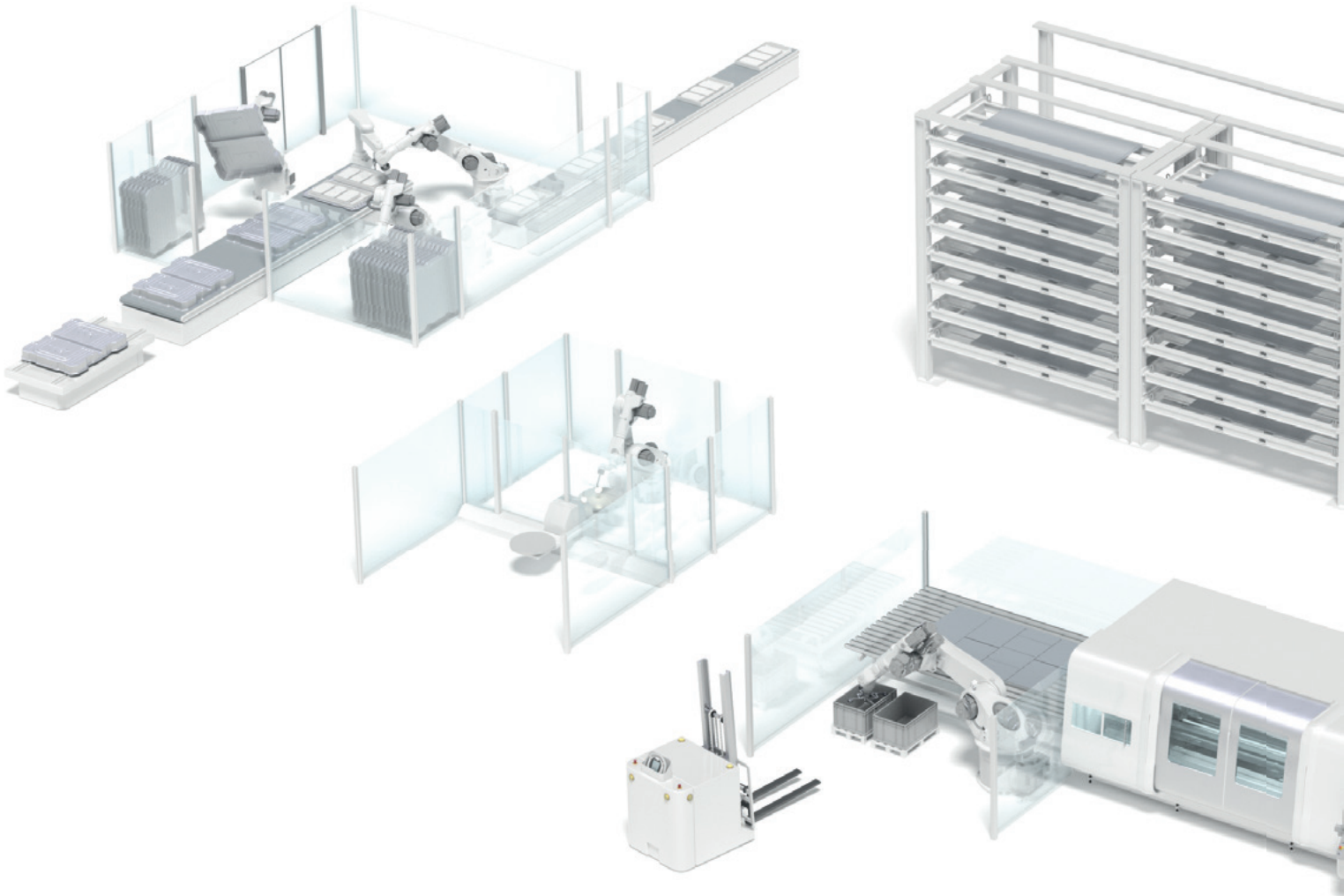
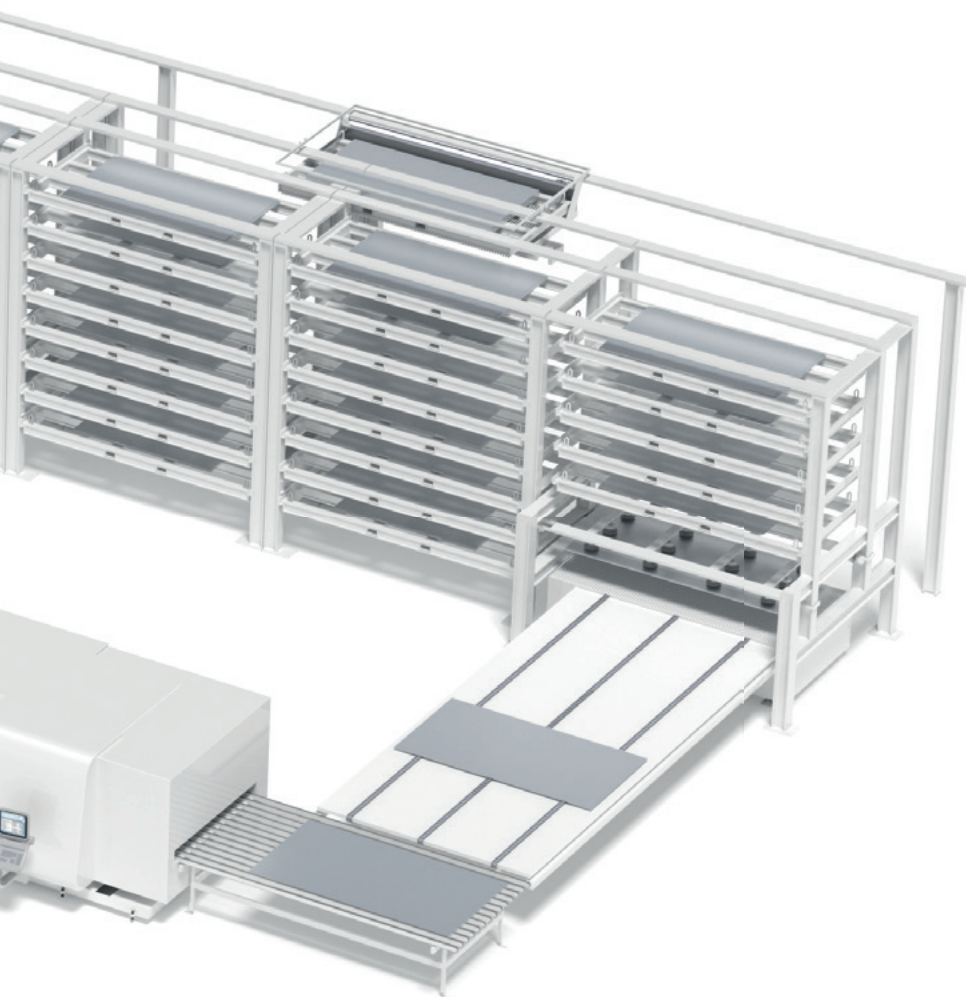


Sensor solutions for machine tools and automation systems







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Creating transformation. Yesterday. Today. Tomorrow.

With curiosity and determination, we – the Sensor People – have been partners for technological milestones in industrial automation for more than 50 years. The success of our customers is what drives us. Yesterday. Today. Tomorrow.





For safely automated machine tools

Machine builders are facing new challenges due to increasing automation and the vision of the smart factory:

From individual machine tools to fully networked production systems, flexibility and networking are becoming increasingly important – with the highest safety and quality standards.

As a sensor manufacturer, our goal is to make your production even more flexible, efficient, and safer through the use of our innovative products and solutions. This is how we ensure your success in an industry that is ever evolving.





Machine tools and automation systems

Production of the future is characterized by flexible structures. From the individual machine tools to a production cell or a fully networked production system of a smart factory. What all have in common are the automated and linked processes in and between the cells. This improves productivity, allows for a more efficient use of materials and enables higher product quality. For a while now, sensors are, thus, not only a matter of process control – today they are above all needed for linking processes together.



Maximum system availability and certified quality standards

Our sensors support you in all areas of automation, quality assurance, traceability and machine safety. They are characterized by easy handling during commissioning and exchange. With sophisticated functions, intelligent devices ensure smooth production and material provision. The long-term quality as well as the availability of the sensors are guaranteed. Our products thereby help to ensure and maintain the high availability of the system.



Safety without compromise

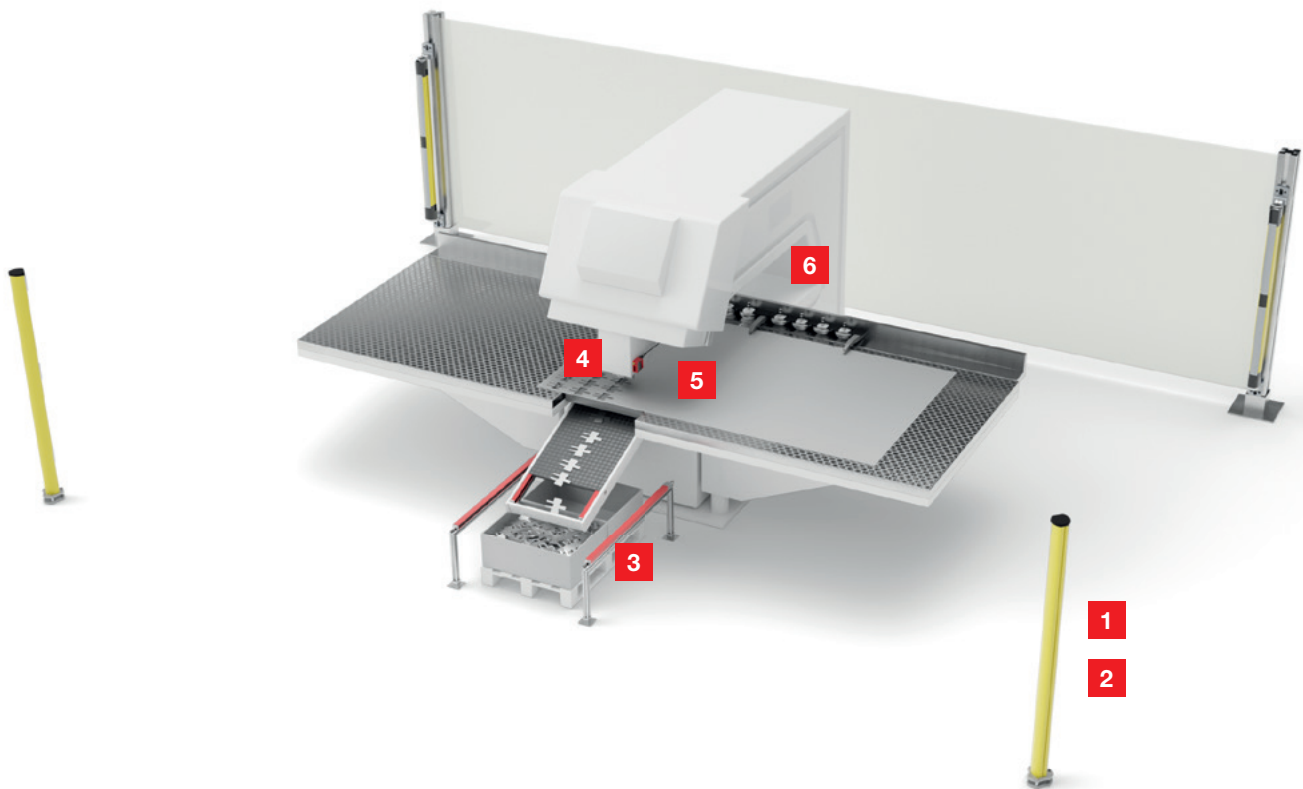
The advance of automation gives rise to new requirements with regard to the safety of persons and machines. Through our specific application know-how and more than 30 years of experience in the area of machine safety, we offer unique insight into safety-related applications. With our safety product range consisting of high-quality products, intelligent systems as well as competent technical services, we provide you with targeted answers.

Punching machine and laser-cutting machine

Punching machines and laser-cutting machines separate very quickly and precisely smaller parts from large sheet metal plates. When processing sheet metal plates with punch presses or with laser cutting, safety at work plays an important role, as work is performed with high pressure and high-energy laser beams. In addition, the sensor system used must be able to detect very small stamping parts to ensure a fault-free production process.

Our sensor solutions reliably and flexibly safeguard hazardous areas. And do so with maximum protection for people and with minimal influence on the workflows. Moreover, sensors check for tool availability, prevent collisions and monitor the ejection of the sheet metal parts being processed.





1 Access guarding, one side

2 Access guarding, multiple sides

3 Monitoring of container filling levels

4 Presence control of the tool in the punching head

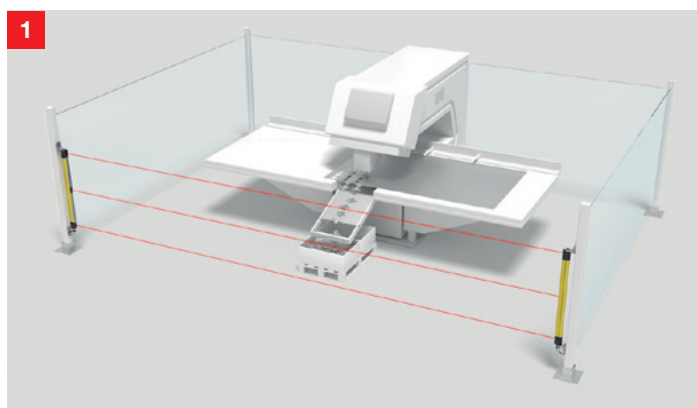
5 Collision avoidance of metal sheet with machine

6 Tool identification

Punching machines and laser-cutting machines

Access guarding, one side

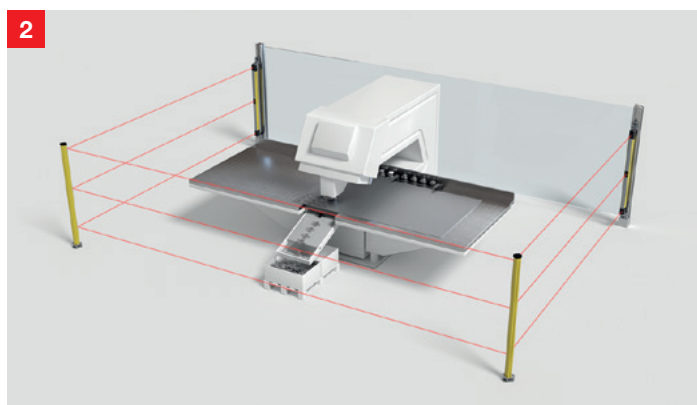
Requirement: Access to a dangerous area at a machine or system is to be guarded. To enable material entry and exit, the machine must be easily accessible from one side.



Solution: The MLD 300/500 multiple light beam safety devices provide cost-effective access guarding solutions. The transceiver models with an operating range of up to 8 m are especially easy to install. For wide-area guarding, transmitter/receiver models are available with a larger operating range.

Access guarding, multiple sides

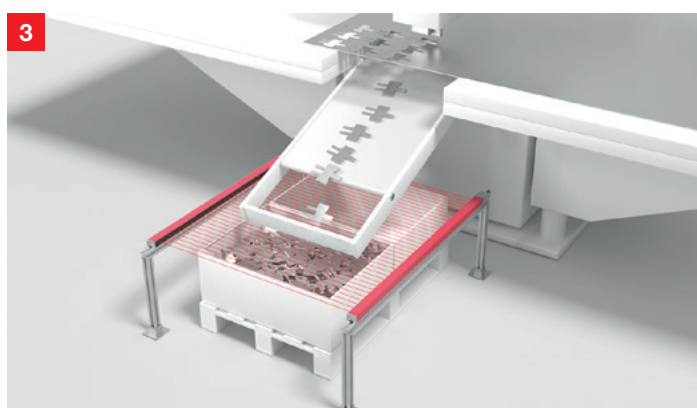
Requirement: Access to the working range is to be guarded while the machine is in operation. To enable material entry and exit, the machine must be easily accessible from multiple sides.



Solution: The MLD 300/500 multiple light beam safety devices in combination with the UMC mirror columns safeguard access to the machine on multiple sides and over lengths of up to 70 m. The integrated laser alignment aid makes installation quick and easy.

Monitoring of container filling levels

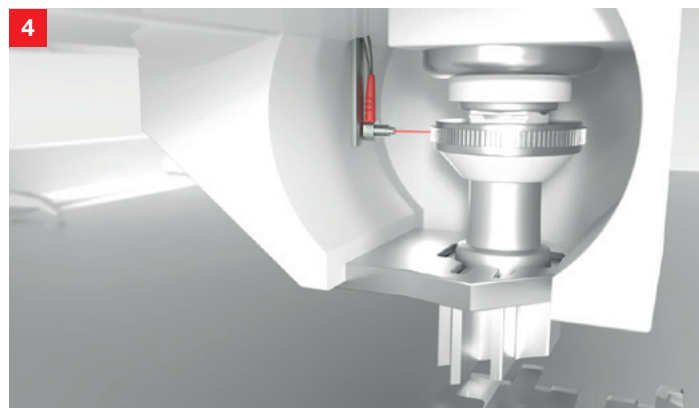
Requirement: After the punching or laser process, the produced parts are guided to a collection container via a chute. The reaching of the maximum permissible fill level of the container is to be monitored. Monitoring must function reliably with oily and glossy surfaces on the parts as well.



Solution: The CSL 710 switching light curtains convince with their ease of configuration and large function reserves – even with extremely small parts. Various fastening materials enable optimum mechanical integration in the machine. For applications with IO-Link interface, the CML 700 measuring light curtains are available.

Presence control of the tool in the punching head

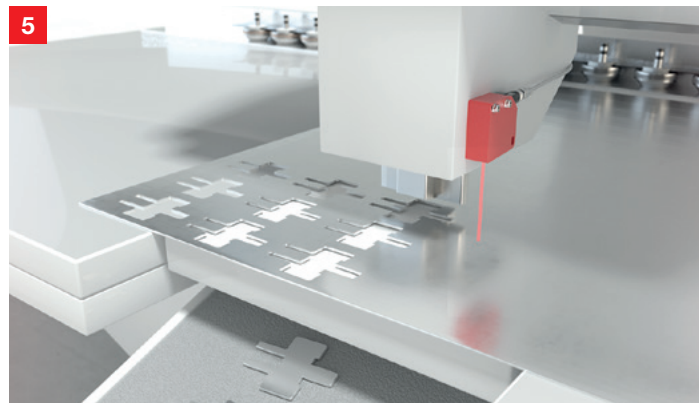
Requirement: On a punching machine, the presence of the punching head in the tool holder is to be checked following the tool change. The check is performed before the actual punching process is started. This serves to avoid down-time and ensures an optimum punching process.



Solution: The fiber optic sensors of the LV/KF series are particularly well suited for use in constrained spaces thanks to their flexible fiber optics. Depending on the contour of the punching head, various beam exits are available. The parallel display of signal and switching threshold on the amplifier ensures fast commissioning.

Collision avoidance of metal sheet with machine

Requirement: To ensure an optimum punching process, the material thickness must be checked. This is performed by measuring the distance to the material with high resolution.



Solution: The ODSL 8 and ODS 9 sensors measure the distance with resolutions of up to 0.01 mm and thereby supply the basis for a high quality of this process step.

Tool identification

Requirement: To ensure clear identification for a reliable tool change, a 2D-code is applied to the work piece, i.e. the punching head.



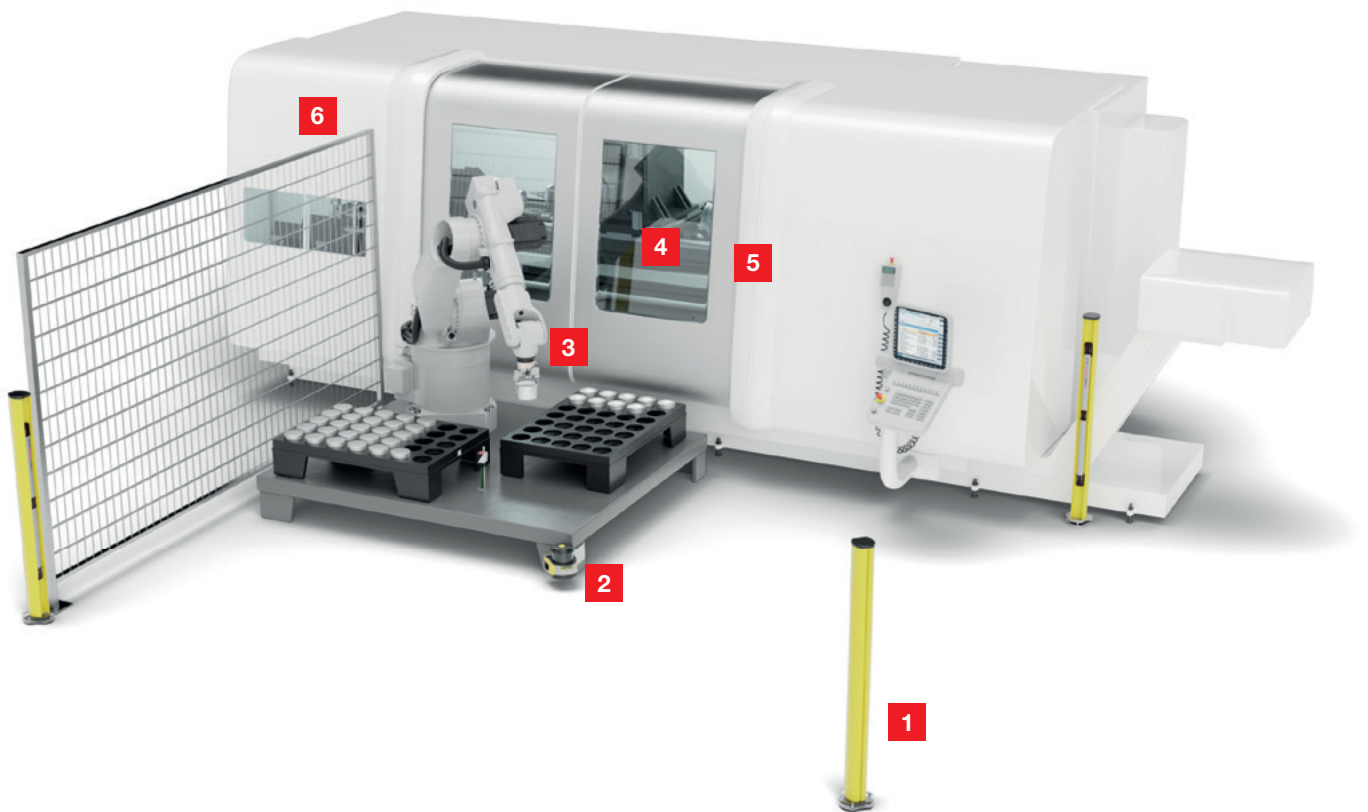
Solution: The DCR 200i code readers and the LSIS 400i smart cameras read 2D-codes. The DCR 200i are characterized by their compact design and simple commissioning. Their optics models enable different reading ranges. With the motor-driven focus adjustment, the LSIS 400i offer a large and flexibly adjustable reading field.

Machining center

In machining centers, objects of various materials are machined, turned, and drilled. The prerequisite for processing work pieces in complex machining centers with a high degree of precision is having the right tool available for each work step. Industrial robots are often used for the automated loading and unloading of processing centers. Before the robot picks up a part, the part must be uniquely identified to ensure that the correct processing step is carried out. The robots perform numerous swivel and gripping movements in a very short period of time. The working ranges of the robots must be reliably safeguarded in terms of access by and the presence of persons.

Our inductive and optical sensors check and monitor the presence and position of work pieces and parts. Our identification systems record data for the traceability of those work pieces and parts and for the next work step. And our safety sensors reliably monitor danger zones and safeguard points of operation.





