

**BALLUFF**

 *innovating automation*

# BENCHMARKS FOR THE STANDARDS OF TOMORROW

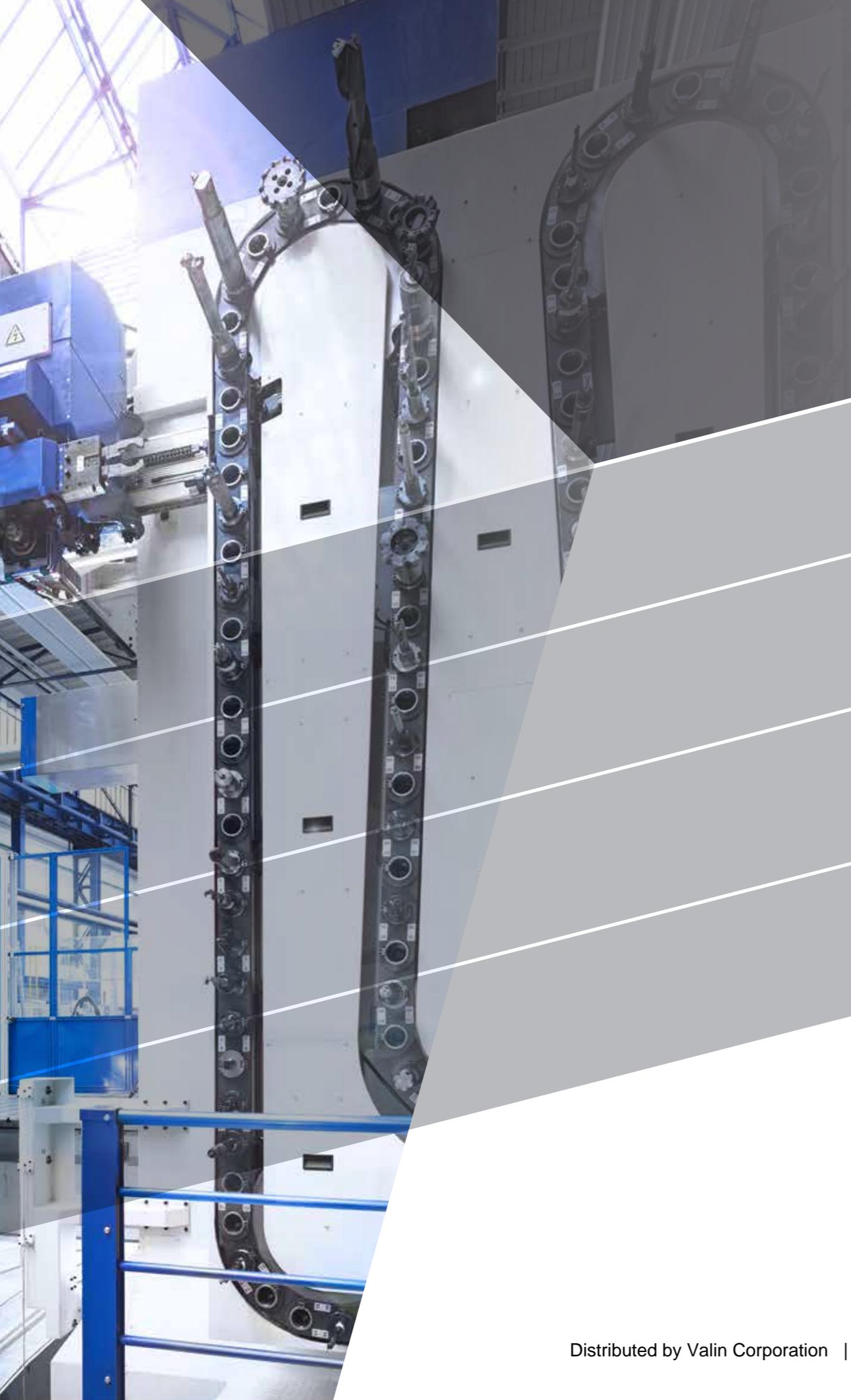
Metalworking

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Balluff and metalworking

## WE ARE AT HOME IN MANY DIFFERENT SECTORS

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Machining and stamping

## ECONOMICAL AND PRECISE – FROM SINGLE PARTS TO LARGE VOLUME.

 *innovating automation*

Machine tools are the backbone of modern manufacturing. They provide precision and high efficiency, and without them high-volume produced, high-quality products are impossible.

As a longtime partner of the metalworking industry, we support you with a broad range of solutions. We have developed and produced these in close cooperation with innovation drivers in metalworking, and machine and systems providers.

Whether in turning, milling or stamping, we have your particular requirements in constant view. Our solutions also ensure high system availability in high-dynamic applications. Whether you are producing in large volume or individual parts, make use of our expertise to protect your investment and produce economically.



# Machining: Turning

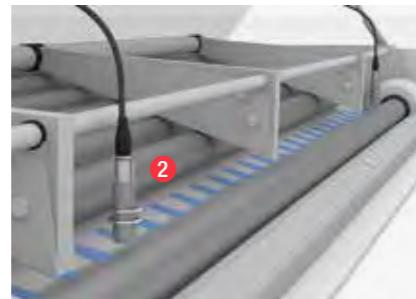


PROTECTION DEVICES  
MONITOR AND LOCK OUT  
With BID safety guard locking devices

Non-contact, transponder-coded safety interlocks are ideal for securing and monitoring guard doors and safety flaps to protect persons from potential hazards or the interruption of processes. The high coding level provides you with outstanding antitamper protection.

## Features

- Suitable for safety applications up to PLe/SIL3
- Immune to vibration and mechanical play
- Economical and efficient – save time and money with simple installation and assembly
- Suitable for heavy protective equipment
- Tamper-proof
- Standardized M12 connection technology

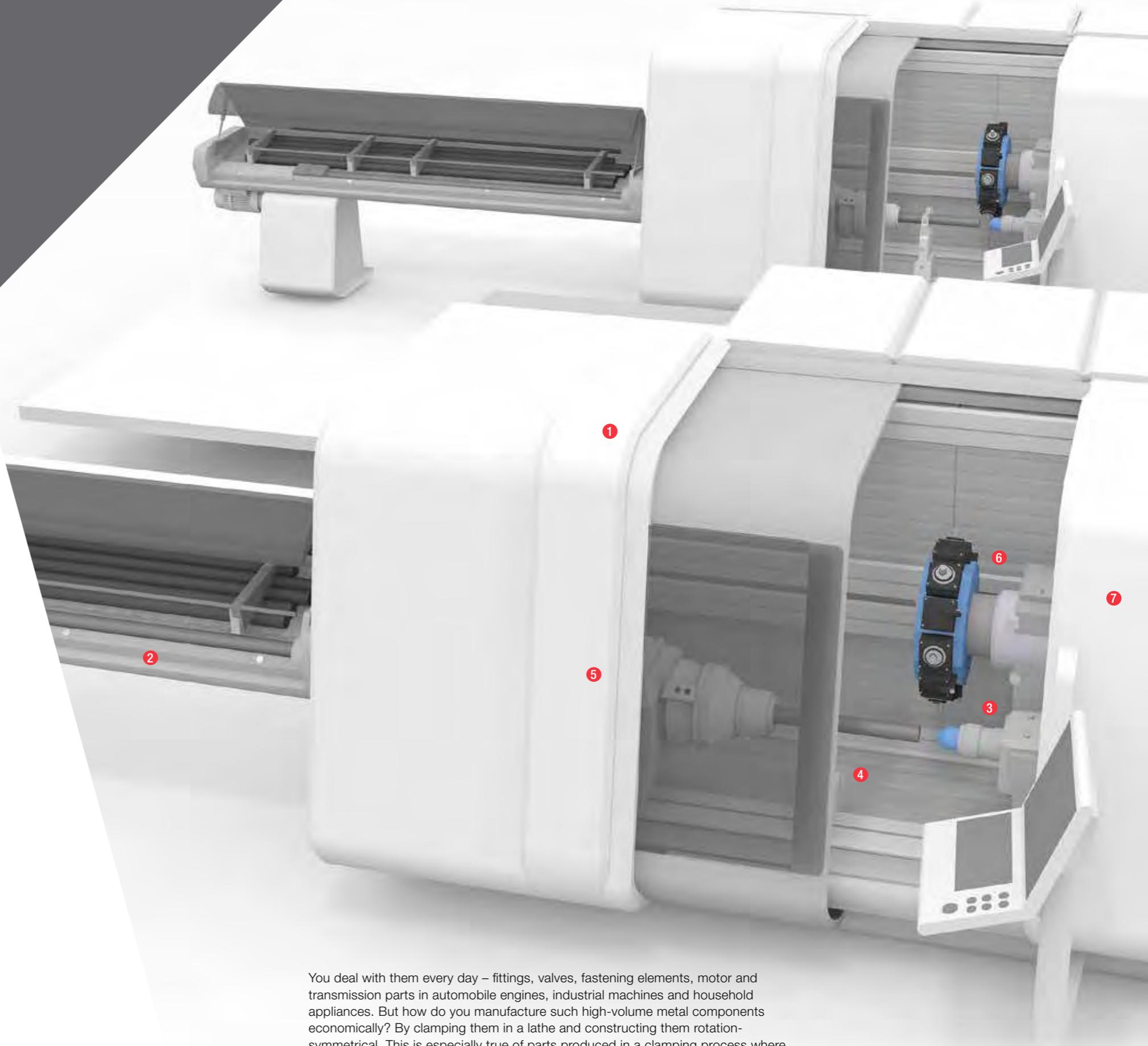


BAR LOADER MONITORING  
With BES inductive sensors

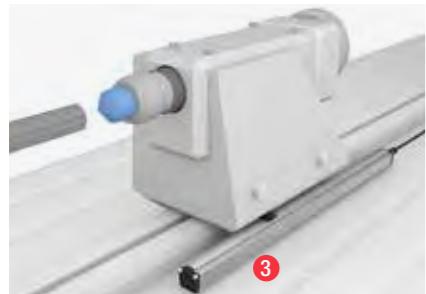
Monitor feeding of the bar material using inductive sensors. Simply install multiple sensors at various locations. This permits you to achieve a seamless production process with optimal machine utilization. This also gives you the ability to implement unmanned shifts.

## Features

- Rugged and reliable solution
- Long service life, wear-free
- Generous switching distance, simple installation



You deal with them every day – fittings, valves, fastening elements, motor and transmission parts in automobile engines, industrial machines and household appliances. But how do you manufacture such high-volume metal components economically? By clamping them in a lathe and constructing them rotation-symmetrical. This is especially true of parts produced in a clamping process where they are automatically fed and removed. Sensors play a decisive role in monitoring these processes with a short cycle and a high level of automation.



#### TAILSTOCK POSITIONING With BTL magnetostrictive linear position sensors

Our BTL magnetostrictive linear position sensors enable reliable and cost-effective tailstock positioning, such as with a hydraulic or a simple motor-driven axis. A second measuring system can be installed for the fine-positioning.

##### Features

- Highly precise and rugged
- Flexible installation and handling
- Optimal price/performance ratio: reduced overall cost



#### STEADY REST ALIGNMENT With BTL magnetostrictive linear position sensors

Steady rests assist the machining process for long or heavy turning parts. Here a rod-style magnetostrictive linear displacement transducer monitors the piston position. For both compact and precise steady rest positioning the actuator and sensor are integrated.

##### Features

- Contact-free, so wear- and maintenance-free
- Hermetically sealed housing
- Highly rugged, long service life



#### CHECKING WORKPIECE CLAMPING With BIP inductive positioning systems

Only if a workpiece is securely clucked can it be machined correctly and with consistent quality. In addition to sensors with a switching output, inductive position measuring systems with a continuous output signal are increasingly taking over this task. Our wide range of measuring systems – from just a few millimeters long up to 130 mm – ensures that you have the greatest precision with varying dimensions.

##### Features

- Wide variety of variants for handling a broad range of applications
- High precision and repeat accuracy
- Continuous checking



#### DETECTING THE TURRET POSITION With BES inductive sensors

If you need to know whether the tool turret has reached its correct index position after a rotational move, our inductive sensors are the right choice. They detect not only the turret position but also the locking.

##### Features

- Highly reliable and rugged
- Economical
- Wide product range with small form factors



#### MONITORING DRIVE BELTS With BCS capacitive or BES inductive sensors

Machine tools often use drive belts for transferring rotary motion. Depending on the drive belt design, either our BCS capacitive or BES inductive sensors can monitor its presence and function. They initiate stopping of the drive in cases of a fault or error.

##### Features

- Economical and simple to implement
- Fast detection of faults



MONITORING END POSITIONS  
With BES inductive sensors

Do you need to monitor the traverse path of machine axes? You can choose from various options: Standard option with BNS mechanical position switches according to the principle of normally closed contacts connected in series, or non-contact with inductive sensors. If you use an incremental linear magnetic encoder system, the sensor signals can also be used for the reference point move.

