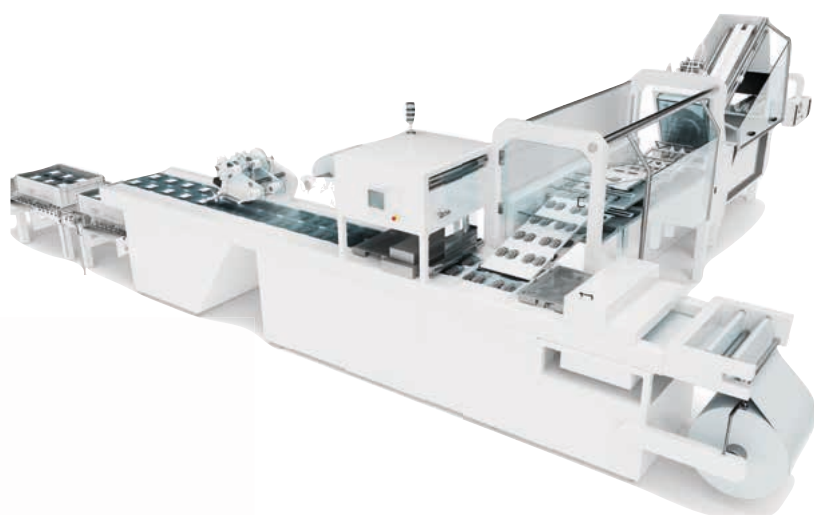
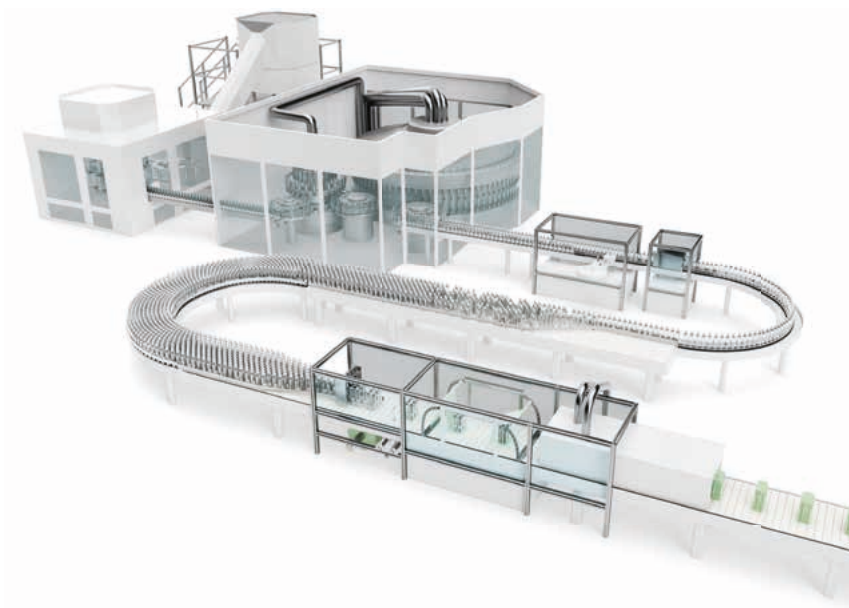
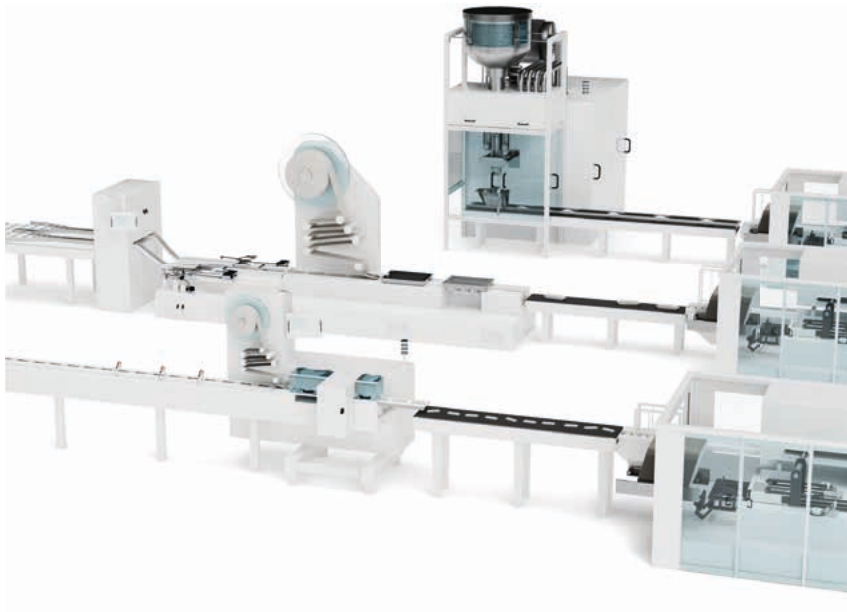


## Sensor solutions for the packaging industry







## **Packaging. Sensors. Solutions.**

Page 6–9

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### **Primary packaging and portioning**

**Beverage filling**  
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**Meat, sausage and cheese packaging**  
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**Confectionery and bakery packaging**  
Page 26–33

**Dairy packaging**  
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**Labeling**  
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### **Secondary packaging**

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### **End-of-line**

**Palletizing**  
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**Technical data**  
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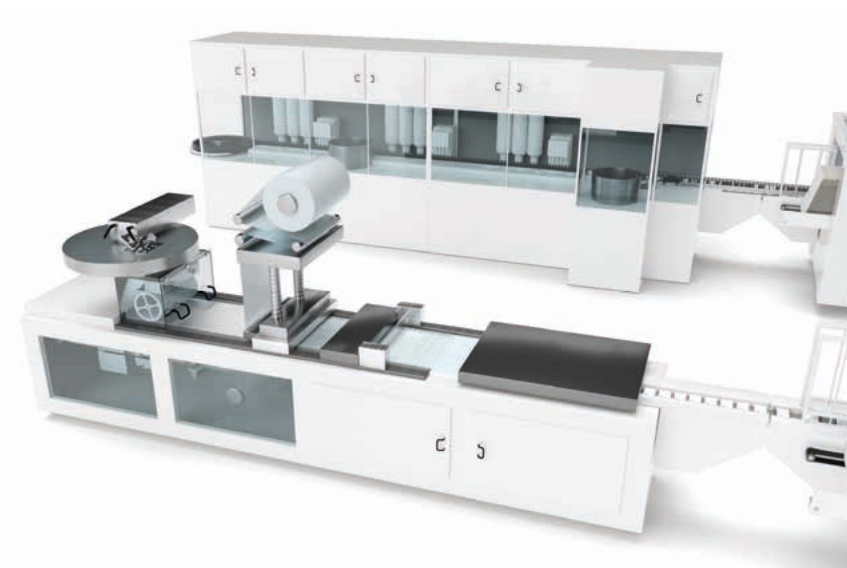
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**Safety Solutions**  
Page 88–91

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**Accessories and supplementary products**  
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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 60 years. The success of our customers is what drives us. Yesterday. Today. Tomorrow.







# Packaging. Sensors. Solutions.

The demands on manufacturers of packaging machines and consumer goods are high and dynamic: consumers expect innovative and sustainable packaging materials, brand and consumer protection are gaining in importance and e-commerce is the defining trend in retail. Packaging processes in the food, beverage filling and pharmaceutical industries must become increasingly flexible, efficient and intelligent.

Our broad product range includes sensors for the entire packaging process – each tailored to your specific requirements. While hygiene requirements are very high in sausage and cheese processing or in the pharmaceutical industry, speed and efficiency are additionally important in the beverage industry. In confectionery packaging, the focus is on flexibility and easy format changes. Together with our customers, we have been developing the right solution for every application for over 60 years. No matter whether this involves individual standard sensors, special sensors or complete solutions. Our goal is to ensure that your systems are available and your production processes are reliable, safe and trackable.





