

BALLUFF

sensors worldwide

Your Partner for every Solution
... in the Metalworking Industry



Mechanical, inductive, photoelectric, capacitive, magnetostrictive and magneto-inductive sensors and industrial RFID systems demonstrate clearly: Balluff has mastered the entire technological variety of commonly used physical principles. On this basis we offer you a variety of solutions that is the envy of the market – and on the highest and most up-to-date technical level.

Intelligent Sensor Solutions from Balluff

The whole range of sensors for your needs



SENSOR LINE

- Inductive Sensors: DC 3-/4-Wire
- Inductive Sensors: DC 2-Wire
- Inductive Sensors: AC/DC
- Inductive Sensors Special Properties
 - Factor 1
 - Steelface
 - Weld Immune
 - Magnetic Field Immune
 - Desina Diagnostic
 - Pressure Rated
 - Temperature Rated
 - PROXINOX
 - Ring Sensors
 - Extended Switching Distances
- Sensors for Pneumatic Cylinders
- Magnetic Field Sensors
- Capacitive Sensors

PHOTOELECTRIC LINE

- Diffuse Photoelectrics Fore- and Background Suppression
- Retroreflectives
- Thru-beams: Emitter/Receiver
- Fiber Optic Systems
- Slot Sensors
- Optical Window Sensors
- Light Grids
- Contrast Sensors
- Luminescence Sensors
- Color Sensors
- Photoelectric Distance Sensors

MECHANICAL LINE

- Mechanical Multiple and Single Position Switches
- Mechanical Multiple and Single Position Switches per DIN EN 60204-1/VDE 0113
- Mechanical Multiple and Single Position Switches with safety switch positions
- Mechanical Multiple Position Switches with quick-change plunger block
- Inductive Multiple and Single Position Switches
- Inductive Multiple Position Switches with extended switching distance
- Mechanical Multiple and Single Position Switches with wireless technology
- Multiple Position Switches with Mixed Assembly



Ruggedness

Micropulse transducers withstand shock levels of 100 g and even under this load operated with a repeatability of a few μm . And their IP 67 enclosure rating makes them extremely resistant to environmental effects.

Dynamic

Our BIW inductive linear position sensor operates at a sampling rate of 20 kHz, making it ideal for sensing highly dynamic processes.

Long range

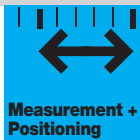
Longer ranges with the same dimensions or a smaller housing with the same range are two sides of the same coin. We supply inductive sensors with 2x, 3x and 4x switching distance. This lets you reduce the installation dimensions and increase tolerances or distances from danger areas: The sensor is protected from thermal, chemical and mechanical stresses by sheer distance.

Small dimensions












We've been pioneers when it comes to miniaturizing sensors. Flip-chip technology enables us to manufacture inductive 3mm sensors using M5 miniature connectors. The BMF 303 magnetic field sensor is so small that it often fits in the slots of a 1-inch cylinder. And our BIS C-121 offers the smallest data carrier design. This makes it perfect for identifying microelectronic components during manufacture.

Standardization






Uniform installation dimensions increase productivity and reduce costs for the supply chain. This is why we offer standard sensors with uniform mechanical interfaces, regardless of whether they use traditional or quick-change construction. This significantly reduces assembly and replacement times.











TRANSDUCER LINE

-  Micropulse® Profile Transducers Series
-  Micropulse® AT Transducers Series
-  Micropulse® Rod Transducers Series
-  Micropulse® Compact Rod Transducers Series
-  Micropulse® BUS Interfaces Processors
-  Magnetic Linear Encoder Systems
-  Incremental and Absolute Encoders
-  Inductive Position Feedback System
-  Inductive Linear Position Sensors
-  Magneto-Inductive Position Sensors
-  Photoelectric Distance Sensors



IDENTIFICATION LINE

-  BIS C Industrial RFID Systems
-  BIS L Industrial RFID Systems (easy loop)
-  BIS M Industrial RFID Systems
-  BIS S Industrial RFID Systems
-  Vision Sensor BVS

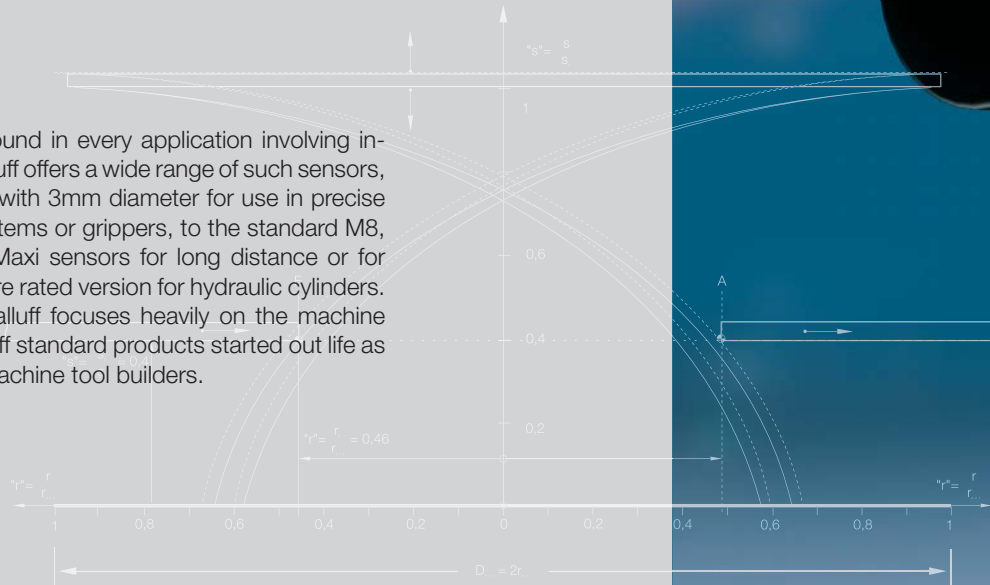
CONNECTIVITY LINE

-  Connectors
-  Splitter Boxes
-  Active Boxes
-  IO-Link
-  Inductive Transmission Systems Remote
-  BUS Systems
-  Wireless
-  Electrical Devices

ACCESSORIES LINE

-  Clamps and Brackets
-  Mounting System

Inductive sensors are found in every application involving industrial automation. Balluff offers a wide range of such sensors, from miniature versions with 3mm diameter for use in precise automated handling systems or grippers, to the standard M8, M12 and M18 size to Maxi sensors for long distance or for example as high-pressure rated version for hydraulic cylinders. The sensor line from Balluff focuses heavily on the machine tool industry. Many Balluff standard products started out life as special requests from machine tool builders.



Object Detection with Inductive Sensors BES

Optimized for machine tool requirements

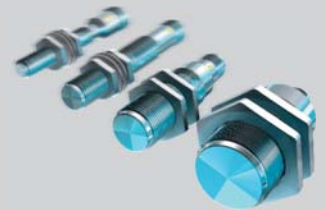


Tubular inductive sensors



Steelface inductive sensors

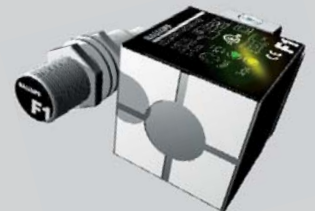
are used in especially harsh environments and applications which are too extreme for standard sensors. These include machine tools, metalworking and the automobile industry. With their rugged active face made of steel, Steelface sensors are at their best in resisting abrasive media and aggressive-coolants. In addition, the sensors have a selective response and depending on the version ignore aluminum chips for example.