#### Features

- Select from among various operating principles and choose your own best solution

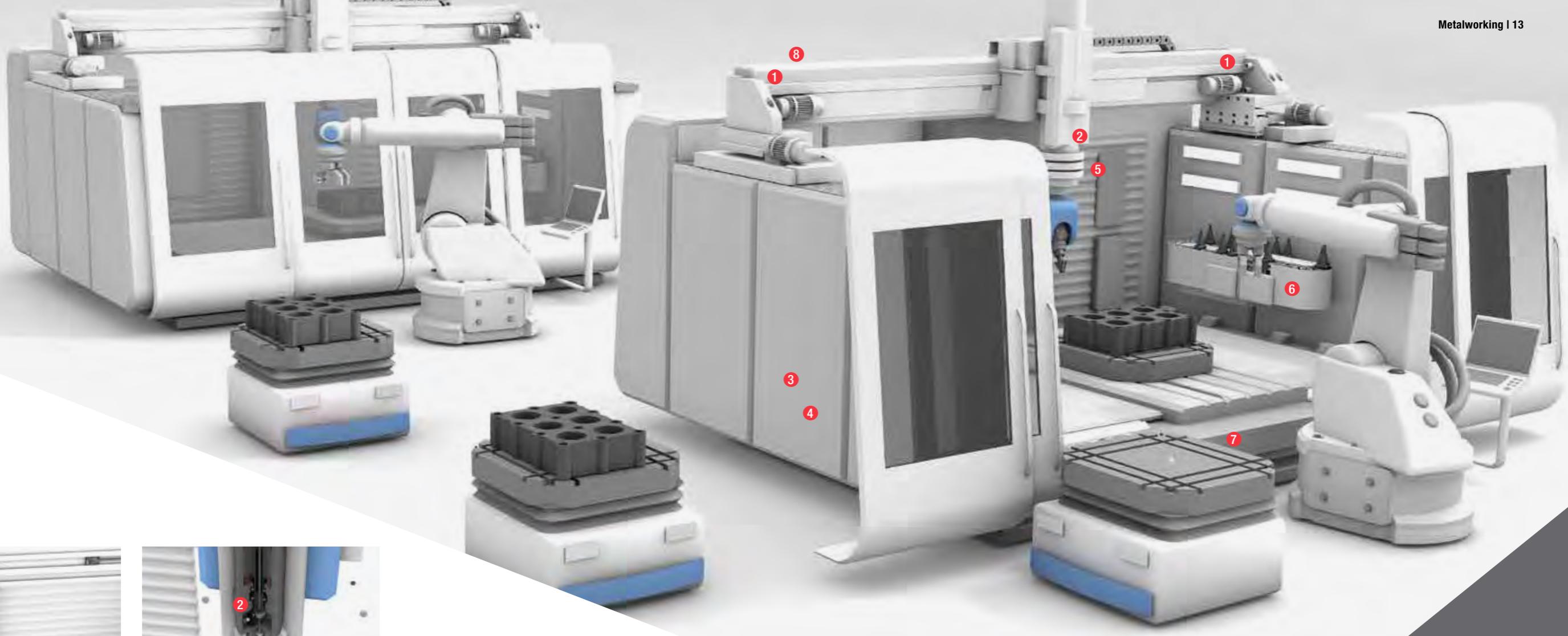


MONITORING TOOL CLAMPING  
With BIP inductive positioning systems

Our inductive position sensors provide information about the correct clamping of the tool: unclamped, clamped with tool, and clamped without tool. Combined with our pressure sensors, the plausibility of the sensor signals can also be checked in hydraulic clamping systems via a second channel.

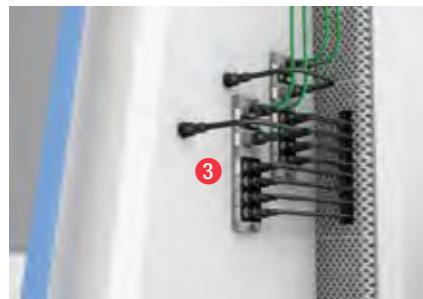
#### Features

- Exact, non-contact position detection
- Impervious to contamination
- Can be perfectly integrated even when there is limited space



Thanks to their flexibility, milling machines and machining centers are among the most commonly found machine tools. They range from simple 3-axis systems to complex multi-axis machining centers to hybrid machines which combine tools, for example, milling and laser machining. The main prerequisite for machining block-shaped workpieces: correct positioning and exact tool guidance at high speed. This is a challenge for the controlling measurement systems, since the degree of automation is continually increasing – especially when linked machines are used more and more for the production of high-volume parts.

# Machining: Milling



#### DECENTRALIZING INSTALLATION TECHNOLOGY With BNI network modules

Compared with traditional star topologies, fieldbus blocks make the startup of the machine controller much simpler and cost-effective. Designed for all commonly used fieldbus systems, these blocks enable the use of many controller types while retaining the same wiring topology. And with IO-Link they are also ideal for the exchange of process, parameter and diagnostic data for the Industrial Internet of Things (IIoT).

##### Features

- Available in all common fieldbus technologies and with IO-Link
- Very rugged versions, with high protection classes
- For efficient field and process communication



#### SAFE COMMUNICATION With BNI Safety over IO-Link blocks

The new safe I/O module is the first to connect automation and safety technology via IO-Link. It is simply connected to the IO-Link master. Since the system is open all the way to the sensor level, you can connect nearly any safety device.

##### Features

- An infrastructure for automation and safety technology up to PLe/SIL3 via IO-Link
- Low maintenance costs in case of service thanks to comprehensive diagnostics and easy device replacement
- Lower costs by using uniform M12 single-ended cordsets
- Reduction of the required IP addresses
- Standardized wiring concept, reliable safety guard locking devices can be connected directly



#### DETECTING THE ROTATION ANGLE ON THE C-AXIS With BML magnetic encoders

To determine the rotation along the Z-axis, rotary axis angles (A-, B-, C-) are increasingly used in addition to the main axes (X-, Y-, Z-). With our magnetic encoder, you can detect the rotation angle with high accuracy. The measuring principle provides you with generous leeway in the center of the axis, so there is more room for media such as coolants, the power supply, and signal lines.

##### Features

- Fast and highly precise with repeat accuracy
- Small sensor head, fits in any recess
- Sensor position eccentric to the axis: media flow-through is possible



#### IDENTIFYING TOOLS IN THE MAGAZINE With BIS Industrial RFID systems

BIS C industrial RFID systems operating at LF (Low frequency) or BIS M at HF (High Frequency) ensure that your CNC controller in milling machines and machining centers always has the correct tool data available (number, diameter, length, number of cuts, etc.). Reliably identified and transmitted, these parameters also form the basis for high-quality tool asset management including service life monitoring.

##### Features

- High degree of flexibility for you with many different types of data carriers and read/write heads, including a read/write head that operates at both LF and HF
- Technology-neutral processor unit – also suitable for large quantities of data



#### CORRECTLY ASSOCIATE AND TRACK WORKPIECES With BIS Industrial RFID systems

Pallet systems with automatic external loading and unloading of workpieces reduce internal setup times to nearly zero so the machine can produce without interruption. At the point where workpieces are brought in, the BIS V frequency-neutral processor unit ensures correct association. This means you can process both large and small data quantities flexibly – depending on whether you favor decentralized or centralized data retention.

##### Features

- Automated workpiece management
- Reduced scrap, increased productivity
- High flexibility with all-frequency processor unit



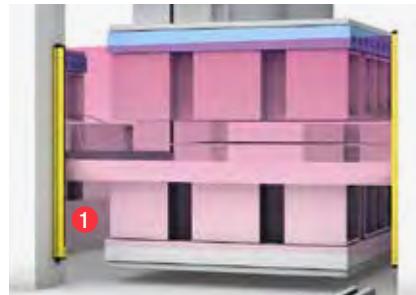
#### DISPLAYING OPERATING STATUS With SmartLight LED stack lights

To reliably monitor the status of machines and systems, Balluff offers you SmartLight LED stack lights with IO-Link interface, which you can use to conveniently visualize the desired information. You can display important or critical machine conditions and use a color scale to simply read off tendencies and trends for physical variables. The SmartLight offers you three different modes which you can change on-the-fly. Changing colors is also possible without any mechanical modifications.

##### Features

- Versatile: various modes such as segment or stack light, level indication or bar graph, run light, and flexible mode can be configured
- Application-flexible: multi-color, bright LEDs with a broad color spectrum – individually definable
- Highly flexible: can be changed on-the-fly – no mechanical reconfiguration necessary
- IIoT-ready – IO-Link makes them simple to install

# Metal forming



**SECURING ACCESS AREAS**  
With BLG photoelectric protection devices

By using light curtains comprised of multiple parallel light beams you can save space, since light curtains can replace cumbersome protective gate constructions or a bundle of multiple individual through-beam sensors. If a person moves into the defined protected zone, the safety light curtain immediately triggers a stop command and all safety-critical movements of the equipment are stopped.

## Features

- Finger, hand and body detection for convenient and fast interaction between man and machine
- Defined protected area with infrared protection field – suitable for safety applications up to PLe/SIL3
- Safe machine stoppage in safety-critical applications
- Better space utilization by eliminating the need for protective fence structures
- High level of manipulation protection

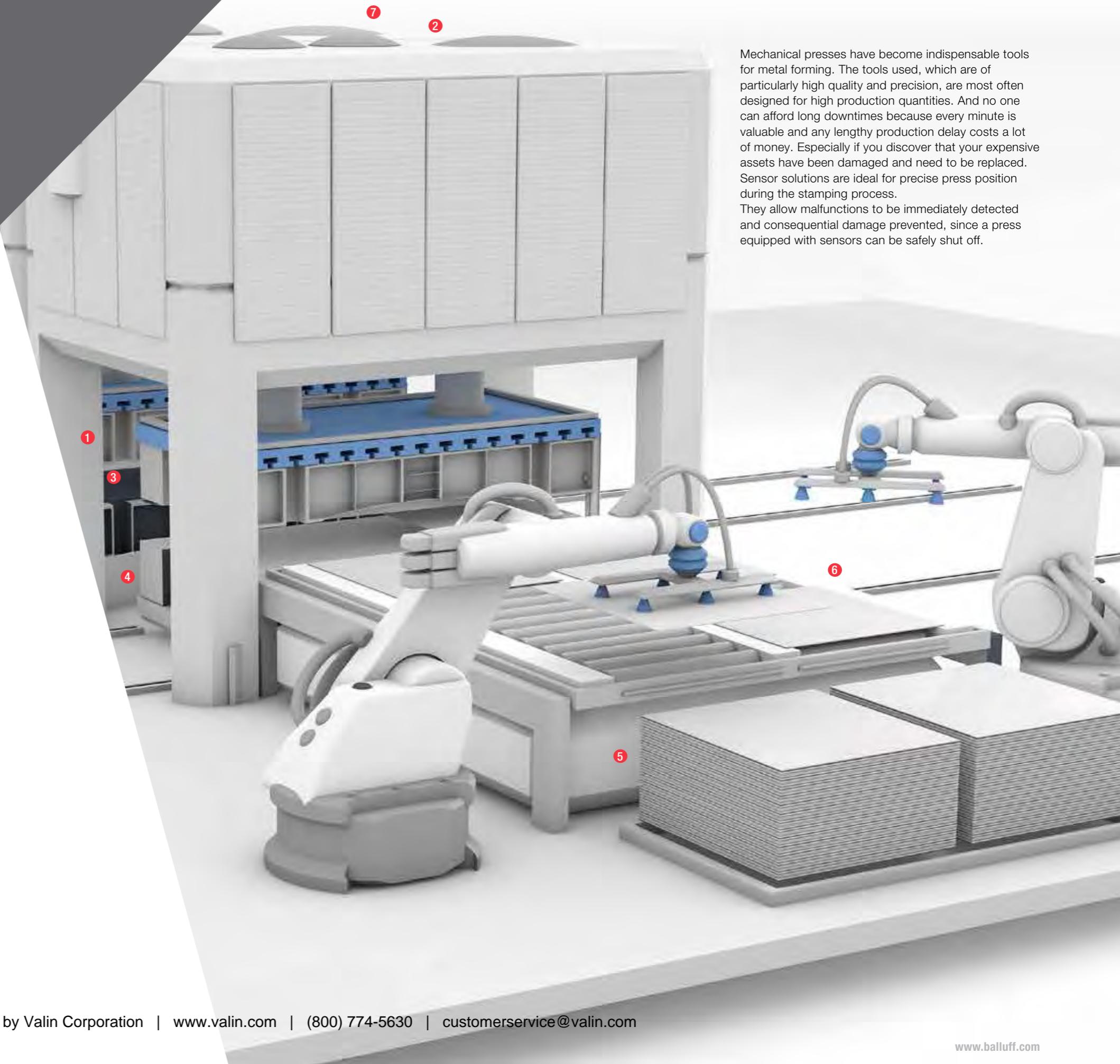


**SWITCHING ECCENTRIC PRESSES**  
With BSW rotary cam switches

For presses with short strokes and high stroke counts our BSW rotary cam switches – available in mechanical and inductive switching versions – have proven themselves for decades. Mechanically adjustable cams allow them to determine multiple on- and off-points for the controller, depending on the rotational angle of the eccentric cam shaft. Depending on the press type and requirements, rotary cam switches are offered with or without safety regulations.

## Features

- Proven, classic solution
- Highly economical



Mechanical presses have become indispensable tools for metal forming. The tools used, which are of particularly high quality and precision, are most often designed for high production quantities. And no one can afford long downtimes because every minute is valuable and any lengthy production delay costs a lot of money. Especially if you discover that your expensive assets have been damaged and need to be replaced. Sensor solutions are ideal for precise press position during the stamping process. They allow malfunctions to be immediately detected and consequential damage prevented, since a press equipped with sensors can be safely shut off.



**CONTROLLING HYDRAULIC PRESSES**  
With **BTL magnetostrictive linear position sensors**

Hydraulic presses (long strokes, low stroke counts) achieve their rated force over the entire stroke travel. Magnetostrictive linear position sensors handle position monitoring. The magnetic position marker is attached to the slide or ram, and the rod with the measuring element is fixed to a location on the press along the axis. These systems with high measurement value precision and update rate are insensitive to mechanical shock, so you can still operate the machine optimally.

#### Features

- High machine availability, since the sensors are insensitive to shock and vibration
- For long strokes and low stroke counts
- Wear-free: high durability and long service life



**CHANGING DIE SETS**  
With **BIC inductive couplers**

To protect expensive press tools, sensors often need to be attached to the die itself. With our inductive couplers you can provide the sensors with power. At the same time this non-contact system transmits the data between the press tool and the press controller. This enables automated changing of dies – without the use of mechanical connectors.

#### Features

- Non-contact: No manual connection, no plugs
- Bi-directional: sends signals in both directions
- Fast format changes with plug-and-play



**MONITORING SHEET METAL THICKNESSES**  
With **BAW inductive distance sensors**

With our inductive distance sensors you prevent improper loading of sheet material. They can be used to monitor whether sheets have been double fed and to detect the thickness of the sheet. They provide a continuous output signal (e.g. 0...10 V) or use an IO-Link interface.

You deploy one or two sensors depending on the application, precision requirements and how the sheet is held.

#### Features

- Fast startup, short stoppage time
- Ease of use with continuous output signal or IO-Link
- Material variants can be distinguished



**CHECKING METAL STRIP SAG**  
With **BUS ultrasonic sensors**

Our BUS ultrasonic sensors with a continuous output signal assist in automatic feeding of metal strips. The speed is matched to the cycle rate of the press. The distance between the sheet metal and the sensor is provided as a signal for controlling the motor speed.