### **Robust sensor systems for the food and pharmaceutical industries**

In hardly any other industry are the demands on sensor systems as high as in the food, beverage filling and pharmaceutical industries. We focus consciously on sensor applications in beverage filling, the packaging of sausage and cheese, confectionery and bakery products, dairy products and pharmaceuticals. Our robust and hygienic sensors meet the highest protection classes and certifications and have proven themselves for decades even in extremely harsh environments.



### **From the first to the last step in the packaging process**

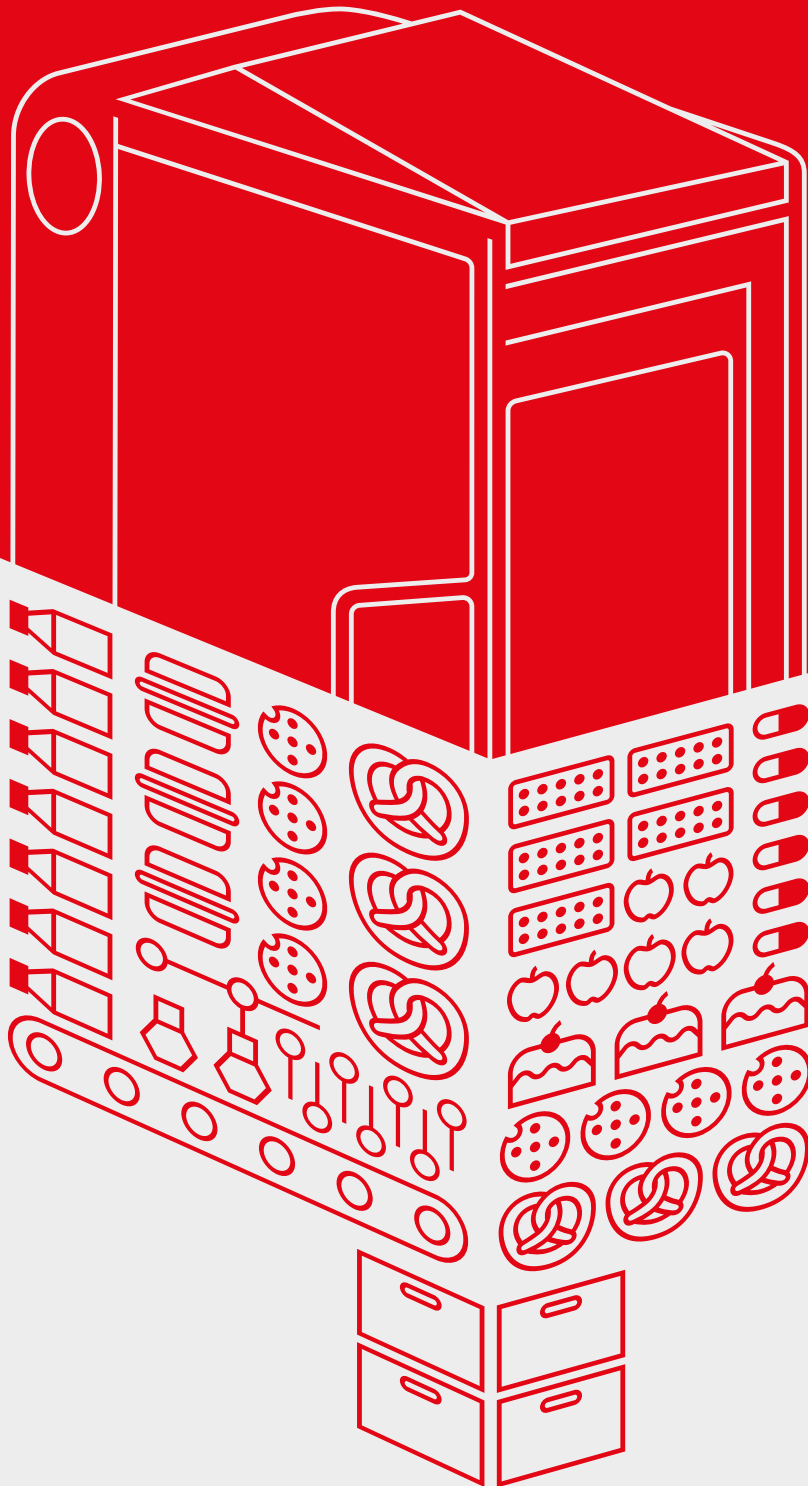
With our sensors and automation solutions, we support you in all steps of the packaging process - from primary and secondary packaging to labelling, final packaging and palletizing of food, beverages or pharmaceuticals. Discover the whole world of packaging sensor systems at Leuze: solutions for machine safety, for optical detection or measurement tasks, for bar code detection or for more demanding tasks in the areas of detection, inspection and identification.



### **Economical processes for your packaging system**

The best possible availability and cost effectiveness of your packaging systems – that is your challenge and the demand on our sensor solutions. Performance improvements can be achieved at different levels. With universally applicable sensors with an IO-Link interface, for example, you can avoid downtimes during format changes. Or collect data in real time via our sensor systems and use it to proactively maintain your systems in terms of Industry 4.0 (predictive maintenance).

# More than you expect.



## Beverage filling



## Meat, sausage and cheese packaging



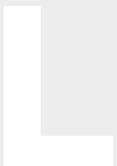
## Confectionery and bakery packaging



## Dairy packaging





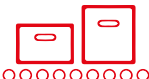
## Pharmaceutical packaging





# Sensor solutions for your tasks in packaging processes



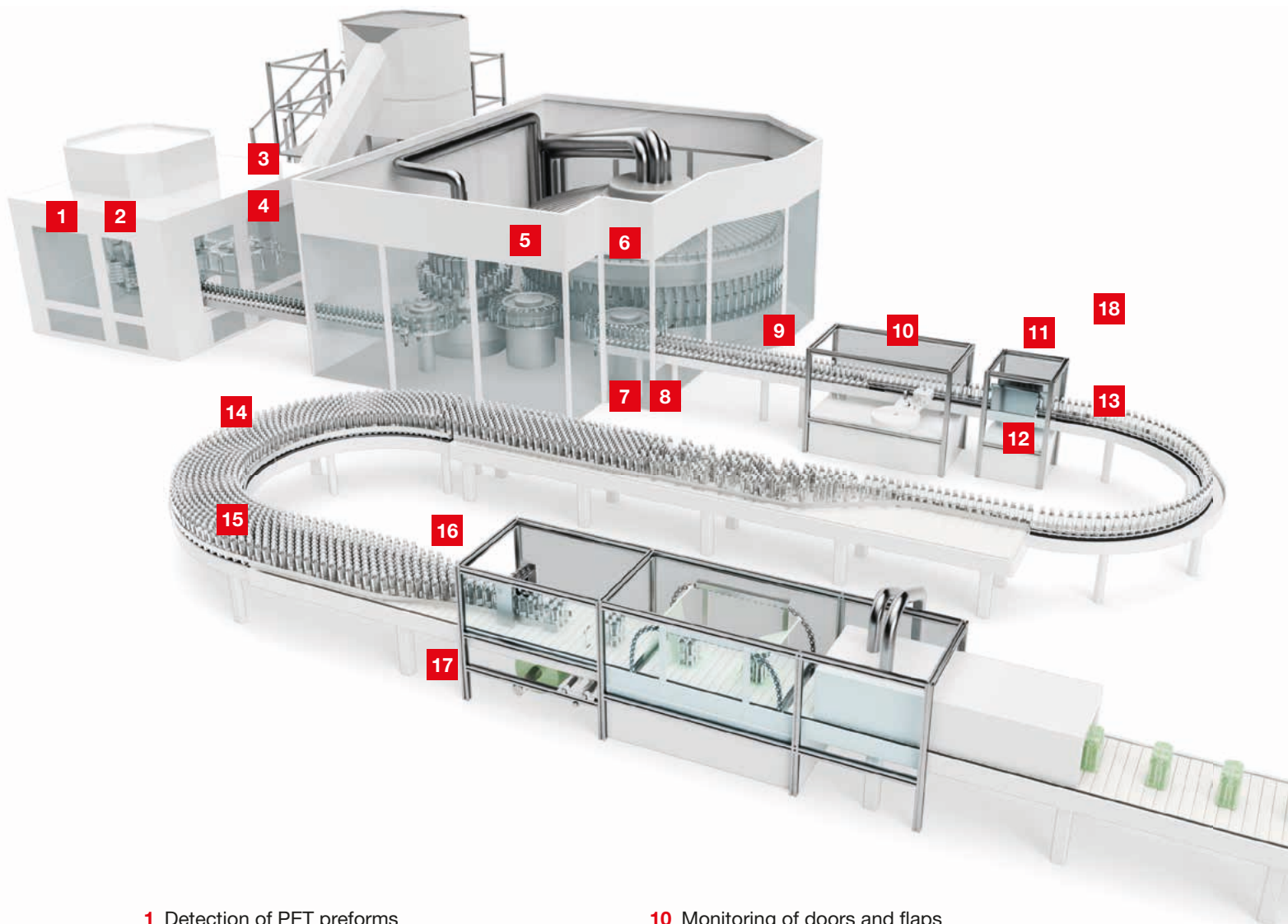
Preparatory process steps	Primary packaging	Labeling	Carton and container packaging	Palletizing
				