1 Access guarding, multiple sides

2 Area guarding

3 Presence control

4 Visual monitoring of the machine compartment

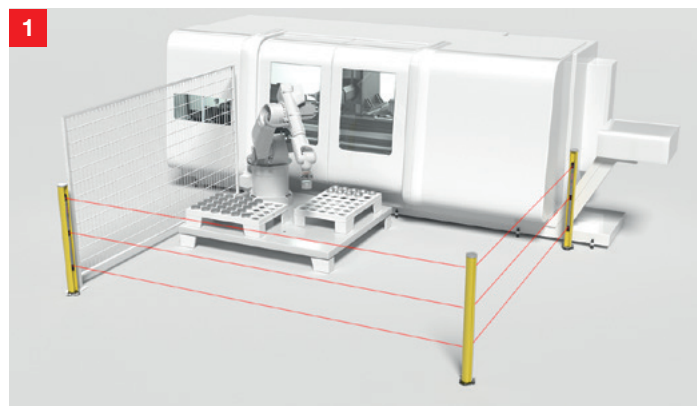
5 Point of operation guarding

6 Machine interior monitoring

Machining center

Access guarding, multiple sides

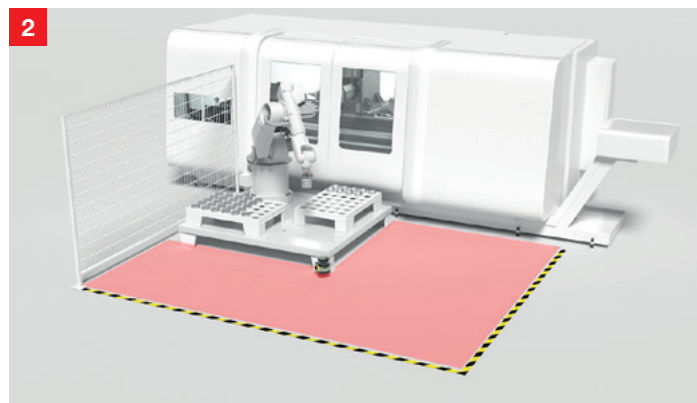
Requirement: Access to the working range is to be guarded while the machine is in operation. To enable material entry and exit, the machine must be easily accessible from multiple sides.



Solution: The MLD 300/500 multiple light beam safety devices in combination with the UMC mirror columns safe-guard access to the machine on multiple sides and over lengths of up to 70 m. The integrated laser alignment aid makes installation quick and easy.

Area guarding

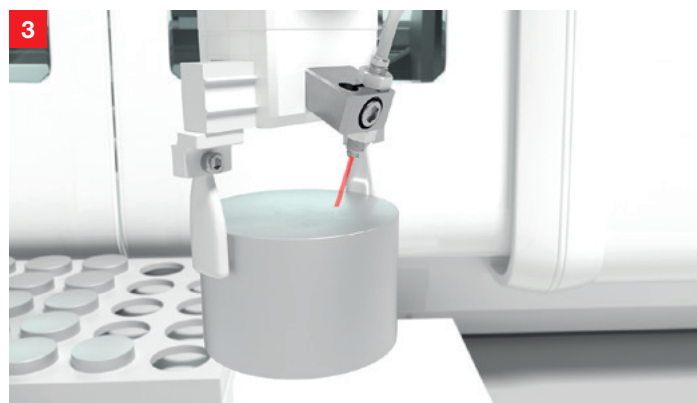
Requirement: The hazardous working range of the robot is to be guarded against entry by and the presence of persons. The interaction of man and machine requires efficient structuring of the processes.



Solution: The RSL 400 safety laser scanners monitor the working range of the robot and enable simple access to the machine. Because the presence of persons is also monitored, an automatic start-up of the robot can be integrated in the processes.

Presence control

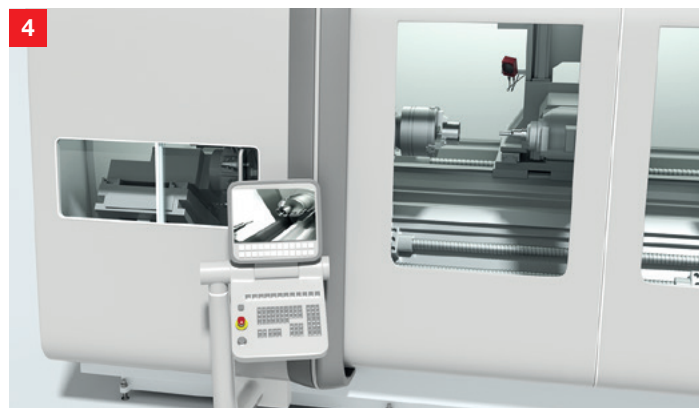
Requirement: During the automatic loading of the processing center, an industrial robot performs numerous swivel and gripping movements in a very short period of time. During the gripping movement, inductive and optical sensors check and monitor the presence and position of work pieces and parts.



Solution: Due to the constrained space, the fiber optic sensors such as the LV / KF series are ideally suited for this application. Depending on the contour of the part/work piece, various beam exits are available. The fiber-optic product range is rounded out by the dual display of the amplifier for convenient commissioning.

Visual monitoring of the machine compartment

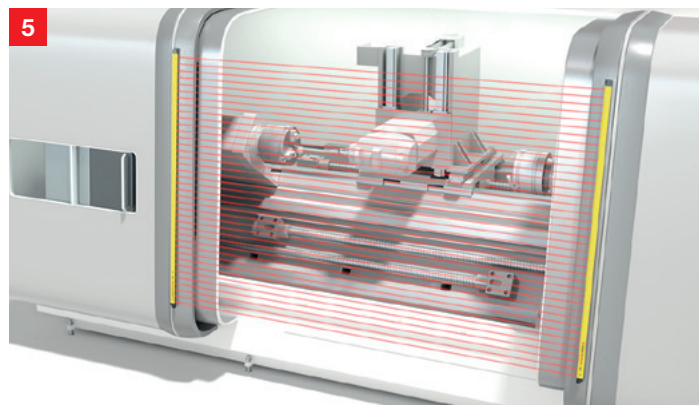
Requirement: The machine room is to be visually monitored. This also applies for areas that cannot be viewed from the outside. Due to the special environmental conditions, an industrial camera with high degree of protection is required.



Solution: The LCAM 408i color camera is optimized for use in harsh, industrial environments. 5-megapixel image resolution and Gigabit Ethernet interface ensure high image quality and fast, live-image transfer. The metal housing with degree of protection IP 67 and models with compressed air connection guarantee reliable operation.

Point of operation guarding

Requirement: The point of operation that arises from opening the safety doors must be safeguarded. Ideally, the optical protective device can easily be integrated in the machine in a space-saving manner.



Solution: The MLC 520-S safety light curtains have an especially narrow design. Together with the finely graduated length selection in increments of 30 mm and the design without dead zones, the devices can be perfectly integrated in the machine assembly.

Machine interior monitoring

Requirement: During the fully automatic loading of processing centers by means of AGVs, it must be ensured that no persons are located in the interior before the process is allowed to restart. This also applies for areas of large processing centers that are difficult to see.



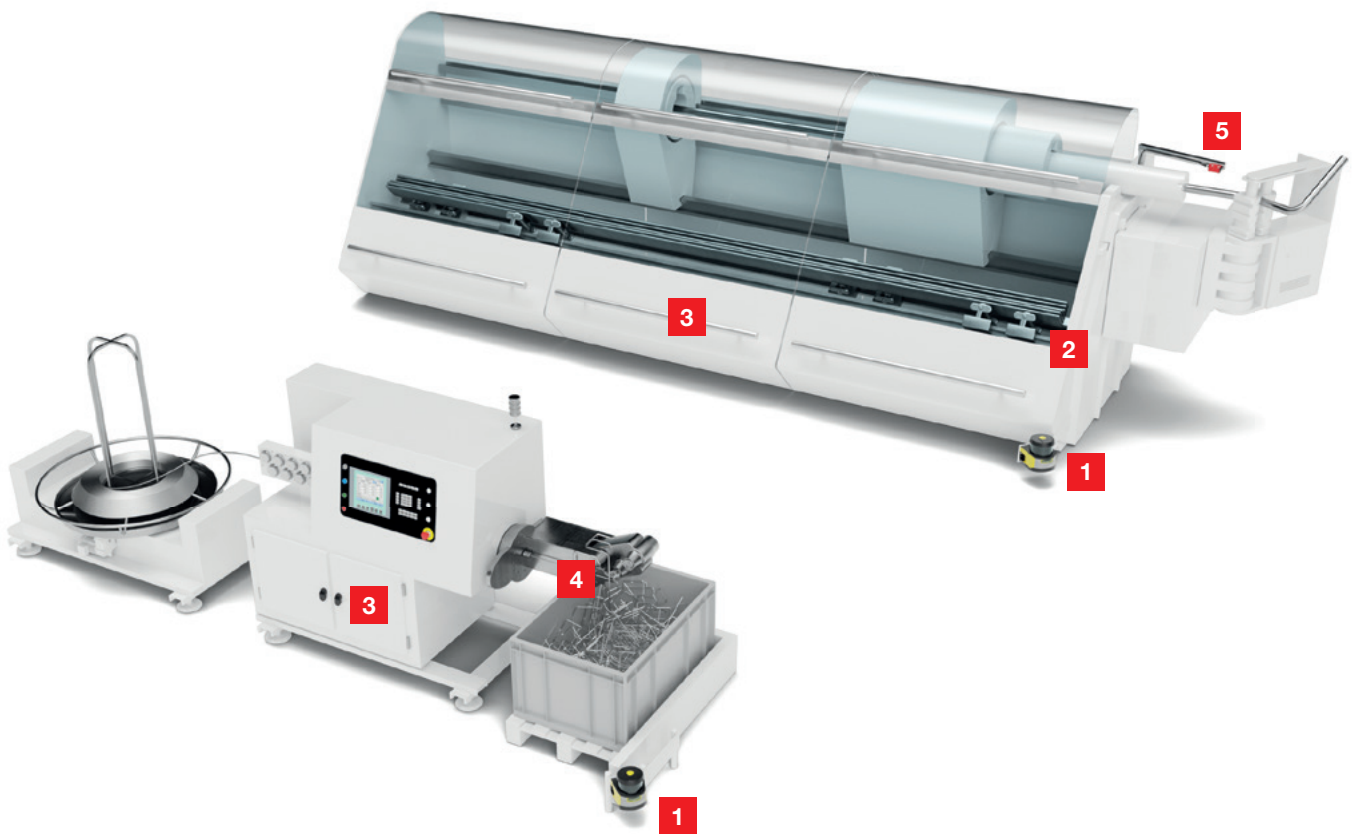
Solution: The LBK 3D safety radar system detects persons in the monitored area and operates reliably even under harsh ambient conditions. Furthermore, the radar technology allows the presence of static objects in the monitored area.

Wire- and pipe-bending machine

Tube and wire bending machines bend and cut round material. Because these machines process materials of various lengths, the area guarding at the bending head of the machines must be adaptable to different dimensions. Also important is reliable presence control of the material – regardless of its surface characteristics.

Our easy-to-configure safety laser scanners facilitate fast configuration of different-sized protective fields for this purpose. In addition, they are very resistant to particles that may separate from the material during the machining process. Our optical sensors function largely reflection-independent and therefore reliably detect a wide range of surfaces.





1 Safeguarding the bending area

4 Presence control

2 Monitoring the closing state of the protection hood

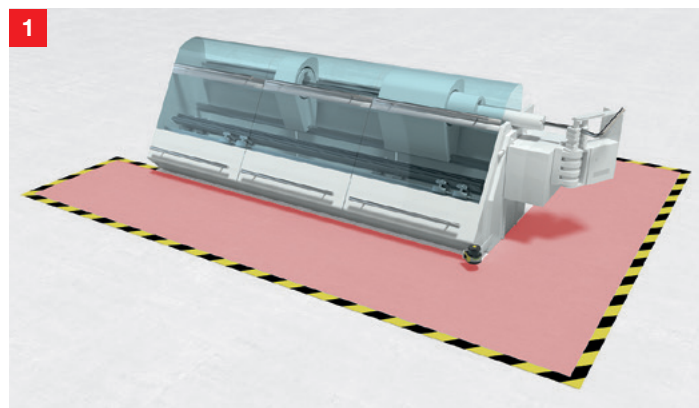
5 Presence control

3 Integration of safety sensors

Wire- and pipe-bending machine

Safeguarding the bending area

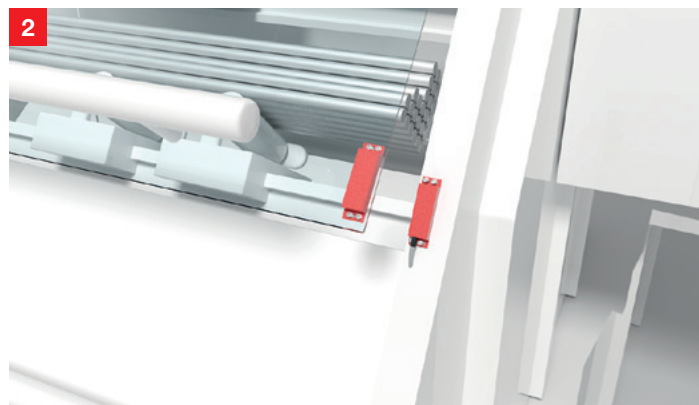
Requirement: The hazardous working range of the machine is to be guarded against entry by and the presence of persons. The contour of the monitored area is to be adapted to the contour of the machine.



Solution: The RSL 400 safety laser scanners use configurable protective fields for area monitoring. Thanks to the 8.25 m operating range and 270° scanning range, large areas can be guarded with just one device.

Monitoring the closing state of the protection hood

Requirement: The closed state of safety guards such as doors or flaps must be monitored. EN ISO 14119 stipulates that measures to protect against manipulation must also be provided. If this is not possible through constructive measures, the sensor must have a high level of protection against manipulation.



Solution: Thanks to diverse installation options, the S20/200 safety switches can be used universally. The contactless, magnetically coded switches of the MC series are ideal for use in harsh environments. The RD 800 safety transponders with RFID coding also offer maximum protection against tampering.

Integration of safety sensors

Requirement: Multiple safety sensors must be integrated into the machine or system control. Functions such as a time delay for releasing a locking device or signal connections are also to be configured.



Solution: The basic module of the MSI 400 expandable safety control already has 24 safe inputs/outputs as well as an Ethernet interface with Industrial Ethernet protocols. The safety control can be configured quickly and efficiently using the license-free configuration software MSI.designer.

Presence control

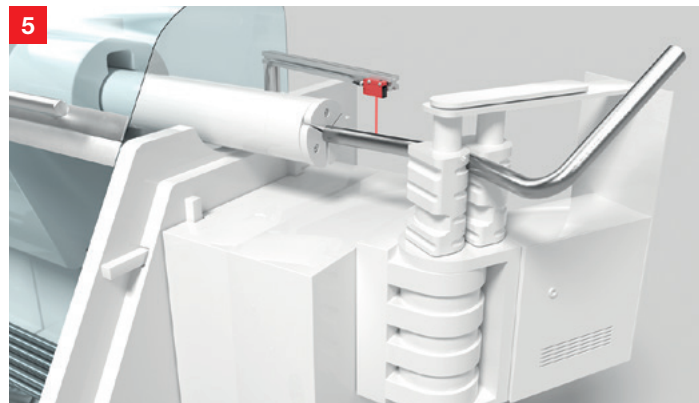
Requirement: The bending process should be performed with consistent accuracy for both simple as well as complex shapes. To do this, the presence control of the correct position of the wire is to be checked to ensure that the subsequent machining process can begin reliably.



Solution: The IS series of inductive switches offers operating ranges of up to 40 mm and a wide range of cylindrical and cubic designs. Furthermore, the models in robust full-metal construction are resistant against aggressive lubricants.

Presence control

Requirement: The bending process should be performed with consistent accuracy for both simple as well as complex shapes. To do this, the presence control for the correct position of the pipe is to be checked to ensure that the subsequent machining process can begin reliably.



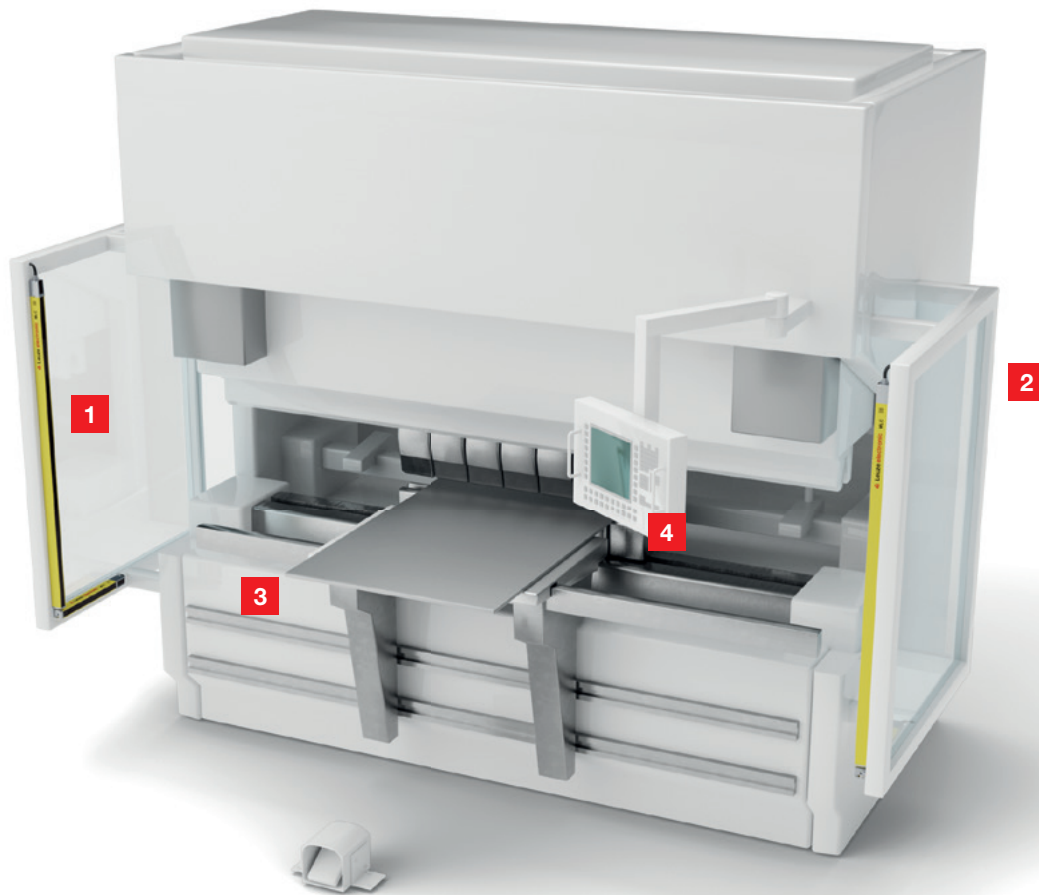
Solution: The HT 3 diffuse reflection sensors for shorter operating ranges and HT 25C for longer operating ranges ensure reliable presence control. Models with various light-spot geometries offer reliable detection of different materials. The version with IO-Link interface makes commissioning quick and easy.

Hydraulic press brake

In hydraulic press brakes, bending presses or bending machines, a wide range of sheet metal parts are produced through bending. Extreme forces are at play here in some cases. These as well as the large dimensions of the manufactured parts require various safety measures.

Our robust safety light curtains safeguard points of operation as needed. The series includes many different models. It thus offers a perfect solution for nearly every requirement. Flexible blanking functions also make it possible to adapt to different work pieces and make them safe, yet efficient to use.





1 Guarding the point of operation with protection against reaching under

2 Access guarding at rear of machine

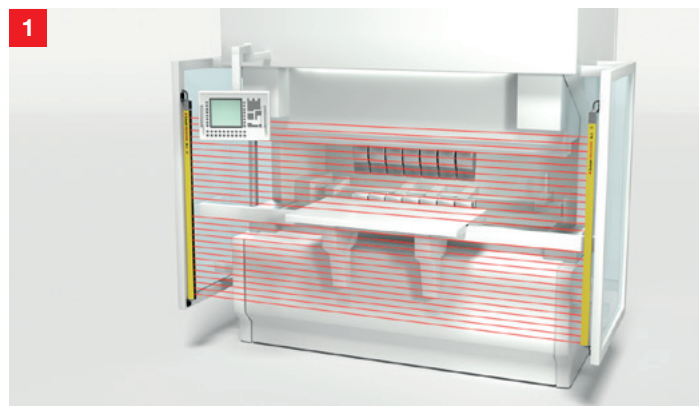
3 Integration of safety sensors

4 Detection of order data

Hydraulic press brake

Guarding the point of operation with protection against reaching under

Requirement: Guarding of the point of operation must detect violation of the protective field. Fixed or moving machine parts or work pieces inside the protective field, however, are to be permitted and must not cause a shutdown.



Solution: The MLC 530 safety light curtains have the following functions: fixed blanking, floating blanking and reduced resolution. These functions can be configured so that certain objects are permitted inside the protective field.

Access guarding at rear of machine

Requirement: Access to the rear of a machine is to be guarded by an electro-sensitive protective device. The necessary distance between the protective device and point of operation is to be as small as possible.



Solution: With their high resolution, the safety light curtains of the ELC and MLC series offer reliable finger and hand detection. Short safety distances can thereby be realized. A multiple light beam safety device of the MLD series is available as an alternative solution for larger safety distances.

Integration of safety sensors

Requirement: Multiple safety sensors must be integrated into the machine or system control. Functions such as a time delay for releasing a locking device or signal connections are also to be configured.



Solution: The basic module of the MSI 400 expandable safety control already has 24 safe inputs/outputs as well as an Ethernet interface with Industrial Ethernet protocols. The safety control can be configured quickly and efficiently using the license-free configuration software MSI.designer.

Detection of order data

Requirement: During the processing of customer and production orders, 1D- or 2D-codes must be read on the corresponding order papers for each order to record and assign individual orders.



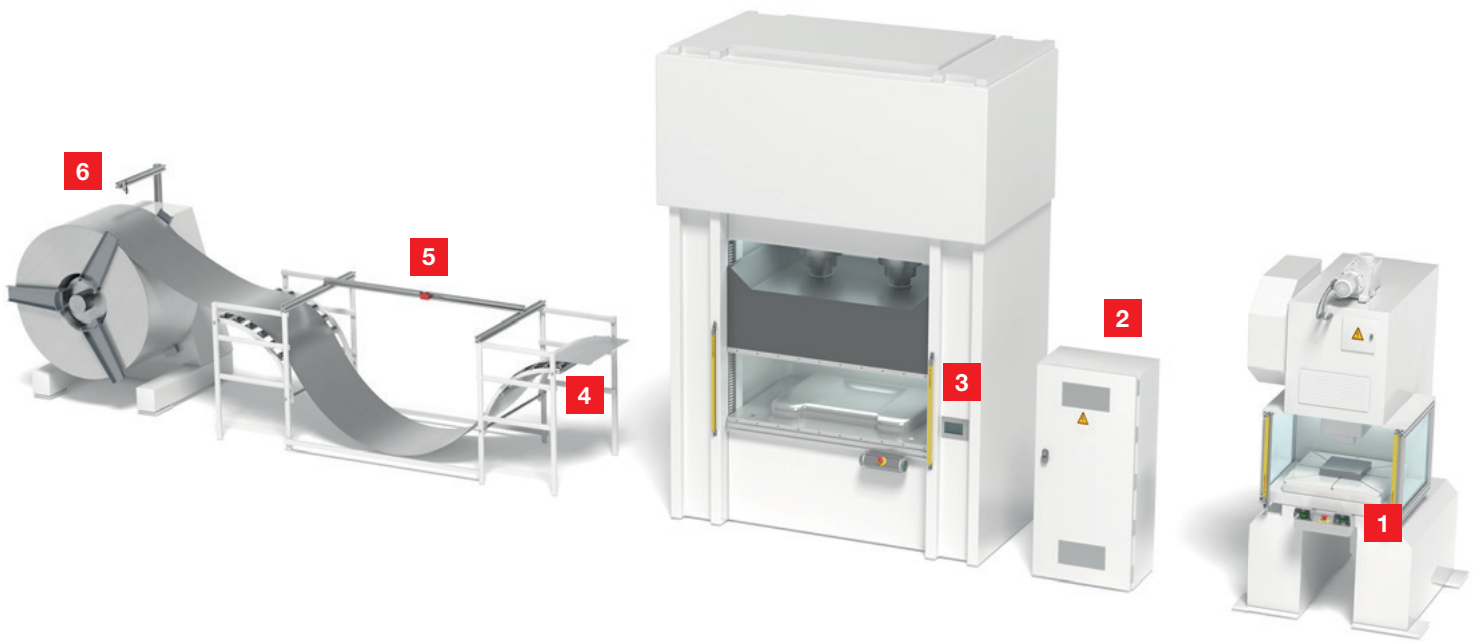
Solution: The IT147xg mobile code readers detect all commonly printed 1D- and 2D-codes. The especially ergonomic housing design is gentle on the user during continuous use. The robust devices also withstand impacts or falling onto the floor. The IT199xi are especially resistant to contamination such as oils or cleaning agents.