#### Features

- Extreme precision with high resolution and no blind zones
- Irrespective of color, transparency, reflection properties and surface finish on the object
- Unmatched in critical environments



**MONITORING PRESS FORCES**  
With **BSP pressure sensors**

By using our BSP pressure sensors you can simply determine press forces based on the hydraulic pressure. This provides users of hydraulic presses with a rugged and economical solution for dynamic monitoring of the press forces. You can install the sensors as needed and operate them conveniently and comfortably due to the rotating housing and simple VDMA-conformal programming. Using the bright LED display, you can track current system pressure quickly and reliably.

#### Features

- Pressure rated -1 to 600 bar
- Process connection G $\frac{1}{4}$ ", G $\frac{1}{2}$ ", R $\frac{1}{4}$ ", NPT $\frac{1}{4}$ "
- Flush with the front surface in G $\frac{1}{2}$ " and TriClamp 1.5"
- Selectable outputs (analog, digital, IO-Link)



Optimizing automation and assemblies

## FLEXIBLE RESPONSE TO CHANGING REQUIREMENTS.

 *innovating automation*

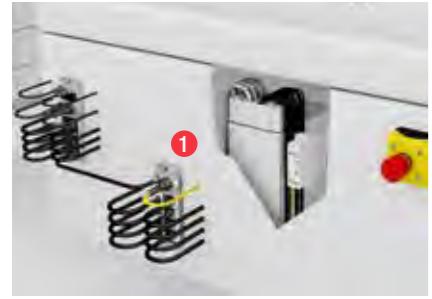
Balluff has been a partner of the metalworking industry since the 1950s and helped to shape the world of machine tool building: from the classic manually operated machines to the complex, automated multi-axis machining centers of today. We are one of the pioneers in the development of inductive sensors; more than 30 years ago we were the very first to turn this technology into RFID for tool identification.

We continue to expand our complete offering for metalworking and machine tool building. In addition to mature technology for measurement, management and identification of parts and tools, you get a full portfolio for detecting machine movements. And we accompany you step-by-step into the world of the IIoT with digital system solutions, process sensors and monitoring.

Providing you with expert support with interlinked production systems is, therefore, a matter of course for us. Handling, transport and process monitoring are achieved efficiently with Balluff. And as a machine builder you can respond flexibly to changing requirements using our solutions.

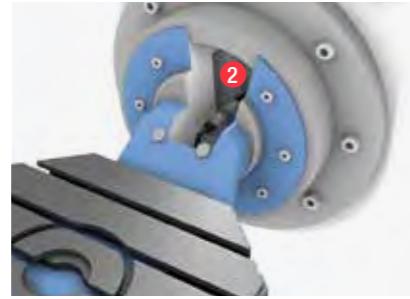


# Solutions for spindles, chucks, rotary and swivel tables



**SAFETY FOR CLAMPING FIXTURES**  
With BNI galvanically isolated sensor/actuator hubs

Our galvanically isolated sensor/actuator hubs ensure safety on the clamping fixture of the pneumatic workpiece holder. These IO-Link modules for safety applications permit applications up to PLd/SIL2 and are equally suited for connecting commonly available binary sensors and actuators.



**SENDING SIGNALS AND DATA ON SWIVEL TABLES**  
With BIC inductive couplers

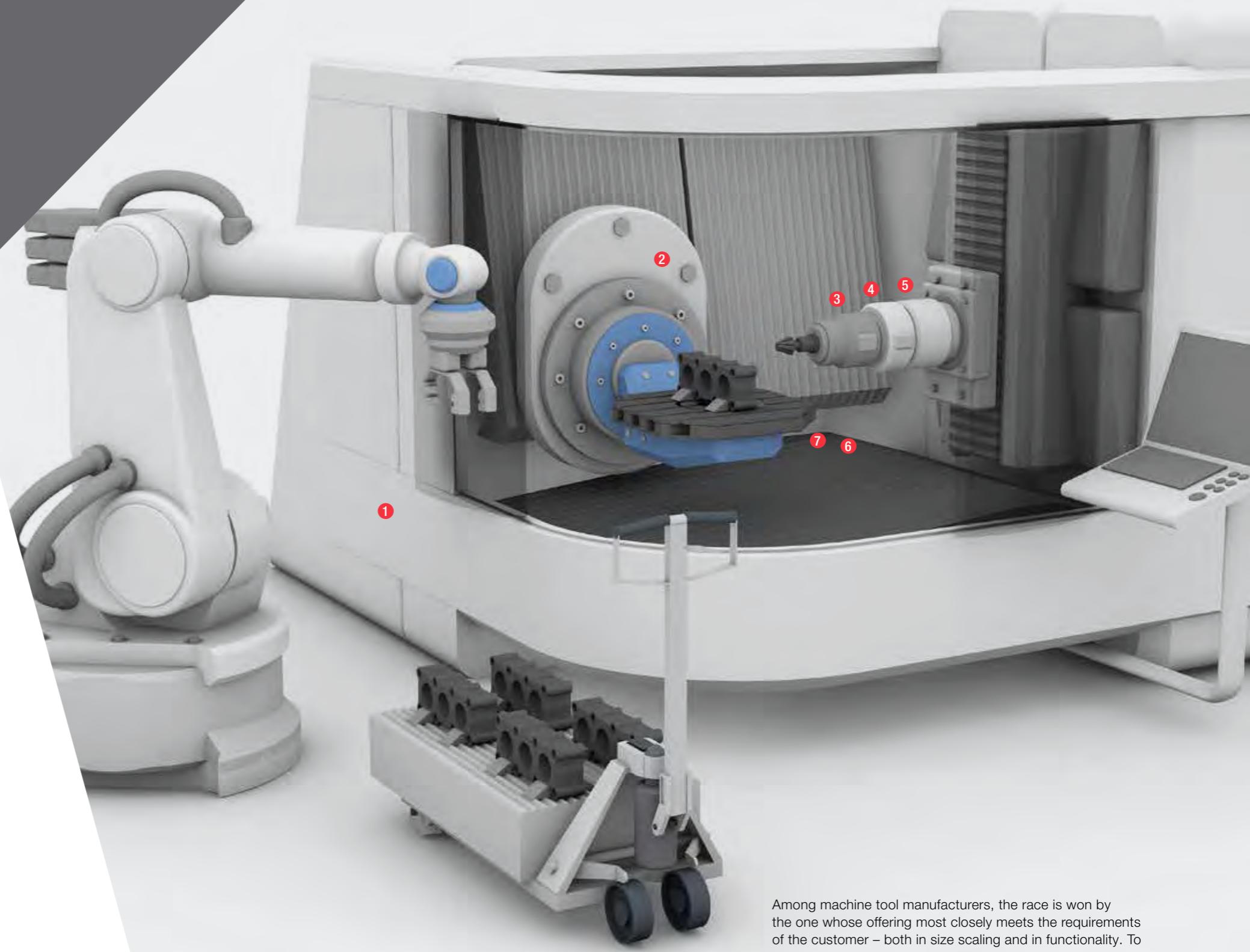
If you want to install sensors and actuators on the swivel table, inductive couplers are ideal. These contactless systems transmit power and signals without connectors. As hermetically sealed non-contact slip ring transmitters, they work very reliably and are especially rugged.

## Features

- Suitable for safety applications up to PLd/SIL2
- Low maintenance costs when service is needed – diagnosis is thorough and component replacement simple
- Cost savings thanks to uniform M12 single-ended cordsets
- Remote maintenance for reduced downtimes
- Saving in blocks by grouping and standardizing machine functions

## Features

- Highly reliable and rugged, hermetically sealed
- No mechanical connection, no cable breaks
- Units can be disconnected quickly



Among machine tool manufacturers, the race is won by the one whose offering most closely meets the requirements of the customer – both in size scaling and in functionality. To take advantage of these market opportunities economically, individual solutions are increasingly devised from modules and assemblies. Such mechatronic components, which are made up of actuators and integrated sensors, must optimally perform their tasks even in limited space conditions. Intelligent enough to adapt to varying installation situations and machine sizes, they then score high marks when compared to the competition.

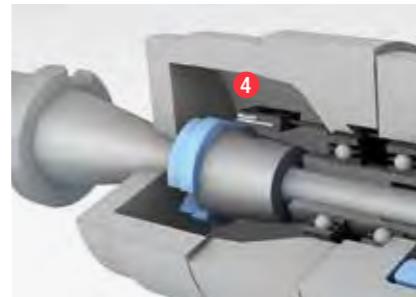


#### MONITORING TOOL CLAMPING DISTANCES With BES inductive sensors

Tools are typically clamped using tapered geometries. With the help of three inductive sensors you can check three conditions without contact: unclamped, clamped without a tool, and clamped with a tool. Since the sensors are installed at a defined distance from each other, you use this type of clamping distance monitoring especially for larger strokes.

##### Features

- Simple to integrate: small form factors
- For longer strokes
- Highly reliable: extremely rugged, high protection rating



#### MONITORING TOOL CLAMPING DISTANCES With BAW inductive distance sensors

If there is a tapered geometry on the tool holder, you can detect movement transverse to the sensor axis using an inductive distance sensor. Such an arrangement is considered the classic solution for continuously monitoring measured clamping distance.

##### Features

- With IO-Link and analog interface, flexible processing
- Position indicating target, can be used as needed depending on the application
- Simple construction, small footprint



#### MONITORING TOOL CLAMPING DISTANCES With BIP inductive positioning systems

Using linear position measurement you can implement clamping distance even when the clamping mechanism rotates. Our inductive position measurement system detects the position of a metallic cam as it laterally passes by the sensor. Measuring sensors for various travel distances are available depending on the requirements.

##### Features

- Measurement ranges adjustable from 0...133 mm
- Temperature output, for diagnostics
- Simple position indicating metal target which can be embedded in the clamping system

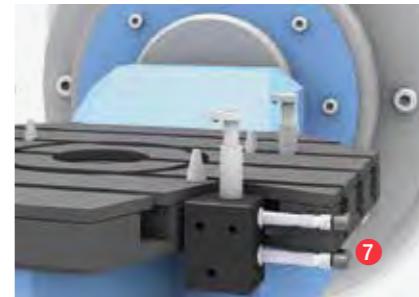


#### DETERMINING TRAVEL ON ROTARY TABLES With BML magnetic encoders

The magnetic encoder is outstanding for precisely detecting rotation angle. With its combination of sensor and actuator in one assembly, it meets the requirement for compactness. Its compatibility with all standard encoder inputs makes integration into your application simple.

##### Features

- High reliability
- Slim design, light and compact
- Extremely accurate



#### DETECTING PISTON POSITION IN CLAMPING CYLINDERS With BHS pressure-rated inductive sensors

To monitor the clamping position of the hydraulic piston on swing clamps, use our high-pressure rated inductive sensors. Their inductive measuring principle reliably detects the position in block cylinders. Thanks to the large number of different versions of these rugged sensors, special applications are also easy to solve.

##### Features

- Pressure-rated up to 500 bar
- Media-resistant housing for ruggedness
- Versatile application thanks to housing diameter and thread size options

Linked production systems consist of standard machines which are connected to each other by means of intralogistic fixtures and continuous conveyors. It is a especially economical concept, with low costs and few modifications to the system, both high-volume parts and lower volume part variants can be produced. At the same time the so-called "small process technology" needs to be state-of-the-art in order to reliably monitor loaders, ensure coolant and lubricant provision and keep an eye on levels in the hydraulic units. And: the ever shorter product development times and associated layout changes need to be easily accommodated.



MONITORING GRIPPERS ON  
GANTRY LOADERS  
With BMF magnetic field sensors

Pneumatically actuated grippers are often equipped with pistons and magnets for position detection of the gripper jaws. When this is the case, the gripping actions can be simply monitored using our magnetic cylinder sensors. Here's how it works: Insert sensors into the mounting slot. Slide to set the desired switching point. Tighten down: That's it.

#### Features

- Universal use on grippers and pneumatic cylinders
- High functional security: switching point remains intact even when the sensor is replaced
- The best hold thanks to metal fasteners