Blow molding <b>from page 10</b>	Bottle/container detection Filling level measurement Cover feed Bottle cap control Transport control <b>from page 10</b>			
Product infeed Cutting and dividing Portioning Film handling <b>from page 18</b>	Cut good detection Containers (trays) Packaging detection and identification Filling-level inspection Transport control Film handling (monitoring of rolled goods, web guiding, splice detection) <b>from page 18</b>	Monitoring of label tape (tape tear monitoring) Monitoring of roll diameter Monitoring of label supply Regulation of carrier tape tension via tension roll	Primary packaging combination Completeness inspection Object detection inside films / packaging	Monitoring of pallet stacks Quality control of pallets Detection of pallets Position of secondary packaging (e.g. crate, carton, package)
Detection of empty molds Dough loop control Film handling <b>from page 26</b>	Detection of packaging and objects Filling level measurement Transport control Object/product height monitoring Film handling (monitoring of rolled goods, web guiding, splice detection, monitoring of sealed seams) Object detection inside packaging films <b>from page 26</b>	Detection of containers and packaging Detection of transparent and non-transparent labels Label presence Label alignment Cut mark detection Container alignment Code reading <b>from page 44</b>	Detection of objects with openings (baskets) Alignment and transport control of packages Stack height monitoring of folding box packaging Carton pile positioning Detection of carton content Closure control of packaging Detection of carton sealing material Shipping label check Shipping carton volume measurement Correlation check Code reading/tracking <b>from page 50</b>	Handling at pallet wrapping machines (winding height detection, end position monitoring of film carriage, film detection, monitoring of film supply) Code reading on pallets Detection of shrink-wrapped pallets Width and height monitoring Machine safety <b>from page 58</b>
	Detection of containers and packaging Filling level measurement Transport control Film handling Bottle cap control <b>from page 34</b>			
	Vial positioning and detection Detection of small parts Packaging alignment Filling level measurement Transport control Handling of rolled goods (diameter monitoring, splice detection) Package insert detection <b>from page 38</b>			

# Beverage filling

Beverage filling systems fill glass bottles, cans and PET containers in highly automated processes and at an impressive speed. Apart from speed, the reliability and maximum availability of the system are also of key importance. As market leaders for sensor systems used in beverage filling, we offer solutions for all applications along this process chain – from filling, labeling and packaging to palletizing and shipping.

The applications are as diverse as our sensor product range, which is tailored to these applications. The precise retro-reflective photoelectric sensors of the PRK 18B series are our specialists for the challenging task of detecting transparent media. A special tracking function integrated in the sensors compensates for any contamination that may occur and increases the availability of your systems. The stainless steel sensors of the 53C and 55C series are characterized by a hygienic design as well as a high degree of resistance against cleaning agents and robustness to large temperature fluctuations. The LS55C.H2O water sensor reliably detects all aqueous liquids in many different types of container. These compact stainless steel sensors meet the high protection class IP 69K and have ECOLAB certification.





- |  |   |
|--|---|
| 1 Detection of PET preforms                              | 10 Monitoring of doors and flaps                          |
| 2 Detection of PET bottles                               | 11 Bottle cap control                                     |
| 3 Guarding of points of operation during bottle cleaning | 12 Detection of positions                                 |
| 4 Detection of projections                               | 13 Bottle detection during transport                      |
| 5 Bottle detection in transfer star                      | 14 Filling level detection in mass transport              |
| 6 Fill level detection when filling                      | 15 Position detection in mass flow                        |
| 7 Detection of filled bottles                            | 16 Aisle control  |
| 8 Presence control of bottle caps                        | 17 Guarding of points of operation                        |
| 9 Cover feed   | 18 Position control in potentially explosive environments |

# Beverage filling

## Detection of PET preforms

**Requirement:** PET bottles are blown from preforms in filling systems for plastic bottles. For this purpose, the transparent preform must be detected on the feed to the stretch blow molding machine.



**Solution:** The retro-reflective photoelectric sensors of the 25C, 55C and 18B series with autocollimation reliably detect transparent objects. They are ideally suited for detection tasks on stretch blow molding machines, as they can compensate for temperature fluctuations and contamination.

## Detection of PET bottles

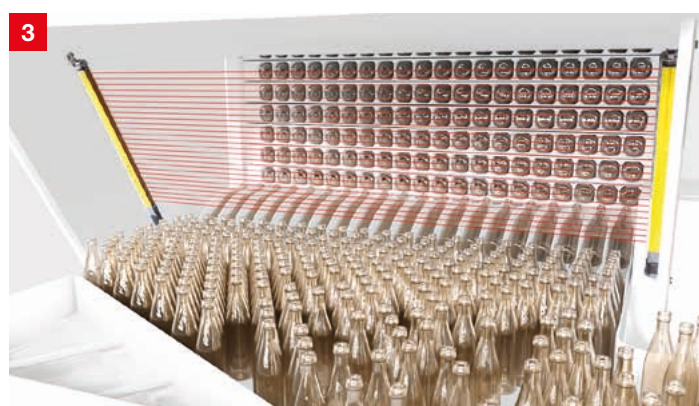
**Requirement:** After the preform has been heated and blown into the mold, the now very thin and highly transparent PET bottle must be detected by the sensor with an extremely high level of reliability. This is the only way to ensure fault-free operation of the stretch blow molding machine.



**Solution:** The PRK 55C and PRK 18B retro-reflective photoelectric sensors with polarization filter are specially developed for the detection of highly transparent bottles. Temperature and contamination compensation offsets environmental influences. In this way, the sensors enable the machine to be operated over long periods without unplanned maintenance stoppages.

## Guarding of points of operation during bottle cleaning

**Requirement:** Machine openings ensure good accessibility to the system. The points of operation must be secured with optical protective devices during operation. Even in harsh environments, such as bottle cleaning machines.