Hydraulic, servo and eccentric presses

Hydraulic, servo and eccentric presses are used for the entire spectrum of metal forming applications. During the forming of sheet metal plates, the operator must be reliably protected from injury in the case of manual operation. Cutting machines or presses can be automated through the use of optional sheet feeders. In this case, the sheet metal plate is unwound from the coil automatically and fed to a cutting machine or press. At the start of the unrolling process, the material must be quickly and unambiguously identified. During the unrolling process, the sheet metal must be inspected for uniform unrolling to ensure precise processing during the subsequent cutting phase.

The safety sensors and controls from Leuze can easily be incorporated in machine processes and process flows, reliably safeguard these processes, and render them tamperproof. Our measuring sensors for loop control and edge control enable smooth process flows when feeding in sheet metal. Our switching sensors reliably detect the end of the coil.





1 Guarding the point of operation with protection against reaching under

2 Monitoring of the press procedure

3 Point of operation guarding

4 Edge control

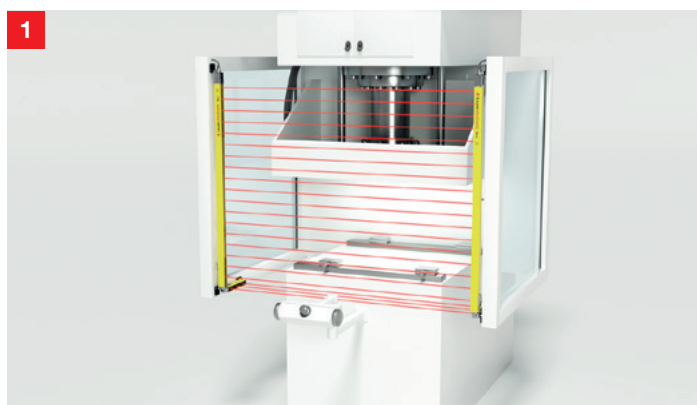
5 Loop control

6 Detection of roll diameter

Hydraulic, servo and eccentric presses

Guarding the point of operation with protection against reaching under

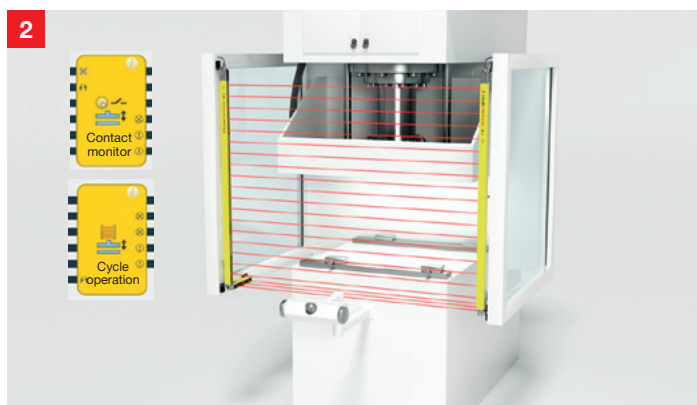
Requirement: Access to the point of operation is to be guarded by means of a safety light curtain. If the sensor can be reached under or stepped behind, then a further safety light curtain is required in order to detect these situations.



Solution: The cascadable MLC 520 and MLC 520-S safety light curtains allow up to 3 segments to be linked together. They are integrated in the control via a common connection. This makes installation easy and cost-effective.

Monitoring of the press procedure

Requirement: The specific requirements on the safety of mechanical and hydraulic presses are described in standard EN ISO 16092. To meet these requirements, the sequence of press movements must be monitored by a safety control.



Solution: Even the base model of the MSI 400 safety controls feature 24 safe inputs/outputs and can be expanded if necessary. The special function library with tailored function blocks for the control and protection of presses make configuration quick and easy.

Point of operation guarding

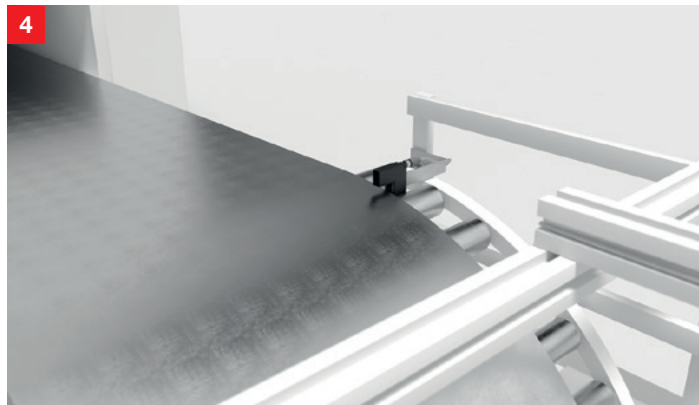
Requirement: The point of operation at a press is to be guarded by an electro-sensitive protective device. The necessary distance between the protective device and point of operation is to be as small as possible.



Solution: With various resolutions from 14 mm, the safety light curtains of the ELC 100 and MLC 500 series offer reliable finger and hand detection and thereby facilitate short safety distances. Through the optimized design, the ELC 100 and MLC 500 in the V-version are especially resistant to shock and vibration.

Edge control

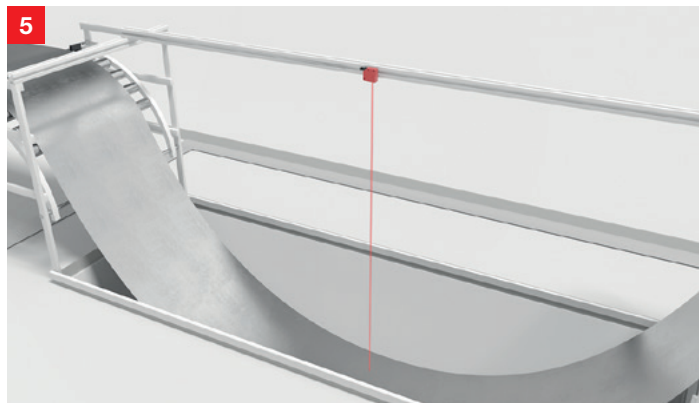
Requirement: The blank cutting system cuts the material that is unwound from the endless band into so-called plates or blanks. To ensure that they are identical in shape and dimensions and within tolerance, the edge must be precisely controlled.



Solution: With their high level of reproducibility of ± 0.03 mm, the GS 754B CCD fork photoelectric sensors ensure precise determination of the web edge. The devices can be flexibly integrated via analog output or serial interface.

Loop control

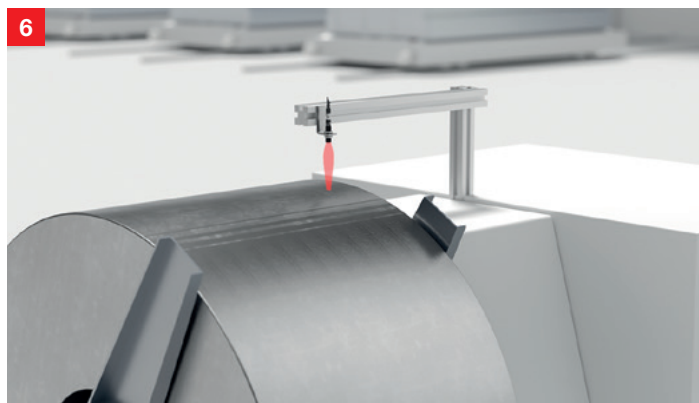
Requirement: In the cutting system, the cutting process must be decoupled from the belt transport. The sag of the loop is to be determined contact-free to communicate the necessary measurement values to the control for determining the haul-off speed.



Solution: The sensors of the ODS10 / 110 and ODSL 96 series, which operate according to the time-of-flight measurement principle (TOF), offer measurement ranges of several meters. They feature a high resolution and a high level of reproducibility. The devices can be flexibly integrated via analog output, serial interface and IO-Link.

Detection of roll diameter

Requirement: To enable an automatic coil change before the material runs out, the diameter of the coil must be constantly monitored. Cost-intensive downtime can thereby be minimized.



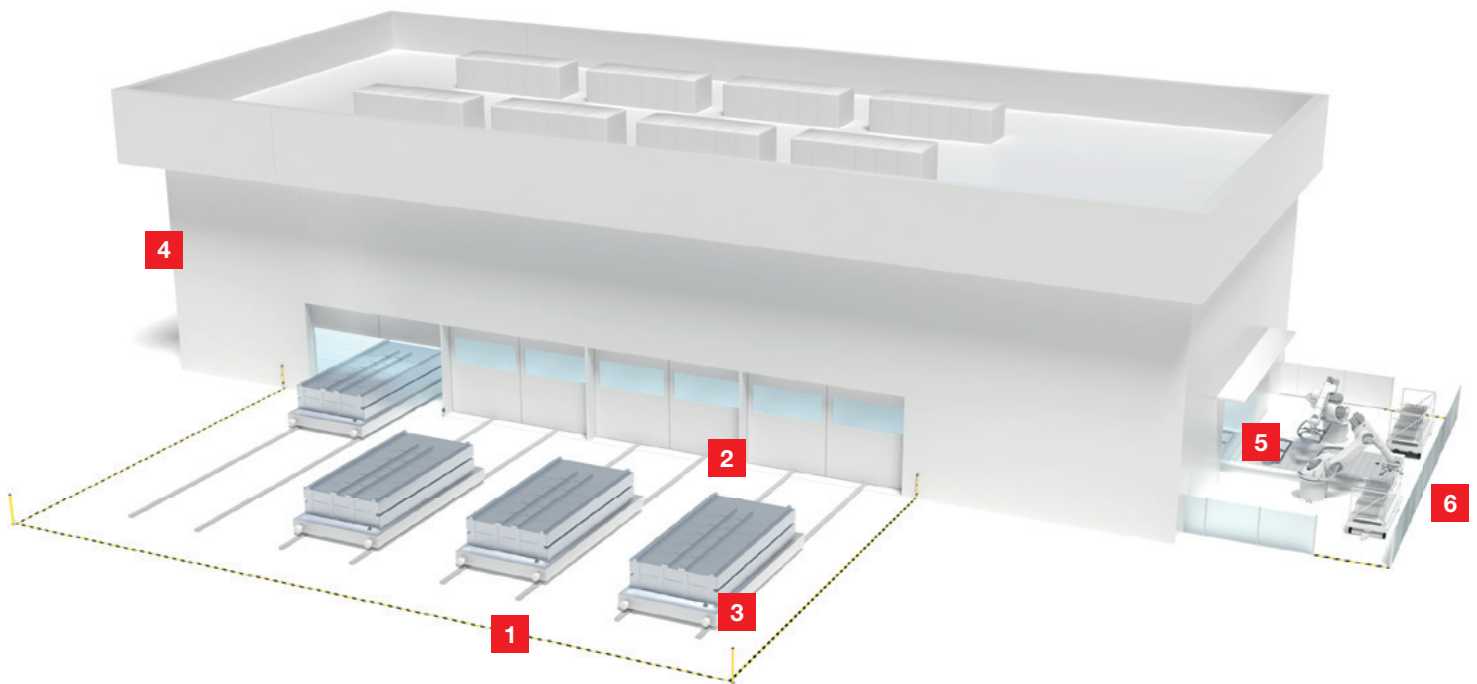
Solution: The measuring ultrasonic sensors of the DMU 300 / 400 series offer an especially large measurement range of up to 6,000 mm. The robust devices in plastic and full-metal versions are characterized by short response times and high resolutions. They are available with analog current or voltage output and IO-Link interface.

Press line

Made from massive steel rolls – known as coils – molded parts, such as car body parts, are produced in various work steps. Whether for cutting the coils or punching, pressing and shaping the blanks: our sensors accompany and safeguard all manufacturing steps, even under harsh environmental conditions.

The applications are as diverse as our product range, which is tailored to these applications. Our inductive and optical sensors check and monitor the presence and position of parts. Our identification systems record data to ensure the traceability of those parts. And at the cutting systems, our sensors supply measurement values for loop control and edge control.





1 Access guarding on press lines

2 Anteroom guarding on press lines

3 Presence control of the tool

4 Monitoring of the stack height

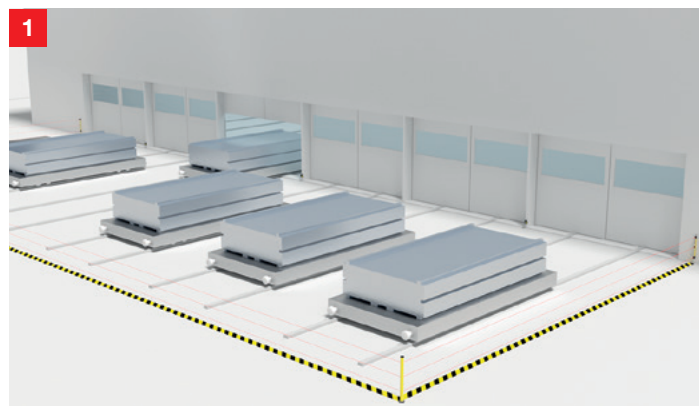
5 Presence control for controlling the gripper robot

6 Code reading on the rack

Press line

Access guarding on press lines

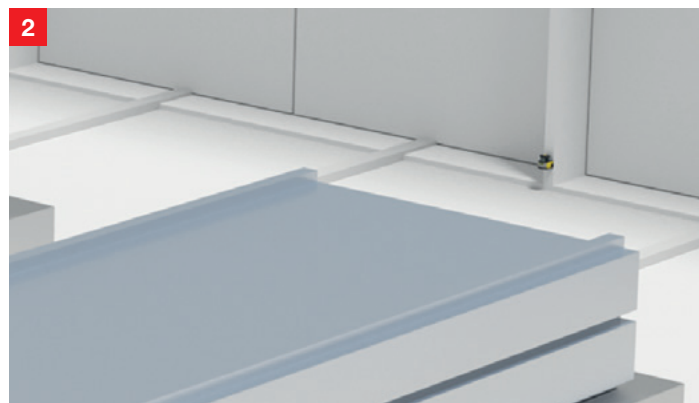
Requirement: The press tools are brought to the press anteroom with gantry cranes and positioned in the press during a tool change. During this process, the entire anteroom is a safety-critical area. The access of persons must be monitored.



Solution: The multiple light beam safety devices of the MLD 500 series offer economical access guarding for large areas. As transmitter-receiver systems with operating ranges of 70 m, they are used together with mirror columns and thereby safeguard the entire press anteroom.

Anteroom guarding on press lines

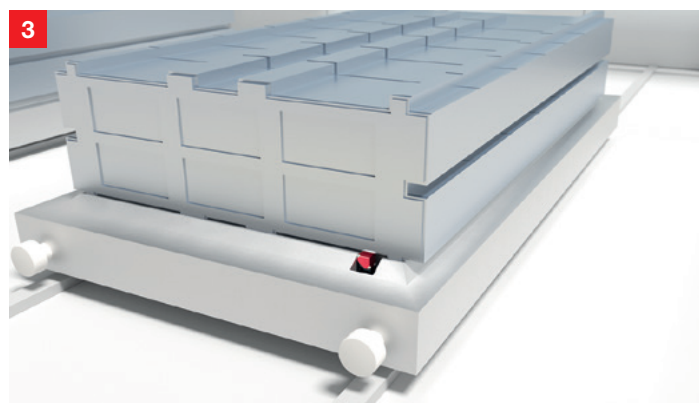
Requirement: Before the carriages move into the press, a check must be performed to ensure that no persons are in front of the gates. During entry, the area to the side of the carriages is to be secured to prevent persons from entering the press line alongside a carriage.



Solution: With its configurable and switchable protective fields, the RSL 400 safety laser scanner secures the area in front of the respective door. With its large operating range of 8.25 m and two parallel protective functions, two entrance areas can be simultaneously monitored independent of one another with just one device.

Presence control of the tool

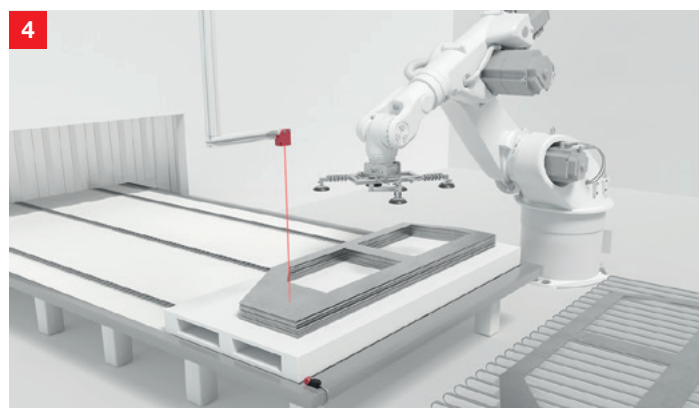
Requirement: The fitting tool is positioned on the shuttle carriage by means of a crane. In doing so, the proper seating is to be checked so that automatic locking can occur.



Solution: The IS/ISS 244 models with cubic design are the best suited from our wide range of inductive switches. The compact sensors can be installed quickly and in a space-saving manner. Status indicators that are easily visible from the side simplify commissioning and visualize states.

Monitoring of the stack height

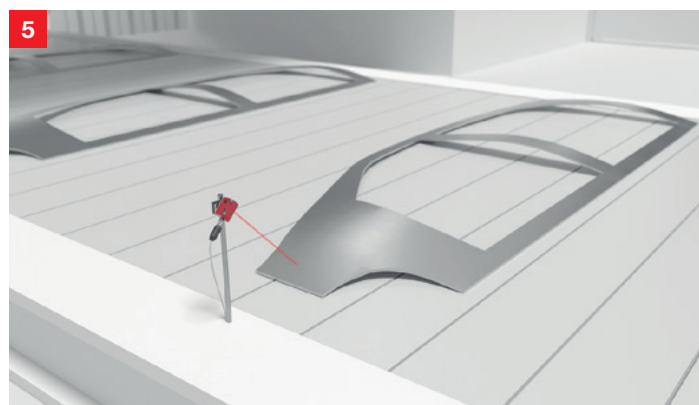
Requirement: During operation, a continuous material infeed must be ensured. If the last blank is gripped by the robot or the filling level of the blank stack drops below a defined level, resupply is to be triggered automatically. To do this, the stack height of the blanks is to be monitored.



Solution: Devices with time-of-flight measurement (TOF) from our wide range of switching and measuring distance sensors are especially well suited for larger operating ranges. These include the HT 10 switching sensors, which monitor a defined stack height to ensure that it does not drop below a defined level, and the ODS 10 measuring sensors, which determine the height of the stack.

Presence control for controlling the gripper robot

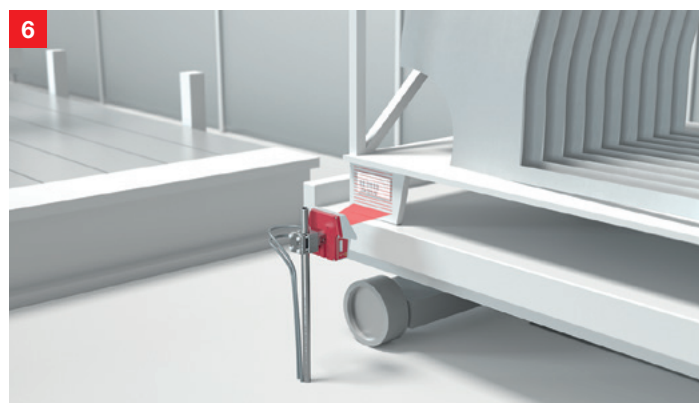
Requirement: At the end of the press line, the finished molded sheet metal parts are automatically removed and loaded on transport vehicles for further processing. To control the gripper robot, the presence of the parts on the belt conveyor must be checked.



Solution: From our wide product range of switching sensors, the HT 25C series combines above-average function reserve with compact size. Parts with glossy and even dark or structured surface are reliably detected. The devices are available as red light and infrared versions.

Code reading on the rack

Requirement: The finished sheet metal parts are stored on movable racks that can be transported, e.g., by automatic tigger trains or AGVs, to the further processing in the body shop. To ensure that the rack is used correctly, the identification code attached to the rack that is to be read.



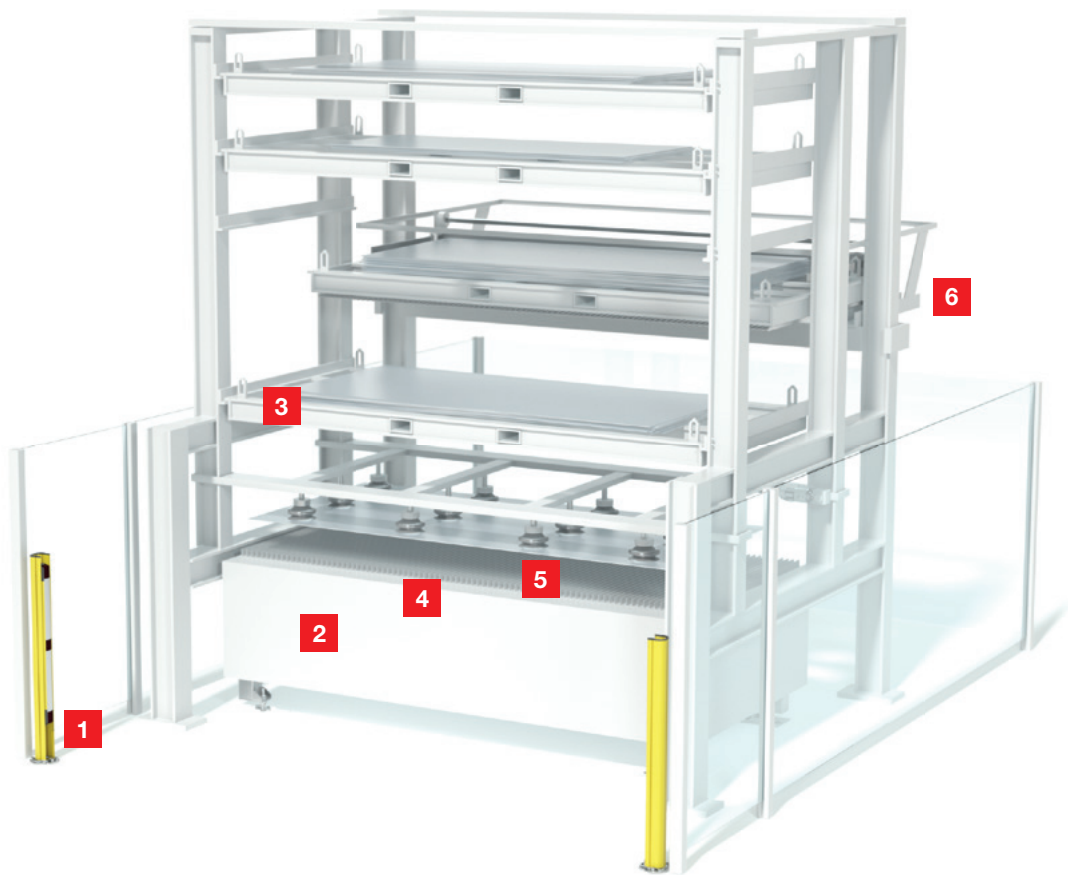
Solution: Depending on the attachment of the code and the reading distance, a BCL 300i decodes the code as a raster scanner and transfers the data to the PLC or to the material flow computer. If the label has large position tolerances, device models with integrated oscillating mirror are used.