Factor 1 sensors

detect objects made of steel, aluminum or brass at the identical switching distance (no reduction factor). This characteristic offers advantages in applications where the material of the detected objects may vary. In addition, all Factor 1 sensors are magnetic field immune. They function even in the presence of strong electromagnetic fields (such as are found in induction hardening or welding equipment).

Factor 1 sensors can withstand weld current up to 25 kA with no affect on their switching response – regardless of whether the source is an AC or DC welding system.



DC
3/4-Wire

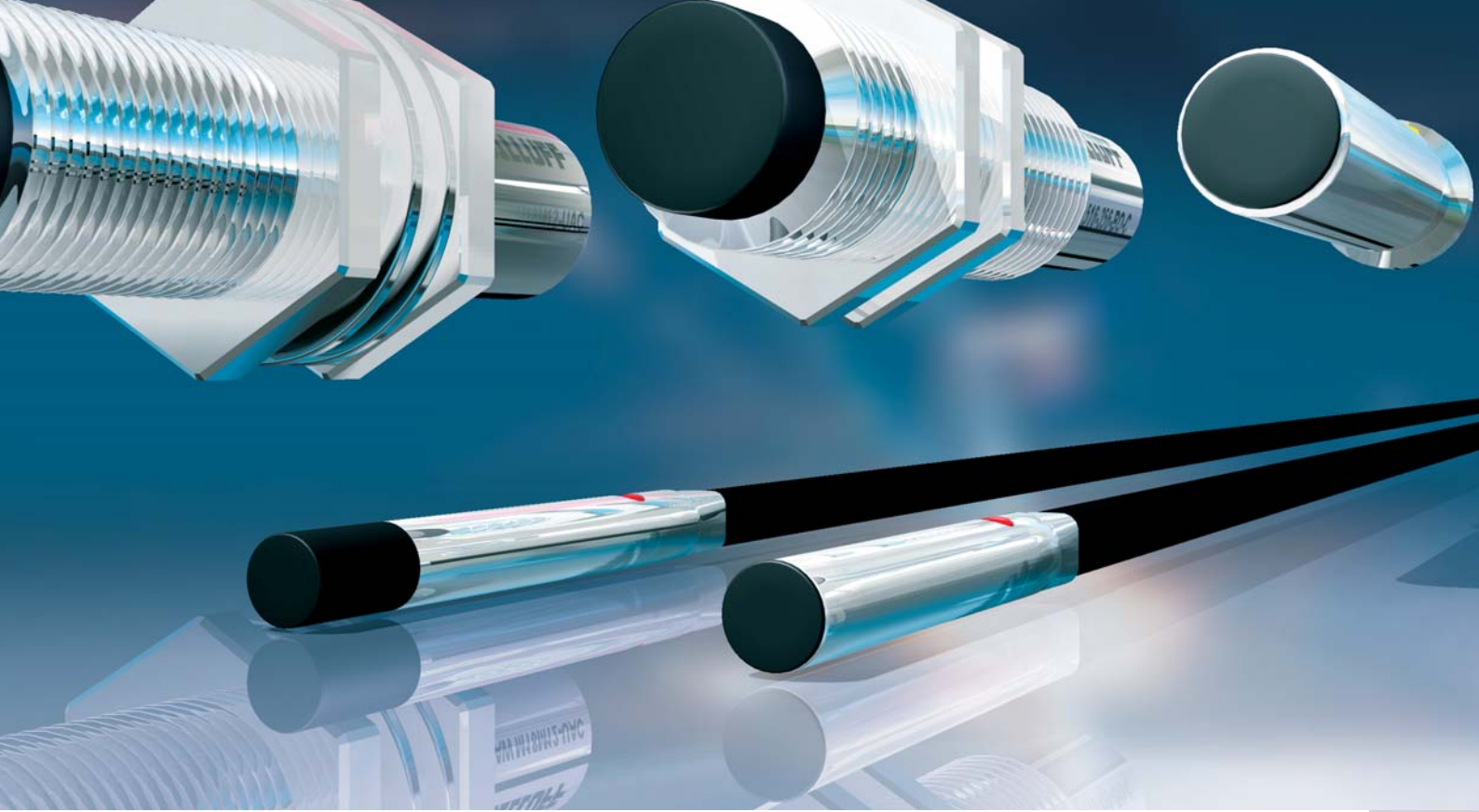
500bar
High Pressure

DC
2-Wire



AC/DC
2-Wire

F1



Block style inductive sensors

High pressure rated sensors

Hydraulic cylinders are often used in machine tools for positioning lifting units, feed components or clamping elements. Our high pressure rated sensors are employed here for end-of-travel sensing.



DESINA inductive sensors to ISO 23750

These switches meet the requirements of the VDW Specification. They offer the following benefits: The additional diagnostics output monitors the function of the switch. Cable break, short circuit sensor head damage and electronics failure are all monitored.



SuperShorties

The extremely short form factor opens up new applications that were previously inaccessible to inductive sensors. With their light weight the SuperShorties are ideal for high-dynamic applications.



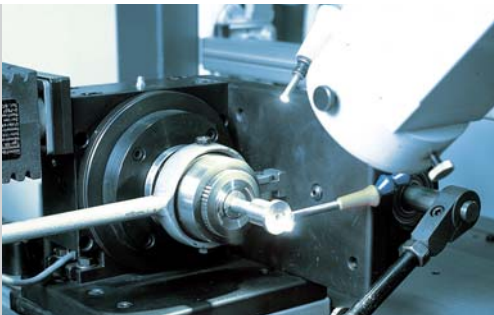
But the product portfolio is made up of more than only inductive sensor solutions. Monitoring of pneumatic cylinders with magnetic field sensors and level feedback for coolants using capacitive sensors are also covered in the product range. Even the challenge of 360° rotating index tables can be easily met thanks to the Remote system with its non-contacting signal transmission.



Object Detection with Sensors for Pneumatic Cylinders **BMF** Capacitive Sensors **BCS** Inductive Transmission Systems **Remote** Optimized for machine tool requirements

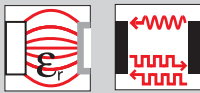


Sensors for pneumatic cylinders



Sensors for pneumatic cylinders

Pneumatic cylinders are being increasingly used for feed systems. The piston position is reliably detected through the cylinder wall by our BMF sensors. Universal designs are available for the various slot shapes.



The all-rounders **BMF 305**

fit on all standard cylinder types. In combination with mounting brackets they assure reliable holding and precise switching.



Our mini.s BMF 103, BMF 273 and BMF 303 work even on the smallest cylinders and grippers!