**Solution:** The MLC 500 safety light curtains are a flexible solution for guarding machine openings. They are available with a resolution from 14 mm and in protective field lengths up to 3,000 mm. For demanding environments, the models with a degree of protection IP 69K in an encapsulated protection tube are suitable.



## Detection of projections

**Requirement:** Reusable bottles are conveyed via mass transport to the bottle cleaning machine, where they are separated into aisles. They are then automatically inserted into the cleaning cells via a gripper system. Sensors are used to detect potential collisions or “bouncing” bottles.



**Solution:** The PRK 46C retro-reflective photoelectric sensors in a plastic housing with degree of protection IP 69K are equipped with a high function reserve for this application. The special light-spot geometry reacts only to bottles, not to splashes, thus ensuring high availability.

## Bottle detection in transfer star

**Requirement:** Bottle filling is characterized by very high speeds. For a smooth process, it must be ensured prior to filling that all positions of the transfer star are occupied with bottles.



**Solution:** The HT55C diffuse sensor with background suppression reliably detects bottles during the filling process and does so without reflectors. ECOLAB certification and the enhanced Leuze cleaning agent long-term test CleanProof+ ensure the functionality of the sensor in wet areas and during intensive cleaning processes.

## Fill level detection when filling

**Requirement:** Water is filled into containers in a filling machine. The fill level must be exactly the same in all containers – underfilling should be prevented.



**Solution:** The LS/LE55CI.H2O throughbeam photoelectric sensors are developed for the detection of aqueous liquids and for fill-level monitoring. The transmitter and receiver system of the stainless steel 55C series in wash-down design has a high radiation capacity and is also used with non-transparent containers and containers with plastic labels.

# Beverage filling

## Detection of filled bottles

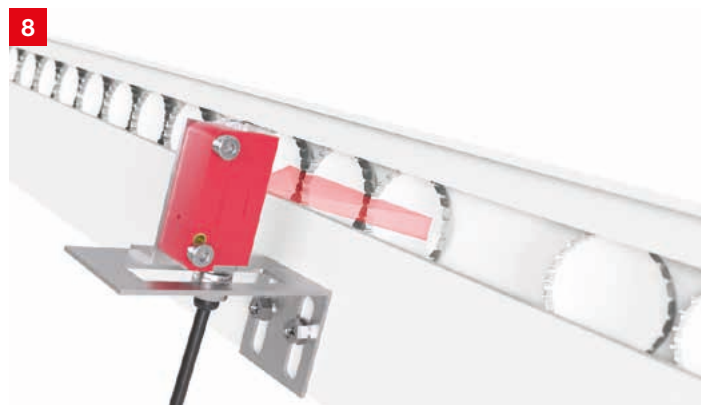
**Requirement:** After the filling process, empty bottles must be detected in order to recognize leaks in PET or glass bottles. This becomes particularly challenging when a clear liquid is in a non-transparent container.



**Solution:** The LS / LE55CI. H2O throughbeam photoelectric sensor is developed with an optimum wavelength for detecting aqueous liquids in transparent or opaque containers. During the filling process, the cleaning and environmental requirements are high, which is why the sensors are designed in stainless steel housings with a degree of protection IP 69K.

## Presence control of bottle caps

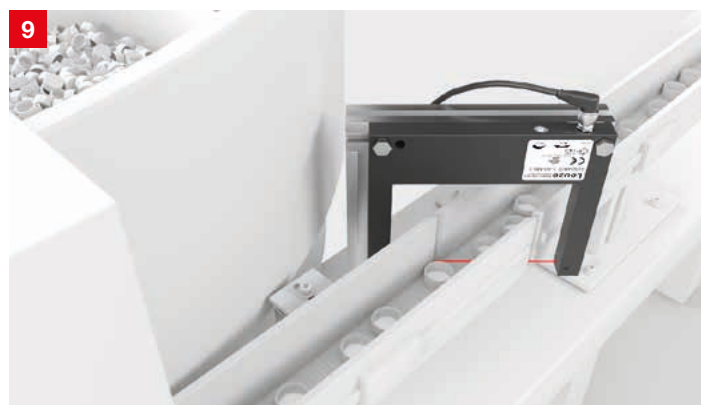
**Requirement:** After the filling process, the bottles are automatically sealed with screw caps or crown caps. For a continuous production process, the presence of the bottle caps in the feeder must be checked. A reflector cannot always be attached here.



**Solution:** Presence control can be solved with retro-reflective photoelectric sensors such as the PRK 3C. If no reflector can be attached, a diffuse sensor with a long light spot, such as the HT3C. XL, is suitable for interrupted and irregular objects. For the detection of crown caps, an IS 200 inductive sensor can be used alternatively.

## Cover feed

**Requirement:** In filling and sealing machines, individual bottle caps in the cover feed must be reliably detected on their way to the capping machine.



**Solution:** The GS 04B and GS 08B fork photoelectric sensors are ideal for detecting small parts. As the transmitter and receiver are located in one device, the compact solution can be integrated easily and without alignment work. The sensors are positioned horizontally to the feed, so each cap interrupts the light beam.

## Monitoring of doors and flaps

**Requirement:** Doors or flaps are often required on machines, for example to change consumables or to clean the machine. These must be closed during operation. To prevent hazards, the closing state must be monitored in terms of safety.



**Solution:** The magnetically coded MC 300 safety proximity sensors monitor doors and flaps. Owing to their enclosed design and contact-free operating principle, they are ideal for use in harsh and damp environments. With their cubic and cylindrical designs, the devices are also easy to integrate.

## Bottle cap control

**Requirement:** After the bottles have been sealed, the fit of the cap is checked at a test station. Only correctly fitted caps ensure a proper sealing of the bottle.



**Solution:** With its extensive tool set, the IVS 1048i Simple Vision sensor can determine whether the bottle cap is sealed correctly. A user-friendly, graphical interface ensures fast setup and smooth operation of the sensor.

## Detection of positions

**Requirement:** In the fast processes of beverage filling, it is important to detect containers as precisely as possible. For inspection machines, the camera must be triggered with position accuracy. This requires sensors with short response times and focused, aligned light spots.



**Solution:** Retro-reflective photoelectric sensors with laser light in plastic housing (PRK 3CL series) or in metal housings (PRK 55CL or PRK 18B) enable precise triggering with very low jitter.

# Beverage filling

## Bottle detection during transport

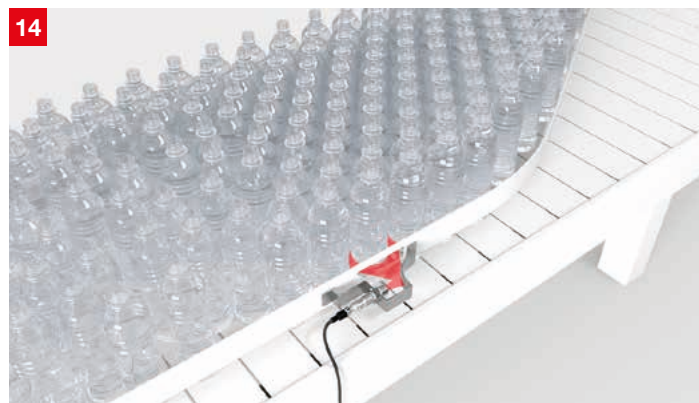
**Requirement:** For the subsequent filling process, the bottles must be spaced apart to prevent them from colliding and thus causing noise pollution. In the transport line there are short conveyor sections where sensors detect the position of the transparent bottles.



**Solution:** The PRK 18B and PRK 55 retro-reflective photo-electric sensors feature a focused light spot and autocollimation (to detect small signal differences) for long-term fault-free operation. The PRK5.R with special reflector is available as an entry-level solution.