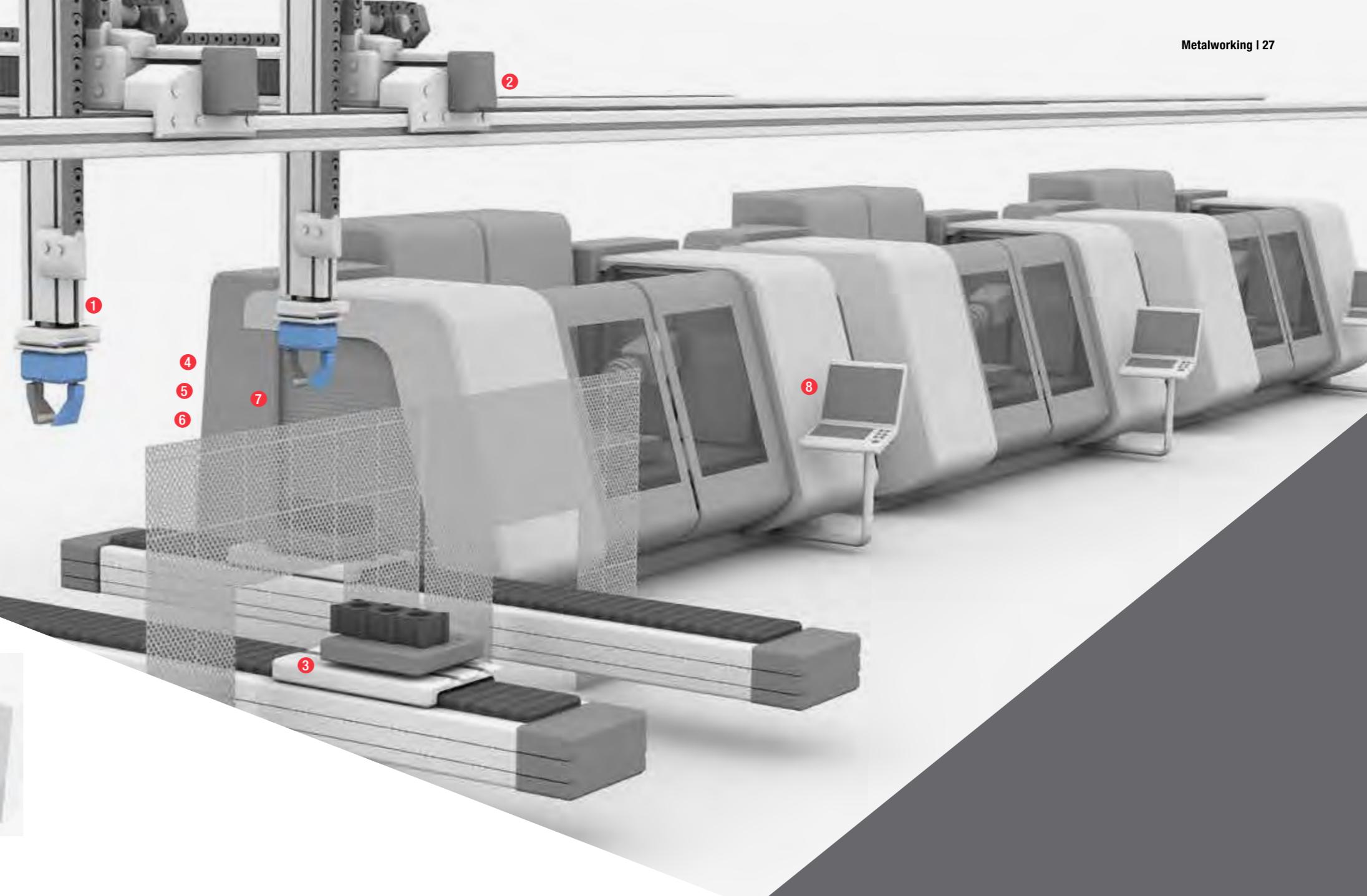


DETECTING END POSITIONS  
ON GANTRY LOADERS  
With BES inductive sensors

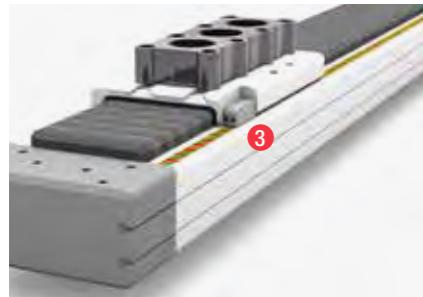
Inductive sensors are used to reliably detect end positions on overhead loading systems. All you need to do is attach a metal switch lug at the desired position. This is detected by the sensors without contact to provide the controller with the correct switching signal.

#### Features

- Generous switching distance, simple installation
- Non-contact and wear-free
- Broad range of rugged, reliable sensors including mini-sizes for a variety of installation situations



## Solutions for handling, transport and process monitoring



**CONTROLLING POSITIONING  
OF LINEAR DRIVES  
With BML magnetic encoders**

Freely selectable target positions increase the flexibility of linear drives with integrated displacement measurement. The highly compact magnetic encoder is all that is needed to upgrade positioning drives including the position-controlled axis. And it is remarkably economical, since the system is easy to retrofit. In addition you can continuously evaluate the signal quality and system status or conveniently read it from the built-in LED. This assists installation, startup, normal operation as well as setup, when, for example, the machine needs to be changed over.

**Features**

- Extremely accurate, even at very low speeds
- Non-contact and maintenance-free
- Absolute interfaces: SSi and BiSS C



**MONITORING LEVELS ON THE  
HYDRAULIC POWER UNIT  
With BTL magnetostrictive  
linear position sensors**

To reliably detect the hydraulic fluid fill level, you just need magnetostrictive fill level sensors with floats. These are fully encapsulated for ruggedness. They stand out with their precision and are designed for high sampling rates.

Both analog signals (0...10 V or 4...20 mA) and IO-Link can be used as interfaces.

**Features**

- Made of corrosion-proof stainless steel with high surface quality
- Continuous precise measurement in the µm range for highly accurate results



**DETECT PROCESS FLUIDS  
AND LEVELS CONTINUOUSLY  
OR SWITCHING  
With BUS ultrasonic sensors**

Depending on the version, you can use our analog ultrasonic sensors for 2-point switching or for continuous level control. You benefit from maximum flexibility in selecting your monitoring type.

**Features**

- Use one or two switching points, work with pure analog or analog measurement combined with two switching points
- High flexibility, greater efficiency and high reliability for the application
- Rectangular and cylindrical styles allow for greater freedom of design

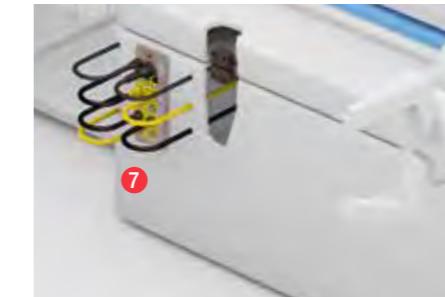


**LEAK DETECTION  
With BCS capacitive sensors**

Installing our capacitive sensors on a spacer attached to the catch tank floor is the most elegant solution to leak detection. The sensors record even the slightest fluid losses with absolute reliability.

**Features**

- High application security: detect non-conductive media in plastic or glass containers
- Teachable using the wire connection
- Easy to install on tubes using cable ties
- Also available with IO-Link



**SAFE POSITION DETECTION  
With BES/BID safety switches/sensors**

The safety switches and sensors offer you various operating principles: Inductive for non-contact safe detection of position and end-of-travel of metallic objects, electromechanical such as Reed, or RFID-based for access or position security for both personal and machine protection.

**Features**

- Safety sensors and switches for a variety of applications
- Rugged housing versions with LED function indicator
- Suitable for safety applications up to PLe/SIL3
- Savings of time and money plus prevention of errors thanks to standardized M12 connection technology
- Reduced installation expense and space requirements
- Also suitable for heavy protective equipment
- Tamper-proofing
- Insensitive to vibration and imprecise door guiding

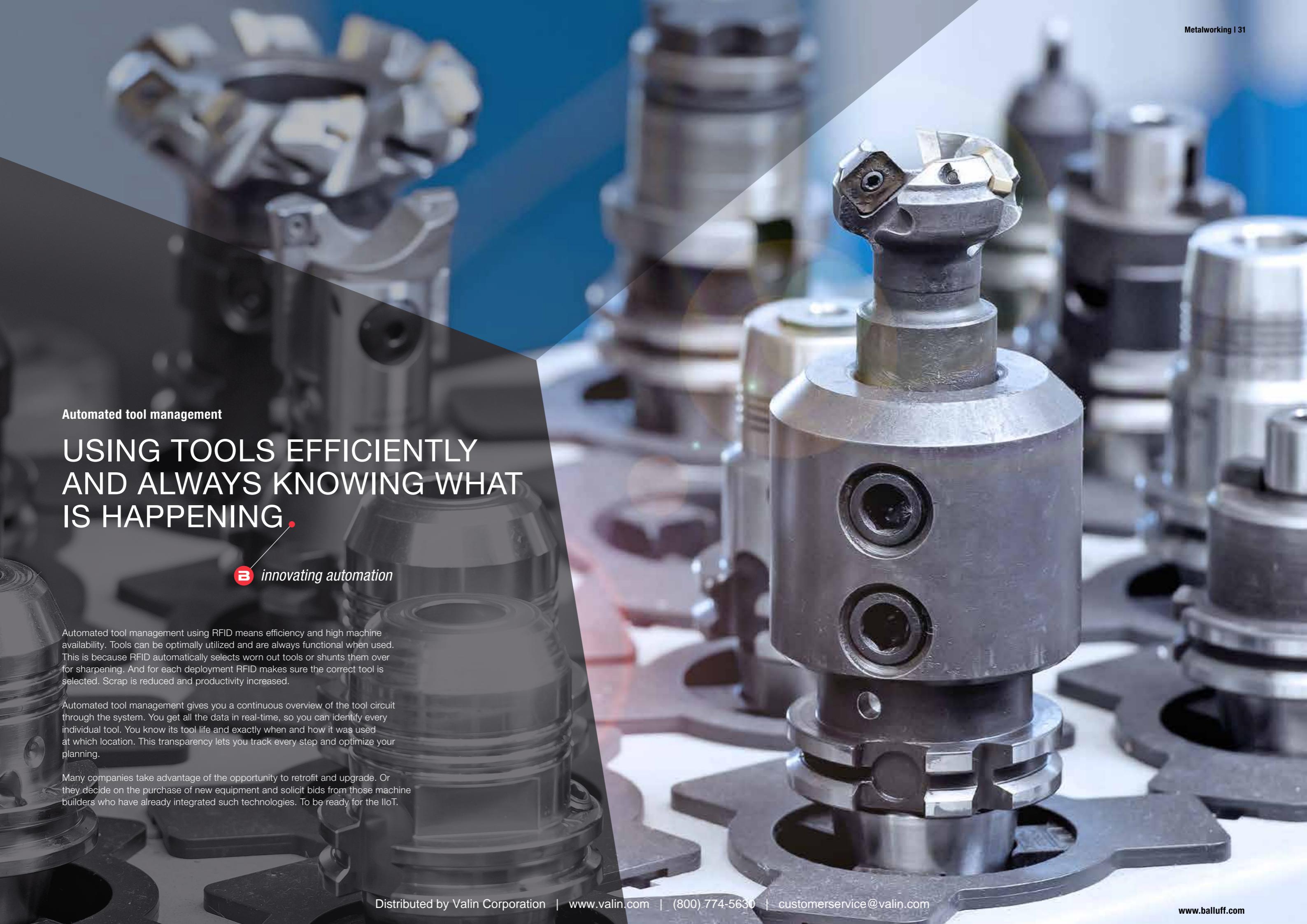


**RELIABLY STOP MACHINES AT  
CRITICAL TIMES  
With BAM ES safety command devices**

To be sure that in emergency situations machine hazards can be prevented or reduced, safety command devices such as E-Stop or E-Off units must be used. As a supplementary measure an E-Stop device must always be available – whether during installation, while running or during maintenance.

**Features**

- Reliable disconnection of the power supply
- Positive opening operation compliant with IEC 60947-5-1, Addendum K
- Plug-in connection with M12 (5-pin)
- Turn-to-release mushroom pushbutton
- High degree of protection against dust and water
- Compact housing, easy installation



Automated tool management

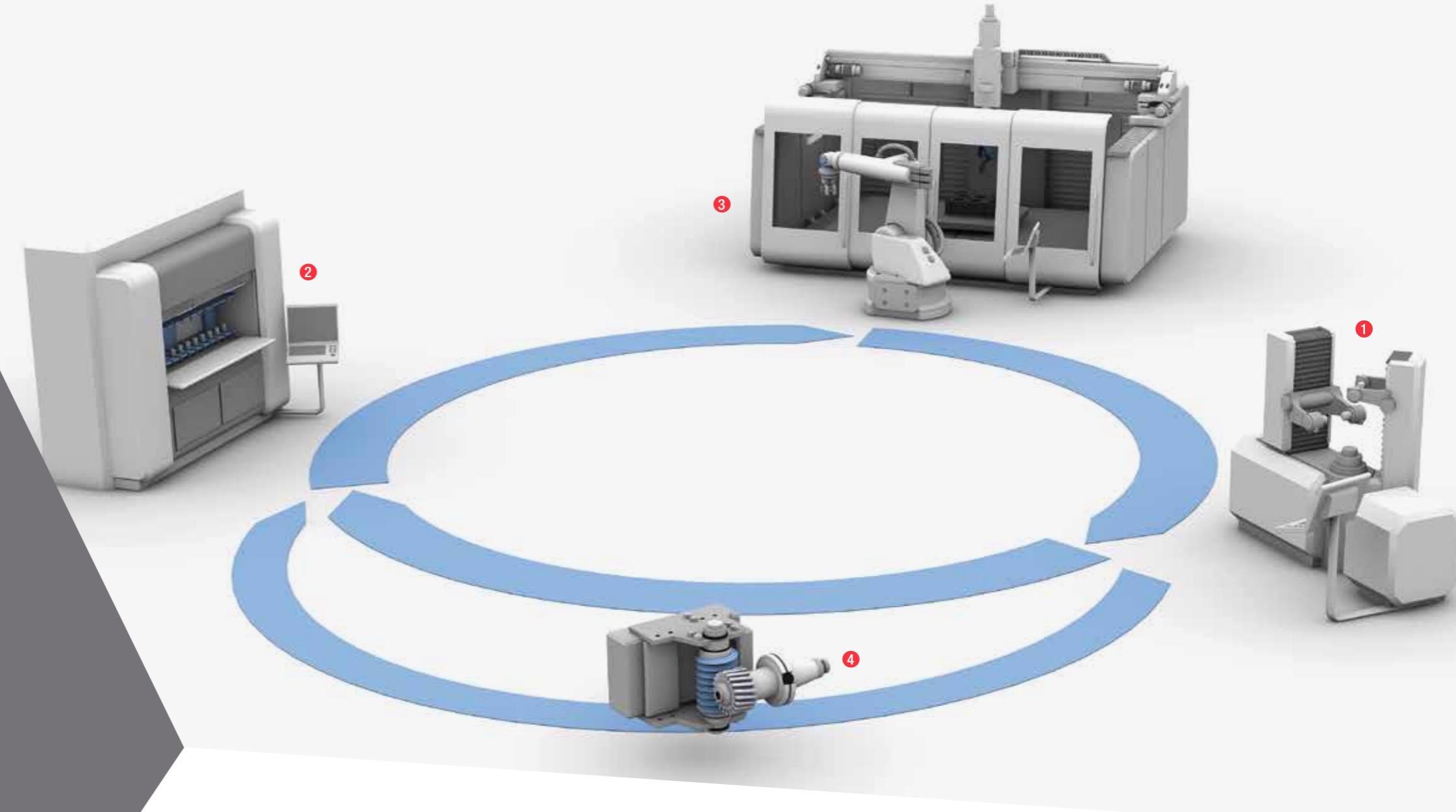
## USING TOOLS EFFICIENTLY AND ALWAYS KNOWING WHAT IS HAPPENING.

 *innovating automation*

Automated tool management using RFID means efficiency and high machine availability. Tools can be optimally utilized and are always functional when used. This is because RFID automatically selects worn out tools or shunts them over for sharpening. And for each deployment RFID makes sure the correct tool is selected. Scrap is reduced and productivity increased.