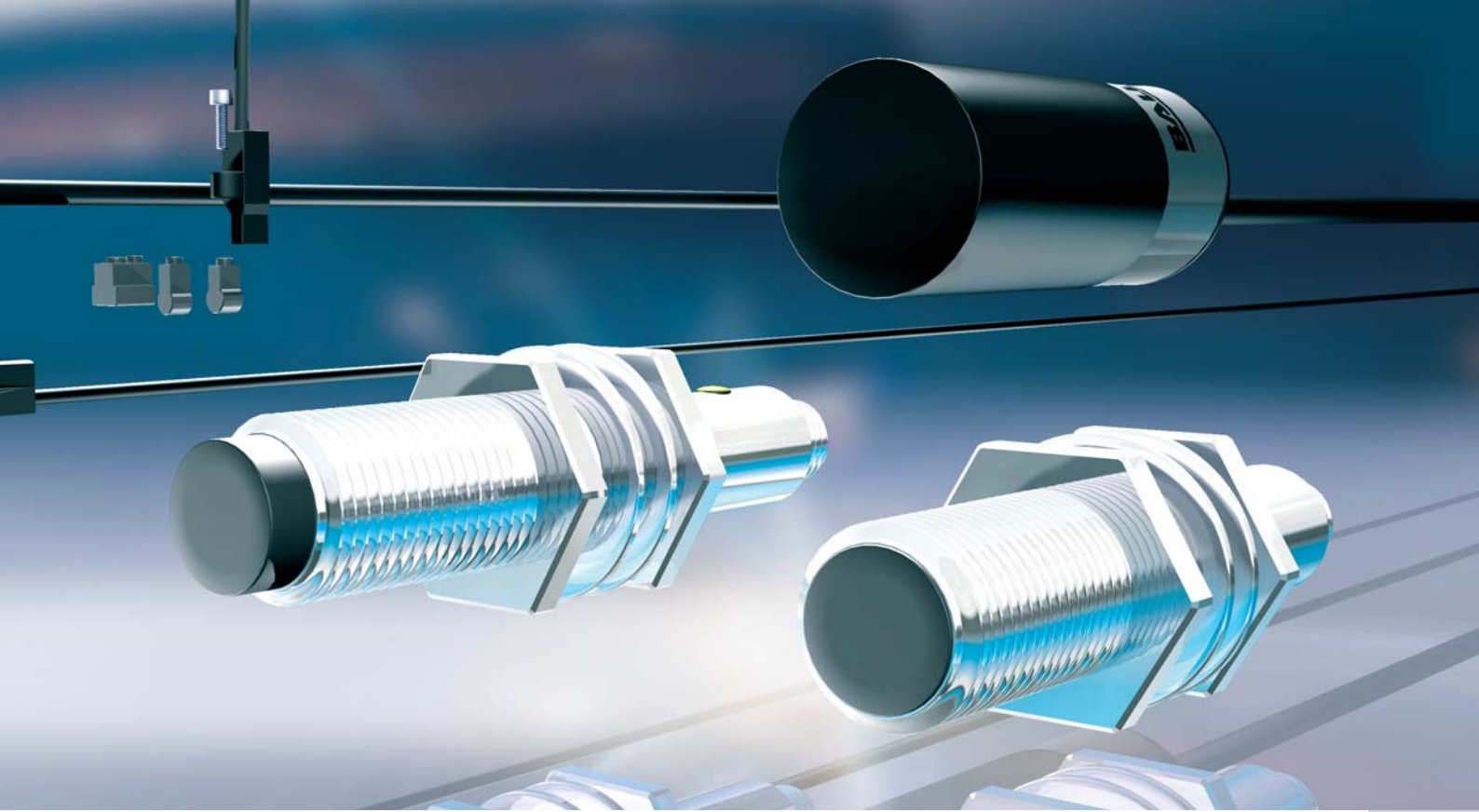
The compact BMF 315K and BMF 207 are optimized for a T-slot and are easy to install.



The specialists BMF 305M, BMF 315M and BMF 10E for extreme applications. Suitable for temperatures up to 105 °C or, in the stainless steel housing, for the foods industry.



Our classics BMF 21 and BMF 32 have proven themselves in applications on tie rods and round cylinders.



Capacitive sensors



Remote inductive transmission systems

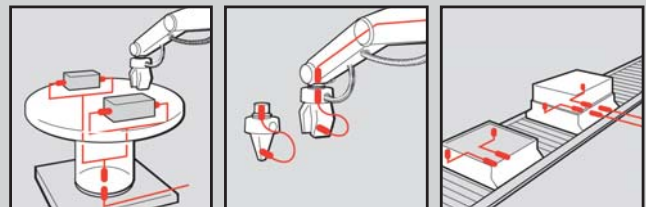
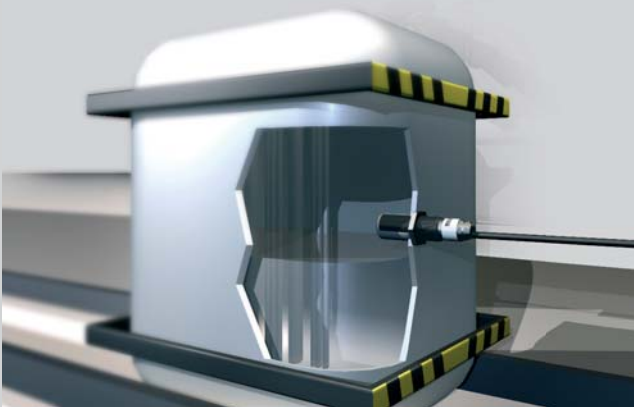
Capacitive sensors

detect metals, plastics and glass. These sensors can be embedded so that the media are sensed even through plastic or glass walls. Capacitive sensors are also often used for level sensing. Whether in reservoir tanks for coolants or on bypass tubes, the capacitive sensor reliably detects the level to help prevent machine damage from dry-running.

Another typical application is leak monitoring, such as on hydraulic fluid pans.

Remote inductive transmission systems

Monitoring clamping jaws in the working area of a 2-spindle machining center. The G-Power Remote systems can monitor the clamping jaws even during machining. Information from 8 sensors on each of two rotary tables on the swing table is sent to the control. Power for the sensor function is also provided inductively. The separable inductive coupling of power and signals enables high flexibility in the machining centers as well.



Complex requirements for parts scanning and positioning tasks expand the applications spectrum of photoelectric sensors in the machine tool industry.

Extremely harsh environments, temperature fluctuations, vibration and aggressive coolants place the highest demands on the mechanical design and electronics of photoelectric sensors.

Balluff offers a broad range of rugged and environmentally resistant photoelectric sensors in both block style and tubular housings.

Balluff's expertise in machine tool applications is seen in the handling of difficult applications with special form factors such as slot sensors and L-shaped through-beam sensors.



Object Detection with Photoelectric Sensors in the machine tool industry



Vision sensor



Tubular housings



Vision sensor BVS

The BVS vision sensor, many functions in one sensor. The BVS vision sensor shows its strengths where multiple sensors used to be required or where the sensors have to be reconfigured during production. Reduce costs through short equipping times and increase quality using 100% quality inspection. The sensor contains all the needed functions, including an alignment aid and the illumination. The BVS is configured using intuitive configuration software. As simple as one sensor, configured in three steps and immediately ready to work.