Tower storage system

Intelligent solutions for the storage of sheet metal plates and long goods optimize material flow, improve machine utilization and improve work safety and process reliability. Through the compact design of a tower storage system, it is thereby possible, for example, to optimally utilize valuable production space as an intermediate warehouse, buffer storage or for material stockage.

Our components guarantee smooth processes and ensure safety. Typical areas of use are access guarding at dangerous areas of machines and systems. Our inductive and optical sensors check and monitor the presence and position of sheet metal plates or stacks. And they optimize the process flow, thereby ensuring high availability of the machine or system.





1 Access guarding, one side

2 Integration of safety sensors

3 Projection monitoring

4 Presence control for sheet metal

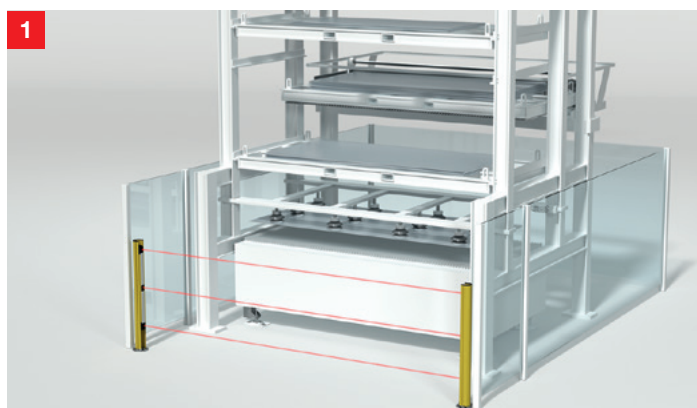
5 Presence control for sheet metal

6 Positioning

Tower storage system

Access guarding, one side

Requirement: Access to a dangerous area at a machine or system is to be guarded. To enable simple entry and exit of material, optoelectronic safety sensors are to be used.



Solution: The MLD 300/500 multiple light beam safety devices provide cost-effective access guarding solutions. The transceiver models with an operating range of up to 8 m are especially easy to install. For wide-area guarding, transmitter/receiver models are available with a range of up to 70 m.

Integration of safety sensors

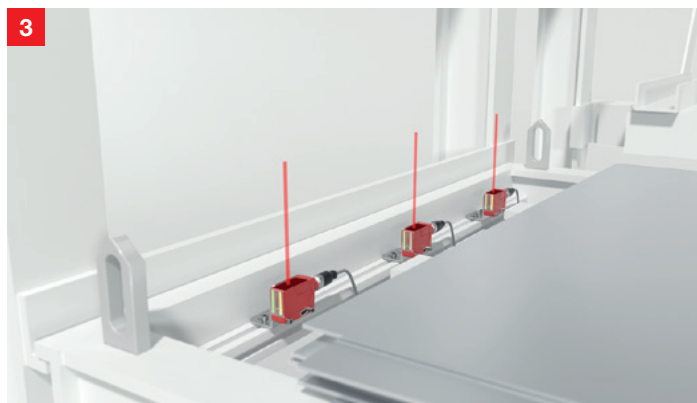
Requirement: Multiple safety sensors must be integrated into the machine or system control. Functions such as a time delay for releasing a locking device or signal connections are also to be configured.



Solution: The basic module of the MSI 400 expandable safety control already has 24 safe inputs/outputs as well as an Ethernet interface with Industrial Ethernet protocols. The safety control can be configured quickly and efficiently using the license-free configuration software MSI.designer.

Projection monitoring

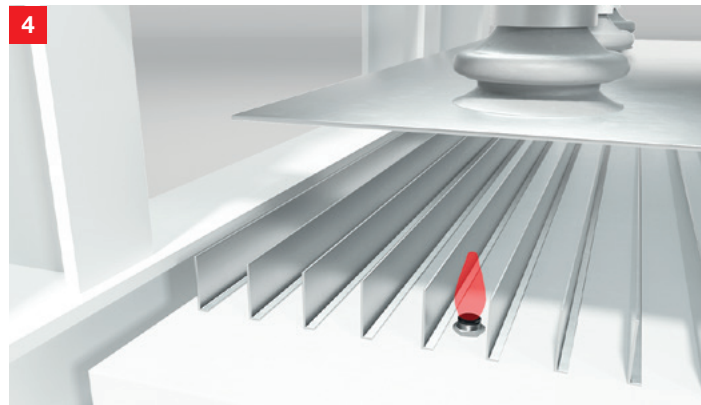
Requirement: To avoid collisions with the load handling device during the storage and retrieval process, a check is to be performed to determine whether sheet metal plates protrude at the loading area. To reliably detect even slightly rotated sheet metal plates, the check is to be performed at multiple points.



Solution: The HT 25C diffuse reflection sensors with background suppression ensure reliable presence control. With their degrees of protection IP 67 and IP 69K as well as the active ambient light suppression, the extremely compact sensors offer a very high level of flexibility and reliability.

Presence control for sheet metal

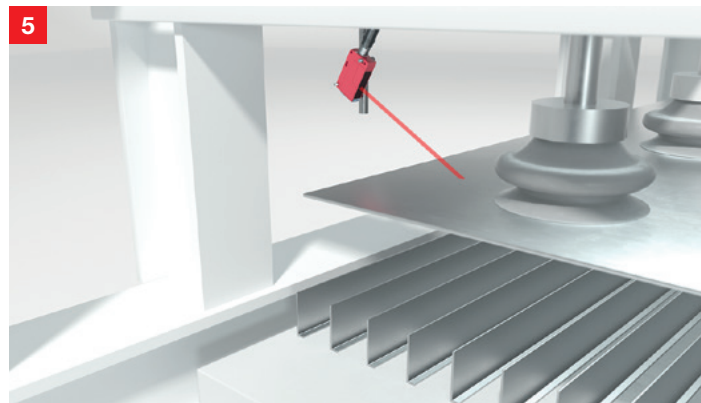
Requirement: After the pick & place unit deposits the sheet metal plate, the presence of the sheet metal plate is to be checked at the storage location to allow the subsequent process step to start, e.g., infeed of the material to the machine.



Solution: The FT 328i energetic diffuse sensors in the sturdy plastic housing with metal thread facilitate robust material detection. The simple adaptation to the material using the teach button enables fast and simple commissioning. Available as an economical alternative are the inductive switches of the IS 200 series.

Presence control for sheet metal

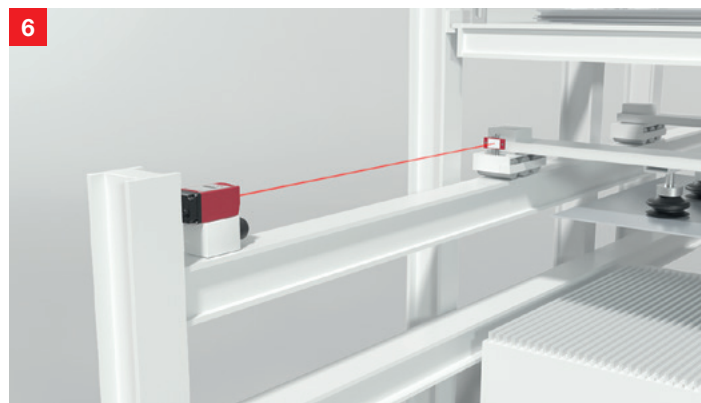
Requirement: After the sheet metal plate is picked up by the pick & place unit, the presence of the sheet metal plate in the unit is to be constantly monitored to ensure a smooth process flow.



Solution: The HT 46C and 25C diffuse reflection sensors with background suppression ensure reliable presence control. Models with various light-spot geometries offer optimum adaptation to the application. Flexible mounting brackets, cables and IO-Link models are also available.

Positioning

Requirement: To position the load handling device in the tower rack, the distance to a specified reference point is to be determined.



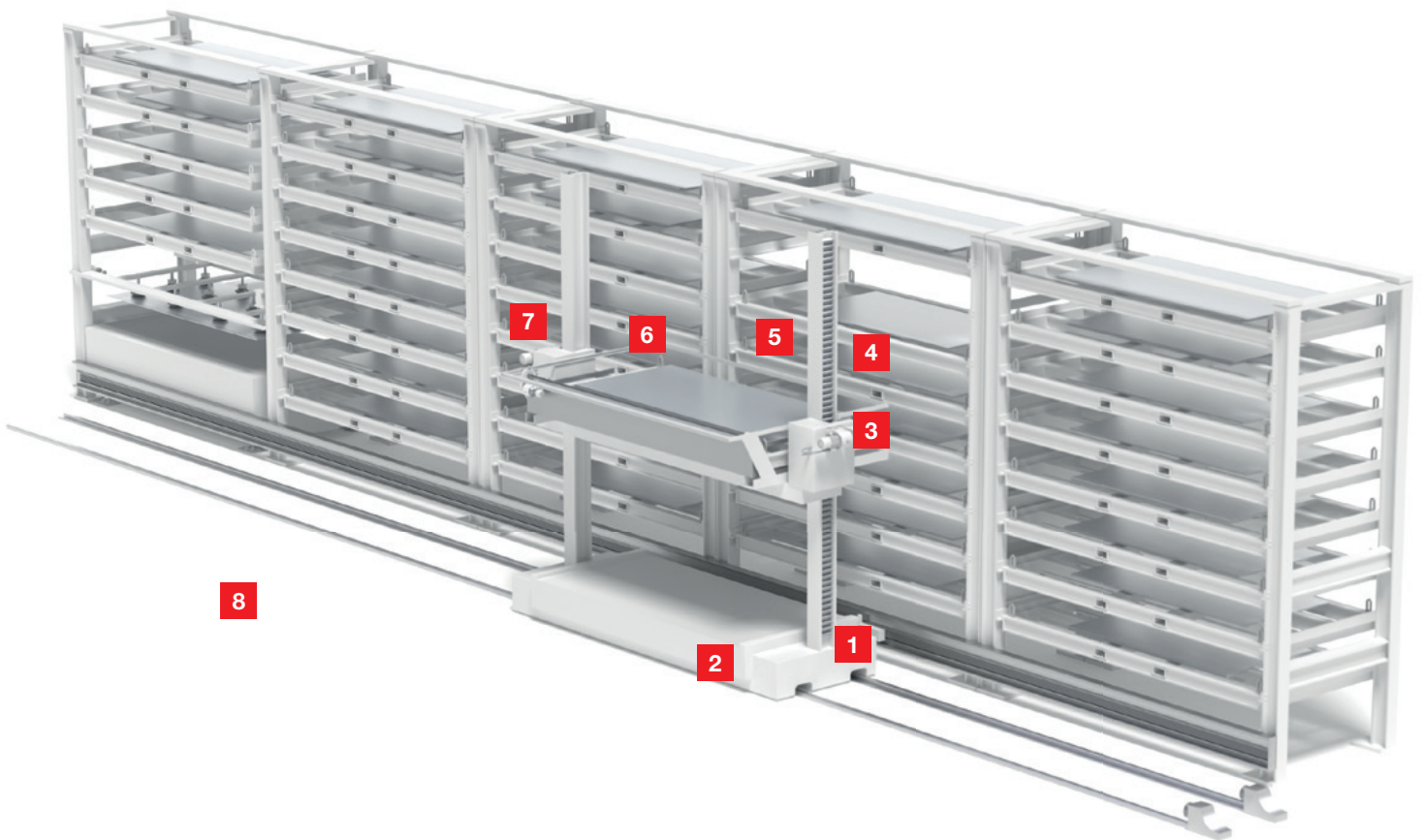
Solution: With the focused laser, the ODSL 30 optical distance sensors offer operating ranges of up to 65 meters and, with an absolute measurement accuracy of ± 2 mm, are ideal for precise positioning.

Storage system with high-bay storage device

Flexible storage systems make a significant contribution to the automation of production processes. In high-bay warehouses, the performance of the high-bay storage devices is especially important. They perform the automatic storage and retrieval of materials such as sheet metal plates and long goods. Their speed and reliability are, thus, decisive for the overall performance and availability of the systems.

Our sensor solutions enable optimum operation of the high-bay storage devices. They capture position data in the travel/lifting area and optically transmit travel commands and position data to the control. In addition, our sensors perform the compartment occupation check and prevent material from being pushed through. Reliable operation and high availability of the system are thereby ensured.



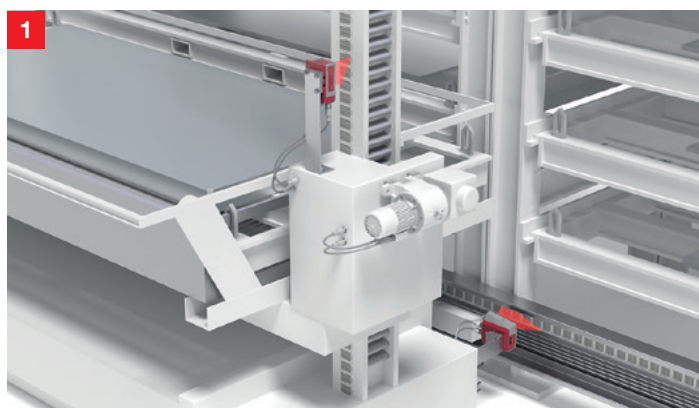


- 1 Positioning (linear)
- 2 Positioning (linear)/ data transmission
- 3 Compartment fine positioning in x- and y-axis
- 4 Compartment fine positioning in x-axis
- 5 Compartment occupation check/ push-through protection
- 6 Presence control
- 7 Projection monitoring
- 8 Access guarding on conveyor lines

Storage system with high-bay storage device

Positioning (linear)

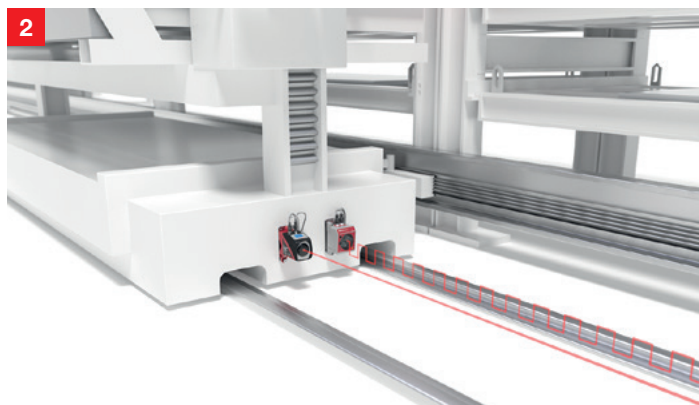
Requirement: The high-bay storage device or load handling device must be positioned in the X-direction (travel axis) and Y-direction (lifting axis) accordingly for the pallet to be approached.



Solution: The BPS 300i compact bar code positioning systems enable exact positioning. Interfaces for fieldbuses, industrial Ethernet as well as SSI or serial connections make integration in the control simple and flexible. The configuration and diagnosis of the devices are just as easy.

Positioning (linear) / data transmission

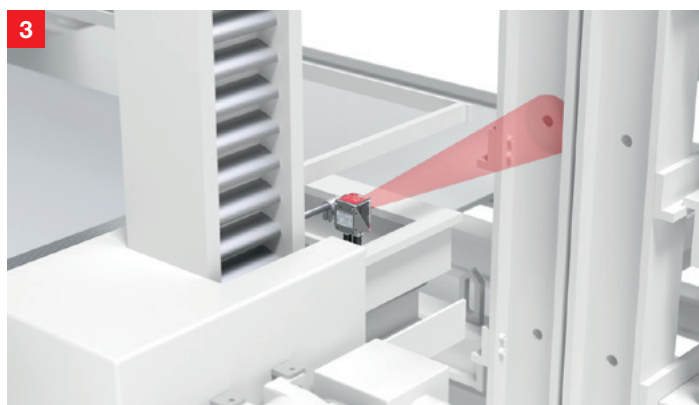
Requirement: The high-bay storage device or load handling device must be appropriately positioned in the X-direction (travel axis) and Y-direction (lifting axis). Travel commands and positioning data are to be optically transferred to the control to ensure high availability of the system.



Solution: The AMS 300i laser distance measurement devices are used for exact positioning. The DDLS 500i data transmission photoelectric sensors function fault-free without offset directly next to the AMS 300i devices. Selectable operating ranges, interfaces and protocols ensure optimum solutions.

Compartment fine positioning in x- and y-axis

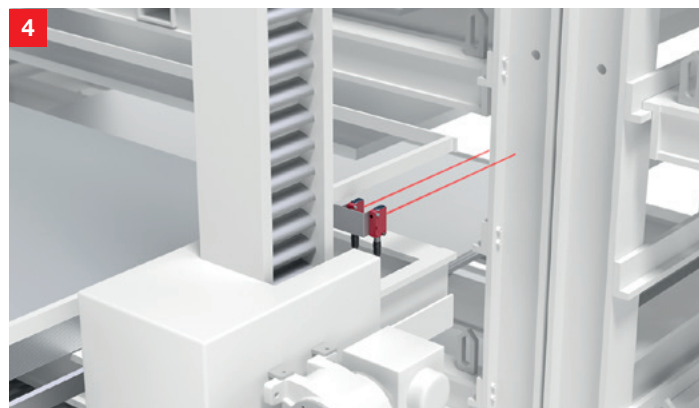
Requirement: Following rough positioning, additional optical sensors are used for the compartment fine positioning of a high-bay storage device in the horizontal (X) and vertical (Y) direction.



Solution: The camera-based IPS 200i are predestined for compartment fine positioning. Extremely small size, simple operation and configuration via the integrated web server are a few of the highlights of the series. The data is transferred to the control via the integrated Ethernet TCP/IP or PROFINET interface.

Compartment fine positioning in x-axis

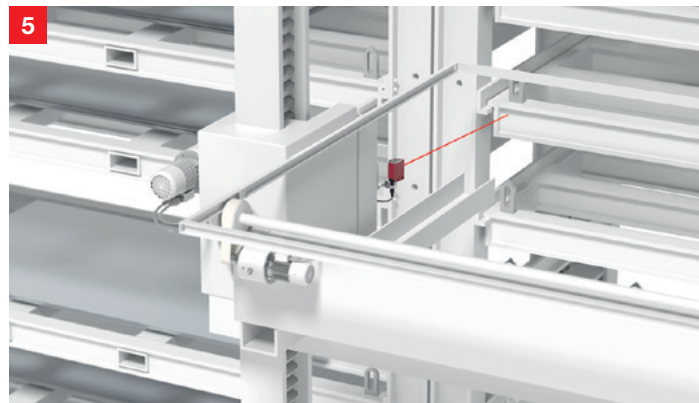
Requirement: Before the material is transferred, the correct position of the load handling device in front of the storage location is to be checked in the horizontal and vertical direction (compartment fine positioning). This is to be performed by optically sensing the column or the bar edge.



Solution: The HT 46C diffuse reflection sensors with background suppression are used for positioning the load handling device. A wide range of profile types as well as color or glossy surfaces are reliably detected. Thanks to the optimized beam path, the sensors function reliably even in the case of columns with holes.

Compartment occupation check / push-through protection

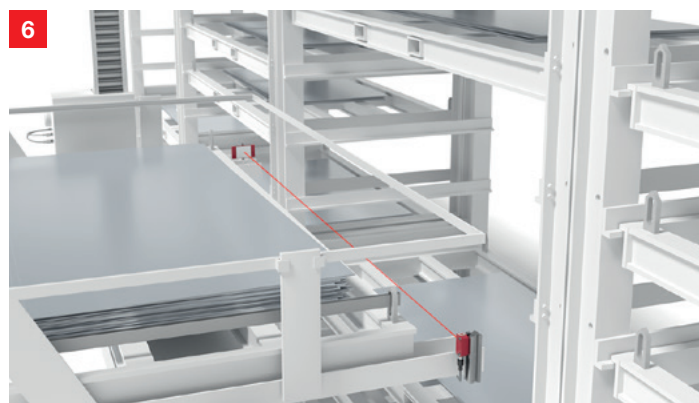
Requirement: Before a pallet or a cassette can be stored in a rack, a check must be performed to determine whether the rack is empty. When retrieving, on the other hand, it is necessary to monitor the entry of the telescopic arm or fork to ensure that the stored material is not pushed in the wrong direction.



Solution: Thanks to their focused laser, sensors ODS 9, ODS/HT 10 and HT 110 detect the cassette at an operating range of up to eight meters. With switching product models, the movement of the cassette can be detected with the help of the window function.

Presence control

Requirement: During a material movement, the cassette with the sheet metal plates, for example, is checked for presence. Especially after retrieval, a check must be performed to ensure that the load handling device has completely pulled in the material in order to avoid collisions and downtime.

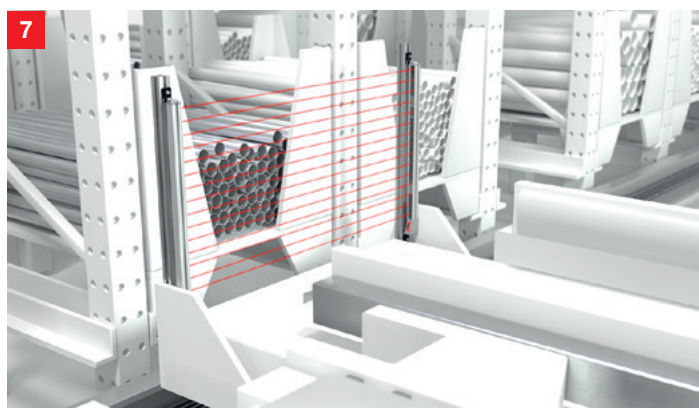


Solution: In addition to large operating ranges and increased function reserves, series 3 is also characterized by simple handling. Thus, the devices stand for reliable object detection even with thin sheet metal plates. The optional IO-Link interface provides additional benefits, such as fast commissioning and diagnostics functions.

Storage system with high-bay storage device

Projection monitoring

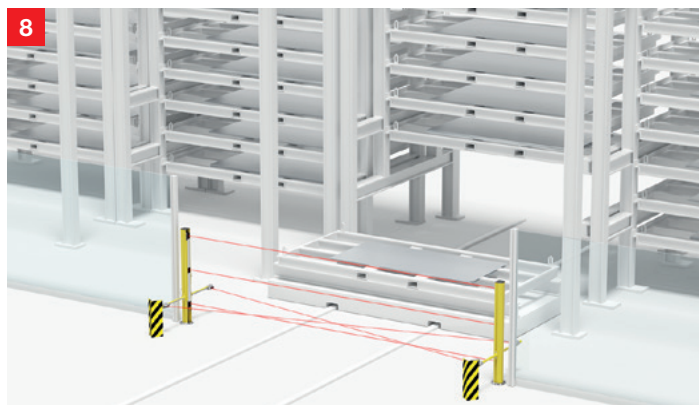
Requirement: After loading, e.g., a cassette on the load receptacle, a check is to be performed to determine whether the cassette or material is protruding and thereby posing a risk of collision. An optical sensor is to monitor a large surface on the load handling device here and ensure reliable operation.