## Fill level detection in mass transport

**Requirement:** Containers are transported in mass flow on conveyor belts to the next station. For a continuous flow, the fill level must be monitored. To reliably detect different container sizes and shapes, a sensor with a large detection range is required.



**Solution:** The robust HTU 318 and HTU 418 ultrasonic sensors in metal or plastic housings with a large detection lobe and one or two switching points that can be set independently via IO-Link are ideally suited for changing container formats or colors.

## Position detection in mass flow

**Requirement:** To detect interferences in the mass flow, a uniform profile of the surfaces can be made from above. Gaps, for example caused by fallen cans, must be reliably detected.



**Solution:** The CML 700 light curtain in V-configuration is developed for measuring moving objects that pass and detects interferences across the entire measurement width. As defects do not reflect light from the transmitter to the receiver, the sensor detects them immediately. Various interfaces are available.



### Aisle control

**Requirement:** Gaps should be avoided for aisle control in the feed to the package formation. For this purpose, the containers are lined up in aisles and stowed at suitable locations. A gap that occurs must be detected and eliminated via the conveyor control system.



**Solution:** A simple solution is provided by mechanical brackets in conjunction with sensors for end position detection. The final position can be detected by an inductive sensor, e.g. IS 218 or IS 212 in metal or stainless steel housings, via metal arms on the plastic brackets.

### Guarding of points of operation

**Requirement:** In a cleaning system for barrels and KEGS, there are access points for manual intervention. Safety sensors with a high IP degree of protection are required to safeguard the points of operation.



**Solution:** The MLC 500-IP safety light curtains safeguard points of operation in hygiene-sensitive areas and have the highest degree of protection IP 69K. For this purpose, the light curtains are mounted in a transparent and encapsulated tube. Different resolutions and protective field lengths offer optimal adaptation to the application.

### Position control in potentially explosive environments

**Requirement:** When filling potentially explosive materials, such as highly volatile substances or dusts, specially protected sensors must be used. Optical sensors need ATEX certification in hazardous areas.



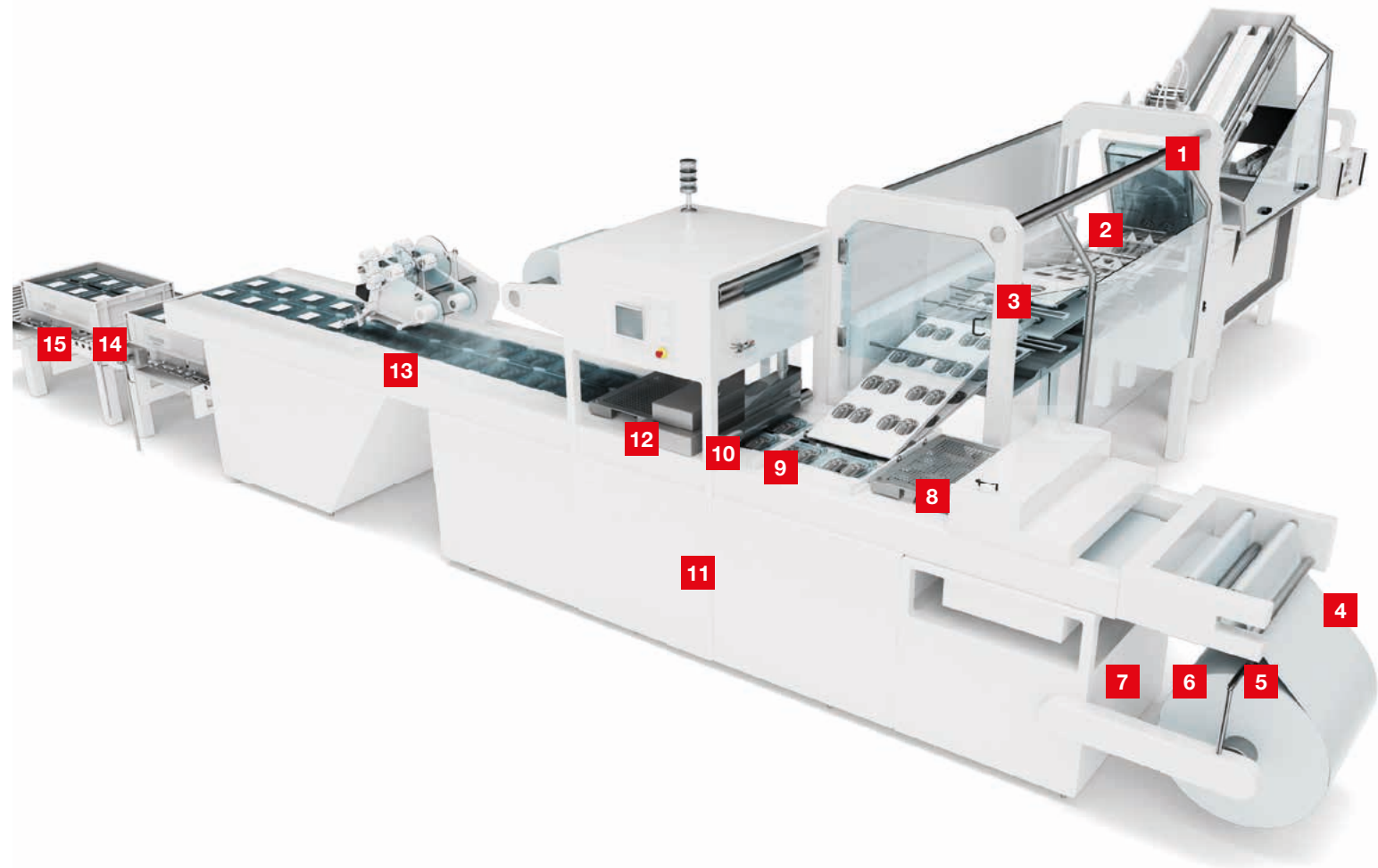
**Solution:** The PRK 55 Ex retro-reflective photoelectric sensor in combination with a reflector is a reliable solution for position detection in potentially explosive zones. 55 Ex series sensors are suitable for Ex-zone 2 (gas) or 22 (dust) environments.

# Meat, sausage and cheese packaging

When it comes to the processing and packaging of sausage, cheese or meat, not only the systems but also the installed sensors need to withstand regular intensive cleaning cycles at high pressures and temperatures using aggressive cleaning agents.

Our sensors, which have a special hygienic design, ensure a consistently high product quality in production areas where there is direct contact with the food, for example when detecting the leading edges of cut goods. The sensors of the 53C and 55C series have a high-quality V4A stainless steel housing (AISI 316L). The extremely smooth surfaces can be cleaned very thoroughly and bacterial carry-overs to production systems are avoided. All of the plastic parts used in the sensors have FDA approval. With the highest degree of protection IP 69K as well as ECOLAB and CleanProof+ certification, the robust miniature sensors enable long operating periods in wet zones (wash-down design) and hygienic areas (hygienic design). This ensures reliable and stable processes.