Automated tool management gives you a continuous overview of the tool circuit through the system. You get all the data in real-time, so you can identify every individual tool. You know its tool life and exactly when and how it was used at which location. This transparency lets you track every step and optimize your planning.

Many companies take advantage of the opportunity to retrofit and upgrade. Or they decide on the purchase of new equipment and solicit bids from those machine builders who have already integrated such technologies. To be ready for the IIoT.



## Tool-ID solutions

Tool-ID solutions assure you of optimal tool utilization. Tool-ID automatically detects all the tool parameters you have defined (tool number, tool diameter, tool length, number of cuts, ...), stores them directly on the tool or sends them to the controller.

Tool-ID checks the current tool status, documents all the data and, thereby, enables a prognosis for future utilization. This is highly beneficial for you as the user, since this not only increases the quality and efficiency of your production process, but also reduces your costs and improves profitability.

Tool-ID from Balluff offers you complete solutions for your tool management and easily retrofittable versions for tool identification. Plug-and-play makes optimal tool utilization easy.

Questions? Contact us at [tool-id@balluff.de](mailto:tool-id@balluff.de) for immediate and comprehensive assistance.



#### TOOL PRESETTING With BIS Industrial RFID systems

The tool presetter with built-in RFID read/write unit uses the tool number to automatically know which tool has been inserted. It then writes the measured actual tool parameters to the RFID chip embedded in the tool holder.

##### Features

- No more manually kept, error-prone tool logs
- No incorrect tool assignments
- Reduced scrap since the tool is always in the best condition



#### DOCUMENTING TOOL DATA With BIS Industrial RFID systems

Having the unique documentation of all the tool parameters on the RFID chip in the tool holder is of great value. In this way the tool attached to it can remain in storage for any length of time without its data getting lost. When needed again, the tool is immediately ready for use.

##### Features

- Unambiguous tool assignment
- All tool data are available at any time
- The tool is always in optimal condition
- Higher productivity

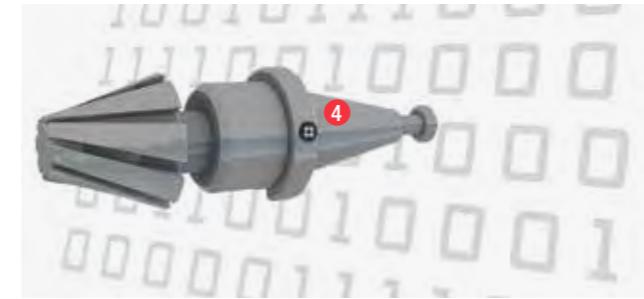


#### COMMUNICATING WITH THE CNC CONTROLLER With BIS Industrial RFID systems

Before or when the tool is introduced into the spindle, the RFID chip reads out the actual tool parameters. Alternately the data can be read in when tools are placed in the tool store chain or magazine. In both cases the CNC controller gets all the current tool data in real time.

##### Features

- Optimal tool utilization because it is reworked at the right time
- Reduced storage levels
- Lowers costs



#### ORGANIZING DATA MAPPING With BIS Industrial RFID systems

The advantage of decentralized data retention on the RFID chip is that tool parameters are available continuously and independent of the central server. The user can define to what extent this data is stored according to his specific requirements. Also important: so-called data mapping, i.e. organization of memory addresses coordinated between the presetter, inventory management and machine tool.

##### Features

- Handles many different requirements: wide spectrum of data carriers in various form factors and different memory types

Different methods of mapping are available depending on the manufacturer. If needed you can also use the Balluff mapping system. Would you like to learn more? Contact us at: [tool-id@balluff.de](mailto:tool-id@balluff.de).

Simplifying assemblies and machine tools

## BENCHMARKS FOR THE STANDARDS OF TOMORROW.

 *innovating automation*

To simplify your assemblies and machines and use them efficiently, Balluff offers you future-oriented technology.

For modern machine tools we offer multi-frequency RFID processors which ensure mixed operation of different systems as well as a hybrid read/write head for low and high frequency.

This means you need only one version for efficient tool utilization. You enjoy maximum flexibility, safe time and money.

IO-Link guarantees you high-performance controller concepts and simplifies your network technology. In addition, IO-Link combines safety technology with automation technology. For machine safety, all IO-Link advantages apply.

Our communication solutions collect all the data from the lowest automation level, transport it and provide it to the host systems. The digital communication standard is the key for this and represents an enabler for the IIoT.

Use our solutions today to build on the standards of tomorrow.

Tool identification, material flow and handling applications  
can be quickly and simply combined

# TOOL MANAGEMENT – REGARDLESS OF FREQUENCY OR ENVIRONMENT.

 *innovating automation*

RFID systems with different frequency ranges – often mixed – are being increasingly used in modern production and assembly systems. While low-frequency (LF) systems prove to be especially rugged and reliable, particularly in metal surroundings, high-frequency (HF) systems feature high speed and greater read/write distance.

Our BIS V processor unit makes multi-frequency use of a controller possible for the first time. It allows up to four HF (13.56 MHz) and LF (70...455 kHz) read/write heads per processor to be operated at the same time. So only one version is needed to automatically track and control the entire material flow without interruption.

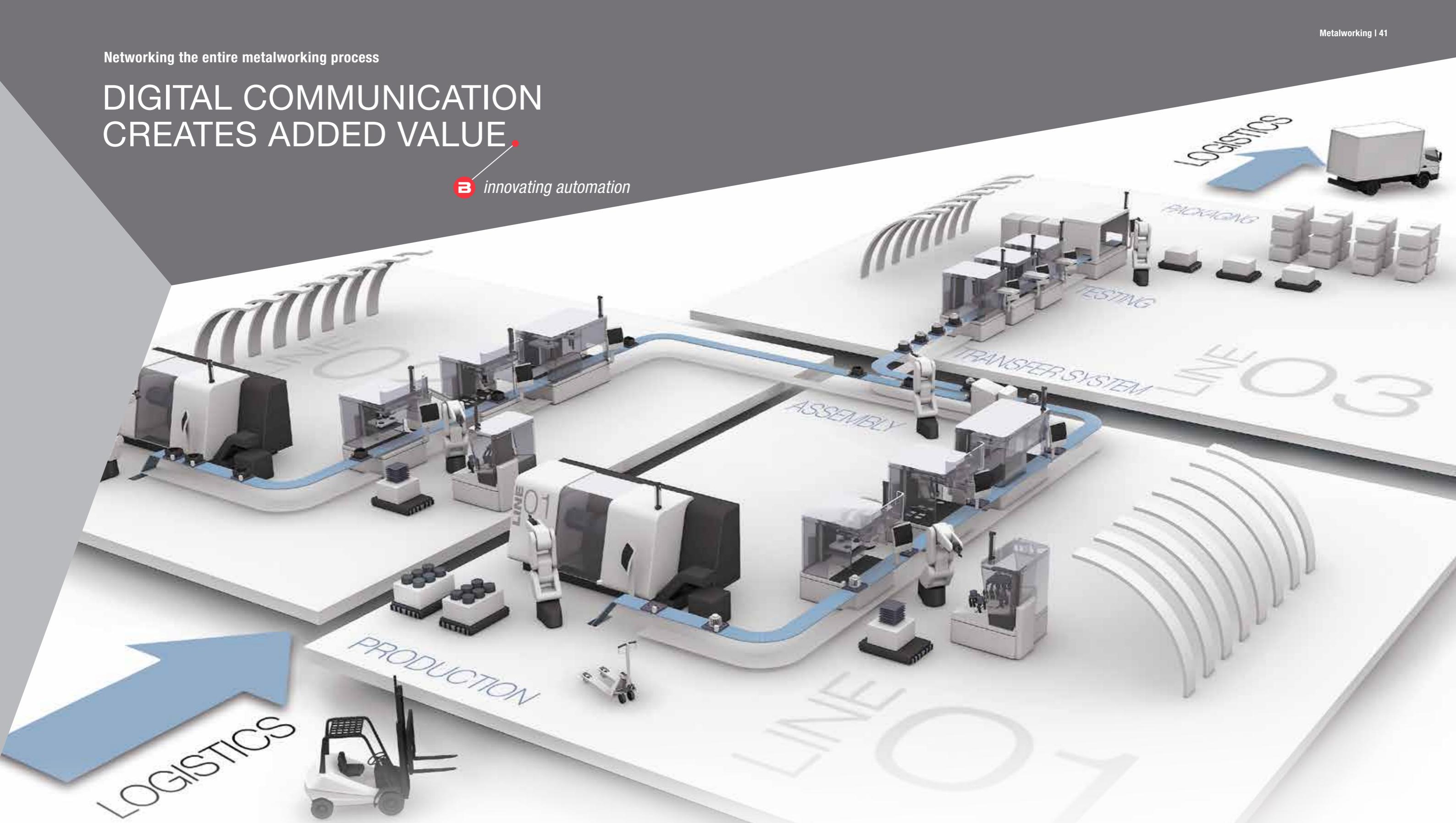
Our hybrid read/write head for the frequency ranges 70/455 kHz and 13.56 MHz opens up another dimension for you. You no longer have to choose between low or high frequency. Because with this read/write head you operate at both frequencies at the same time. Simply connect to our multi-frequency BIS V processor unit. You only use two read head inputs and are more flexible than ever.



Networking the entire metalworking process

# DIGITAL COMMUNICATION CREATES ADDED VALUE.

**B** innovating automation



With solutions for the entire metalworking process and viable concepts for the Industrial Internet of Things (IIoT), we expedite your entry into smart automation. Start now to keep step with the digital world. The basis of IIoT is the availability of all relevant data in real-time, as well as the ability to create optimal value creation flow from this data at any point in time. Balluff sensors and system solutions ensure this availability. With our networking technology and connectivity solutions, the data can be collected and transported. All the data is interpreted and passed on

to the higher level systems or the cloud. Communication over IO-Link is a central component for successful networking on all levels. This digital standard collects data from the sensor/actuator level and makes this last meter communication-capable. Thanks to detailed diagnostic information, IO-Link enables intelligent condition monitoring and predictive maintenance. A centralized parameter setting means fast format and recipe changes, so you can meet requirements, such as lot size 1, flexibly and efficiently.

## Modular control concepts

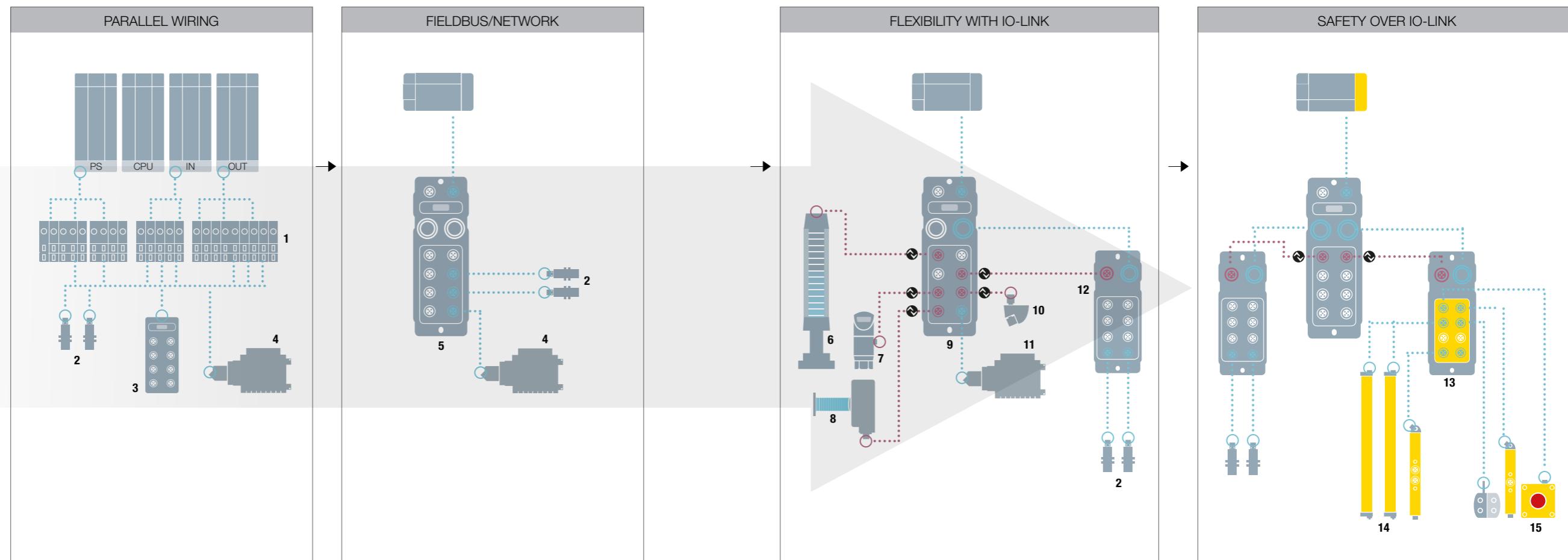
# UNIVERSAL, SIMPLE AND FLEXIBLE: IO-LINK.

 *innovating automation*

The IO-Link digital communication standard has universal application, networks a variety of devices together, and ensures you of flexible controller concepts in metalworking. All you need is unshielded, three- or four-conductor standard industry cables. They are highly flexible and suitable for many bending cycles. Plus they are easy to wire and exceedingly economical. Connection is made using standardized M5, M8 or M12 connectors.

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

The layout without a control cabinet was already possible with the fieldbus protocol, and the immense installation cost and effort associated with expensive copper cable was eliminated because a bus cable linked the components from different levels and replaced the parallel wiring configurations. But only IO-Link is efficient, simple and cost effective – both universal and flexible at the same time. You could think of IO-Link as a universal interface – the USB of automation.



- 1 Terminal strip
- 2 Sensors
- 3 Junction blocks
- 4 Valve interfaces
- 5 Fieldbus block
- 6 IO-Link SmartLight
- 7 IO-Link pressure sensor
- 8 Industrial RFID system
- 9 IO-Link master
- 10 IO-Link analog converter
- 11 IO-Link valve interfaces
- 12 IO-Link I/O modules

- 13 Safe I/O modules with IO-Link
- 14 Opto-electronic protective devices
- 15 Emergency stop device

More efficiency, lower costs

# IO-LINK SAVES TIME AND MONEY.

 *innovating automation*

## Easy installation

For IO-Link all you need is an industry-standard three- or four-conductor cable. The uniform standard interface can be quickly and easily integrated into the fieldbus world to simply link even complex devices. One special feature: the digital communication ensures noise immunity even without the use of expensive shielded cabling. Analog signals are digitized with no conversion losses.