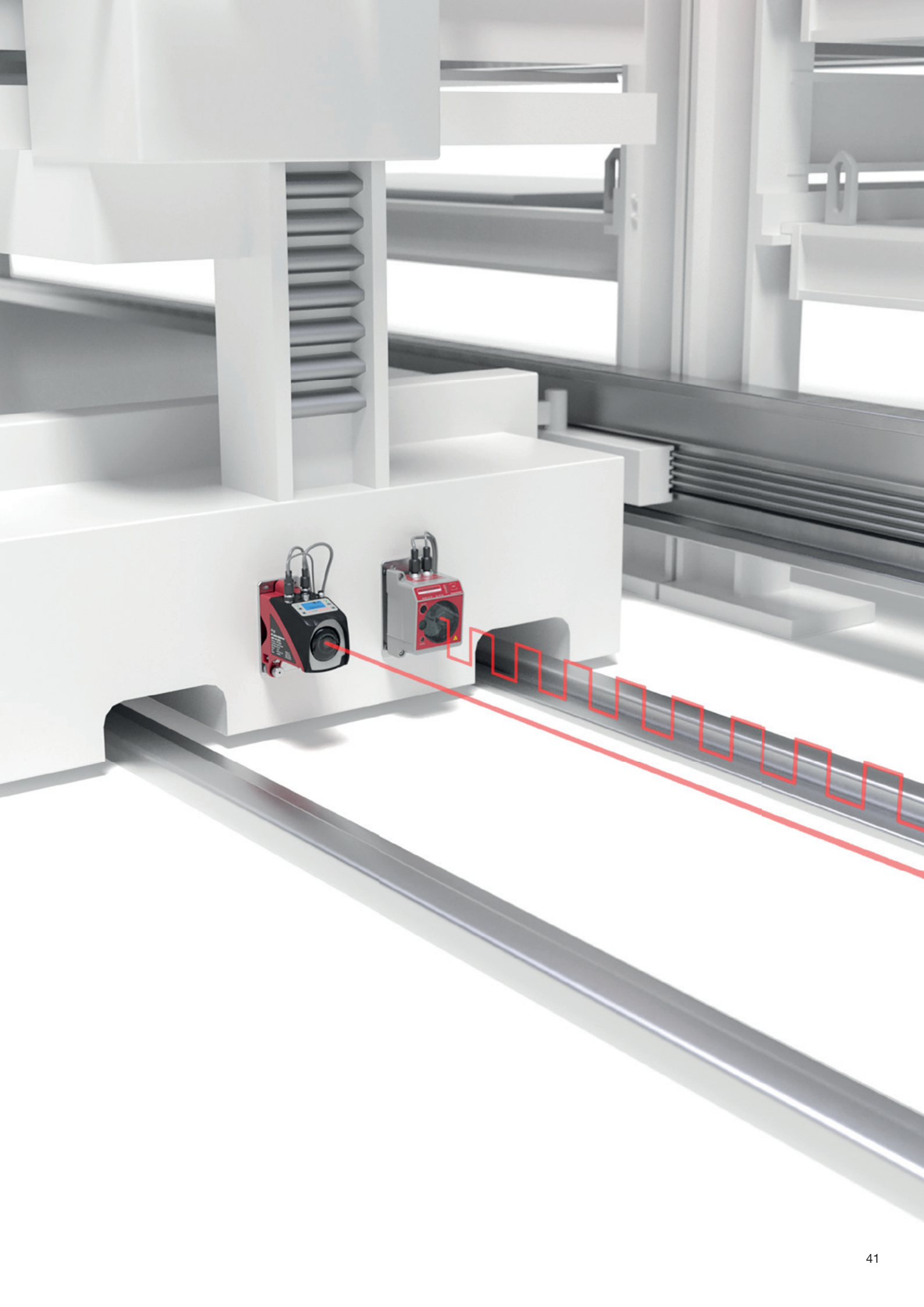
Solution: The CSL 710 switching light curtains monitor large areas and convince with their ease of configuration and large function reserves. Various fastening materials enable optimum integration. Alternatively, the CML 700i measuring light curtains with integrated PROFINET or PROFIBUS interface are available.

Access guarding on conveyor lines

Requirement: Access guarding on conveyor lines is to prevent persons from accessing the danger zone, while at the same time allowing the transported goods to pass through.



Solution: The muting function bridges the safety sensor in a controlled manner to allow the transported goods to pass through. This function is already integrated in the MLD 500 multiple light beam safety devices and the MLC 500 safety light curtains. The MSI-MD-FB muting interface and MSI 400 safety control provide an external muting control.

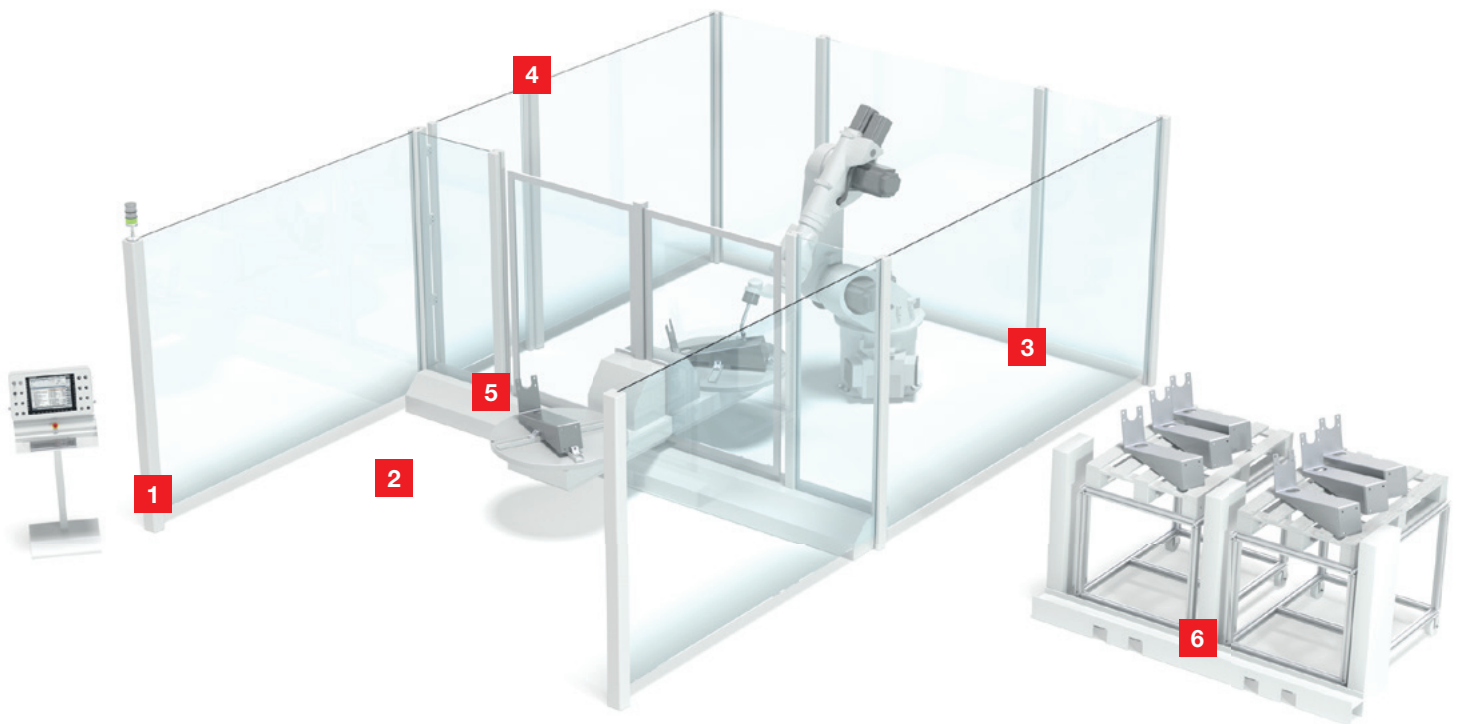


Production cell

The factory of the future is characterized by flexible production cells. From individual production cells to a fully networked production system of a smart factory. What all have in common are the automated and linked processes in and between the cells. This improves productivity, allows for a more efficient use of materials and enables higher product quality.

With our sensor solutions, processes run efficiently: from material flow, in which the presence of work pieces or parts is detected, to information flow via intelligent sensors, whose data is captured and analyzed with the help of new communication technologies across all levels of a production system. The applications and possibilities here are as diverse as our product range tailored to them. Our inductive and optical sensors check and monitor the presence and position of work pieces and parts. Our identification systems record data for the traceability of those work pieces and parts and for the next work step. Our safety solutions reliably and flexibly safeguard hazardous areas.





1 Access guarding, one side

2 Area safeguarding

3 Restart protection and monitoring of hidden areas

4 Monitoring of doors, with locking device

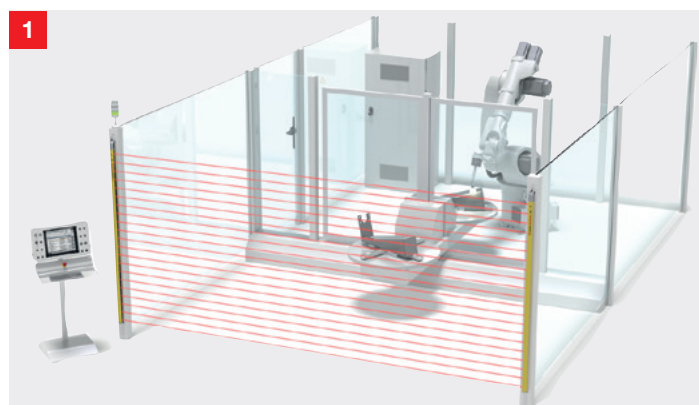
5 Presence control of the work piece

6 Presence control and pallet identification

Production cell

Access guarding, one side

Requirement: Access to the dangerous area of the robot cell is to be guarded.
To enable simple entry and exit of material, optoelectronic safety sensors are to be used.
The compact layout of the cell means that the necessary distance between protective device and danger zone must be as small as possible.



Solution: The ELC 100 and MLC 500 safety light curtains offer high resolutions for short safety distances and a compact system design. If there is sufficient space, the MLD 500 multiple light beam safety devices are used. These are optionally available with integrated muting functions.

Area safeguarding

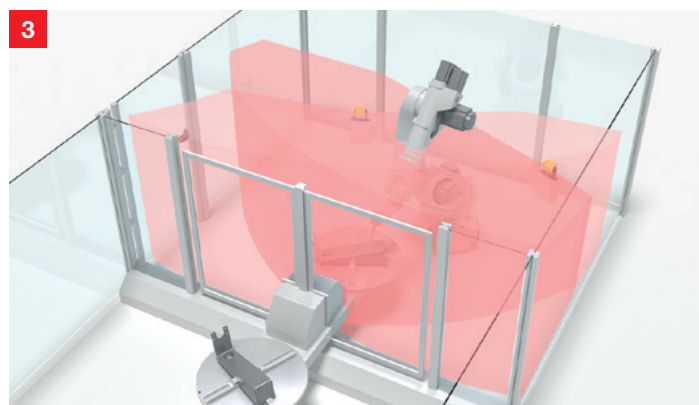
Requirement: Access to the dangerous area of the robot cell is to be guarded.
To enable an automatic start/restart, this area must be constantly monitored for the presence of persons.



Solution: The RSL 400 safety laser scanners use configurable protective fields for area monitoring. Thanks to the 8.25 m operating range and 270° scanning range, large areas can be guarded with just one device. The models with PROFIsafe / PROFINET interface can easily be integrated into industrial networks.

Restart protection and monitoring of hidden areas

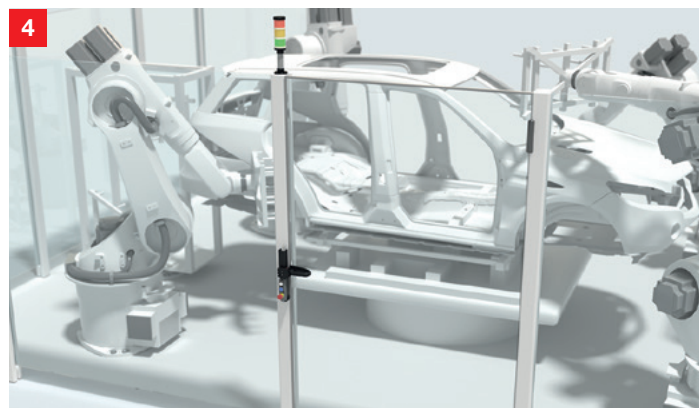
Requirement: To prevent danger, the process is not permitted to restart until it has been ensured that no persons are in the work area or in the hidden area. Safe operation and high availability must also be guaranteed under harsh ambient conditions – such as dirt or welding sparks.



Solution: With its protected area, the LBK 3D safety radar system monitors for the presence of persons – even under harsh ambient conditions. Furthermore, the radar technology allows the presence of static objects in the monitored area.

Monitoring of doors, with locking device

Requirement: Areas with hazardous movements can be entered via safety doors to allow maintenance. If the movement does not stop immediately after the door is opened, the door is to be guarded by a safety switch with locking device. Work and safety conditions are to be signaled.



Solution: The robust safety switches with locking device of the L series lock safety doors until they are released by means of an electrical signal. In addition to the standard models, there are devices with integrated control buttons and emergency stop as well as devices with RFID-coded actuator. Optical and acoustic signalers of the A7 series complement the integrated LED status displays.

Presence control of the work piece

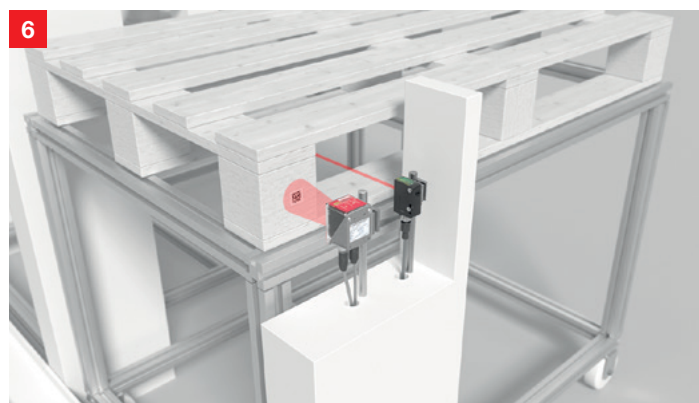
Requirement: The presence of components as well as shapes, holes and openings or other special features is to be detected prior to the next processing step.



Solution: The HT 25C diffuse reflection sensors with background suppression for longer operating ranges and HT 3 for shorter operating ranges ensure reliable presence control. Models with various light-spot geometries offer optimum adaptation to the application. Flexible mounting brackets, cables and IO-Link models are available.

Presence control and pallet identification

Requirement: In addition to the traceability of individual processing steps, the “track & trace” concept also includes determination of the current location. Depending on the used system, the 1D-/2D-code affixed to the pallet is to be captured. To start the read process of a code reader, the presence of the pallet in the work station is to be detected.



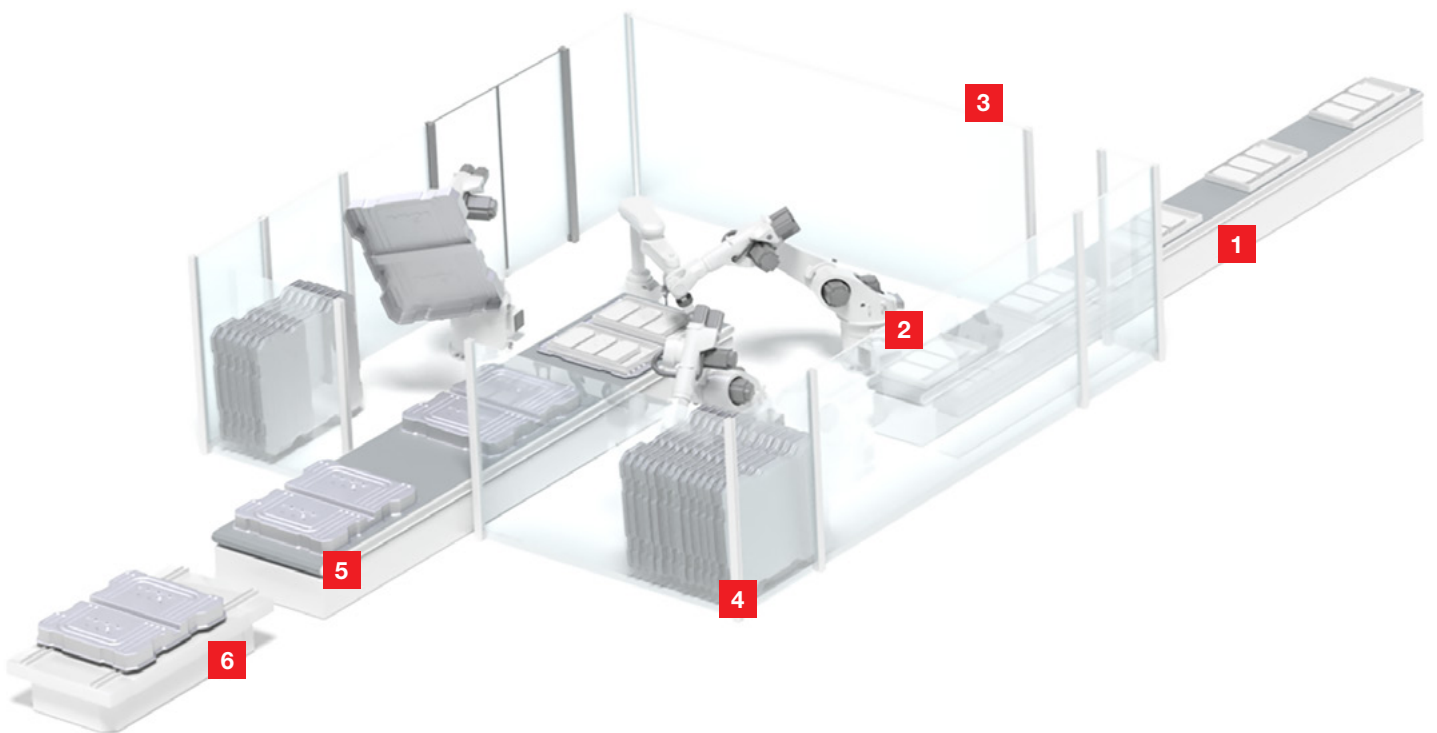
Solution: The DCR 200i decode the 2D-codes on the pallet. They combine a compact design with large reading range and high depth of field, making them easy to integrate. The compact HT 15 diffuse reflection sensors with background suppression ensure reliable presence control.

Assembly line using e-mobility as an example

On assembly lines, components and products are manufactured through successive assembly processes. Depending on requirements, everything from small, partially automated lines to fully automated lines are used. In the area of e-mobility, the installation of battery cells, modules and packs is usually fully automated. The “tracking & tracing” of the components, transport- and logistics solutions for material supply of the assembly cells and the safety of the work stations determine the requirements on the sensors.

Our components guarantee smooth processes and ensure machine safety. Typical areas of use are code reading and identification for the traceability, object detection for automation as well as access guarding at the assembly cells.





1 Code reading for the traceability of the batch

2 Code reading for the traceability of the cells

3 Access guarding of the work systems

4 Access guarding with short safety distances

5 Transport control of the conveyor line

6 Guarding and navigation of automated guided vehicles (AGVs)

Assembly line using e-mobility as an example

Code reading for the traceability of the batch

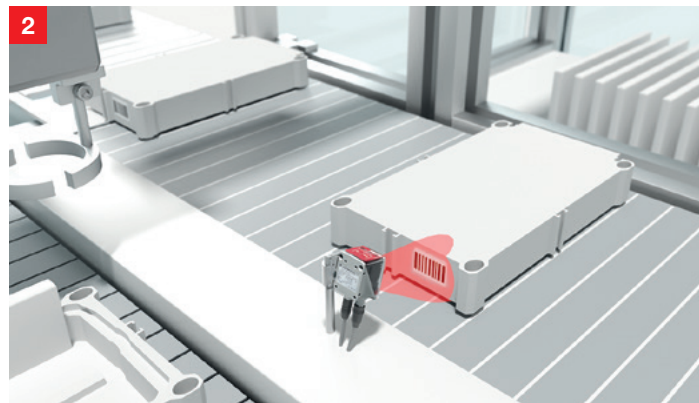
Requirement: The order and the batch are to be detected at the start of battery production and stored for the further course of action. To do this, the processing steps and all relevant components are to be identified using a bar code.



Solution: Mobile code readers are well suited for detecting the orders and the batches. Wireless models like the IT 1991i make operation easy and comfortable. Depending on the control concept, they are connected directly to a PC or – for integration via common fieldbus and Ethernet interfaces – to the MA 200i modular connection unit.

Code reading for the traceability of the cells

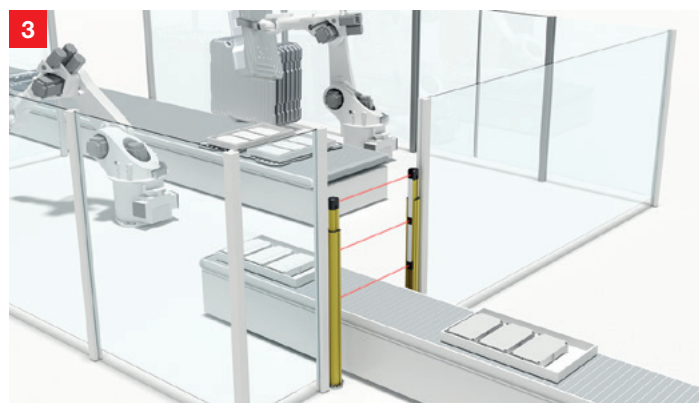
Requirement: The “track & trace” concept also includes the traceability of each individual battery cell that is in the work system for processing. Depending on the used system, the 1D- or 2D-code affixed to the cell is to be captured.



Solution: The DCR 200i code readers and the LSIS 400i smart cameras reliably identify 1D- and 2D-codes. The DCR 200i are characterized by their compact design and simple commissioning. The LSIS 400i operate especially flexibly. If, for example, the reading distance changes, the focus and the field of view can be adapted online using a browser.

Access guarding of the work systems

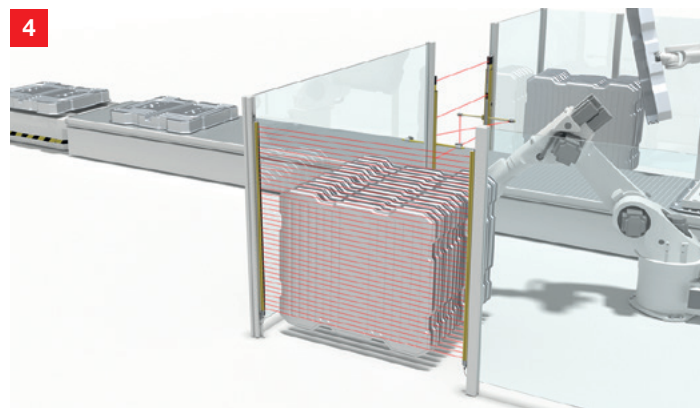
Requirement: The battery components are moved from one robot assembly cell to the next via the conveyor system. The entrances and exits to the robot cells must be secured against access.



Solution: The MLD 500 multiple light beam safety devices safeguard the access point to the conveyor lines. Depending on requirements, e.g., installation situation and size of the transport material, models are available with and without muting function. Configuration is easily performed via the pin assignment. With the integrated muting function, no additional devices are necessary.

Access guarding with short safety distances

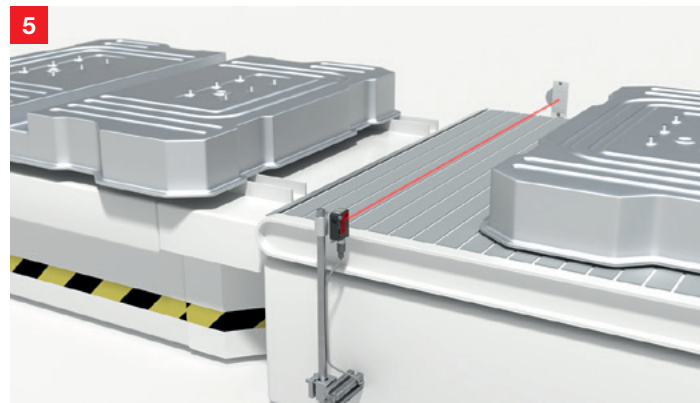
Requirement: Even on automatic operating systems, it can be necessary for the operating personnel to intervene. Because easy access is required in these cases, optical safety sensors are to be used. To keep the designs of the system as compact as possible, the sensors should enable short safety distances.