**1** Monitoring of the product infeed

**2** Detection of cut goods

**3** Monitoring of doors and flaps with locking device

**4** Detection of film

**5** Detection of splices

**6** Web edge control

**7** Measurement of roll diameter

**8** Detection of empty trays

**9** Filling-level inspection

**10** Detection of products on conveyor belt

**11** Integration of safety sensors

**12** Safeguarding of points of operation at access points

**13** Detection of thermoformed trays

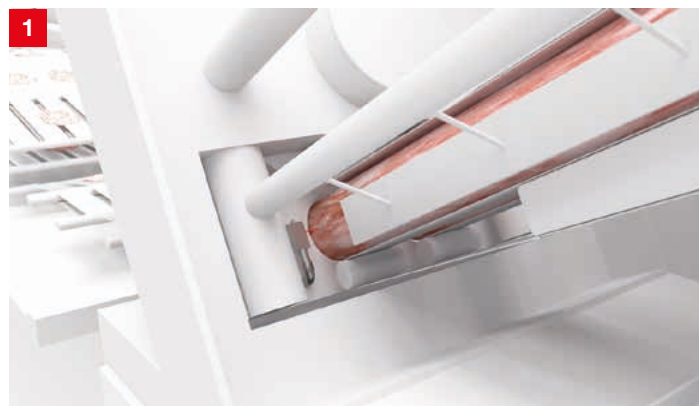
**14** Detection of containers

**15** Identification of containers

# Meat, sausage and cheese packaging

## Monitoring of the product infeed

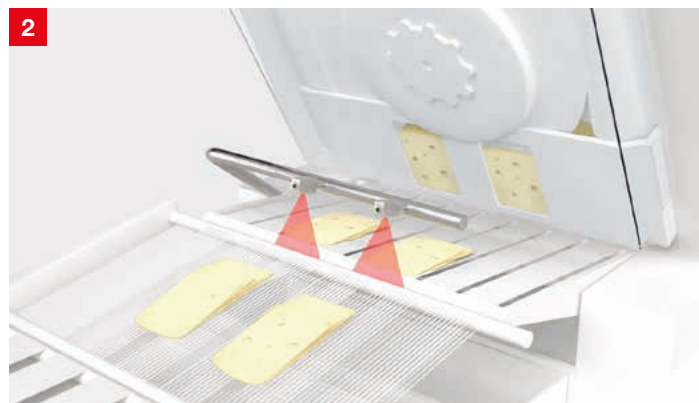
**Requirement:** In the food industry, sausage or cheese is delivered in large bars and cut into thin slices in a cutting machine. The product must be reliably detected in the infeed of the machine so that the gripper can uniformly push the material towards the knife and so that all cut slices have the required thickness.



**Solution:** The HT53C.S diffuse sensor in hygienic design monitors the product infeed at the cutting machine. A particularly small light spot ensures very good performance, especially with objects with colored structure. Background suppression of the sensor enables reliable color-independent product detection.

## Detection of cut goods

**Requirement:** In an industrial cutting machine, cut goods are cut into small stacks and pre-portioned for the subsequent packaging in trays. The challenge for the sensor system is that the front edge of the cut goods must be reliably detected at the same switching point. The sensors are mounted directly above the conveyor belt.



**Solution:** The HT53CL1.X diffuse sensor with background suppression is optimized for the detection of the front edge of products thanks to a long laser light spot. The sensor in hygienic design ensures that cut goods are positioned precisely when loaded into the deep-drawing packaging.

## Monitoring of doors and flaps with locking device

**Requirement:** Moving protective devices such as doors and flaps protect the operator from hazards. In the so-called white areas, safety switches with locking device in a hygienic design are required.



**Solution:** The L100, L250 and L300 safety switches with locking device keep safety doors locked until access is released by an electric signal. The series includes standard designs, devices with integrated operational controls as well as with RFID-coded actuators. Technopolymer housings with smooth surfaces are suitable for hygiene-sensitive areas.



### Detection of film

**Requirement:** The film infeed must be ensured throughout the complete packaging process. Sensors are used at suitable points to detect the presence of the transparent film as well as film tears or film ends.



**Solution:** The PRK 18B retro-reflective photoelectric sensors are suitable for detecting highly transparent films, ideally with an MTKS reflector. Models for the detection of transparent objects include the PRK25C.A and PRK3C.A retro-reflective photoelectric sensors.

### Detection of splices

**Requirement:** Hard-wearing thermoforming sheets are bonded when changing film rolls. For a fault-free process, this splice must be reliably detected and discharged.



**Solution:** Ultrasonic sensors enable material-independent splice detection. The VSU 12 ultrasonic system developed for this application consists of a pair of ultrasonic sensors and an analysis amplifier. The IGSU14E SD ultrasonic fork sensor is an alternative.

### Web edge control

**Requirement:** Film webs must be precisely aligned laterally before further processing. Sensors ensure a precise web guide, both for the bottom and top film. Suitable sensor solutions are required in each case for transparent or printed film webs.



**Solution:** Different solutions are available for the web guide – with plastic fiber optic cables from the KF series or with switching retro-reflective photoelectric sensors, e.g. PRK 18B, two-point control can be realized. With a GS 754 measuring fork sensor, a high-precision analog web guide is possible.

# Meat, sausage and cheese packaging

## Measurement of roll diameter

**Requirement:** Thermoforming film for trays is provided in large rolls. To ensure uniform unrolling of the film, the axis is motor-driven. A sensor must permanently detect the diameter of the roll.



**Solution:** The measuring sensors of the ODS9 or ODS96 series send an analog signal in relation to the roll diameter to the control. An alternative for diameter measurement are the DMU318 and DMU418 ultrasonic sensors. Distance sensors are available with different measurement ranges.

## Detection of empty trays

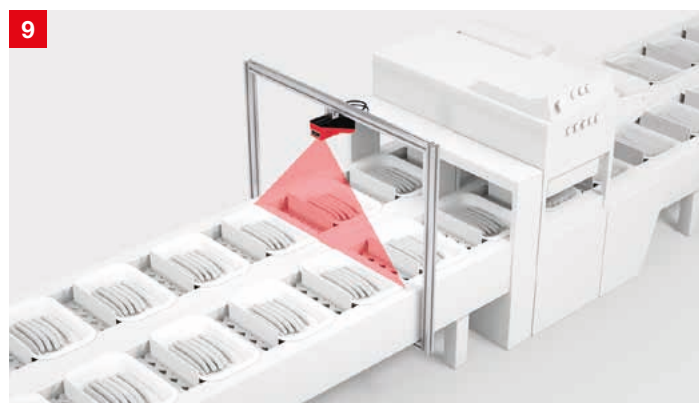
**Requirement:** Empty plastic trays that are often transparent must be reliably detected in the feed of a tray sealer. Ideally, retro-reflective photoelectric sensors are used for the detection of transparent objects.



**Solution:** The compact retro-reflective photoelectric sensors of the 3C or 25C series in plastic housings and the 55C series in stainless steel housings are designed as autocollimation models for this application. Suitable reflectors with microtriples of type MTKS are available in various dimensions and materials.

## Filling-level inspection

**Requirement:** Before the trays are sealed in the sealing machine, it must be checked to determine whether all trays are filled. Unfilled and overfilled containers must be discharged. The control is carried out by sensors mounted above the conveyor.



**Solution:** The LRS 36 light section sensor uses a projected laser line to detect the filling status of the individual trays. The sensor provides several switching outputs and process data for the control.

### Detection of products on conveyor belt

**Requirement:** In order to be able to control transport sections between process steps, objects on the conveyor line must be detected. The challenge is that the objects have different shapes and colors or are transparent. Due to their proximity to the food, sensors must meet high hygiene requirements.



**Solution:** Retro-reflective photoelectric sensors of the 55C series in stainless steel housings with suitable MTKS.5 stainless steel reflectors as well as diffuse sensors with different light-spot geometries are optimized for detection tasks in the food industry. The housing design of the 53C series in hygienic design is suitable for direct food contact.

