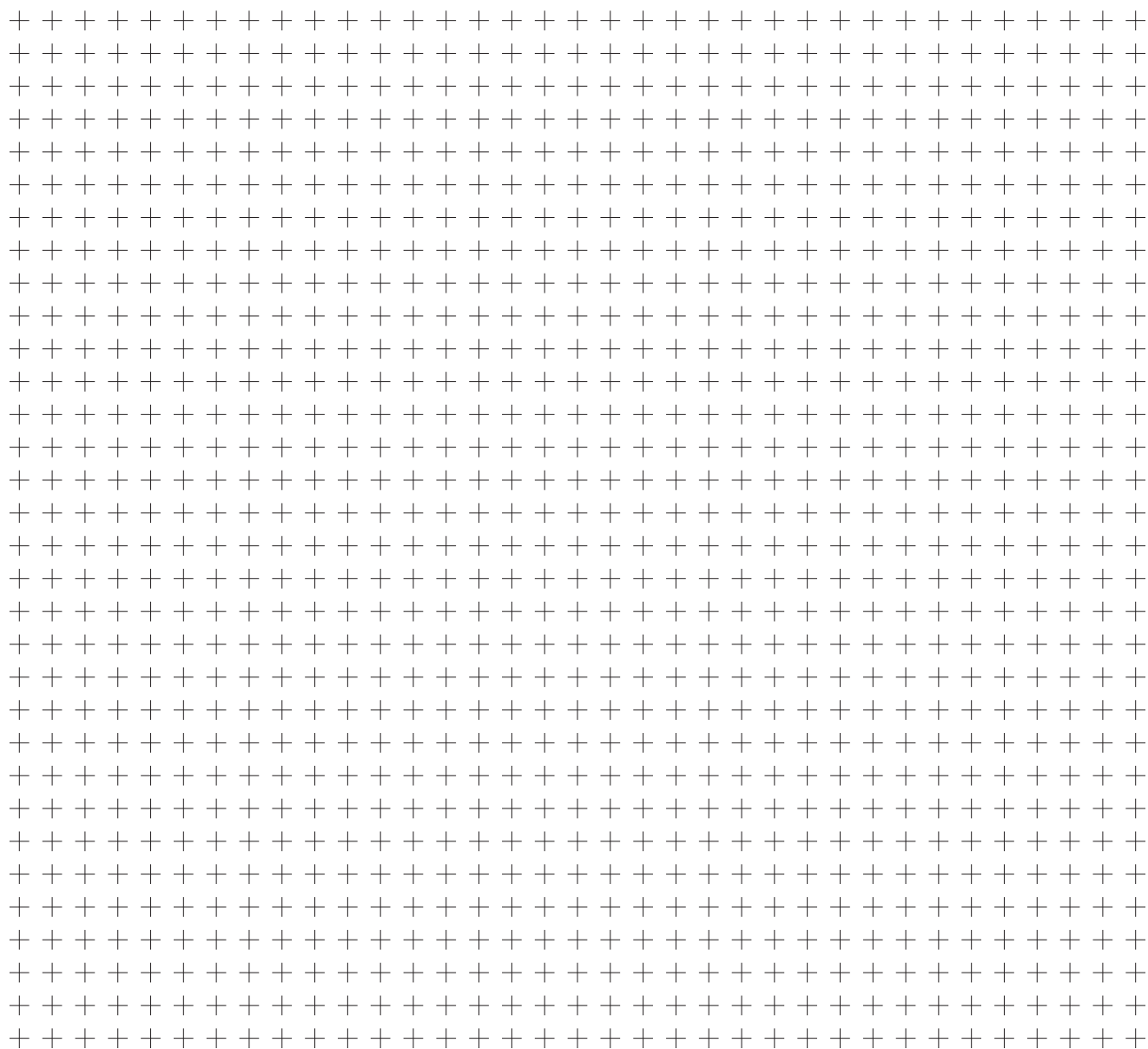
SENSOR SOLUTIONS AND SYSTEMS

BALLUFF

sensors worldwide

As a recognized partner in all sectors of the automation industry, Balluff offers comprehensive expertise in sensor technology and networking. We supply advanced technology and state-of-the-art electronics to our customers, who benefit from excellent service, application-specific solutions and individual consultation. You too can benefit from the excellent quality of our products and services.

Object Detection

Linear Position Sensing

Fluid Sensors

Industrial Identification

Accessories

Industrial Networking and Connectivity
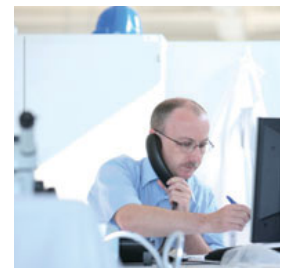
Services

www.balluff.com
Phone 1-800-543-8390

BALLUFF

sensors worldwide

Services

Industrial Networking and Connectivity

Industrial Identification

Object Detection

Linear Position Sensing

Fluid Sensors

Accessories

USA
Balluff Inc.
8125 Holton Drive
Florence, KY 41042
Phone: (859) 727-2200
Toll-free: 1-800-543-8390
Fax: (859) 727-4823
Web: www.balluff.us
E-Mail: balluff@balluff.com

Canada
Balluff Canada, Inc.
2840 Argentia Road, Unit #2
Mississauga, Ontario L5N 8G4
Phone: (905) -816-1494
Toll-free: 1-800-927-9654
Fax: (905) 816-1411
Web: www.balluff.ca
E-mail: balluff.canada@balluff.ca

Mexico
Balluff de México S.A. de C.V
Anillo Vial II Fray Junípero Serra No. 4416
Colonia La Vista Residencial.
Querétaro, Qro CP76232
Phone: (++52 442) 212-4882
Fax: (++52 442) 214-0536
Web: www.balluff.mx
E-Mail: balluff.mexico@balluff.com

www.balluff.com