## Highest machine availability

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

## Requirements-based maintenance

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

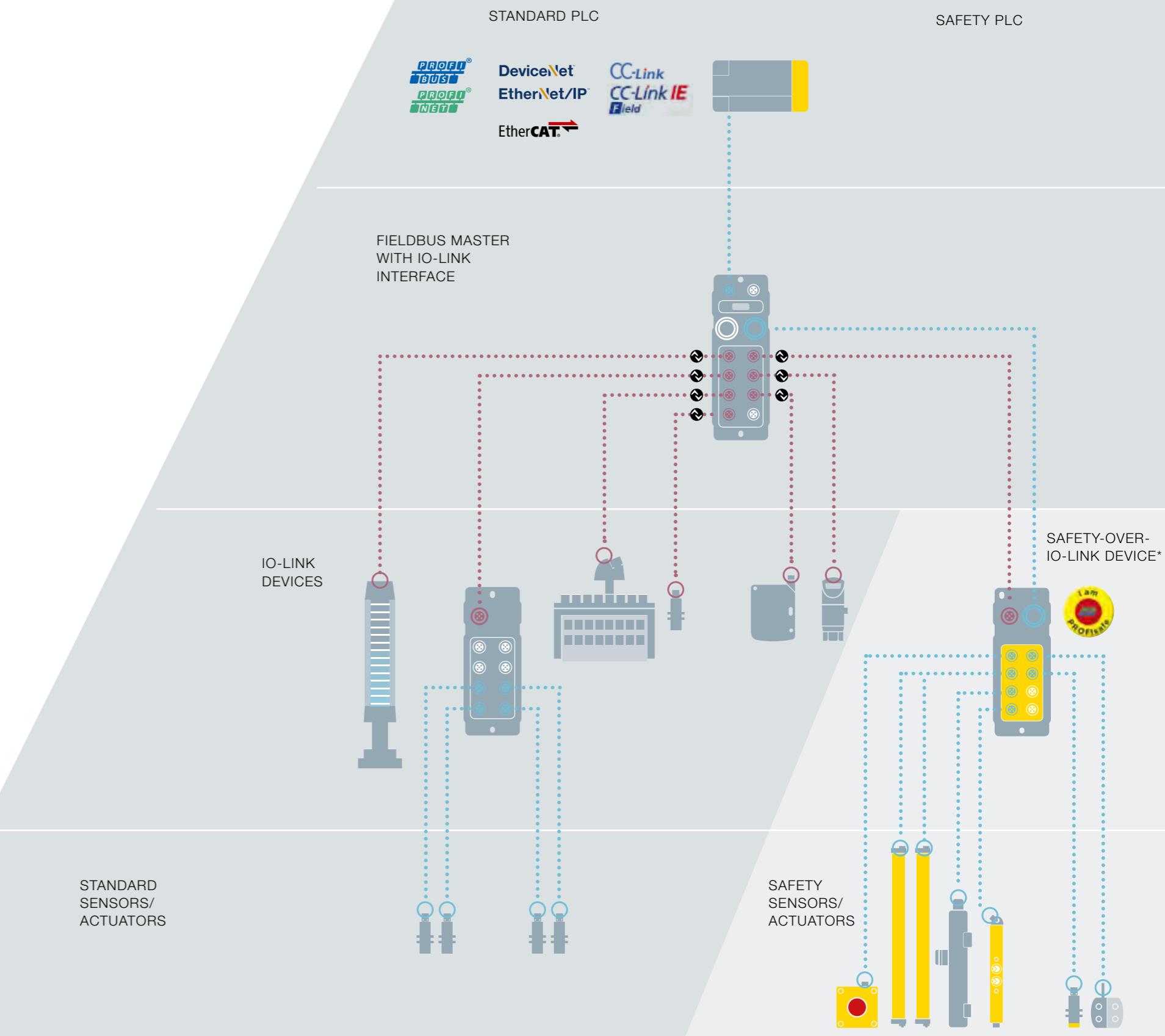
## More efficient operation

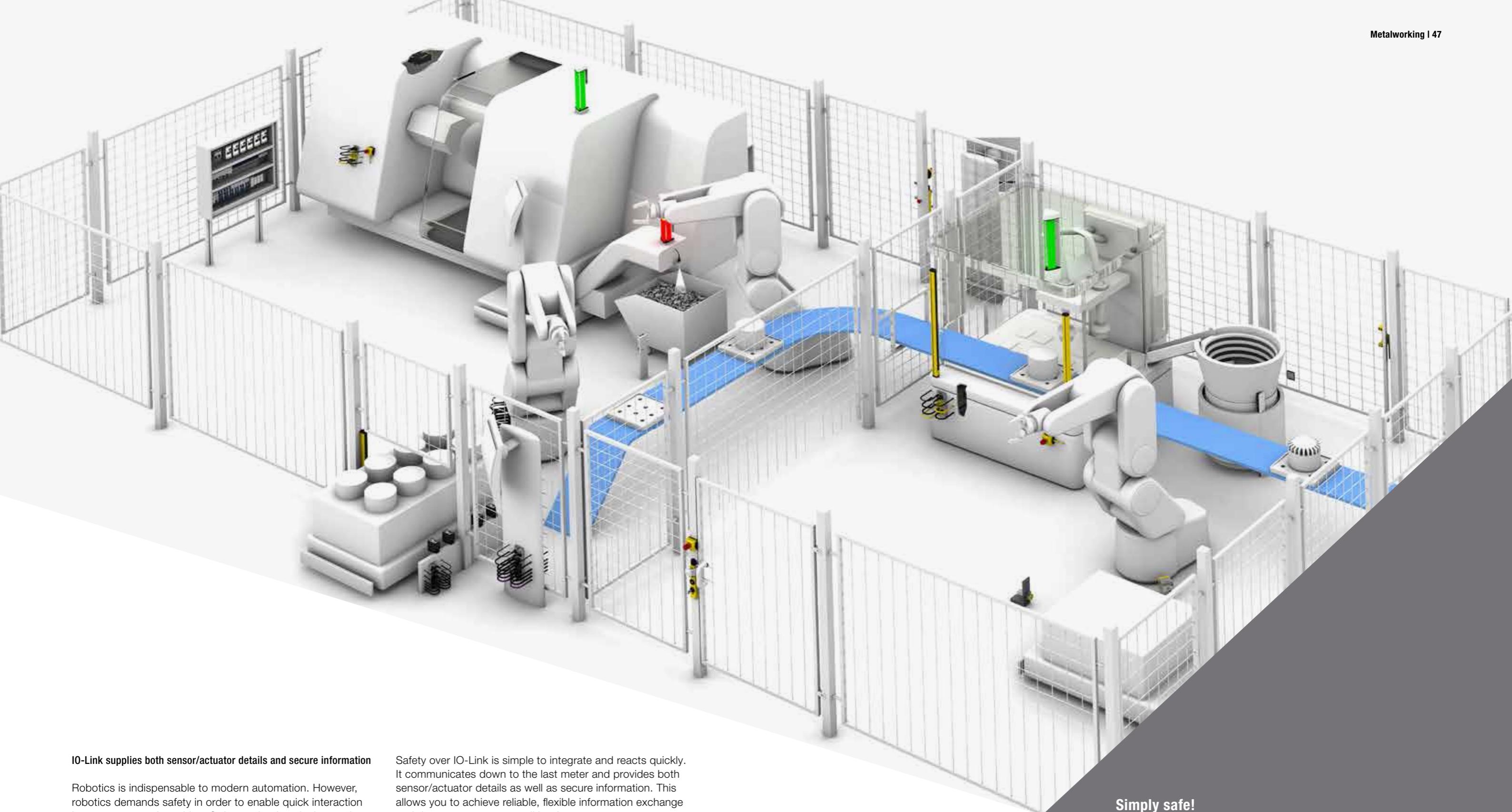
With IO-Link you can position sensors in the machine just as the process requires, since accessibility of the sensors is no longer a factor. Process monitoring, configuration, and error analysis of the IO-Link devices now takes place in the controller so your machine cycles are optimized. Signal delays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

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

## High-performance, consistent network

Control concepts using IO-Link provide you with simple and universal solutions for a high-performance, consistent network, so that with this universal interface you benefit from lower costs and are more flexible than ever.





#### IO-Link supplies both sensor/actuator details and secure information

Robotics is indispensable to modern automation. However, robotics demands safety in order to enable quick interaction between man and machine. Safety technology is thus a given for automation: only with it, for example, fast applications with pick-and-place can be realized.

With our concept, you use solutions that will work precisely and safely over years. The best part is that these are also easy to implement because safety technology from Balluff offers the advantages of IO-Link.

Safety over IO-Link is simple to integrate and reacts quickly. It communicates down to the last meter and provides both sensor/actuator details as well as secure information. This allows you to achieve reliable, flexible information exchange and data transport across all levels.

Integration is as simple as connecting the safe I/O module to the IO-Link master. You can connect nearly any safety device to this system, which is open all the way to the sensor level, and bundle the signals from binary standard sensors. Parameterization is done centrally via the controller. The safety-relevant information is sent through the master to the controller.