### Integration of safety sensors

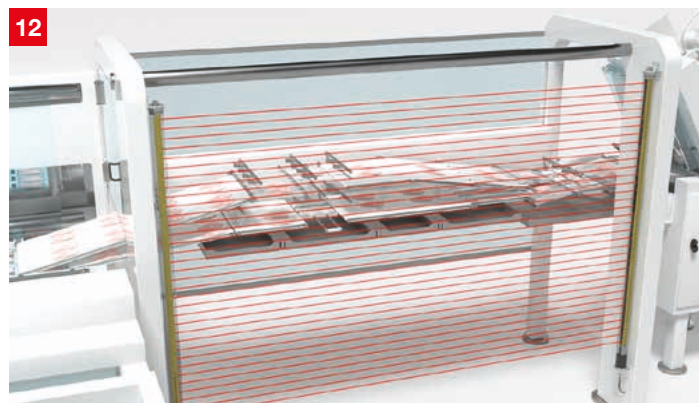
**Requirement:** Reliable evaluation units are required for the integration of safety sensors and command devices into the safety circuit of the machine control. Either as safety relays with a fixed function for individual safety sensors or as programmable safety controls with flexible functions for several safety sensors.



**Solution:** The MSI SR safety relays offer simple and cost-effective solutions for the integration of individual safety sensors. For more complex safety functions and multiple sensors, the configurable MSI 400 safety controls are used. They are modularly expandable and can be easily adapted to the application.

### Safeguarding of points of operation at access points

**Requirement:** Large machine openings through which access to danger zones is possible must be secured during operation. Safety sensors with a high IP degree of protection are required for use in hygiene-sensitive environments.



**Solution:** The MLC 500-IP safety light curtains safeguard points of operation in hygiene-sensitive areas of food processing and have the highest degree of protection IP 69K. For this purpose, the light curtains are mounted in a transparent and encapsulated tube. Different resolutions and protective field lengths offer optimal adaptation to the application.

# Meat, sausage and cheese packaging

## Detection of thermoformed trays

**Requirement:** After products have been packaged in thermoformed trays, for example, the front edge must be reliably detected from above, even in single or multiple track systems. Different heights of the trays can pose a challenge for the sensor system used.



**Solution:** The DRT 25C dynamic reference diffuse sensor sets the conveyor belt as a reference and thus allows for reliable detection of the front leading edges of the object on the belt – independent of the colors or heights of the products. Light spots arranged perpendicular to the transport direction also detect products with gaps.

## Detection of containers

**Requirement:** Standardized containers are used in the process steps between meat cutting and further processing. Sensors for detecting these containers must be designed for high hygienic requirements.



**Solution:** Retro-reflective photoelectric sensors of the PRK 46C or PRK 25C series can be used for container detection on the transport system. HT 46C or HT 25C diffuse sensors are often also used here. The 46C and 25C series have a degree of protection IP 69K and are ECOLAB-certified.

## Identification of containers

**Requirement:** To control the path of the standard containers, the codes attached to the containers must be reliably read. Due to the high requirements of the cleaning agents used and ambient temperatures, sensors must be used that can withstand this environment.



**Solution:** The bar codes or Data Matrix codes present on the containers can be read and identified very reliably with the compact, image-based code reader DCR 200i in a stainless steel housing (hygienic design) with a degree of protection IP 69K. The most important Ethernet-based interfaces are available for selection.



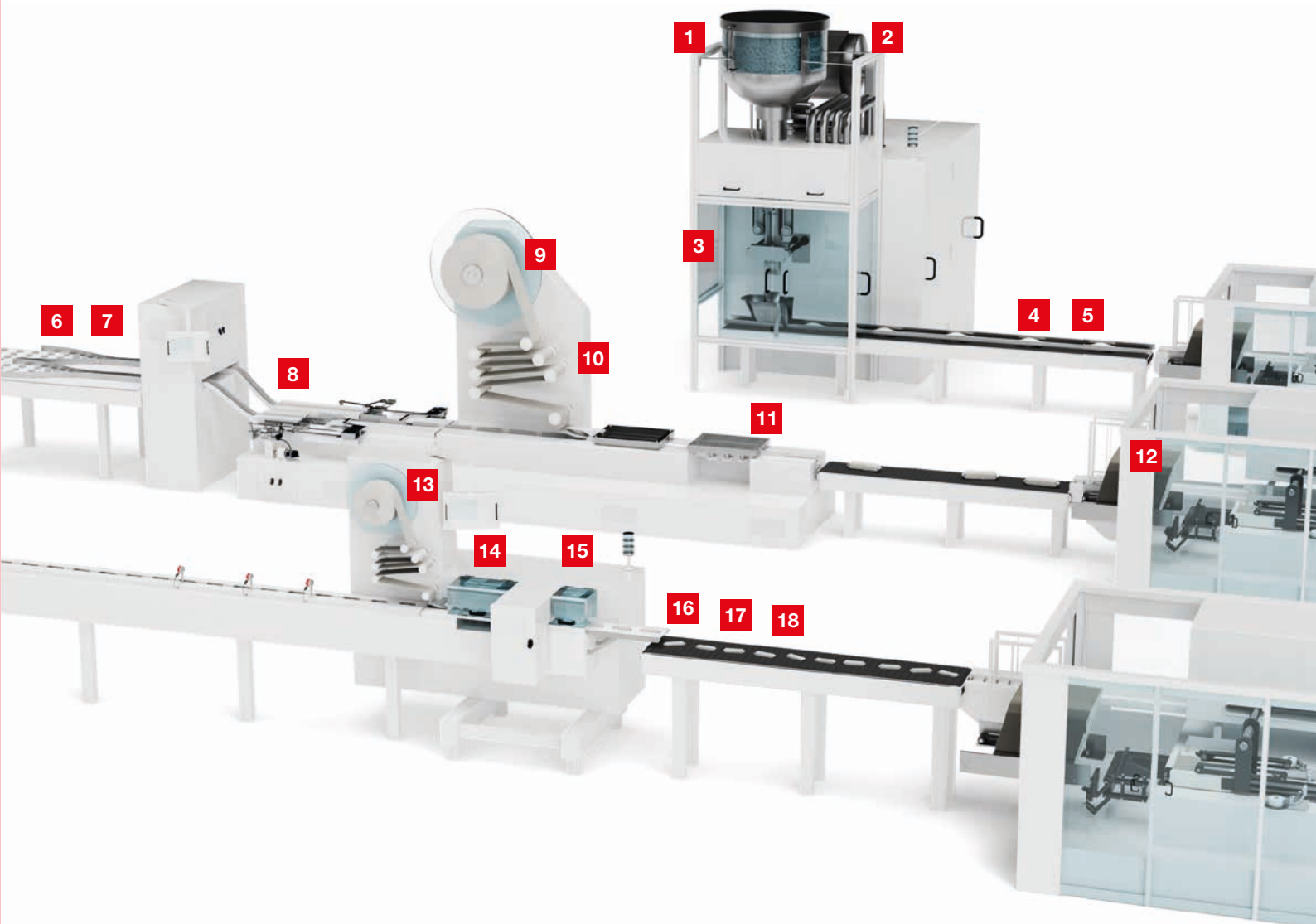


# Confectionery and bakery packaging

With automated packaging processes in the confectionery and baked goods industry, flexibility is a decisive requirement: It is usually the case that very different products are produced and packaged on the same system. Here sensors are required that detect all of these products reliably and, wherever possible, without adjustments or additional settings having to be made. This becomes particularly challenging if confectionery is packaged in high-gloss and/or transparent films.

Our innovative sensors are optimized for applications in processing and packaging systems for confectionery and baked goods. The DRT 25C dynamic reference diffuse sensor uses the conveyor of the system as a reference and is therefore a specialist in detecting products with challenging shapes or surfaces. The LS 25CI Super Power throughbeam photoelectric sensor transilluminates even metalized film without problem and thereby detects products packaged inside films. When it comes to more complex inspection tasks, the flexible Simple Vision sensors are an optimum solution. Most of our sensors have an IO-Link interface. This allows presettings and recipes to be transferred directly from the machine control to the sensors. In this way, any sensor settings that may be required when the product is changed over can be made extremely flexibly and without long downtimes.