Photoelectric sensors tubular housings

Photoelectric sensors from Balluff are typically enclosed in the tubular housings of inductive proximity sensors familiar to the machine tool industry. These fully potted sensors are resistant to contamination, vibration and temperature fluctuations, earning them an IP 69 enclosure rating. Whether M8, M12, M18 or M30 – there is no easier mounting concept for these form factors than a simple hole.



IP68

BWN Pr27
BWN Pr20

Stainless Steel





Block style housings

**Photoelectric sensors
block style housings**

Block style housings provide the greatest possible functionality in the smallest possible space and are thus the answer to a variety of requirements in machine tool building.

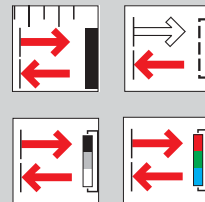
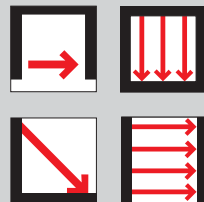
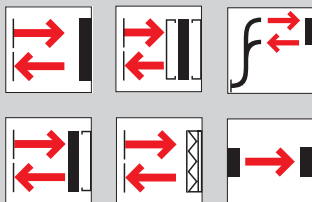
The light types available include infrared light for low sensitivity to contamination, visible red light for ease of alignment, or laser light for precise small parts detection.

**Photoelectric sensors
for special applications**

Great flexibility and customer-oriented solutions are the hallmarks of the machine tool industry – like the photoelectric applications solutions from Balluff. By adapting mechanical, optical or electrical functions to customer-specific requirements, unusual solutions can be realized.

Photoelectric distance sensors

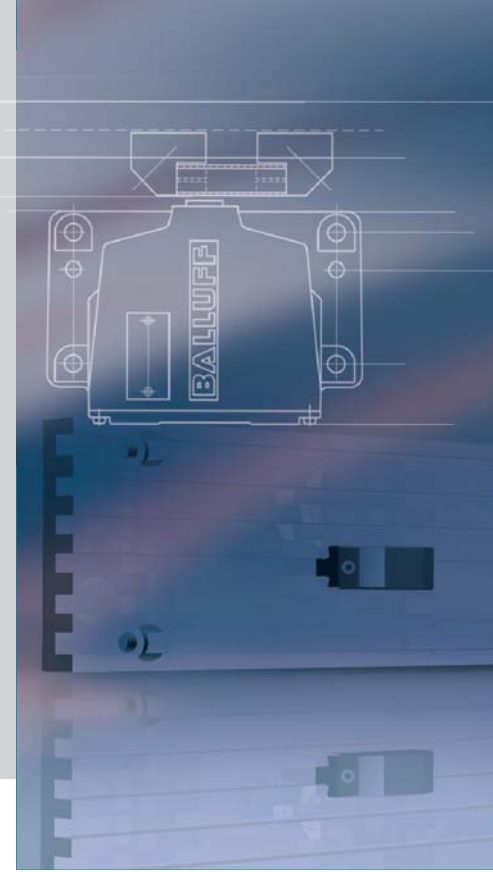
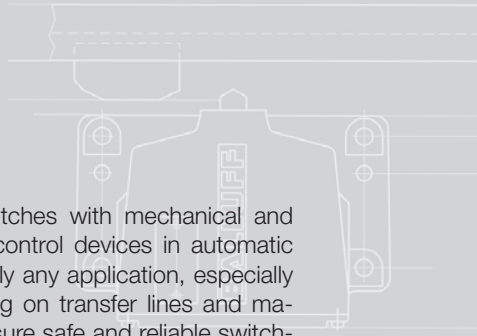
These diffuse-type sensors can also perform the most precise scanning even over longer distances of up to 6 m and without regard to surface characteristics or material composition. Distances can be simply indicated by a signal which is easily integrated into the machine controller.



Multiple and single position switches with mechanical and inductive switch inserts act as control devices in automatic controllers and systems in virtually any application, especially for positioning and limit switching on transfer lines and machine tools. Our mechanicals ensure safe and reliable switching wherever you need it.

They are especially designed and proven over decades for use under extreme conditions such as vibration, shock and bump or where coolants and lubricants are present.

DIN 43697 and DIN 43693 standard housings as well as application-specific designs are available for our multiple and single position switches. A wide range of accessories completes the offering and enables custom specifications and configurations.



Object Detection with Mechanical and Inductive Multiple and Single Position Switches

The automation classics



Mechanical multiple and single position switches



Mechanical multiple and single position switches with safety switch inserts



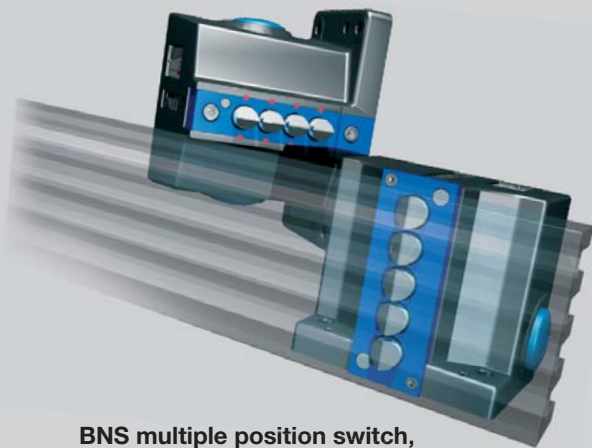
Multiple and single position switches with safety switch positions per DIN EN 60204-1 /VDE 0113

- Switch elements with forced opening per DIN EN 60204-1/VDE 0113.
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing
- All safety switch position use rigid plunger





Inductive multiple and single position switches



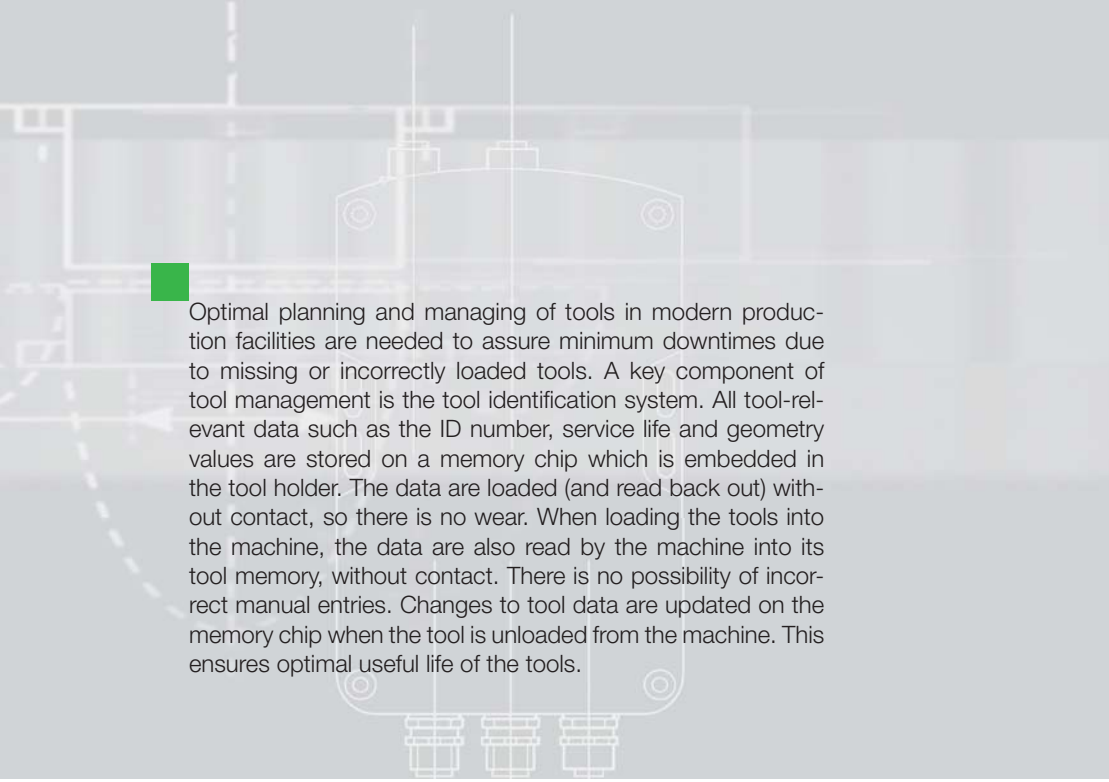
BNS multiple position switch, the problem solver with quick-change plunger block