Solution: With their resolution of 14 mm, the MLC 510 safety light curtains offer the shortest possible safety distances. Various mounting options and protective field lengths of up to 3,000 mm ensure simple and tailored integration of the devices. For European requirements, the devices feature AIDA-compliant pin assignment.

Transport control of the conveyor line

Requirement: The production systems for battery production are linked by means of conveyor systems. The products are fed to the next process step either directly on these or in trays. To allow the products to be removed by the gripper robot or transferred to an AGV, the conveyor line must be controlled through detection of the products.



Solution: The universally usable PRK 15 and PRK 25C retro-reflective photoelectric sensors offer high function reserves for high system availability. With their bright light spot, they can be adjusted quickly and easily. Additional functions, such as warning output and activation input, increase process reliability.

Guarding and navigation of automated guided vehicles (AGVs)

Requirement: The transportation path of the AGV must be guarded by means of safety sensors. The protective fields are to be flexibly adapted to the movement and loading situation. If the principle of natural navigation is used, the device is at the same time to provide the measurement data for the navigation software.



Solution: The RSL 400 safety laser scanners merge safety technology and high-quality measurement value output in a single device. They have a scanning range of 270° and 100 reversible field pairs. Two scanners therefore provide optimum guarding of the AGV. The measurement data has a high angular resolution of 0.1° and a low measurement error.

Switching sensors

Photoel. sensors / diffuse sensors,
cubic housing



3C series
Universal, mini

15 series
Standard

25C series
Universal

Technical data	Dimensions excl. connector, W × D × H	11 × 32 × 17 mm	15 × 43 × 30 mm	15 × 43 × 30 mm
	Operating voltage	10–30V DC	10–30V DC	10–30V DC
	Switching outputs	Push-pull, PNP, NPN, IO-Link	PNP, NPN	PNP, NPN, push-pull, IO-Link
	Connection type	M8, cable, cable+M8 / M12	M12, cable, cable+M12	M8 / M8+snap / M12, cable, cable+M8 / M12
	Degree of protection	IP 67, IP 69K	IP 66, IP 67	IP 67, IP 69K
	Certifications	CDRH cULus	cULus	CDRH cULus
	Housing	Plastic	Plastic	Plastic
Throughbeam photoelectric sensors	Operating range*	0–10 m	0–30 m	0–30 m
	Light source	Red light / laser (class 1)	Red light	Red light
	Switching	Light, dark, antivalent	Light, dark	Light, dark
	Switching frequency	1,000 / 3,000 Hz	500 Hz	1,500 Hz
Retro-reflective photoelectric sensors	Operating range*	0–7 / 0.02–5.5 / 0–3 m	0–8 / 0–10 m	0–10 / 0–12 / 0–25 m
	Light source	Red light / infrared / laser (class 1)	Red light	Red light / laser (class 1 and 2)
	Switching	Light, dark, antivalent	Light, dark	Light, dark, antivalent
	Switching frequency	1,000 / 1,500 / 3,000 Hz	500 Hz	1,500 / 2,500 Hz
Energetic diffuse sensor	Operating range*			
	Light source			
	Switching			
	Switching frequency			
Diffuse sensors with background suppression	Operating range*	5–600 mm	0–1,000 mm	0–1,200 mm / 0–1,300 mm
	Light source	Red light / laser (class 1)	Red light / infrared	Red light / infrared / laser (class 1 and 2)
	Switching	Light, dark, antivalent	Light, dark	Light, dark, antivalent
	Switching frequency	1,000 / 3,000 Hz	500 Hz	1,000 Hz / 2,500 Hz
Additional functions	Transparent media	X		X
	Protective sensors category 2/4			X (type 2)
	Warning output	X		X
	Activation input	X	X	X
	Deactivation input			
	Active ambient light suppression A ² LS	X	X	X
Features		ECOLAB Two housing through holes with metal sleeves or threaded sleeves Sensor with different light-spot geometry and V-configuration Laser variants Teach-in Bottle detection Contrast sensors Detection of labels on bottles Devices with IO-Link communication interface Teach button with remote function	Mechanically adjustable operating range Sensitivity adjustment Retro-reflective sensor with large function reserve / for stretch-wrapped containers	ECOLAB M4 metal threaded sleeves Sensors with small and long light spot Sensor for bay positioning / for the detection of broken containers Focused light spot Foreground suppression High function reserve For stretch-wrapped packages Bottle detection Laser variants Teach-in Dynamic reference diffuse sensor Long-range sensor IO-Link interface Safety-vest sensor

Photoel. sensors / diffuse sensors, cubic housing



46C series
Universal, long range

Photoel. sensors / diffuse sensors, cylindrical housing



318(B) series, 328 series
M18, cylindrical

Fiber optic sensors



LV46x
Fiber optic amplifiers



KF
Plastic fiber optics

20.5 × 76.3 × 44 mm	M18 × 46 mm, M18 × 60 mm		Ø 2.2 × 500 / 2,055 mm
10–30V DC	10–30V DC	10–30V DC	
PNP, NPN, push-pull	PNP, NPN, push-pull	PNP, NPN, IO-Link	
M12, cable, cable+M12	M12, cable	M8, cable, cable+M8, cable+M12	Ø 2.2 plugged
IP 67, IP 69K	IP 67	IP 65	
CDRH cULUS	CDRH cULUS	cULUS	
Plastic	Full metal, stainless steel, plastic	Plastic	Plastic, models with bending protection
0–150 m	0–15 / 0–23 / 0–120 m		0–1,700 mm
Red light / infrared	Red light / infrared / laser (class 1)	Red light, infrared	Red light, infrared (with LV46x)
Light, dark, antivalent	Light, dark, antivalent	Light, dark	
100 / 500 Hz	500 / 1,000 / 5,000 Hz	250 Hz ... 50 kHz	
0.05–30 m	0–7 / 0.02–6 / 0.1–15 m		
Red light	Red light / laser (class 1)		
Light, dark, antivalent	Light, dark, antivalent		
25 / 150 / 500 Hz	500 / 5,000 Hz		
	0–140 / 0–1,000 / 0–300 / 0–280 mm		0–270 mm
	Red light / infrared / laser	Red light, infrared	Red light, infrared (with LV46x)
	Light, dark, antivalent	Light, dark	
	500 / 1,000 / 5,000 Hz	250 Hz ... 50 kHz	
5–3,000 mm	1–140 mm		
Red light / infrared / red light laser (class 1 and 2)	Red light		
Light, dark, antivalent	Antivalent		
20 / 100 / 200 / 250 / 500 Hz	1,000 Hz		
	X		
X	X		
X			
X	X		
	X		
X	X		
Retro-reflective photoelectric sensors with light-band for objects with openings / irregular contour Detection of tubular bags on a conveyor belt Can be used as muting sensor Roller conveyor sensor Models for dusty environments Optimized for parallel operation Extreme background suppression Devices with IO-Link interface	Bracket versions Simple alignment with omni-mount Embedded mounting option Models with M18 stainless steel sleeve and full-metal version Variant available with preset range and as label sensor	For glass and plastic fiber optics High-speed or long-range amplifier Teach-in Sensitivity adjustment Time functions Multifunction input IO-Link interface	Straight or lateral optical outlet Various ancillary lenses Arrays, V-arrangement Various types of fiber structure, e.g., highly flexible, coax Highly precise or heat resistant, models with bending protection

Long-range sensors



25 LR series
TOF, long range

110 series
TOF, long range laser

10 series
TOF, long range laser

Technical data	Dimensions excl. connector, W×D×H	15 × 38.9 × 28.7 mm	50 × 23 × 50 mm	25 × 65 × 55 mm
	Operating voltage	10–30V DC	18–30 V DC	18–30 V DC
	Switching outputs	PNP, NPN, push-pull, IO-Link	Push-pull, IO-Link	Push-pull, IO-Link
	Connection type	Cable+M12	Turnable M12 connector	Cable+M12, cable, turnable M12 connector
	Degree of protection	IP 67	IP 67, IP 69K	IP 67
	Certifications	CDRH US	CDRH US	CDRH US
Housing	Plastic	Plastic	Plastic	
Diffuse sensors with background suppression	Operating range*	50–3,000 mm	100–5,000 mm (WH) / 3,000 mm (BK)	50–8,000 mm / 25,000 mm
	Light source	Infrared TOF (light propagation time measurement)	Laser, red, 655 nm (class 1)	Red light laser (class 1)
	Switching	Light, dark	Light	Light
	Switching frequency	30 / 40 Hz	250 Hz	40 Hz
Additional functions	Transparent media			
	Protective sensors category 2/4			
	Warning output	X		X
	Activation input	X	X	X
	Active ambient light suppression A ² LS			X
Features		Detection of objects with low diffuse reflection > 4% 2 teachable switching points (TOF) Line teach and deactivation All devices with IO-Link interface for configuration (including adaptation to the application) and process data transfer Very good fading Operating range adjustment via IO-Link	All devices with IO-Link interface Turnable M12 connector 2 switching points Small black-white error High repeatability Adjustment via teach buttons Propagation time of the radiated light (TOF)	Turnable M12 connector All devices with IO-Link interface Light/dark switching via teach button Window function Adaptation to the application by means of configurable filters and gain values Propagation time of the radiated light (TOF)

Inductive switches

IS 203, 204, 205, 206
 Miniature sensors,
 cylindrical housing

IS 208, 212, 218, 230
 Standard, cylindrical

IS 240, 244 / ISS 244
 Standard, cubic

Technical data	Dimensions incl. connector, W × D × H	Ø 3.0: 22 mm Ø 4.0: 25 mm M5: 25–38 mm Ø 6.5: 35–65 mm	M8: 22–45 mm M12: 35–60 mm M18: 35–64 mm M30: 40.6–73.5 mm	12 × 40 × 26 mm 40 × 40 × 67 mm 40 × 40 × 118 mm
	Type of installation	Embedded / non-embedded	Embedded / non-embedded	Embedded / non-embedded
	Operating voltage	10–30V DC	10–30V DC	10–30V DC
	Operating range	1–3 mm	2–40 mm	4–40 mm
	Switching outputs	PNP	PNP, NPN	PNP, NPN
	Switching principle	NO, NC	NO, NC, NO + NC (antivalent)	NO + NC (antivalent)
	Switching frequency	Up to 5,000 Hz	Up to 5,000 Hz	Up to 1,400 Hz
	Connection type	M8, cable + M8, cable	M12, cable + M12, cable	M8, M12, terminal, cable
	Degree of protection	IP 67	IP 67	IP 67, IP 68, IP 69 K
	Certifications	CE c_{UL} US	CE c_{UL} US	CE c_{UL} US
Housing	Stainless steel (V2A)	Metal	Plastic	
Features	Cylindrical miniature housing Versions with increased operating range	Different versions available: Short housing design Increased range AC/DC device versions Antivalent switching output	Bright status display Antivalent switching outputs (NO+NC) Increased ranges M12 plug, turnable 270° and thus suitable even for angled connection cables 360° visibility through 4-way LED indicator on the sensor head	

Measuring sensors

Distance sensors



ODS 9
Optical distance sensors

ODS 10
Optical distance sensors

ODS 110
Optical distance sensors

	ODS 9 Optical distance sensors	ODS 10 Optical distance sensors	ODS 110 Optical distance sensors	
Technical data	Function	Distance measurement, optical	Distance measurement, optical	Distance measurement, optical
	Dimensions excl. connector, W x D x H	21 x 50 x 50 mm	25 x 65 x 55 mm	50 x 23 x 50 mm
	Operating voltage	18–30 V DC	18–30 V DC	18–30 V DC
	Outputs	4–20 mA 1–10 V, 0–10 V RS 232 / RS 485 Push-pull IO-Link	4–20 mA 1–10 V, 0–10 V Push-pull IO-Link	4–20 mA 1–10 V 1x push-pull IO-Link
	Connection type	M12	M12	M12
	Degree of protection	IP 67	IP 67	IP 67
	Certifications	CE CDRH cUL US	CE CDRH cUL US	CE cUL US
	Measurement range	50–650 mm	50–3,500 mm 50–8,000 mm (90 % diffuse reflection) 100–25,000 mm on reflective tape	100–3,000 mm 100–5,000 mm (90 % diffuse reflection)
	Measurement principle	Optical / laser (class 1 and 2)	Optical / laser (class 1)	Optical / laser (class 1)
	Measurement time	1 ms	3,4–1,020 ms (adjustable)	4–20 ms
	Measurement field width / Scanning angle			
	Ultrasonic frequency			
	Resolution	0.01–0.5 mm	1 mm	1 mm
	Mouth width			
Mouth depth				
Number of inspection tasks				
Operation	Teach-in Control buttons on foil display or Sensor Studio	Control buttons on foil display or Sensor Studio	Teach-in or Sensor Studio	
Features	Display for measured value display and configuration Turnable M12 connector Triangulation measurement Supports the IO-Link smart sensor profile	Display for measured value display and configuration Turnable M12 connector All devices with IO-Link interface Propagation time measurement (TOF)	All devices with IO-Link interface Turnable M12 connector Adjustment via teach button Propagation time measurement (TOF)	


Ultrasonic sensors

Fork sensors

ODSL 30

Optical distance sensors

ODSL 96B

Optical distance sensors

300, 400 series

Measuring ultrasonic sensors

GS 754B

CCD fork sensors

Distance measurement, optical	Distance measurement, optical	Distance measurement, ultrasonics	Edge/diameter measurement, optical
79 × 69 × 149 mm	30 × 90 × 70 mm	M18 × 46.3 / 51.8 / 74.3 / 75 / 77.6 / 82.8 mm M30 × 75 / 88.8 / 142.5 mm	19.4 × 81.5 × 91 mm 20 × 155 × 91.5 mm
10–30 V DC 18–30 V DC (analog)	10–30 V DC 18–30 V DC (analog, IO-Link)	10–30 V DC 12–30 V DC	10–30 V DC (digital) 18–30 V DC (analog)
4–20 mA 1–10 V RS 232 / RS 485 1 × PNP, 2 × PNP, 3 × PNP	4–20 mA 1–10 V, 0–10 V RS 232 / RS 485 Push-pull IO-Link	PNP (NPN)	2 × 4–20 mA 2 × 0–10 V RS 232 / RS 422 / RS 485 1 × PNP, 2 × PNP
M12	M12, cable	M12	M12
IP 67	IP 67, IP 69K	IP 67	IP 67
CE	CE CDRH c UL US ECOLAB	CE c UL US	CE c UL US
200–30,000 mm 200–65,000 mm (50 % ... 90 % diffuse reflection)	150–2,000 mm 300–10,000 mm 300–25,000 mm on reflective tape	25–400 / 50–400 / 80–1,200 / 150–1,300 / 250–3,500 / 300–3,000 / 350–6,000 / 600–6,000 mm	
Optical / laser (class 2)	Optical / LED / laser (class 1 and 2)	Ultrasonics	Optical / LED
30–100 ms	1–100 ms	0.1–1 s	Min. 2.5 ms
			25 mm
		200 kHz / 310 kHz	
1 mm	0.1–3 mm	1 mm	14 μm
			27 / 98 mm
			42 mm
			5
Teach-in Display	Teach-in Configuration software Display	Teach-In IO-Link	Terminal program via RS232 interface
Metal housing Display for measured value display and configuration M12 connector Ex devices are also available Phase measurement	Robust metal housing Display for measured value display and configuration M12 connector Ex devices are also available Triangulation measurement Propagation time measurement (TOF) Phase measurement	3/5 operating modes Temperature-compensated Metal/plastic housing Small dead zone	Detection of transparent media Foil detection >0.1 mm Turnable M12 connector Wide-ranging evaluation functions Perfect for thread and fiber measurement

Positioning



AMS 300i

BPS 300i

	AMS 300i	BPS 300i	
Technical data	Function	Distance measurement, optical	Position detection, optical
	Operating range	40 / 120 / 200 / 300 m	10,000 m
	Reading distance		50 ... 170 mm
	Interfaces	Integrated: PROFIBUS and SSI PROFINET PROFINET and SSI DeviceNet EtherCAT EtherNet/IP CANopen Ethernet TCP/IP, UDP Interbus-S RS 232, RS 422, RS 485 SSI	Integrated: PROFINET EtherCAT PROFIBUS SSI RS 422 RS 232 RS 485
	Connectivity	Via the interfaces mentioned above	
	Position calculation through	Reflector	Bar code tape
	Measurement value output	1.7 ms	1 ms
	Reproducibility	±0.9 / 1.5 / 2.1 / 3 mm (3 sigma)	±0.15 mm (3 sigma)
	Accuracy	±2 / 2 / 3 / 5 mm	
	Degree of protection	IP 65	IP 65
	Light source	Red light laser (class 2)	Red light laser (class 1)
	Supply voltage	18–30 V DC	18–30 V DC
	Operating temperature	–5 ... +50 °C (–30 ... +50 °C with heating)	–5 ... +50 °C (–35 ... +50 °C with heating)
	Additional functions	Speed measurement and monitoring	Speed measurement and monitoring
Certifications	CE CDRH cUL US	CE CDRH cUL US	
Features	Absolute measurement system with very high accuracy, tested by the Physikalisch-Technische Bundesanstalt (German Metrology Institute) Simultaneous use of the PROFIBUS and SSI; alternatively, PROFINET and SSI interface Easy programming via extensive configuration file Optionally with heating Multiple language menu-driven display Heatable reflectors available as accessories	Positioning on curves, gradients and track switches Curve-going, horizontally and vertically Metal housing 3 selectable connection systems Fast, secure and position-neutral installation using special mounting device Extensive diagnostic options Comfortable programming via GSDML/GSD or ESI files Optionally with heating or display	

Sensors for compartment fine positioning

IPS 200i
Sensors
for positioning

IPS 400i
Sensors
for positioning

Typical applications	Compartment fine positioning	Single compartment depth	Double compartment depth
	Sensor / cameras	CMOS (Global Shutter)	CMOS (Global Shutter)
	Resolution (pixel)	1,280 × 960	1,280 × 960
	Focal point	Reading distance 100 ... 600 mm Marker dependent	Reading distance 250–2,400 mm Marker-dependent
	Interface	Integrated: Ethernet TCP/IP, UDP PROFINET IO/RT	Integrated: Ethernet TCP/IP, UDP PROFINET IO/RT
	Digital inputs/outputs	3x IN; 5x OUT	3x IN; 5x OUT
	Optional	Cables, mounting devices, reflectors, heating model to –30°C	Cables, mounting devices, reflectors, heating model to –30°C, external illumination
	Number of test routines	8	8
	Configuration /Operating system	Web-based configuration tool (webConfig tool) XML commands; 2x operational controls	Web-based configuration tool (webConfig tool) XML commands; 2x operational controls
	Additional functions	Configuration on the device via configuration codes	Configuration on the device via configuration codes
	Dimensions, W × H × D	43 × 61 × 44 mm	43 × 61 × 44 mm
	Certifications	CE cULus	CE cULus
Features	Time savings through fast commissioning via web-based configuration tool or printed configuration codes Innovative alignment system via feedback LEDs simplifies alignment One device for the entire region of interest from 100–600 mm Quality score enables the early detection of a deterioration in reading performance Can be used flexibly thanks to high-performance, infrared LED illumination that is independent of ambient light Model with integrated heating for use to –30°C		Time savings through fast commissioning via web-based configuration tool or printed configuration codes Innovative alignment system via feedback LEDs simplifies alignment Quality score enables the early detection of a deterioration in reading performance One device for double-depth working range from 250–2,400 mm Can be used flexibly thanks to high-performance, infrared LED illumination that is independent of ambient light Model with integrated heating for use to –30°C

Measuring and switching light curtains



CML 700i
Measuring



CSL 505
Switching



CSL 710
Switching

	CML 700i Measuring	CSL 505 Switching	CSL 710 Switching	
Technical data	Function	Size / contour detection, optical	Throughbeam principle	Throughbeam principle
	Dimensions excl. connector, W x D x H	29 x 35 x 168 ... 2,968 mm	10 x 27 x 150 ... 3,180 mm 12 x 58 x 120 ... 480 mm	29 x 35 x 168 ... 2,968 mm
	Operating voltage	18–30 V DC	24 V DC	18–30 V DC
	Outputs	Analog, CANopen, IO-Link, PROFIBUS, PROFINET, RS 485 (MODBUS)	2x outputs / push-pull	4 I/Os (configurable) + IO-Link
	Connection type	M12	M8	M12
	Degree of protection	IP 65	IP 65	IP 65
	Certifications			
	Operating range*	4.5 ... 9.5 m	Up to 5 m	Up to 3.5 ... 7 m
	Light source / Measurement principle	Infrared	Infrared	Infrared
	Cycle time / measurement time	10–30 µs per beam + 0,4 ms	1 ms per beam	30 µs per beam
	Measurement field length / scanning angle	160–2,960 mm	35–3,100 mm	160–2,960 mm
	Resolution	5, 10, 20, 40 mm	5**, 12.5, 25, 50, 100 mm	5, 10, 20, 40 mm
	Number of beams	Max. 592	Max. 160	Max. 592
Operation	Control buttons on foil display, 5 languages, configuration software	Autocalibration, configuration software, configuration by means of pin assignment	Control buttons on foil display, 5 languages, configuration software	
Features	Cycle time CML 730: 10 µs x number of beams + 0.4 ms Cycle time CML 720: 30 µs x number of beams + 0.4 ms Detection of transparent media Display for diagnosis and alignment Standard profile for simple mounting Robust metal housing Suitable for low-temperature applications down to –30 °C	2 switching ranges Narrow profile Through holes Suitable for low-temperature applications down to –30 °C	8 switching ranges Simple area splitting 4 switching outputs + 1 IO-Link Robust metal housing Extremely fast cycle time Display for diagnosis and alignment Suitable for low-temperature applications down to –30 °C	

* Guaranteed operating range

** 5 mm resolution only with 58 mm housing depth

Data transmission



DDLS 500

Technical data	Operating range	40, 120, 200 m
	Light source	Infrared laser (laser class 1M)
	Transmission rate	100 Mbit/s
	Interfaces	PROFINET EtherNet IP EtherNet TCP/IP EtherCAT UDP
	Degree of protection	IP 65
	Supply voltage	18–30 V DC
	Operating temperature	–5 °C ... +50 °C (–35 °C ... +50 °C with heating)
	Certifications	CE CDRH cUL US
Features	<p>Transparent, real-time transmission of all TCP/IP- and UDP-based protocols Very simple diagnosis of the transmission technology Pre-mounted and complete delivery of all mounting and alignment elements Integrated laser pointer for fast installation (available optionally) Simple remote diagnosis via web browser-based user interface (available optionally) Device models as PROFINET network participants</p>	

Identification

2D-code reader



DCR 200i

Typical applications	Code reading	Data Matrix, bar code, QR-Code, Pharmacode, Aztec, GS1 Databar
	Sensor / cameras	CMOS (Global Shutter)
	Resolution (pixel)	1,280 × 960
	Focal point	U optics: 50 mm N optics: 70 mm M optics: 105 mm F optics: 185 mm L optics: 285 mm
	Interfaces	Integrated: Ethernet TCP/IP, UDP PROFINET IO/RT RS 232 RS 422
	Connectivity	With MA 200i connection unit PROFIBUS Ethernet TCP/IP, UDP, IP EtherCAT DeviceNet CANopen
	Digital inputs/outputs	2 / 2
	Number of test routines	Memory capacity for 1 parameter set in the camera
	Configuration / Operating system	Configuration via configuration codes or via PC using standard web browser without software to be installed additionally (webConfig tool)
	Options	Optional: connection cables Optical filters Housing hoods External illumination Mounting devices: BTU 320M-D12, BT 320M MA 150 modular connection unit
Dimensions, W × H × D	43 × 61 × 44 mm	
Certifications	CE c(UL)us	
Features	Camera system for omnidirectional reading of bar codes, stacked codes and 2D-codes Integrated illumination (type-dependent: red or IR) High object speed of up to 7 m/s Integrated teach functions for simple adjustments via buttons Optional robust stainless steel housing Optional with NPN switching inputs/outputs Optionally with integrated heating for use to -30 °C	