**Simply safe!**

**SAFETY OVER  
IO-LINK.**

 *innovating automation*

INNOVATIVE SOLUTIONS  
FOR ALL REQUIREMENTS



# PRODUCT OVERVIEW

 *innovating automation*

Application	Product Group	Example	Functions, interfaces and properties	Application	Product Group	Example	Functions, interfaces and properties							
<b>TURNING</b>														
Monitoring protection devices	Transponder-coded safety sensors	BID000H	PLe/SIL3, 106 x 25 x 22 mm, IP65/67/69, plastic housing, high coding level, 18N latching force, M12 plug	Bar loader monitoring	Inductive sensors	BES0068	M12 x 1, PNP normally open, switching distance 4 mm, flush mountable, M12 connector							
		BID000F	PLe/SIL3, 106 x 25 x 22 mm, IP65/67/69, plastic housing, high coding level, M12 plug			BES0055	M12 x 1, NPN normally open, switching distance 4 mm, flush mountable, 3 m PUR cable							
		BID000E	PLe/SIL3, 106 x 25 x 22 mm, IP65/67/69, plastic housing, low coding level, 18N latching force, M12 plug			BES008M	M18 x 1, PNP normally open, switching distance 8 mm, flush mountable, M12 connector							
		BID000C	PLe/SIL3, 106 x 25 x 22 mm, IP65/67/69, plastic housing, low coding level, M12 plug			BES007M	M18 x 1, NPN normally open, switching distance 8 mm, flush mountable, M12 connector							
		BID0009	PLe/SIL3, 39.2 x 18 x 29.5 mm, IP65/67, plastic housing, high coding level, M12 plug			BES00AH	M30 x 1.5, PNP normally open, switching distance 15 mm, flush mountable, M12 connector							
		BID0008	PLe/SIL3, 39.2 x 18 x 29.5 mm, IP65/67, plastic housing, low coding level, M12 plug			Tailstock positioning								
		BID0007	B <sub>10d</sub> : 25 mil. switching cycles (at 20 % contact load), 26 x 36 x 13 mm, IP67, plastic housing, low coding level, M12 plug			BTL...-P-...	Profile, measuring range max. 7620 mm, analog interface 0...10 V or 4...20 mA, SSI, Start/Stop pulse interface, CANopen, Devicenet, Profibus DP, Profinet, EtherCAT							
	Magnetically coded safety switches	BID0005	B <sub>10d</sub> : 5 mil. switching cycles, 40 x 147.7 x 43.5 mm, IP65, aluminum housing, low coding level, M12 plug			BTL...-PF-...	Profile flat, measuring range up to max. 4572 mm, analog interface 0...10 V or 4...20 mA, IO-Link							
		BID0011	PLe/SIL3 (PLd/SIL2), 87.5 x 120 x 35 mm, IP66/67/69, plastic housing, high coding level, spring-operated retainer, M12 plug	Steady rest alignment	Magnetostrictive linear position sensors, rod series	BTL...-B-...	Rod-style, measuring range max. 7620 mm, analog interface 0...10 V or 4...20 mA, SSI, Start/Stop pulse interface, CANopen, Profibus DP, Profinet, EtherCAT, IO-Link, connection flange M18 x 1.5, alternately inch threads style Z							
		BID0012	PLe/SIL3 (PLd/SIL2), 87.5 x 120 x 35 mm, IP66/67/69, plastic housing, high coding level, magnetically operated retainer, M12 plug			BTL...-K-...	Compact rod-style, measuring range max. 7620 mm, analog interface 0...10 V or 4...20 mA, SSI, Start/Stop pulse interface, CANopen, connection flange Ø 18 mm							
Locking protection devices	Transponder-coded interlock	BID0013	PLe/SIL3 (PLd/SIL2), 87.5 x 129 x 35 mm, IP66/67/69, plastic housing, high coding level, spring-operated retainer and emergency release, M12 plug			Checking workpiece clamping	Inductive positioning systems							
		BID0004	B <sub>10d</sub> : 5 mil. switching cycles, 40 x 197.7 x 47.5 mm, IP65, aluminum housing, low coding level, spring-operated retainer, M12 plug			BIP0002	Measuring range 40 mm, analog interface 0...10 V, teachable, M12 plug							
		BID0003	B <sub>10d</sub> : 5 mil. switching cycles, 40 x 197.7 x 44 mm, IP65, aluminum housing, low coding level, spring-operated retainer, M12 plug			BIP0004	Measuring range 40 mm, IO-Link, teachable, M12 connector							
		BID0002	B <sub>10d</sub> : 5 mil. switching cycles, 40 x 247.7 x 61.3 mm, IP65, aluminum housing, low coding level, spring-operated retainer and emergency release, M12 plug			BIP0007	Measuring range 14 mm, IO-Link							
		BID0001	B <sub>10d</sub> : 5 mil. switching cycles, 40 x 247.7 x 61.3 mm, IP65, aluminum housing, low coding level, magnetically operated retainer and emergency release, M12 plug			BIP000C	Measuring range 70 mm, analog interface 0...10 V and 4...20 mA, teachable, M8 plug							
	Electromechanical safety switches	Detecting the turret position		Inductive sensors	BES00FT	BES0060	Measuring range 133 mm, analog interface 0...10 V and 4...20 mA, teachable, M8 connector							
		Monitoring drive belts				M5 x 0.5 mm, PNP normally open, switching distance 0.8 mm, flush mountable, 2 m PUR cable, installation length 27 mm								
		Capacitive sensors				M8 x 1, PNP normally open, switching distance 1.5 mm, flush mount, 2 m PUR cable, installation length 30 mm								
<b>DRILLING</b>														
<b>WELDING</b>														
<b>PAINTING</b>														
<b>PACKAGING</b>														
<b>GLASS</b>														
<b>PLASTIC</b>														
<b>FOOD &amp; BEVERAGE</b>														
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Application	Product Group	Example	Functions, interfaces and properties
<b>MILLING</b>			
Monitoring end positions	Inductive sensors	BES01W2	20 x 32 x 8 mm (R01), PNP complementary, switching distance 7 mm, 0.2 m PUR cable with M12 connector
	Mechanical cam switches	BNS 813-D...-100-...	Series 100 multiple position switch with safety switch inserts per DIN EN 60204-1
Monitoring tool clamping	Inductive positioning systems	BIP0001	Measuring range 14 mm, analog interface 0...10 V, teachable, 2 m PUR cable
		BIP0008	Measuring range 14 mm, analog interface 4...20 mA, teachable, 2 m PUR cable
		BIP001M	Measuring range 14 mm, IO-Link, connection 2 m PUR cable
Installation technology decentralized	Fieldbus blocks	BNI003K	Profibus, metal housing, 8 ports, 16 x in-/outputs, 4 x IO-Link, configurable
		BNI005H	Profinet, metal housing, 8 ports, 16 x in-/outputs, 8 x IO-Link, configurable
		BNI007M	Profinet, metal housing, 16 ports, 32 x in-/outputs, 16 x IO-Link, configurable
		BNI0040	CC-Link, metal housing, 8 ports, 16 x in-/outputs, 4 x IO-Link, configurable
		BNI0077	EtherCAT, metal housing, 8 ports, 16 x in-/outputs, 8 x IO-Link, configurable
		BNI00AZ	Profinet, metal housing, 8 ports, 12 x in-/outputs, 8 x IO-Link, configurable, M12 plug
		BNI005U	8 x M12 ports, plastic housing, 16 x in-/outputs, configurable
Safe communication	Safe I/O modules	BNI0098	PLe/SIL3, Profisafe over IO-Link, 68 x 32.4 x 181.5 mm, IP67, zinc die-cast housing, 8 ports (6 x M12 5-pin, 2 x M12 8-pin), 12 x safe PNP inputs, 2 x safe outputs, 2 x PNP inputs, 2 outputs
Detecting rotation angle on the C-axis	Magnetically coded sensors	BML S1F_-Q...	Compact form factor 25 x 12 x 13 mm, incremental, RS422 per DIN 66259, resolution 1...10 µm
		BML ring	Various form factors/polarities on request
Identifying tools in the magazine	Industrial RFID Systems	BIS0011	Data carrier Ø 10 x 4.5 mm, standardized per DIN 69873, BIS C with 455/70 kHz (LF), 511 bytes
		BIS004A	Data carrier Ø 10 x 4.5 mm, standardized per DIN 69873, BIS M with 13.56 MHz (HF), 2000 bytes
		BIS005Z	Read/write head Ø 14.5 mm, BIS C with 455/70 kHz (LF), 5 m PUR cable with M12 female, adapter BCC0FCK ordered separately
		BIS013Z	Read/write head Ø 14.5 mm, BIS M with 13.56 MHz (HF), 0.3 m cable with M12 plug
		BIS V...-C1...	BIS V processor unit for BIS M, BIS L and BIS C, various fieldbus versions on page 18
		BIS V...-C0...	BIS V processor unit for BIS M and BIS L, various fieldbus versions on page 15
Tool assignment and tracking	Industrial RFID systems	BIS00NZ	Data carrier 24 x 24 x 21 mm, bar antenna, BIS M with 13.56 MHz (HF), 2000 bytes, corner style
		BIS00PT	Data carrier Ø 22 mm /M6, round antenna, BIS M with 13.56 MHz (HF), 2000 bytes, data screw
		BIS0131	Read/write head 105 x 40 x 15 mm, BIS M with 13.56 MHz (HF), 0.3 m PUR cable with M12 connector
		BIS0132	Read/write head M30 x 1.5, round antenna, BIS M with 13.56 MHz (HF), M12 plug
		BIS V...-C0...	BIS V processor unit for BIS M and BIS L, various fieldbus versions on page 15
Flexibly visualize production sequences	SmartLight	BNI0072	IO-Link, five segments, seven colors, 60 x 60 x 278 mm, IP65, working temperature max. +50 °C, M12 connector
	SmartLight	BNI0085	IO-Link, five segments, seven colors, with sound, 60 x 60 x 330.5 mm, IP30, working temperature max. +50 °C, M12 plug

Application	Product Group	Example	Functions, interfaces and properties
<b>METAL FORMING</b>			
Securing access areas	Opto-electronic protective devices	BLG 4A...-014-...	Finger protection, PLe/SIL3, 14 mm detection capability, 15–180 cm protection field height, 6 m range, M12 plug
		BLG 4A...-030-...	Hand protection, PLe/SIL3, 30 mm detection capability, 15–180 cm protection field height, 19 m range, M12 plug
		BLG 4A...-B0-...	Body protection, PLe/SIL3, 315 –515 mm detection capability, 50–120 cm protection field height, 50 m range, M12 plug
Switching eccentric presses	Mechanical rotary cam switches	BSW0040	259 x 190 x 140 mm, six switch positions with positive opening contacts, BG certificate
		BSW003N	199 x 190 x 140 mm, three switch positions with positive opening contacts
Controlling hydraulic presses	Magnetostrictive linear position sensors, profile series	BTL...-P...	Profile, measuring range max. 7620 mm, analog interface 0...10 V or 4...20 mA, SSI, Start/Stop pulse interface, CANopen, Devicenet, Profibus DP, Profinet, EtherCAT
		BTL...-PF...	Profile flat, measuring range up to max. 4572 mm, analog interface 0...10 V or 4...20 mA, IO-Link
Changing die sets	Inductive couplers	BIC005C, BIC005A	40 x 40 mm, unidirectional version, working range 1...5 mm, IO-Link
		BIC0072, BIC0071	40 x 40 mm, bi-directional version, working range 1...5 mm, IO-Link
I/O modules		BNI003T	Metal version, 8 ports, 16 x inputs, unidirectional, coding for tool identification
		BNI005U	Plastic version, 8 ports, 16 x in-/outputs, configurable, bi-directional, coding for tool identification
Monitoring sheet metal thicknesses	Inductive distance sensors	BAW0056	M12 x 1, measuring range 0.2...7 mm, IO-Link
		BAW0026	M18 x 1, measuring range 1...5 mm, flush mountable, analog interface 0...10 V, temperature output
Checking metal strip sag	Ultrasonic distance sensors	BUS005K	M30 x 1.5, analog interface 0...10 V or 4...20 mA, measuring range 65...350 mm, straight version
		BUS004Z	M18 x 1, distance and switching distance via IO-Link, straight version
		BUS004Y	M18 x 1, distance and switching distance via IO-Link, right-angle version
Process monitoring	Pressure sensors	BSP...	pressure sensors with and without display for relative pressure measurement, pressure ranges –1...600 bar, output 4...20 mA, 0...10 V, switching points (PNP/NPN) and IO-Link
		BFT...	media-contacting temperature sensors with and without display, output Pt1000, 4...20 mA, 0...10 V and switching point (PNP)
	Temperature sensors	BFF...	thermal flow controllers for liquid media, switching point output (PNP)
	Adapters for pressure sensors with display	BAM01KP	Process-side G1/4" outer thread
		BAM01KT	Process-side NPT1/4" outer thread

Additional products can be found on our website at: [www.balluff.de/go/product-finder](http://www.balluff.de/go/product-finder)

Application	Product Group	Example	Functions, interfaces and properties
SPINDLES, CHUCKS, ROTARY AND SWIVEL TABLES			
Safety for clamping fixtures	IO-Link blocks for safety applications	BNI00CL	PLd/SIL2, IO-Link interface, galvanically isolated supply voltages, 68 x 32.4 x 181.5 mm, IP67, zinc die-cast housing, 8 ports (8 x M12, 5-pin), 8 x PNP inputs + 8 x outputs, expanded diagnostics capability
		BNI003Y	PLd/SIL2, IO-Link interface, galvanically isolated supply voltages, 68 x 32.4 x 181.5 mm, IP67, zinc die-cast housing, 8 ports (8 x M12, 5-pin), 16 x PNP inputs, expanded diagnostics capability
		BNI003W	PLd/SIL2, IO-Link interface, galvanically isolated supply voltages, 68 x 32.4 x 181.5 mm, IP67, zinc die-cast housing, 8 ports (8 x M12, 5-pin), 8 x PNP inputs, expanded diagnostics capability
		BNI0034	PLd/SIL2, IO-Link interface, galvanically isolated supply voltages, 68 x 32.4 x 181.5 mm, IP67, zinc die-cast housing, 8 ports (8 x M12, 5-pin), 16 x PNP inputs
		BNI0033	PLd/SIL2, IO-Link interface, galvanically isolated supply voltages, 68 x 32.4 x 181.5 mm, IP67, zinc die-cast housing, 8 ports (8 x M12, 5-pin), 8 x PNP inputs
		BIC0078, BIC0077	M12 x 1, unidirectional version, Working range 0...2 mm, 50 mA Power, 2 x PNP signals
Transmitting signals and data on swivel tables	Inductive couplers	BIC0054, BIC0053	M30 x 1.5, unidirectional version, Working range 0...5 mm, IO-Link coupling 4 x analog
		BNI0008	Plastic version, 8 ports, 4 x analog 0...10 V, 8 x inputs, IO-Link coupling to BIC
	I/O modules	BNI0007	Plastic version, 8 ports, 4 x analog 4...20 mA, 8 x inputs, IO-Link interface to BIC
		BES013N	M8 x 1, PNP normally open, switching distance 1.5 mm, flush mount, M8 plug
Monitoring clamping distances on tools	Inductive sensors	BES01C8	M12 x 1, PNP normally open, switching distance 2 mm, flush mount, M12 plug
		BAW003E	14 x 38.5 x 17 mm, measuring range 1...5 mm, analog interface 0...10 V, temperature output, 2 m PUR cable
	Inductive distance sensors	BAW003A	14 x 38.5 x 17 mm, measuring range 1...5 mm, IO-Link, temperature output, 2 m PUR cable
		BIP0001	Measuring range 14 mm, analog interface 0...10 V, 2 m PUR cable
	Inductive positioning systems	BIP001M	Measuring range 17 mm, IO-Link, M12 plug
		BIP0004	Measuring range 40 mm, IO-Link, teachable, M12 connector
		BIP001J	Measuring range 48 mm, IO-Link
		BIP000N	Measuring range 70 mm, analog interface 0...10 V and 4...20 mA, teachable, M12 connector
		BIP000U	Measuring range 103 mm, analog interface 0...10 V and 4...20 mA, teachable, M12 connector
		BIP000R	Measuring range 133 mm, analog interface 0...10 V and 4...20 mA, teachable, M12 connector
		BML-S1G...	97 x 17.4 x 18.5 mm, absolute, interface BiSS C or SSI
Determining travel on rotary tables	Magnetically coded sensors	BML-M02- A55- ...	Magnetic tape, absolute, 10 mm wide, for rotation angle < 360°

Application	Product Group	Example	Functions, interfaces and properties
HANDLING, TRANSPORT AND PROCESS MONITORING			
Detecting piston position in clamping cylinders	High-pressure inductive sensors	BHS0054	M8 x 1, pressure rated to 500 bar, PNP normally open, switching distance 1.5 mm, M8 connector, installation length 45 mm
		BHS002Y	M12 x 1, pressure rated to 500 bar, PNP normally open, switching distance 1.5 mm, M12 connector, installation length 56 mm
		BAW0040	M12 x 1, pressure rated to 500 bar, analog 0...10 V, measuring range 0.5...2 mm, M12 connector, installation length 78 mm
		BMF008E	Various slot styles, M12 connector, aluminum housing, with clamping holder (order separately)
		BMF00K9	Various slot types, M8 plug
		BMF00C4	Can be installed in the T-slot from above, PNP normally open, 0.3 m PUR cable with M8 plug
Monitoring grippers on gantry loaders	Magnetic sensors	BMF00C9	Two sensors with one plug connection, can be installed in the T-slot from above, PNP normally open, 0.3 m PUR cable with M12 plug
		BMF0002	Can be slid into the C-slot (Festo), PNP normally open, 0.3 m PUR cable with M8 plug
		BMF00A2	Can be slid into the C-slot (SMC), PNP normally open, 0.3 m PUR cable with M8 plug
		BMP0007	M8 x 1, IO-Link, measuring range 32 mm, IP67, analog interface 0...10 V/4...20 mA
Positioning	Magnetic field positioning systems	BES0028	M8 x 1, PNP normally open, switching distance 2 mm, flush mount, M12 plug, installation length 65 mm
		BES0068	M12 x 1, PNP normally open, switching distance 4 mm, flush mount, M12 plug, installation length 65 mm
		BES008L	M18 x 1, PNP normally open, switching distance 8 mm, flush mount, M12 plug, installation length 65 mm
		BES00AF	M30 x 1.5, PNP normally open, switching distance 15 mm, flush mount, M12 plug, installation length 65 mm
Detecting end positions on gantry loaders	Inductive sensors	BML-S1G...	97 x 17.4 x 18.5 mm, absolute, interface BiSS C or SSI
		BML-M02- A55- ...	Magnetic tape, absolute, 10 mm wide, max. 48 m long
		BTL...-B-...	Rod-style, analog interface 0...10 V or 4...20 mA, Start/Stop pulse interface, CANopen, Profibus DP, Profinet, EtherCAT, connection flange M18 x 1.5, alternately inch threads style Z
		BTL...-K-...	Compact rod-style, analog interface 0...10 V or 4...20 mA, Start/Stop pulse interface, CANopen, connection flange Ø 18 mm
Controlling positioning of linear drives	Magnetically coded sensors	BAM024J	Ø 32 x 53 mm, stainless steel
		BAM0146	Ø 44 x 49 mm, stainless steel
		BUS005Y	M30, process connection G1", range 85...350 mm, analog interface 0...10 V/4...20 mA and PNP, NO/NC selectable, pressure rated to 6 bar, M12 connector
		BUS005U	M30, process connection G1", range 200...1300 mm, 2 x PNP, NO/NC selectable, pressure up to 6 bar, M12 plug
Detecting process fluids with switching points or continuously	Ultrasonic fill level sensors	BUS005W	M30, process connection G1", range 200...1300 mm, analog interface 0...10 V/4...20 mA and PNP, NO/NC selectable, pressure rated to 6 bar, M12 connector