The plungers in the multiple position switch are the only moving parts outside of the housing. In hard, everyday use these parts are subjected to abrasive materials, weld splatter, strongly resinous coolants and high mechanical loads caused by long cam travel paths. For such applications we have developed an alternative with quick-change plunger block for the 100 and 61 series. In just a few steps using no special tools the complete switch assembly on multiple position switches can be replaced in minutes. Downtimes are reduced to a minimum. Time-consuming replacement of the plungers is eliminated, wiring mistakes are prevented and repair costs are kept to a minimum.

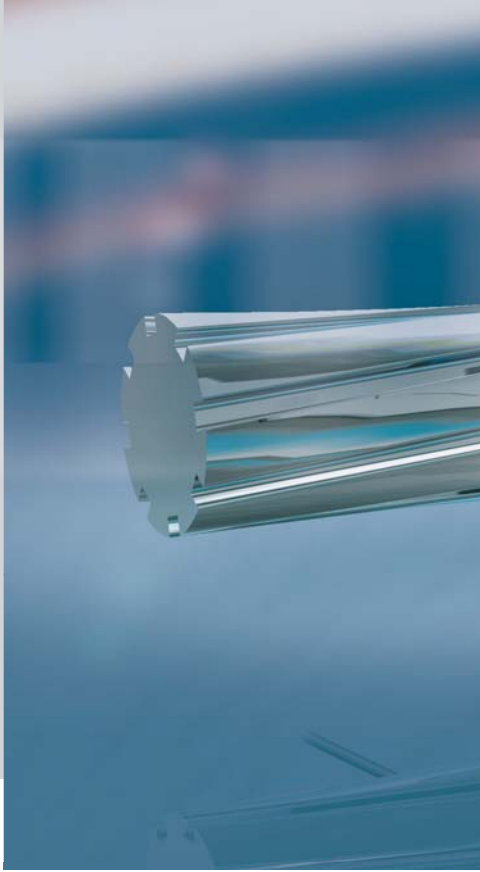
Wireless Transmission System BWT: Multiple and single position switches with wireless technology

Balluff offers a complete RF transceiver solution for the mechanical switches using the license-free 868 MHz ISM band. The multiple and single position switches are mechanically actuated, by a cam for example. The use of wireless signal transmission eliminates cables and wires to and from the mechanical limit switches. Power is self-generated, making any external energy supply or battery unnecessary. The complete Wireless Transmission System can be quickly and individually tailored to applications or changing space conditions and makes it an attractive solution in all areas of industry.





Optimal planning and managing of tools in modern production facilities are needed to assure minimum downtimes due to missing or incorrectly loaded tools. A key component of tool management is the tool identification system. All tool-relevant data such as the ID number, service life and geometry values are stored on a memory chip which is embedded in the tool holder. The data are loaded (and read back out) without contact, so there is no wear. When loading the tools into the machine, the data are also read by the machine into its tool memory, without contact. There is no possibility of incorrect manual entries. Changes to tool data are updated on the memory chip when the tool is unloaded from the machine. This ensures optimal useful life of the tools.



Industrial RFID Systems BIS

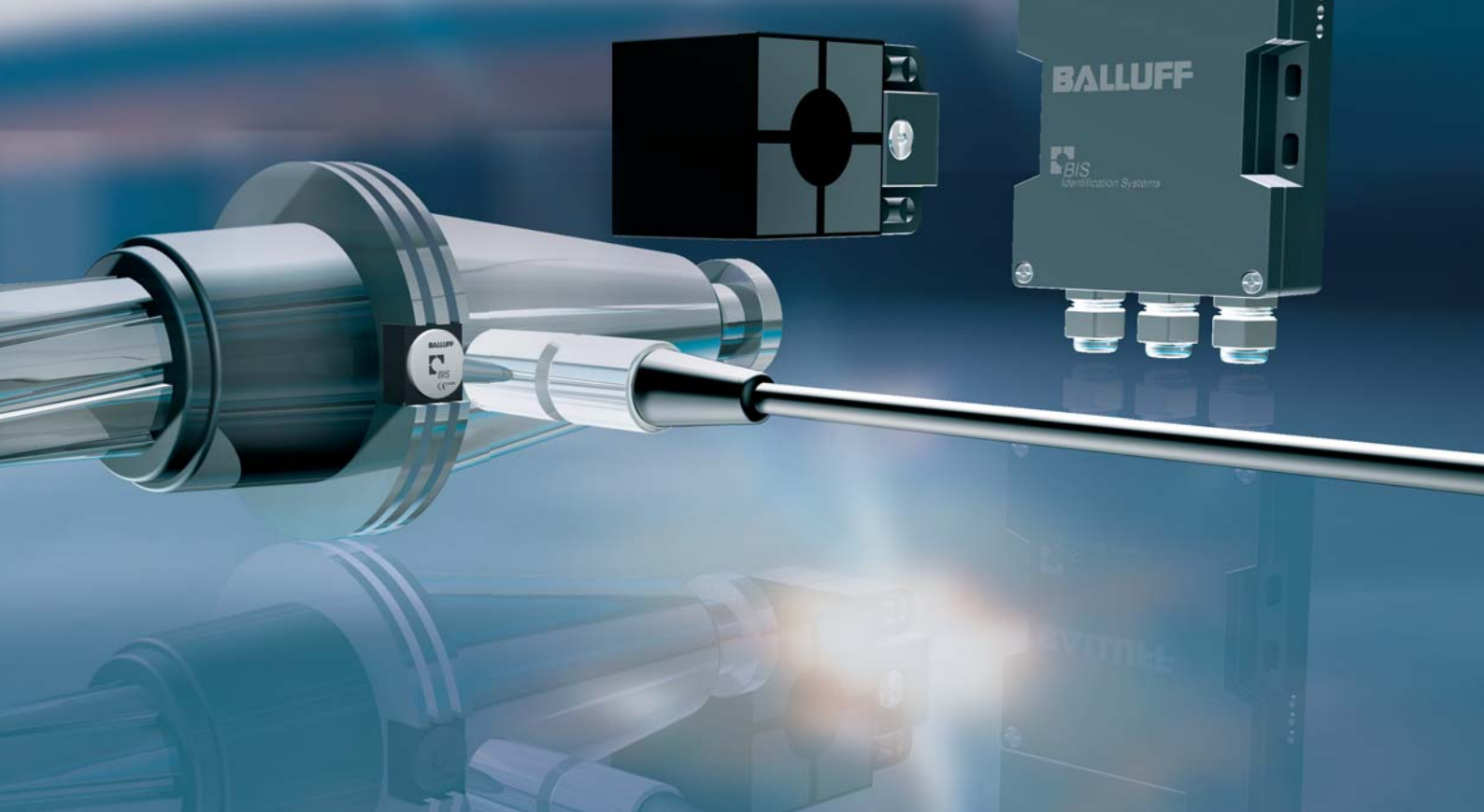
Tool and pallet identification with industrial RFID