Stationary bar code readers



BCL 300i

Technical data	Reading distance (dependent on version)	20 – 700 mm
	Smallest resolution	0.127 mm
	Scanning rate	1,000 scans/s
	Optics models	N, M, F, L, J
	Reading method	Single line scanner Raster scanner Deflecting mirror Oscillating mirror Code reconstruction technology
	Inputs/outputs	1 / 1
	Interfaces	Integrated: RS 232 / 485 / 422 multiNet PROFIBUS PROFINET IO/RT Ethernet TCP/IP, UDP Ethernet IP EtherCAT
	Connectivity	With MA 200i connection unit DeviceNet, CANopen
	Supply voltage	18 – 30 V DC
	Degree of protection	IP 65
Network master	MA 31	
Certifications	CE CDRH c(UL)us	
Accessories	Optional	
	Mounting devices	BT 56, BT 59, BT 300 W, BT 300
Features	Integrated fieldbus connectivity Code reconstruction technology (CRT) Available as a front scanner, deflecting mirror and oscillating mirror model Simple configuration without additional software via USB interface or GSD/GSDML file Modular connection type via M12 hood with integrated connectors, terminal hood or cable hood Optional with display and as heating model	

Industrial image processing

Smart cameras



LSIS 412i, 462i

Industrial IP cameras



LCAM 408i

Typical applications	Presence control / completeness monitoring	X	
	Dimension / position monitoring	X	
	Position and type detection	X	
	Code reading	Data Matrix, bar code, Pharmacode (LSIS 462i)	
	Measurement	(LSIS 462i)	
	Monitoring camera		X
	Sensor / cameras	CMOS (Global Shutter)	Color CMOS
	Resolution (pixel)	752 × 480	2,592 × 1,944
	Focal point	50 mm ... ∞ (focal length 8 mm) 75 mm ... ∞ (focal length 16 mm) Depends on lens with C-mount models	500 mm ... ∞
	Interface	Integrated: Ethernet, RS 232	Integrated: Ethernet
	Connectivity	With MA 200i connection unit PROFINET IO/RT PROFIBUS EtherCAT DeviceNet CANopen	
	Digital inputs/outputs	8, configurable	
	Fast EtherNet	Yes	Gigabit
	Optional	Cables, mounting devices, external illumination	Cables, mounting devices, air blower
Number of test routines	Typically 10 to 60, depending on scope of test		
Configuration / Operating system	Configuration via PC using standard Web browser (webConfig tool)	Configuration via PC using standard Web browser (webConfig tool)	
Dimensions, W × H × D	75 × 113 × 55 mm	75 × 113 × 55 mm / 76.5 × 66 × 126 mm	
Certifications	CE cULus	CE	
Features	Very well suited for industrial use through glass or plastic window Metal housing and homogeneous integrated illumination (depends on type: white, IR or RGBW) Degree of protection IP 65 / IP 67 Flexible use through motor-driven focus adjustment		

Safety

Safety laser scanners



RSL 410, 420, 425

RSL 430, 440, 445

RSL 420P, 450P, 455P

	RSL 410, 420, 425	RSL 430, 440, 445	RSL 420P, 450P, 455P	
General	Protective field range	3,0/4,5/6,25/8,25m	3,0/4,5/6,25/8,25m	3,0/4,5/6,25/8,25m
	Scanning angle	270°	270°	270°
	Angular resolution	0.1°	0.1°	0.1°
	Warning field range (at 10% diffuse reflection)	20m	20m	20m
	Resolution, selectable	30/40/50/60/70/150mm	30/40/50/60/70/150mm	30/40/50/60/70/150mm
	Response time	≥ 80 ms	≥ 80 ms	≥ 120 ms
	Safety	Type 2, SIL 3, PL d	Type 2, SIL 3, PL d	Type 2, SIL 3, PL d
	Dimensions, incl. connection unit (W x H x D)	140 x 149 x 140 mm	140 x 149 x 140 mm	140 x 170 x 142 mm
	Temperature range	0 ... +50°	0 ... +50°	0 ... +50°
Certifications	CE cULUS TÜV	CE cULUS TÜV	CE cULUS TÜV	
Functions	Safety-related switching outputs	1	2	RSL 420P: PROFIsafe, 1 protective field RSL 450P, 455P: PROFIsafe, 4 simultaneous protective fields
	Number of field pairs (1 protective field + 1 warning field)	RSL 410: 1 RSL 420: 10	RSL 430: 10+10 RSL 440, 445: 100	RSL 420P: 10 RSL 450P, 455P: 100
	Number of 4-field sets (1 protective field + 3 warning fields)	RSL 410: 1 RSL 420: 10	10	RSL 420P: 10
	Number of 4-field sets (2 protective fields + 2 warning fields)	–	RSL 440, 445: 50	RSL 450P, 455P: 50 (Warning fields can be evaluated as protective fields)
	Number of independent sensor configurations	1	RSL 430: 2 RSL 440, 445: 10	RSL 420P: 1 RSL 450P, 455P: 10
	Plain-text display, integrated electronic spirit level	X	X	X
	Configurable signal outputs	RSL 410: 3 RSL 420: 4	9	All status information can be called up
	UDP data output optimized for AGV navigation, configurable, 50 m operating range	RSL 425 Distance and signal strength, angular resolution 0.1°	RSL 445 Distance and signal strength, angular resolution 0.1°	RSL 455P Distance and signal strength, angular resolution 0.1°
Interfaces / connection	Connection unit (removable, with integrated configuration memory)	RSL 410: M12 connector, RSL 420, 425: cable or connector, 16-pin	Cable or connector, 29-pin	3x M12 connector for 2-port switch and voltage supply or 4x M12 connector with additional voltage output AIDA variant with push-pull connectors, communication via copper or fiber-optic cable
	Interfaces for configuration and diagnosis	Ethernet TCP/IP, Bluetooth RSL 420, 425: USB	Ethernet TCP/IP, USB, Bluetooth	Ethernet TCP/IP, USB, Bluetooth
	PROFINET	–	–	Conformance class C Network load class III PROFINET device acc. to Specification V2.3.4 GSDML acc. to Specification V2.3.2
	Further features	Technology for robust operation Contactor monitoring (EDM), start/restart interlock (RES) Vertical access guarding with reference boundary monitoring Parking function (protective field switchover, RSL 420 and RSL 425)	Technology for robust operation Contactor monitoring (EDM), start/restart interlock (RES) Vertical access guarding with reference boundary monitoring Parking function (protective field switch-off)	Technology for robust operation Start/restart interlock (RES) Vertical access guarding with reference boundary monitoring Parking function (protective field switch-off)

Safety radar systems



**LBK with I/O controller
(LBK-C22-LZ)**

**LBK with PROFIsafe controller
(ISC-Bus-PS)**

	LBK with I/O controller (LBK-C22-LZ)	LBK with PROFIsafe controller (ISC-Bus-PS)	
General	SIL in accordance with EN IEC 62061 (SILCL)	SIL 2	SIL 2
	Performance Level (PL) in accordance with EN ISO 13849-1	PL d	PL d
	Category in accordance with EN ISO 13849-1	Category 2	Category 2
	Operating principle	FMCW (frequency modulated continuous wave) for movement detection	FMCW (frequency modulated continuous wave) for movement detection
	Response time	100 ms	100 ms
	Temperature range	-30 °C ... +60 °C	-30 °C ... +60 °C
	Certifications		
Sensor	Operating range	0 ... 4 m	0 ... 4 m
	Adjustable protective field and warning field size	1 ... 4 m	1 ... 4 m
	Angle of radiation	Wide: 110° (horizontal plane) 30° (vertical plane) Narrow: 50° (horizontal plane) 15° (vertical plane)	Wide: 110° (horizontal plane) 30° (vertical plane) Narrow: 50° (horizontal plane) 15° (vertical plane)
	Frequency range	24.0 ... 24.5 GHz	24.0 ... 24.5 GHz
	Emitted power	≤ 13 dBm	≤ 13 dBm
	Dimensions (W × H × D)	85 × 85 × 53 mm	85 × 85 × 53 mm
	Connection	M12, 5-pin	M12, 5-pin
	Supply voltage	Via controller	Via controller
	Degree of protection	IP 67	IP 67
	Controller	Safety-related switching outputs	Relay output, 2-channel
Signal outputs		2 relay outputs	Via PROFINET
Inputs		3 (2-channel)	2 (2-channel)
Number of sensors in a system		6	6
Number of configurable groups (1 to 6 sensors)		3	2
Deactivation of individual groups		X	X
Switchable configurations		–	32
Start / restart interlock (RES)		X	X
Dimensions (W × H × D)		166.25 × 92.6 × 46.5 mm	90 × 60 × 110 mm
Degree of protection		IP 20	IP 20
Interfaces for configuration and diagnosis		USB 2.0 Micro USB	Ethernet TCP/IP USB 2.0







Safety light curtains



ELC 100



MLC 310
MLC 510

	ELC 100	MLC 310 MLC 510	
General	Type in accordance with EN IEC 61496	Type 4	MLC 300: type 2 MLC 500: type 4
	SIL in accordance with IEC 61508 and EN IEC 62061 (SILCL)	SIL 3	MLC 300: SIL 1 MLC 500: SIL 3
	Performance Level (PL) in accordance with EN ISO 13849-1	PL e	MLC 300: PL c MLC 500: PL e
	Resolution	17 / 30 mm	14 / 20 / 30 / 40 / 90 mm
	Operating range	3 / 6 m	6 / 15 / 10 / 20 / 20 m
	Protective field height	300 ... 1,500 mm	150 ... 3,000 mm
	Response time	4.5 – 21 ms	MLC 300: 3 – 51 ms MLC 500: 3 – 64 ms
	Profile cross section	34.7 mm × 39.3 mm	29 × 35 mm
	Temperature range	0 ... +55°C	MLC 300: 0 ... +55°C MLC 500: –30 ... +55°C
	Safety-related switching outputs (OSSDs)	2 PNP transistor outputs	2 PNP transistor outputs
	Connection type	300 mm cable with M12 connector	M12 connector
	Certifications	 	   
Functions	Range reduction on the transmitter		X
	Switchable transmission channels		X
	LED indicator	X (additional alignment indicator)	X
	7-segment display		
	Configuration by means of wiring		X
	Automatic start / restart	X	X
	Start / restart interlock (RES)		
	Contact monitoring (EDM)		
	Beam blanking, fixed or movable		
	Muting function, integrated		
Linkage of safety output, multiscan			
Versions for special applications	Extremely slim design		
	Cascadable (triple)		
	AIDA version		X
	AS-i Safety interface		X
	Ex marking acc. to EN 60079		
	Degrees of protection IP 67 / IP 69K, mounted in protective tube		X
Extra shock / vibration resistant	X (standard for all devices)	X	



MLC 320
MLC 520

MLC 520-S

MLC 530

MLC 530-SPG

MLC 300: type 2 MLC 500: type 4	Type 4	Type 4	Type 4
MLC 300: SIL 1 MLC 500: SIL 3	SIL 3	SIL 3	SIL 3
MLC 300: PL c MLC 500: PL e	PL e	PL e	PL e
14 / 20 / 30 / 40 / 90 mm	14 / 24 mm	14 / 20 / 30 / 40 / 90 mm	30 / 40 / 90 mm
6 / 15 / 10 / 20 / 20 m	6 m	6 / 15 / 10 / 20 / 20 m	10 / 20 / 20 m
150 ... 3,000 mm	150 ... 1,200 mm	150 ... 3,000 mm	150 ... 3,000 mm
MLC 300: 3 – 51 ms MLC 500: 3 – 64 ms	7 – 17 ms	3 – 64 ms	3 – 64 ms
29 x 35 mm	15.4 x 32.6 mm	29 x 35 mm	29 x 35 mm
MLC 300: 0 ... +55°C MLC 500: -30 ... +55°C	-10 ... +55°C	-30 ... +55°C	-30 ... +55°C
2 PNP transistor outputs	2 PNP transistor outputs	2 PNP transistor outputs	2 PNP transistor outputs
M12 connector	160 mm cable with M12 connector	M12 connector	M12 connector
X		X	X
X		X	X
X	X	X	X
X		X	X
X	X	X	X
X	X	X	X
X	X	X	X
X	X	X	X
		X	X
		X (2-sensor timing controlled)	X (Smart Process Gating)
		X	
	X		
X	X		
(group II, cat 3D and 3G)			
X		X	

Safety light curtains



**MLD 310, MLD 320
MLD 510, MLD 520**

**MLD 330, MLD 335
MLD 530, MLD 535**

Single light beam safety devices



**MLD 510, MLD 520,
MLD 530**

**SLS 46C type 4
SLS 46C type 2**

	MLD 310, MLD 320 MLD 510, MLD 520	MLD 330, MLD 335 MLD 530, MLD 535	MLD 510, MLD 520, MLD 530	SLS 46C type 4 SLS 46C type 2	
General	Type in accordance with EN IEC 61496	MLD 300: type 2 MLD 500: type 4	MLD 300: type 2 MLD 500: type 4	Type 4 (self-monitoring) Type 4, in combination with an MSI-TRM safety relay Type 2, in combination with a safety monitoring device	
	SIL in accordance with IEC 61508 and EN IEC 62061 (SILCL)	MLD 300: SIL 1 MLD 500: SIL 3	MLD 300: SIL 1 MLD 500: SIL 3	SIL 3 SIL 3 (SLS 46C type 4 with MSI-TRM safety relay) SIL 1 (SLS 46C type 2 in combination with safety monitoring device)	
	Performance Level (PL) in accordance with EN ISO 13849-1	MLD 300: PL c MLD 500: PL e	MLD 300: PL c MLD 500: PL e	PL e PL e (SLS 46C type 4 with MSI-TRM safety relay) PL c (SLS 46C type 2 in combination with safety monitoring device)	
	Number of beams / beam distance	2 / 500 mm 3 / 400 mm 4 / 300 mm	2 / 500 mm 3 / 400 mm 4 / 300 mm	1	1
	Operating range	0.5 ... 50 m or 20 ... 70 m (transmitter-receiver systems) 0.5 ... 6/8 m (transceiver systems)	0.5 ... 50 m or 20 ... 70 m (transmitter-receiver systems) 0.5 ... 6/8 m (transceiver systems)	0.5 ... 70 m 20 ... 100 m	0.25 ... 40 m 5 ... 70 m
	Dimensions	Profile cross section 52 x 65 mm	Profile cross section 52 x 65 mm	52 x 65 x 193 mm	20.5 x 77 x 44 mm
	Temperature range	-30 ... +55 °C	-30 ... +55 °C	-30 ... +55 °C	-30 ... +60 °C
	Safety-related switching outputs	2 PNP transistor outputs (OSSDs)	2 PNP transistor outputs (OSSDs)	2 PNP transistor outputs (OSSDs)	2 push-pull transistor outputs
	Connection type	M12 connector	M12 connector	M12 connector	2 m cable, M12 connector
	Certifications				
Functions	LED indicator	X	X	X	
	7-segment display	MLD 320, 520	X	MLD 520, 530	
	Start / restart interlock (RES)	MLD 320, 520	X	MLD 520, 530	
	Contacting monitoring (EDM)	MLD 320, 520	X	MLD 520, 530	
	Configuration by means of wiring	MLD 320, 520	X	MLD 520, 530	
	Laser alignment aid (optional for transmitter/receiver systems)	X	X	X	
	2-sensor muting (timing and sequence controlled)		MLD 330, 530 MLD 335, 535	MLD 530	
	4-sensor muting (timing controlled)		MLD 335, 535		
	Muting-timeout extension to up to 100 hours		X	MLD 530	
	Integrated status indicator (optional)	X	X		
AS-i Safety interface	MLD 510		MLD 510		

Safety switches



S20, S200

Safety position switches



S300

Safety proximity sensors, magnetically coded



MC 300

Safety proximity sensors, RFID coded



RD 800

General	Type in accordance with EN ISO 14119	Type 2 interlock device without guard interlocking	Type 1 interlock device without guard interlocking
	Safety	For safety applications with performance level up to PL e/SIL 3	For safety applications with performance level up to PL e/SIL 3
	Housing / Degree of protection	Technopolymer (S20) or metal (S200) / both IP 67	Technopolymer or metal, both IP 67
	Actuator	Mechanical tongue, with low coding level in accordance with EN ISO 14119	Actuated by unencoded cam in accordance with EN ISO 14119
	Locking type, locking force acc. to ISO 14119		
	Connection type	Cable entry M20 x 1.5 (S20: optional 3-way), M12 connector	Cable entry M20 x 1.5 (1- or 3-way), M12 connector
	Certifications		
Functions	Function	Safety switches with separate actuator	Safety switches with plunger and roll actuator
	Integration in safety circuit	Positive-opening contacts for integration in a safety circuit	Positive-opening contacts for integration in a safety circuit
	Actuator	Up to 8 different actuators	6 different plunger and roll actuators
	Special functions		Switching direction selectable
Features		Universal use with 5 actuator approach directions	Universal use with individually set actuator approach directions and angles in 10° grid
		Easy mounting with standard construction	Extremely durable / robust
		High-quality silver contacts for long life expectancy	Various contact blocks
		Various contact blocks	

General	Type in accordance with EN ISO 14119	Type 4 interlock device without guard interlocking	Type 4 interlock device without guard interlocking	
	Category in accordance with EN ISO 13849-1	Up to 4 (depending on the number of sensors)	4	
	Performance Level (PL) in accordance with EN ISO 13849-1	Up to PL e (depending on the number of sensors)	PL e with a single device	
	Dimensions (housing)	M30 x 36 mm (MC 330) 36 x 26 x 13 mm (MC 336) 88 x 25 x 13 mm (MC 388)	87.5 x 25 x 18 mm (sensor) 45 x 25 x 18 mm (actuator)	
	Assured operating distances (Seo, Sar)	< 6 mm, > 14 mm (MC 330) < 3 mm, > 11 mm (MC 336) < 6 mm, > 30 mm (MC 388)	12 mm, 10 mm	
	Switching tolerance	± 1 mm		
	Contact type	2 NC or 1 NC + 1 NO		
	Code type	Actuator with low coding level in accordance with EN ISO 14119		
	Connection type	M8, M12, cable, cable+M12		
	Min. approach speed of actuator towards sensor	50 mm/s		
	Response time	3 ms	3 ms	
	Degree of protection	IP 67	IP 67 / IP 69K	
	Certifications			
	Functions	Encoding	Magnetically coded	RFID coded, for maximum protection against manipulation
		Status indicator	LED	4 LEDs
		Signal contact	X	X
		Programming input		For teaching-in actuators
Features		Contactless actuation without mechanical contacts Long life expectancy Not sensitive to soiling	Contactless actuation without mechanical contacts Long life expectancy Not sensitive to soiling Series connection possible	

Safety locking devices



L100, L200



L250



L300

		L100, L200	L250	L300
General	Type in accordance with EN ISO 14119	Type 2 interlock device with guard interlocking	Type 4 interlock device with guard interlocking	Type 4 interlock device with guard interlocking
	Safety	For safety applications with performance level up to PL e / SIL 3	Performance Level PL e / SIL 3 with a single device	Performance Level PL e / SIL 3 with a single device
	Housing / Degree of protection	Technopolymer or metal, both IP67	Technopolymer IP 67 / IP 69K	Metal, IP 67 / IP 69K, IP 65 for integrated operational controls
	Actuator	Mechanical tongue, with low coding level in accordance with EN ISO 14119	Mechanical tongue with RFID-encoded actuator in accordance with EN ISO 14119; AC-L250-SCA: low AC-L250-UCA: high	Mechanical tongue with RFID-encoded actuator in accordance with EN ISO 14119; AC-L300-SCA: low AC-L300-UCA: high
	Locking type, locking force acc. to ISO 14119	With either quiescent current principle or open circuit current principle L100: F _{1max} 1,100 N L200: F _{1max} 2,800 N	With either quiescent current principle or open circuit current principle, F _{1max} 2,100 N	With either quiescent current principle or open circuit current principle, F _{1max} 9,750 N
	Connection type	Cable entry M20 × 1.5 (3-way)	M12 connector, various outgoing lines	Cable entry M20 × 1.5 (3-way), M12 (8- or 12-pin), M23 (19-pin)
	Certifications			
Functions	Function	Safety switches with locking device	Safety switches with locking device	Safety switches with locking device
	Integration in safety circuit	Positive-opening contacts for integration in the safety circuit	OSSD safety-related switching outputs	OSSD safety-related switching outputs
	Actuator	Multiple heavy-duty actuators	Contactless actuation through RFID technology	Contactless actuation through RFID technology
	Status indicator	LED status display (L200)	LED status display	LED status display
	Escape release	Models with escape unlocking (L200)	Models with escape unlocking	Models with escape unlocking
	Special functions			Models with up to three integrated operational controls
Features		Universal use with 5 actuator approach directions Robust design for big machinery and systems in harsh ambient conditions (L200)	Large center opening for actuator shaft Flexibly mounted actuator enables secure closing even with warped doors Variable installation options: Front and side mounting with just two screws Flexible and independent alignment of connection unit and escape unlocking	Large center opening for actuator shaft Flexibly mounted actuator enables secure closing even with warped doors Variable installation options: Flexible and independent alignment of device head and escape unlocking Lock-out/tag-out functionality Door handle for simple mounting of switches and actuators

Programmable safety controls



MSI 410

**MSI 420
MSI 430**

**MSI-EM-I8
MSI-EM-I084**

Technical data	Device type/function	Safety control base module	Safety control base module	Safe extension module
	Category / Performance Level (PL) in accordance with EN ISO 13849-1	4 / PL e	4 / PL e	4 / PL e
	SIL in accordance with IEC 61508 or EN IEC 62061 (SILCL)	3	3	3
	Inputs/outputs / Inputs or outputs, configurable	20 / 4 / –	16 / 4 / 4	8 / – / – 8 / 4 / –
	Maximum switching power per output	4 A	4 A	4 A
	Test outputs/signal generators	4 / 4	4 / 4	8 / 2 (EM-I8) 2 / 2 (EM-I084)
	Interfaces	USB mini	USB mini, Ethernet TCP/IP	
	Fieldbus protocols		MSI 430: PROFINET IO, EtherNet/IP and Modbus TCP integrated	
	Supply voltage	16.8 ... 30 V DC	16.8 ... 30 V DC	16.8 ... 30 V DC
	Ambient temperature, operation			
Dimensions	45 × 96 × 115 mm	45 × 96 × 115 mm	22.5 × 93.7 × 120.8 mm	
Certifications				
Functions		40 certified function blocks Expandable to up to 116 safe inputs / 56 safe outputs and 2 gateway modules Special function blocks for press control	40 certified function blocks Expandable to up to 116 safe inputs / 56 safe outputs and 2 gateway modules Special function blocks for press control	Safe extension modules Each base module can be expanded by up to 12 freely selectable extension modules
Features		Configuration via MSI.designer configuration software (license-free): supports up to 300 function blocks in one project, integrated simulation with logic analyzer, configurable report, online diagnosis Removable program memory in SD card format, 512 MB Designs with screw or spring-cage terminals	Configuration via MSI.designer configuration software (license-free): supports up to 300 function blocks in one project, integrated simulation with logic analyzer, configurable report, online diagnosis Removable program memory in SD card format, 512 MB Designs with screw or spring-cage terminals	Designs with screw or spring-cage terminals