Application	Product Group	Example	Functions, interfaces and properties
Leak detection	Capacitive sensors	BCS012T	16 x 34 x 8 mm, PNP normally open, 0.3 m PUR cable with M8 connector, for non-conductive media, universal holder for leak detection included
		BCS012Z	16 x 34 x 8 mm, PNP normally open, 0.3 m PUR cable with M8 connector, for conductive media, universal holder for leak detection included
Safe position detection	Inductive safety sensors	BES0574	PLd/SIL2, M12 x 70 mm, IP67, non-flush mount, stainless steel housing, uncoded, M12 plug
		BES0575	PLd/SIL2, M18 x 70.5 mm, IP67, non-flush mount, stainless steel housing, uncoded, M12 plug
		BES0576	PLd/SIL2, M18 x 70.5 mm, IP67, flush mount, brass housing, uncoded, M12 plug
		BES0578	PLd/SIL2, M30 x 70 mm, IP67, non-flush mount, stainless steel housing, uncoded, M12 plug
		BES0579	PLd/SIL2, M30 x 70 mm, IP67, flush mount, brass housing, uncoded, M12 plug
		BES0577	PLe/SIL3, M30 x 80 mm, IP68/69, non-flush mount, stainless steel housing, uncoded, M12 plug
		BES057A	PLe/SIL3, 40 x 66 mm, IP67, one-side flush mount, zinc die-cast housing, uncoded, M12 plug
		BES057C	PLe/SIL3, 40 x 66 mm, IP67, non-flush mount, zinc die-cast housing, uncoded, M12 plug
	Transponder-coded safety sensors	BID0008	PLe/SIL3, 39.2 x 18 x 29.5 mm, IP65/67, plastic housing, low coding level, M12 plug
		BID000C	PLe/SIL3, 106 x 25 x 22 mm, IP65/67/69, plastic housing, low coding level, M12 plug
		BID0009	PLe/SIL3, 39.2 x 18 x 29.5 mm, IP65/67, plastic housing, high coding level, M12 plug
		BID000F	PLe/SIL3, 106 x 25 x 22 mm, IP65/67/69, plastic housing, high coding level, M12 plug
	Magnetic coded safety switches	BID0007	B <sub>10d</sub> : 25 mil. switching cycles (at 20 % contact load), 26 x 36 x 13 mm, IP67, plastic housing, low coding level, M12 plug
	Electromechanical safety switches	BID0005	B <sub>10d</sub> : 5 mil. switching cycles, 40 x 147.7 x 43.5 mm, IP65, aluminum housing, low coding level, M12 plug
Reliably stop machines at critical times	Emergency stop device	BAM02HA	B <sub>10d</sub> : 0.1 mil. switching cycles, 80 x 106 x 72 mm, IP65, plastic housing, M12 plug

Application	Product Group	Example	Functions, interfaces and properties
RFID SYSTEMS			
Controlling	Industrial RFID systems	BIS00T3	Processor unit BIS V, Profibus, IP65, for connecting up to four read/write heads BIS VM/VL, IO-Link master port, zinc die-cast housing
		BIS00U9	Processor unit BIS V, EtherCAT, IP65, connection for up to four read/write heads BIS VM/VL, IO-Link master port, zinc die-cast housing
		BIS010P	Processor unit BIS V, CC-Link, IP65, connection for up to four read/write heads BIS VM/VL, IO-Link master port, zinc die-cast housing
		BIS012F	Processor unit BIS V, Power 5-pin, Ethernet/IP, IP65, for connecting up to four read/write heads BIS VM/VL, IO-Link master port, zinc die-cast housing
		BIS0186	Processor unit BIS V, Power 5-pin, USB, Ethernet TCP/IP, IP65, for connecting up to four read/write heads BIS VM/VL, IO-Link master port, zinc die-cast housing
		BIS0122	Processor unit BIS V, Power 4-pin, Ethernet/IP, IP65, for connecting up to four read/write heads BIS VM/VL, IO-Link master port, zinc die-cast housing
		BIS018J	Processor unit BIS V, Power 4-pin, USB, Ethernet TCP/IP, IP65, for connecting up to four read/write heads BIS VM/VL, IO-Link master port, zinc die-cast housing
		BIS013U	Processor unit BIS V, Profinet, IP65, for connecting up to four read/write heads BIS VM/VL, IO-Link master port, zinc die-cast housing
		BIS012E	Processor unit BIS V, Profibus, IP65, for connecting up to four read/write heads BIS C/VM/VL, IO-Link master port, zinc die-cast housing
		BIS0147	Processor unit BIS V, EtherCAT, IP65, for connecting up to four read/write heads BIS C/VM/VL, IO-Link master port, zinc die-cast housing
		BIS014E	Processor unit BIS V, CC-Link, IP65, for connecting up to four read/write heads BIS C/VM/VL, IO-Link master port, zinc die-cast housing
		BIS014C	Processor unit BIS V, Power 5-pin, Ethernet/IP, IP65, for connecting up to four read/write heads BIS C/VM/VL, IO-Link master port, zinc die-cast housing
		BIS0187	Processor unit BIS V, Power 5-pin, USB, Ethernet TCP/IP, IP65, for connecting up to four read/write heads BIS C/VM/VL, IO-Link master port, zinc die-cast housing
		BIS0146	Processor unit BIS V, Power 4-pin, Ethernet/IP, IP65, for connecting up to four read/write heads BIS C/VM/VL, IO-Link master port, zinc die-cast housing
		BIS018K	Processor unit BIS V, Power 4-pin, USB, Ethernet TCP/IP, IP65, for connecting up to four read/write heads BIS C/VM/VL, IO-Link master port, zinc die-cast housing
		BIS013W	Processor unit BIS V, Profinet, IP65, for connecting up to four read/write heads BIS C/VM/VL, IO-Link master port, zinc die-cast housing
Hybrid read head versions		on request	
Data carrier		The appropriate data carrier can be selected using our configurator: <a href="http://www.balluff.com/local/de/rfid-configurator">www.balluff.com/local/de/rfid-configurator</a>	

Application	Product Group	Example	Functions, interfaces and properties
<b>IO-LINK</b>			
Reliable communication	Profinet network modules	BNI007M	IO-Link, active distributor, 16x ports, digital in-/outputs max. 32/32, configurable, IP67, zinc die-cast housing
		BNI005H	IO-Link, active distributor, 8x ports, digital in-/outputs max. 16/16, configurable, IP67, zinc die-cast housing
		BNI0092	IO-Link, active distributor, 4x ports, digital in-/outputs max. 8/8, configurable, IP67, zinc die-cast housing
		BNI00A9	IO-Link, active distributor, 4x ports, digital inputs max. 4, Class B, IP67, zinc die-cast housing
	EtherNet/IP network modules	BNI006A	IO-Link, active distributor, 8x ports, digital in-/outputs max. 16/16, configurable, IP67, zinc die-cast housing
		BNI009T	IO-Link, active distributor, 4x ports, digital in-/outputs max. 8/8, configurable, IP67, zinc die-cast housing
		BNI00AA	IO-Link, active distributor, 4x ports, digital inputs max. 4, Class B, IP67, zinc die-cast housing
	Network blocks EtherCAT	BNI0077	IO-Link, active distributor, 8x ports, digital in-/outputs max. 16/16, configurable, IP67, zinc die-cast housing
		BNI009U	IO-Link, active distributor, 4x ports, digital in-/outputs max. 8/8, configurable, IP67, zinc die-cast housing
		BNI00AC	IO-Link, active distributor, 4x ports, digital inputs max. 4, Class B, IP67, zinc die-cast housing
	Network blocks CC-Link IE/Field	BNI008C	IO-Link, active distributor, 8x ports, digital in-/outputs max. 16/16, IP67, zinc die-cast housing
Reliable signal transmission	I/O modules sensor/actuator hub	BNI00CP	8x ports, IO-Link interface, digital in-/outputs max. 16/16, configurable, M12 connection, power supply IN 7/8" connection, IP67, zinc die-cast housing
		BNI007Z	8x ports, IO-Link interface, digital in-/outputs max. 16/16, M12 connection, IP67, plastic housing
		BNI0093	8x ports, IO-Link interface, digital in-/outputs max. 8/8, M8 connection, IP67, zinc die-cast housing
		BNI00AU	16x ports, IO-Link interface, digital in-/outputs max. 16/16, M8 connection, IP67, zinc die-cast housing
Efficient transport of signals	Universal interfaces	BNI0042	IO-Link, analog converter, voltage version, 1x analog input, IP67 (when connected), M12 connection
		BNI00C9	IO-Link, analog converter, universal version (voltage, current, temperature), IP67 (when connected), M12 connection, stainless steel housing
		BNI004W	IO-Link, valve interface Power Aux, 24 outputs, IP67 (when connected), cable length 0.5 m, M27 connection
		BNI005M	IO-Link, universal interface, digital in-/outputs max. 16/16, IP54 (up to open cable end)
		BNI006N	IO-Link, valve interface Power Aux, 24 outputs, IP40 (when connected), cable length 0.6 m, connection, D-Sub connection
		BNI0073	IO-Link, USB master, IP21, USB-B, M12 connections

Application	Product Group	Example	Functions, interfaces and properties
<b>ACCESSORIES</b>			
Single-ended cordsets		BCC02M9	M8 female straight, 3-pin, 5 m PUR cable, drag chain compatible
		BCC02MJ	M8 female right-angle, 3-pin, 5 m PUR cable, with LED, drag chain compatible
		BCC032H	M12 female straight, 4-pin, 5 m PUR cable, drag chain compatible
		BCC032P	M12 female right-angle, 3-pin, 5 m PUR cable, with LED, drag chain compatible
Junction blocks		BPI00HJ	Plastic, sensor connection 8 ports (M8 female, 3-pin), controller connection M12 connector, 12-pin
		BPI00JY	Plastic, sensor connection 8 ports (M12 female, 4-pin), controller connection M23 connector, 19-pin
Machine lights		BAE00W8	Ø 20 x 250 mm, illumination area 170 mm, White LED with 120° beam angle, M12 plug
		BAE00W9	Ø 20 x 358 mm, illumination area 278 mm, White LED with 120° beam angle, M12 plug
		BAE00WA	Ø 20 x 432 mm, illumination area 562 mm, White LED with 120° beam angle, M12 plug
		BAM02ML	35 x 29 x 15 mm, clamp for machine light, 2 pcs. included, attached using M6 screw
Fasteners		BAM00E0	M12 clamp with positive stop, coated brass, for thread lengths 30 mm and greater
		BAM00CY	M12 clamp with positive stop, coated brass, for thread lengths 40 mm and greater
		BAM00FT	M18 clamp with positive stop, coated brass, for thread lengths 30 mm and greater
		BAM00FN	M18 clamp with positive stop, coated brass, for thread lengths 50 mm and greater
		BAM00J6	M30 clamp with positive stop, coated brass, for thread lengths 30 mm and greater
		BAM00J4	M30 clamp with positive stop, coated brass, for thread lengths 50 mm and greater
		BAM00C4	M12 clamp holder without fixed stop, plastic PA 6
		BAM00F2	M18 clamp holder without fixed stop, plastic PA 6
		BAM00HN	M30 clamp holder without fixed stop, plastic PA 6
Switching power supplies		BAE00TP	IP67 Heartbeat power supply with IO-Link, input 100...240 V AC, output 24 V DC/3.8 A, 91.2 W power rating
		BAE00TL	IP67 Heartbeat power supply with IO-Link, input 100...240 V AC, output 24 V DC/8 A, 192 W power rating
		BAE00T4	IP20 Heartbeat power supply with IO-Link, input 115/230...V AC, output 24 V DC/5 A, 120 W power rating
		BAE00M3	IP20 Heartbeat power supply with IO-Link, input 115/230...V AC, output 24 V DC/20 A, 480 W power rating
		BAE00TF	IO-Link adapter for IP20 Heartbeat power supply for controlling and diagnosing the power supply

**Balluff**

## OPENING UP NEW PERSPECTIVES

Balluff is one of the leading providers of high-quality sensor, identification, network and software solutions for your automation requirements. Family-run for more than 90 years, the company now employs more than 4000 employees in 38 subsidiaries with distribution, production and development sites worldwide, all working towards your success. Together with our branches, we guarantee the highest quality standards worldwide. This is how we empower you to always receive the best.

We give our all to provide top services for innovative solutions that increase your competitive edge. Through years of experience we bring the competence of a manufacturer and high personal engagement.

We live our motto 'innovating automation': we are automation pacesetters, developers and technological pioneers. In open interactions with associations, universities and research facilities, and in close contact with our customers, we create new industry solutions for automation. Innovative Balluff solutions prepare you for a successful future.

We keep the future firmly in sight. In everything we do. With sophisticated environmental management, we protect the environment and handle our resources carefully. This creates the best conditions for sustainable action, also for you.

You can always count on us, our products and our scheduling and delivery reliability. In the spirit of a good partnership.

## REFERENCES

The demands in metalworking are high and getting higher. Our complete commitment is to the success of our customers. Future-looking technologies, market-oriented solutions, and the expertise of an experienced manufacturer are what we draw on to increase your competitiveness. This is why leading companies worldwide trust in Balluff solutions.

We work together with such companies as:



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