Industrial RFID



All products in our tool identification system have proven themselves over many years and easily withstand the ambient conditions of mechanical production.



Powerful and flexible

BIS C is a system designed for production and assembly. A wide range of data carrier and read head models offers solutions for an equally broad range of applications. These include applications in vacuum, on machine tools with frequent exposure to coolants and lubricants, or in autoclaves. Special heads allow on-the-fly reading and writing.

Economical

BIS L is an especially economical solution for logistics and assembly lines. Data carriers in extremely flat packages have a 40-bit read-only capacity, or 192 bytes of read/write memory. The read distance is up to 150 mm, or 100 mm for writing. BIS L is compatible with widely used 125 kHz transmission technology.

Fast and economical

Economical data carriers with fast data transmission are the highlight of the BIS M system. With their 752 bytes of EEPROM memory and Kbytes of FRAM, these data carriers are ideal for applications where smaller amounts of data need to be processed very quickly. The system operates at a transmission frequency of 13.56 MHz in accordance with the ISO 14443 standard and ISO 15015693.

Fast and rugged

BIS S offers large data capacity for assembly and production. The data carriers can store up to 32 kb. The newest FRAM technology enables an unlimited number of read/write cycles. Whether production or quality data: this system will handle all your important data.

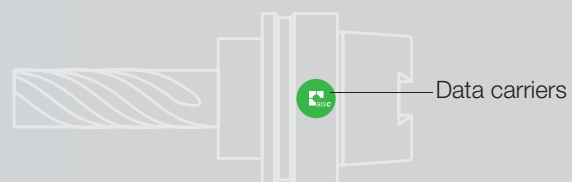
Identifying high-value grinding discs and saw blades

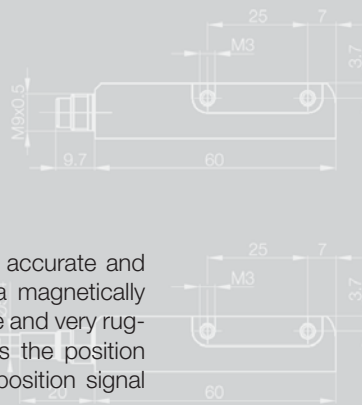
- Optimize the process sequence by storing the usage time, regrind intervals, geometries and leasing or service data.
- Protection against knock-offs



RS 232	INTERBUS	PROFIBUS	DeviceNet	Ethernet	Parallel
RS 485					
RS 422					

Interfaces





Magnet band linear encoder systems are very accurate and realtime-capable. Displacement sensors with a magnetically encoded tape are a highly precise, fast response and very rugged measuring system. The controller receives the position signal in realtime. The controller receives the position signal in realtime.

In spite of the high accuracy and realtime capability, distances (gaps) of up to 2 mm (approx. 30 % of the pole width) above the magnetic tape are permitted. Since the system works on the principle of magnetism, unlike optical systems it is highly immune to contamination from oils, dust etc. These properties make it predestined for use in harsh industrial environments.

Displacement Measurement with Magnetic Linear Encoder Systems BML Absolute and Incremental Encoders BDG/BRG Inductive Distance Sensors BAW

Non-contact and high-resolution



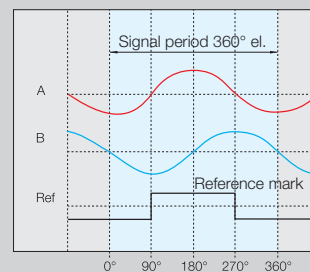
Magnetic linear encoder systems

System features

- Non-contact operating principle
- Resolution down to 1 μm
- System accuracy to $\pm 10 \mu\text{m}$
- Digital square wave signals RS422 or 10...30 V
- Sinusoidal analog signals 1 V_{pp}
- Distance between sensor and tape up to 2 mm
- Reference and limit switch function

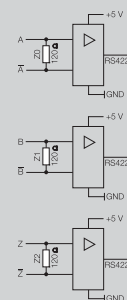
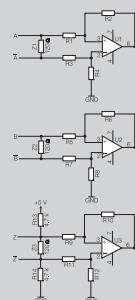
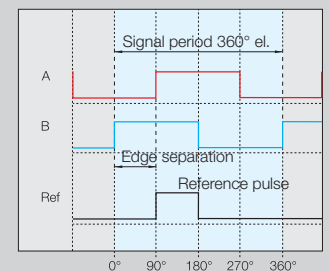
Sinusoidal analog signals 1 V_{pp}

- Sinusoidal voltage signal with inversion
- Signal period 360° electrical = 1000 μm
- Termination resistance 120 Ohm



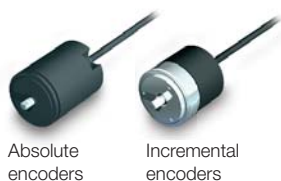
Digital square wave signals RS422

- RS422 square wave signals to DIN 66259 90° phase-shifted
- Edge separation A/B corresponds to the resolution of the sensing head
- Differential signal





Magnetic linear encoder systems



Absolute encoders
Incremental encoders



Inductive distance sensors

Sense high speeds and direction of rotation

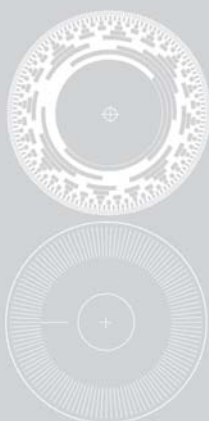
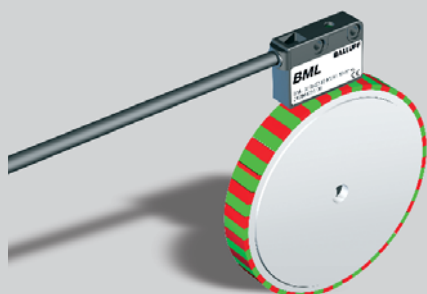
The combination of magnet ring or tape and BML sensor is extremely flat. The system also reliably detects speeds of over 10,000 rpm.