Network and connection technology

Connection units



MD 700i
IO-Link master

MD 798i
IO-Link master

MD 742
IO-Link hub

	MD 700i IO-Link master	MD 798i IO-Link master	MD 742 IO-Link hub	
Technical data	Connection type	2x M12, 4-pin, D-coded, Ethernet fieldbus connection 2x M12, 5-pin, L-coded, voltage supply 8x M12, 5-pin, A-coded	2x M12, 4-pin, D-coded, Ethernet fieldbus connection 2x M12, 5-pin, L-coded, voltage supply 8x M12, 5-pin, A-coded, IO-Link	1x M12, 5-pin, A-coded, IO-Link / voltage supply 8x M12, 5-pin, A-coded, 8x M8, 3-pin, digital input
	Interfaces	PROFINET EtherNet/IP IO-Link 1.1	PROFINET EtherNet/IP IO-Link 1.1	IO-Link 1.1
	Features	Integrated switch Voltage IN/OUT 8x IO-Link Class A 8 IO-Link + 8 DI 16 DI / 8 DI/8DO	Integrated switch Voltage IN/OUT 8x IO-Link Class A+B, pin 4 in IOL mode 4x DIO + 8 SIO mode 4x DO	16 (M12) / 8 (M8) digital PNP inputs COM 2 / 38.4 kbit/s
	Shield	Shielded	Shielded	Shielded
	Degree of protection (only in the screwed-down state with the corresponding mating parts)	IP 65 / 67 / 69K*	IP 65 / 67 / 69K*	IP 65 / 67 / 69K*
	Dimensions, L x W x H	65 x 210.4 x 30 mm	60 x 230 x 39 mm	54 x 150 x 27 mm 32 x 144 x 32 mm
	Certifications	CE cULUS	CE cULUS	CE cULUS
Functions	Cloud connection via OPC UA Integrated web server Can be operated as stand-alone device	Integrated web server	Economical connection of digital signals	
Features	Robust design for harsh conditions For the connection of up to 8 IO-Link devices Parallel data exchange with control and the IT world Models with OPC UA as standardized model for transferring data from the field level to the cloud Stand-alone system with fully integrated web server No further software necessary Module cloning for device exchange and extension to new devices	Robust design for harsh conditions Resistant to welding sparks For the connection of up to 8 IO-Link devices Stand-alone system with fully integrated web server No further software necessary Module cloning for device exchange and extension to new devices	Robust design for harsh conditions Resistant to welding sparks Standardized mounting holes in the middle enable flexible mounting on all standard profiles and mounting plates For bundling up to 16 digital signals per hub No further software necessary, description via IODD	

Accessories and Supplementary Products



MD 200i
IO-Link master

2x RJ45 Ethernet fieldbus connections, 2x screw terminals for the voltage supply, 8x IO-Link master ports

PROFINET
EtherNet/IP
IO-Link 1.1

Integrated switch
Voltage IN/OUT
8x IO-Link Class A
8 IO-Link + 8 DI
16 DI / 8 DI/8DO

Shielded

IP 20

114 x 45 x 108 mm



Cloud connection via OPC UA
| Integrated web server | Can be operated as stand-alone device

Robust design for harsh conditions
| Mounting holes in the middle and additional fixing holes on the side enable flexible mounting on all standard profiles and mounting plates | For the connection of up to 8 IO-Link devices | Parallel data exchange with control and the IT world | Models with OPC UA as standardized model for transferring data from the field level to the cloud
| Stand-alone system with fully integrated web server | No further software necessary | Module cloning for device exchange and extension to new devices

Signaling devices



Signaling column, type A

Signaling column, type E

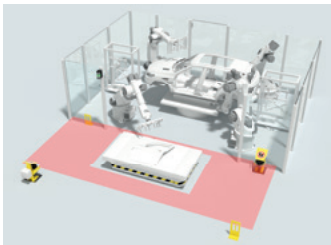
		Signaling column, type A	Signaling column, type E
Technical data	Operating voltage	24 V DC ±10 %	24 V AC/DC, ±10%
	Degree of protection	IP 66	IP 66
	Diameter	70 mm	70 mm, 40 mm
	Certifications	CE cUL US	CE cUL US
	Housing	Plastic, PC-ABS	Plastic, PC
Func-tions		Optical & acoustic signaling for displaying machine states	Optical & acoustic signaling for displaying machine states
Features		Flexible configuration: 6 different colors (red, orange, yellow, green, blue, white) Simple mounting: base mounting: 3 stand heights with plastic foot, flat mounting variant, hinged mounting variant Models with and without M12 connector Module connection via bayonet lock Position-independent – protection against interchanging Transparent calottes/uniform clear glass optics Single-sound & multi-sound buzzer modules (up to 105 dB) Preassembled models & freely configurable elements Signal image: continuous light & flashing light Multicolor with 7 different colors	6 different colors (red, orange, green, blue, white, yellow) Base mounting, bracket mounting, horizontal mounting Single-sound buzzer module Freely configurable elements Signal image: continuous light & flashing light

Safety solutions

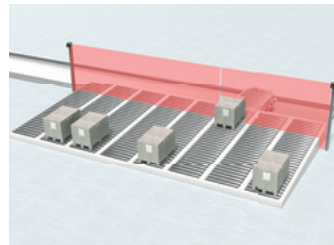
Efficient material flow and maximum safety

The increasing automation of processes places growing demands on safety concepts. Classic concepts such as muting are often pushed to their limits here, e.g. at transfer stations and material locks. Our innovative safety solutions guarantee gapless safety, efficient material flow and high availability of your system, even with automatic processes.

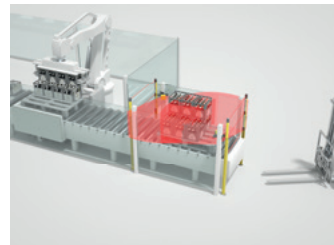
Safeguarding of robot/AGV transfer stations



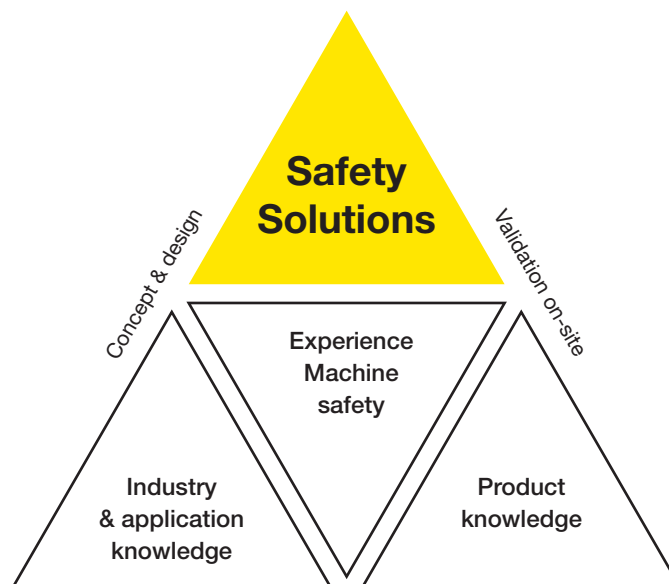
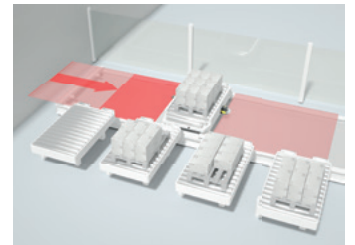
Access guarding on multi-track transport systems



Access monitoring at material transfer station



Area guarding at transverse side-tracking skate



Use our experience and our know-how

Innovative ideas are based on experience and know-how. For more than 30 years, we have been supporting safety-related applications in different industries by offering a broad range of products. Our safety experts have comprehensive knowledge of the latest norms and standards and extensive experience in designing safety concepts. This allows us to develop efficient safety solutions for use in automated environments.

- Global network of certified experts for the creation of safety concepts and the validation of the solutions on-site
- In-house Solutions Engineering Center
- Development and design according to the V-model in accordance with EN ISO 13849-1
- Extensive selection of in-house safety products

Your partner for efficient safety solutions

From the gathering of the requirements to the safety acceptance, you are accompanied by our professional project teams.

They make sure that the safety solution meets your requirements and ensure that the project runs smoothly.



Tailored to your needs

Our solutions are based on qualified safety concepts which, if necessary, can also be extended or created new. Every solution is individually tailored to your system layout and includes

- All necessary hardware and software components
- Engineering services, such as configuration according to project requirements
- Start-up support
- Validation of the safety function
- Full documentation



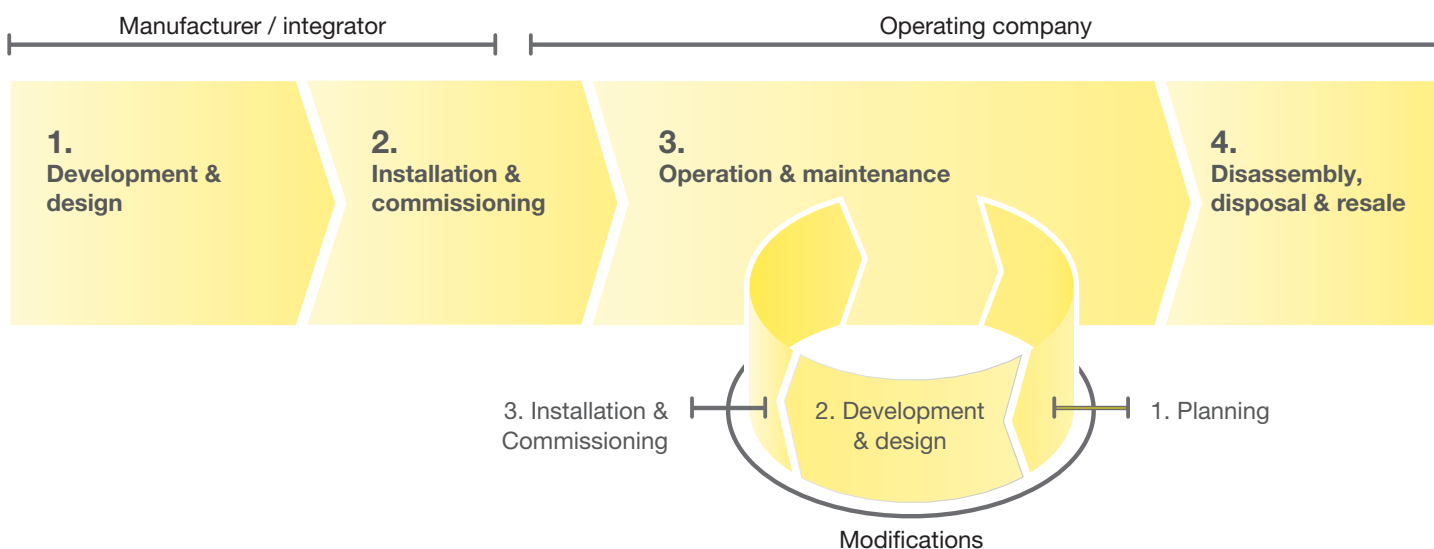
The path to your solution



Machine Safety Services

Sustainable machine safety begins with professional planning of the safety systems and spans the entire lifecycle of a machine. Our teams of experienced and certified experts offer the appropriate support here.

Stages of a machine life cycle



When designing and constructing machines, we create the safety-related concept together with you and support you in its realization. During operation, we regularly perform tests to ensure the permanent function of the safety systems. If changes are made to existing machines, we provide you with support on everything from the safety-related planning to renewed commissioning.

Through our services, you benefit from our many years of experience in the area of machine safety and our extensive industry and application knowledge. Efficient safety-related solutions for every phase of a machine's life cycle are thereby created together.

Our service offerings



Status check: safety technology on machines and systems

- Our experts analyze the safety-related condition of your machinery and check whether the current safety-related requirements are satisfied in accordance with the current state of the art.
- In the event of deviations, we provide recommendations on what corrections can be performed so as to comply with legal requirements.



Risk assessment and hazard assessment

In accordance with applicable directives, the manufacturer of a machine is required to perform a risk assessment. This also applies in the case of significant modifications or extensions of machines.

The national regulations for the operation of machines require employers to conduct a hazard assessment before using work equipment and to update this assessment at regular intervals according to the current state of the art.

- Our experts support you in identifying the dangers, in assessing and evaluating the risks as well as in defining the risk-reducing measures.



Inspection of protective devices

- Within the scope of the initial or regular inspection, we check the condition, mounting and correct function of the protective device as well as the correct integration in the safe part of the machine control
- We summarize the results of the tests in a detailed report. If necessary, this includes practically oriented suggestions on how deviations can be corrected.



Stopping time measurement

For the correct placement of the protective device, the required minimum distance between protective device and dangerous movements is to be calculated. To do this, the stopping time of the machine must be known. With the stopping time measurement, we determine this value reliably.

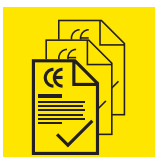
- By measuring the stopping time within the scope of regular inspections, any wear, such in brake components, can be detected in good time.



Status check: CE marking of machines

During the development of machines, the specifications from the machinery directive must be adhered to and documented by the manufacturer. This is confirmed with the Declaration of Conformity and the CE marking.

- We check the documentation for completeness and give recommendations of how any deviations can be corrected.



Conformity assessment in accordance with the European machinery directive

The machinery directive defines the procedure for the design and construction of machines for satisfying the applicable safety and health protection requirements. This is a prerequisite for the Declaration of Conformity and the CE marking.

- We help you comply with and implement the legal requirements of the machinery directive.



Safety concept and safety design

The measures necessary for risk minimization are known from the risk analysis. The safety concept and the safety functions are developed on the basis of these requirements.

- With our extensive industry knowledge and our many years of safety-related experience, we create practically oriented concept proposals for you and support you during their implementation.



Verification and validation

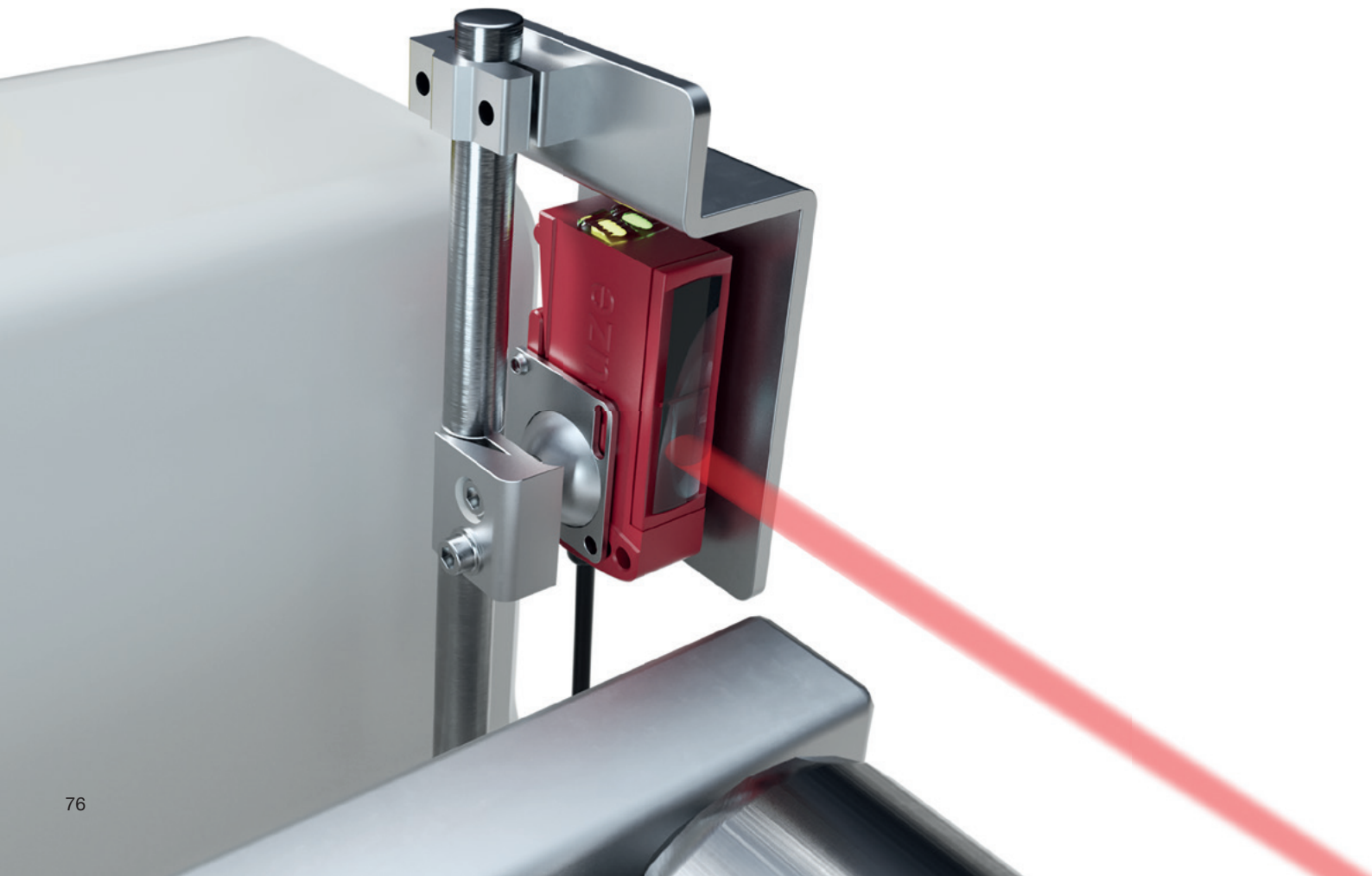
To avoid errors during the implementation of safety functions, both the hardware as well as the software must be checked to determine whether the requirements of the functional specification were met completely and correctly. The function test of all safety functions is to be performed according to the validation plan.

- We support you during the planning, development and execution of the function tests as well as with the creation of the required documentation.

Accessories and Supplementary Products

Efficient work requires more than just a sensor. Almost as important are the appropriate accessories, which allow the sensor to utilize its full functionality. No matter if you need easy mounting, uncomplicated connection or reliable signaling, you can easily find the right accessories for your application in our extensive product range.

You can find our complete accessories range on our website at www.leuze.com.





Mounting systems

We place great emphasis on our products being easy to mount and simple to align. For this reason, you will find specially-attuned mounting systems in our product range such as mounting brackets, rod holders or device columns.

Reflectors

Just how reliably retro-reflective photoelectric sensors can detect depends upon the selected reflector, among other things. That is why we offer various matching solutions made of plastic, film, and glass for all conceivable conditions.



Cables

To facilitate the integration of our sensors, we offer a large variety of connection and interconnection cables with M8, M12, and M23 connectors – straight or angled, and with or without LED.

Connection units

Today, sensors, safety switches and cameras are linked together via active or passive sensor distribution boxes with fieldbus interfaces from our product range to ensure more flexibility and transparency during installation.



Mounting brackets and device and mirror columns

The mounting brackets designed for our safety sensors ensure simple mounting and alignment of the devices. Device columns for free-standing floor assembly and mirror columns for multi-sided safeguarding simplify the installations.

Signaling devices

For signaling in automated systems, we offer an extensive product range of single- and multi-colored as well as acoustic transducers in order to ensure productivity and efficiency.



Our company

Everything at a glance

In a constantly changing industrial world, we work together with our customers to find the best solution for their sensor applications: innovatively, precisely and efficiently.

Key figures

Foundation	1963
Company structure	GmbH + Co. KG, wholly family-owned
Executive management	Ulrich Balbach
Headquarters	Owen, Germany
Distribution companies	21
Production locations	6
Technological competence centers	3
Distributors	40
Employees	> 1,200

Product range

- Switching sensors
- Measuring sensors
- Safety
- Identification
- Data transmission
- Network and connection technology
- Industrial image processing
- Accessories and supplementary products

Focus industries

- Intralogistics
- Packaging industry
- Machine tools
- Automotive industry
- Laboratory automation



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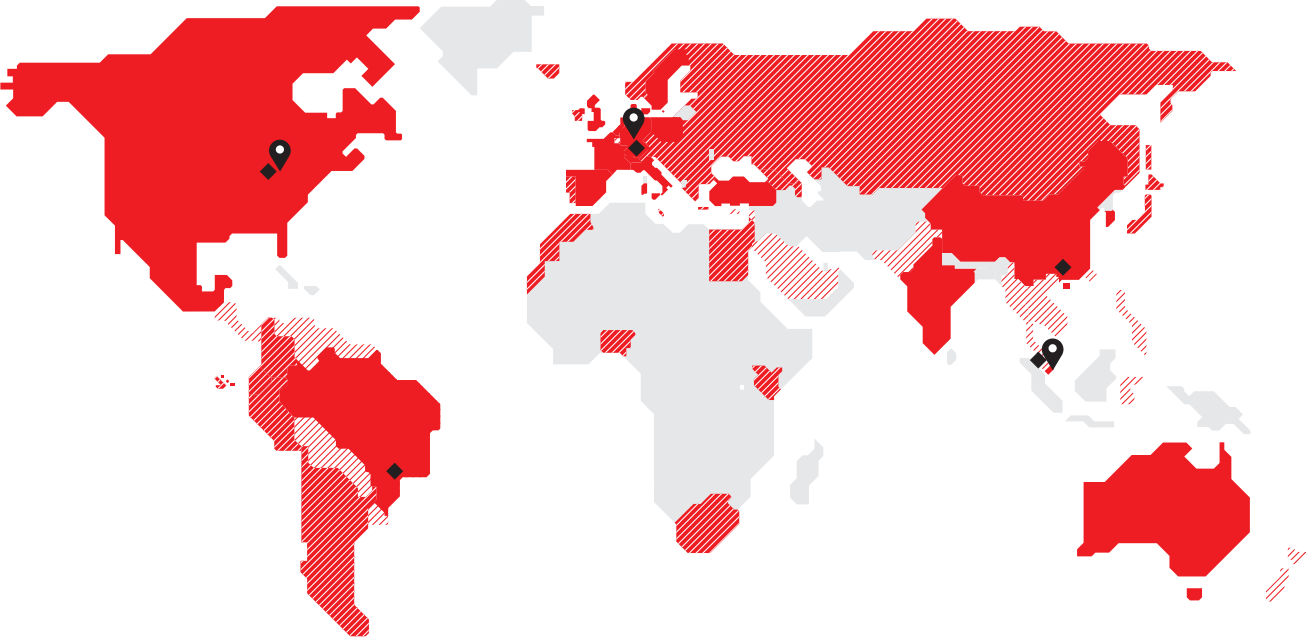




Our Locations

At work for you around the world

Your success is our motivation. We therefore place great value on always being personally, quickly, and easily accessible to you. We produce on four continents, allowing us to offer you reliable product availability.



- 📍 Technological competence centers
- ◆ Production locations
- Distribution companies
- ▨ Distributors
- ▨ Distribution through neighboring country

Technological competence centers

Owen, Germany
 New Hudson/Detroit, USA
 Singapore

Production locations

Owen, Germany
 Unterstadion, Germany
 New Hudson/Detroit, USA
 Shenzhen, China
 São Paulo, Brazil
 Malacca, Malaysia

Distribution companies

Australia/New Zealand
 Belgium
 Brazil
 China
 Denmark/Sweden
 France
 Germany – headquarters
 Germany – distribution company
 Great Britain
 Hong Kong
 India
 Italy
 Mexico
 Poland
 Singapore
 South Korea
 Spain
 Switzerland
 The Netherlands
 Turkey
 USA/Canada

Our product range at a glance

Switching sensors

- Optical Sensors
- Inductive Switches
- Capacitive Sensors
- Ultrasonic Sensors
- Fiber Optic Sensors
- Fork Sensors
- Light Curtains
- Special Sensors

Measuring sensors

- Distance Sensors
- Sensors for Positioning
- 3D Sensors
- Light Curtains
- Bar Code Positioning Systems
- Fork Sensors

Safety

- Safety Solutions
- Safety Laser Scanners
- Safety Light Curtains
- Single and Multiple Light Beam Safety Devices
- Safety Radar Sensors
- Safe Locking Devices, Switches and Proximity Sensors
- Safety Controls and Relays
- Machine Safety Services

Identification

- Bar Code Identification
- 2D-Code Identification
- RF Identification

Data transmission

- Optical Data Transmission Systems

Network and Connection Technology

- Connection Technology
- Modular Connection Units

Industrial image processing

- Light Section Sensors
- Smart Camera

Accessories and Supplementary Products

- Signaling Devices
- Mounting Systems
- Reflectors

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