Encoders

Series BDG dual-track incremental encoders monitor the spindle speed on automatic lathes and position workpieces for complex milling operations in the X-Y axis. Series BRG absolute angle encoders send the current position of the tool turret.

Inductive distance sensors

are used for clamping distance monitoring on tool spindles and tool clamping devices, even where space is at a premium. The three possible states unclamped, clamped without workpiece and clamped with workpiece, are programmed individually and flexibly in the controller, and are reliably detected and evaluated.



Clamping distance sensing

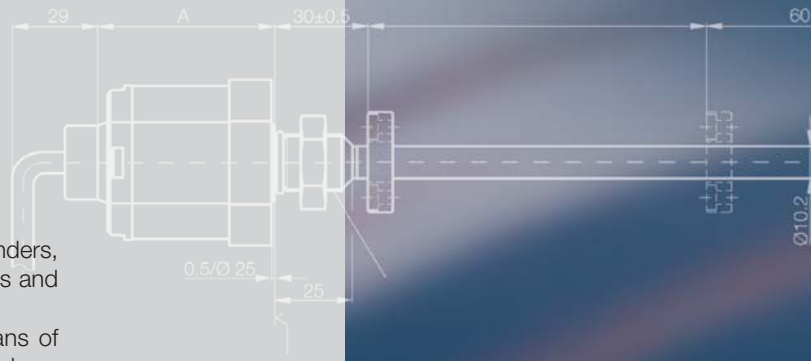
The inductive distance sensors are optimized for a sensing range of from 5 to 10 mm. Strokes of 50 mm and more can be measured using an inclined plane or cone.

Out-of-round detection

The use of eccentrics, cams or out-of-round targets causes a periodic change in the sensor's output signal. This property is used among other things as an approach rule to optimize cycle times and enable smooth deceleration.

Micropulse® transducers, integrated into hydraulic cylinders, are used both for positioning clamping cylinders, chucks and tailstocks and for actual position value feedback.

The transducers detect the measured position by means of magnetostriction and without contact. This makes them absolutely wear- and maintenance-free, assuring the user of extremely long service life without unproductive and expensive downtimes. In addition to the absolute output signal, they feature high resolution, repeatability and linearity as well as immunity to shock, vibration and contamination.



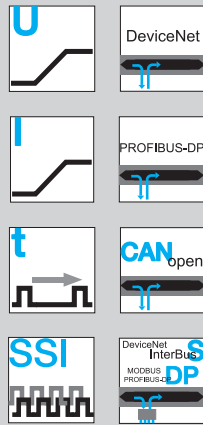
Displacement Measurement with Micropulse Transducers BTL Inductive Linear Position Sensor BIW

Linear position sensing – high precision with extreme reliability



Micropulse transducer profile-style

Micropulse transducer rod-style



Interfaces

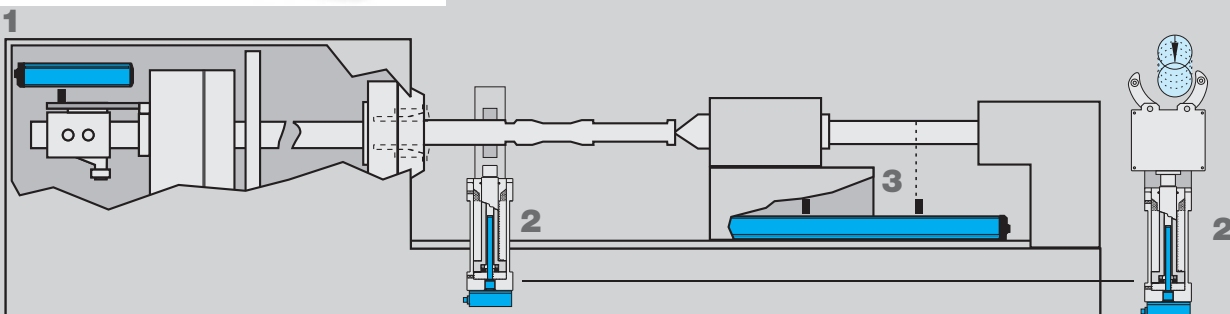
The right feedback system for any application

Benefits

- Non-contact, wear-free system
- Very reliable with high enclosure rating
- Pressure rated for installation in cylinders
- Numerous interface options
- Special form factors for Ex-hazard, redundant, etc.
- Stroke lengths from 25...5500 mm

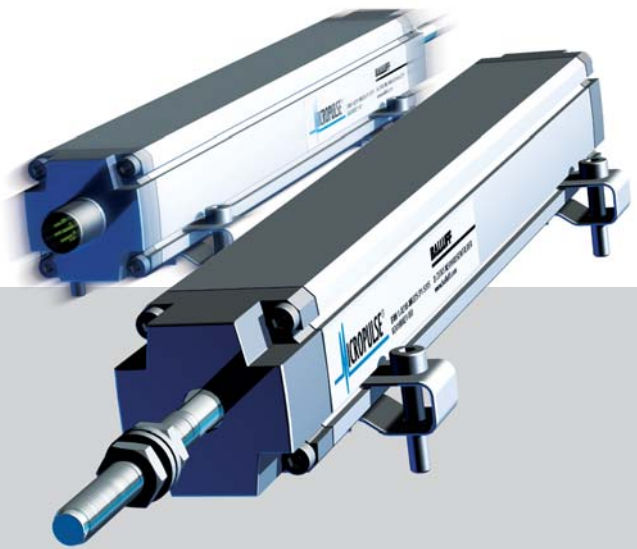
Micropulse applications on machine tools

1. Continuous clamping distance monitoring
2. Hydraulically actuated chuck positioning
3. Monitors traverse of the tailstock and extension of the spindle simultaneously





Inductive linear position sensor



The **BIW inductive linear position sensor** is based on a new, patented operating principle that detects actual position without contact.

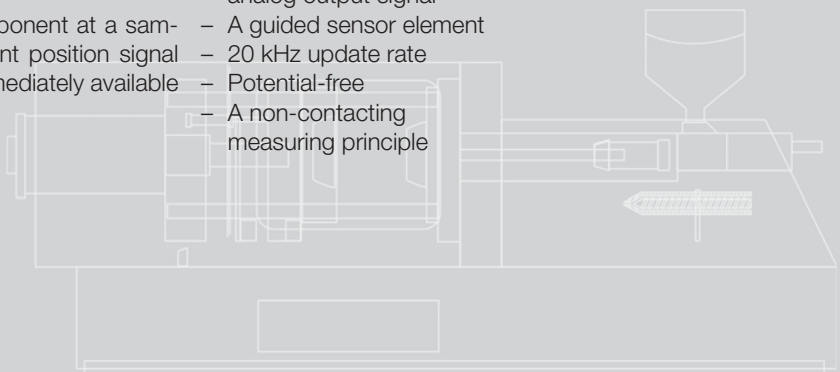
The BIW transducer contains an excitation oscillator and a passive tuned-circuit resonator – all protected by an extruded aluminum housing. The oscillator is attached to a sliding rod which is in turn attached to the moving member of the machine or equipment.

The oscillator is excited by the sender component at a sampling rate of 20 kHz and couples the current position signal into the receiver element. The position is immediately available on the output as an absolute analog value.

Features

BIW transducers offer

- High resolution and repeatability
- Resistance to shock, vibration and noise fields
- An absolute rising or falling analog output signal
- A guided sensor element
- 20 kHz update rate
- Potential-free
- A non-contacting measuring principle



IO-Link – The new standard in sensing and distribution technology. Under the roof of the Profibus User Organization, an international committee for standardization, IO-Link technology was standardized across manufacturers. This interface makes it possible to adapt process parameters or change tool/workpiece parameters within seconds. Competitive advantages result from increased production time and less downtime.

Communication with the sensors is pure digital, which enables reliable and noise-immune data exchange. Using the refined installation concept from Balluff, simple wiring without shielded cables and intermediate terminals is possible.



IO-Link

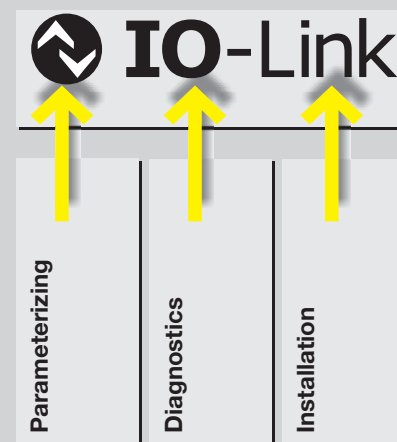
Breakthrough in communication



Pressure sensor

IO-Link

IO-Link drastically reduces down- and maintenance times. The sensor's diagnostic capabilities prevent wear and excessive contamination. This allows new concepts in increasing machine availability to be achieved. When part replacement is necessary, unambiguous fault localization and automatic sensor parameter configuration get you running again in no time.





IO-Link-capable sensors



IO-Link-capable splitter boxes

Combining the proven with the new

The installation technique that has been proven over decades is now communication-capable. Service technicians and installers will truly appreciate the benefits. The proven M12 connector/cable lines are still used to connect the sensors. The sensor sends its information digitally in both directions to an IO-Link distributor. This box directly supplies the information for Profibus, DeviceNet or Ethernet.

Simplified cabling using industry-proven M12 standard cable for all sensors and actuators. Reduced cost through standardization and fast wiring.



3-conductor IO-Link cable

Pressure and temperature monitoring on machine tools

IO-Link makes it possible to detect three or more switching thresholds for pressure monitoring. This enables a flexible response, whether the variable is clamping, feed or system pressure. The switching thresholds are sent to the sensor when the machine is powered up. From then on the sensor monitors the pressures and sends a signal to the controller when the threshold is reached. This takes a burden from the controller, increases speed and simplifies the sequences. The pressure sensor can be installed wherever it makes the most sense. Since no settings need to be made on the sensor itself, it also does not have to be accessible from the outside. This in turn saves hydraulic lines and assembly time.

Displacement measurement with BAW

Non-contacting, wear-free inductive displacement measurement with BAW. With IO-Link the distance signal is sent directly to the controller. Fast and reliably, with no analog/digital converter and using standard cables.

Tool identification with BIS

Reduce costs with a tool management system. Modern RFID technology optimizes the service life of tools and prevents scrap. The read head is connected directly to the IO-Link distributor and the data are directly available to the controller via Profibus, DeviceNet or Ethernet.

A complete line of accessories saves costs and provides for optimum integration of the sensors in any application. Precise, lasting and always changeable locating of the sensor is just as much the function of our mechanical accessories as is its protection. Installation elements which are tailored precisely to our sensors make exact positioning possible. A comprehensive line of connectors rounds out our accessories range and enables use in every area of automation.



Accessories

The optimum peripherals for the sensor



Connectors



Clamps



Brackets



Mounting System



Clamping brackets ensure the correct position of the sensors. Sensors can be replaced immediately with no readjustment necessary. Also available in a model for use around welding equipment.

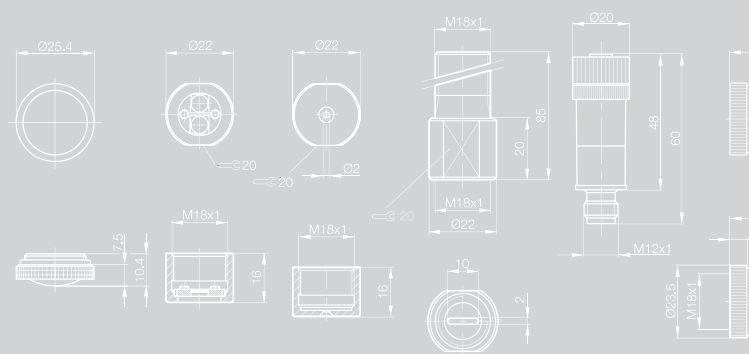
Mounting brackets make it possible to quickly and simply attach the sensors to the machine. Slotted holes enable flexible installation in base plates or on rails.

Positive stops for sensors with a housing diameter of 4 mm or 8 mm with corresponding mounting cuff for switching point setting between proximity switch and trigger pin.

Holding systems make it possible to position sensors of various housing types on rails or base plates.

Clamping pedestals ensure the correct position of the sensors. Sensors can be replaced immediately with no readjustment necessary. Also available with vertical/horizontal sensor holder.

Connectors in various styles enable use in every area of automation.



We are partners in the global market – Through the close networking of our headquarters in Germany with 21 subsidiaries in Europe, North and South America and Asia, we join forces for development, production and market knowledge. Sales activities in over 50 countries assure fast, global availability of our sensing products.

Our versatile, worldwide presence also creates proximity to customers, shortens delivery routes and allows the customer to see the details in his own location. Because in spite of cost-optimized global product lines, short distances to the user are critical.

Balluff Worldwide

Expertise and innovation



Corporate Headquarters

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Austria
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Singapore
Slovak Republic
Slovenia
South Africa
Spain
Sweden
Switzerland
Taiwan
Thailand
Turkey
Ukraine
USA
Venezuela



1800 employees
53 subsidiaries
and representatives
7 production plants

FAXINFO

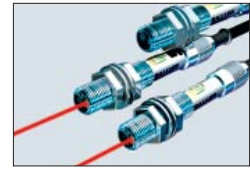
- **The Sensor Line –**
optimized for every automation task
- **Photoelectric Sensors –**
Product overview
- **The Mechanical Line –**
Mechanical and inductive multiple and single position switches
- **Industrial RFID Systems BIS C –**
Non-contact data communication
- **Industrial RFID Systems BIS L –**
Non-contact data communication at 125 kHz
- **Industrial RFID Systems BIS S –**
Non-contact data communication - High Speed
- **Industrial RFID Systems BIS M –**
Non-contact data communication at 13.56 MHz
- **Vision Sensor BVS –**
Easy to use
- **Magnetic Linear Encoder Systems BML –**
Non-contact and high-resolution
- **Micropulse Transducers BTL –**
Position sensing – with extreme precision
- **IO-Link –**
System Components for Industrial Communication
- **Inductive SuperShorties BES –**
Opens up new possibilities for position sensing
- **Electronic Catalog –**
DVD Full Line

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