- |   |  |
|---|--|
| 1 Fill level monitoring                           | 10 Code identification on flowpacks        |
| 2 Web edge measurement                            | 11 Product height monitoring               |
| 3 Dough loop control                              | 12 Ejection monitoring and product count   |
| 4 Detection of products on conveyor belts         | 13 Detection of cut marks in film feed     |
| 5 Multiple-track object detection                 | 14 Monitoring of sealed seams              |
| 6 Identification of empty molds                   | 15 Detection of packaging content          |
| 7 Detection of residual quantities in empty molds | 16 Detection of packaged products          |
| 8 Quality and object height monitoring            | 17 Detection of products on conveyor belts |
| 9 Detection of splices                            | 18 Alignment control                       |

# Confectionery and bakery packaging

## Fill level monitoring

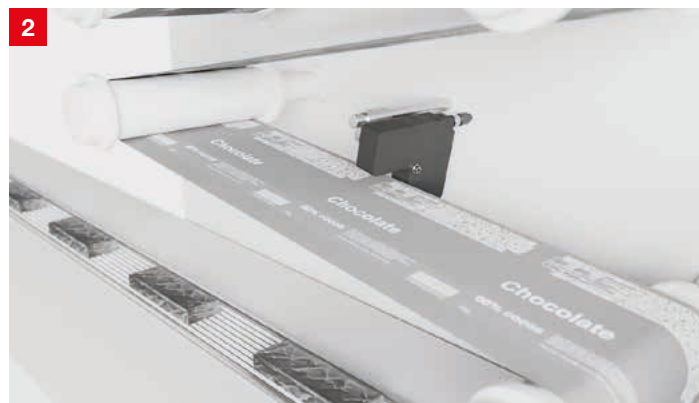
**Requirement:** In confectionery production, numerous ingredients and additional items such as chocolate buttons, liquids, etc. are used. For continuous control of the provision of ingredients, the fill levels in the respective containers must be detected.



**Solution:** The LCS capacitive sensors detect the fill levels of liquids or bulk materials in plastic or glass containers. The sensors detect through the container wall and without contact with the product. The position of the sensors defines a minimum and a maximum fill level.

## Web edge measurement

**Requirement:** In order to guarantee a parallel run of the film and right-angled cuts, a web edge control along the film run is helpful. High demands on accuracy require a precise measuring sensor.



**Solution:** The GS 754 measuring fork sensor is available in different mouth widths for edge control with maximum precision. The resolution of 0.01 mm allows for very fine web guiding. The GS 754 is a reliable solution for a wide range of materials.

## Dough loop control

**Requirement:** Dough is rolled out in a machine and later processed into baked goods. The dough is precisely rolled out to a required thickness. A sensor monitors that the dough retains its shape unchanged when transferred to the conveyor belt. The distance between the dough and the sensor is used as the measured variable.



**Solution:** The ODT 3C is positioned at the output of the rolling machine above the dough loop and provides a distance value to the higher-level control. The measurement value is evaluated using the process data via IO-Link. In addition, diagnostic data is transmitted to the controller via IO-Link for Industry 4.0 purposes.

### Detection of products on conveyor belts

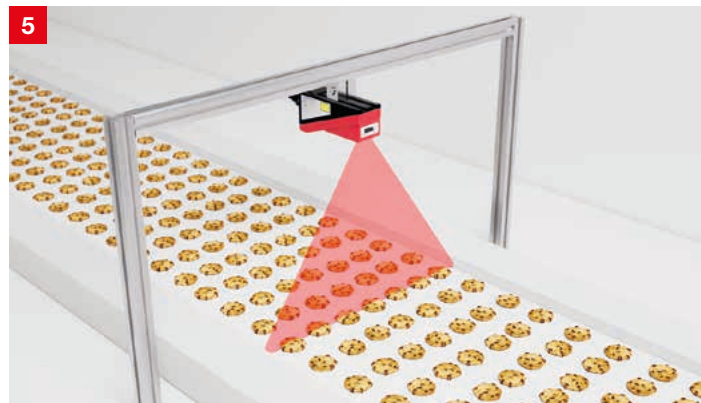
**Requirement:** To control the buffer section, the front edges of the products on the conveyor belt must be reliably detected. The sensor must also detect products with challenging dimensions from very flat to very tall, in order to prevent machine downtimes due to incorrect detection.



**Solution:** Due to its operating principle, the DRT 25C dynamic reference diffuse sensor reliably detects the entire range of products, from small and flat to tall and spherical. The single button teach function also makes the DRT 25C easy to set up. Additional sensor functions can be controlled via the IO-Link interface.

### Multiple-track object detection

**Requirement:** In the food industry, products are often transported between processes in multiple tracks. Detection of products for presence and / or completeness can only be done from above and should cover all tracks.



**Solution:** The LRS 36 (object detection), LES 36 (object measurement) and LPS 36 (profile measurement) light section sensors detect different objects over a measurement field width of 600 mm. Missing products are thus easy to identify. The sensors provide the object position and height as output value.

### Identification of empty molds

**Requirement:** In confectionery production, molds are used to manufacture or mold products. In the process, the first step is to identify and verify the empty mold.



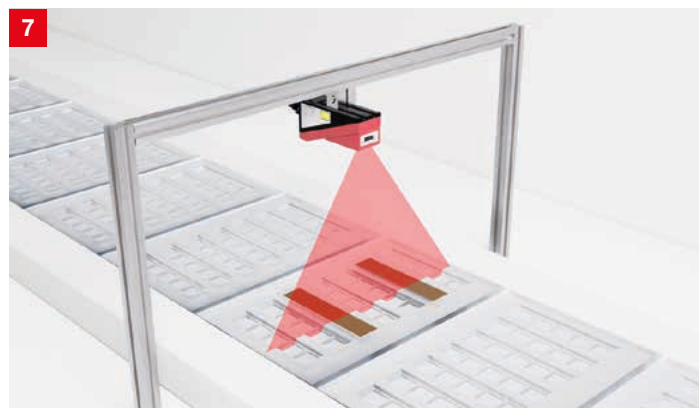
**Solution:** The universal compact DCR 200i code reader reliably captures 1D or 2D codes. It is available with a stainless steel housing for use in food processing. For larger distances to the empty mold, the high-performance DCR 1048i Simple Vision sensor is suitable.



# Confectionery and bakery packaging

## Detection of residual quantities in empty molds

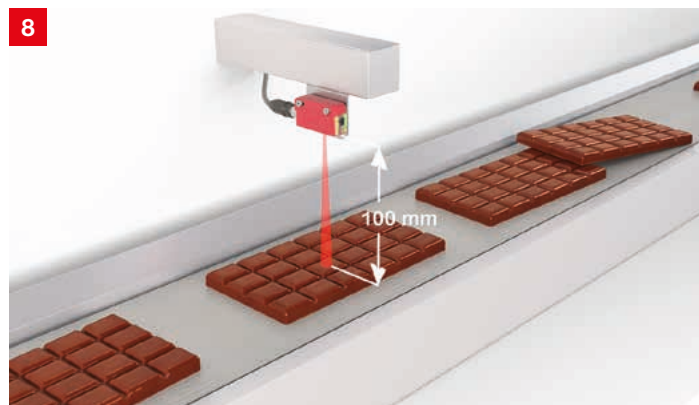
**Requirement:** Before reusing empty molds, it must be inspected to ensure that no residues are present in any of the molds.



**Solution:** The LPS 36 light section sensor records a profile of the mold and provides a distance and position value for each measuring point along the laser line. The connected control evaluates “empty” or “residues in the mold”. Alternatively, the IVS 1048i Simple Vision sensor with integrated image processing can be used.

## Quality and object height monitoring

**Requirement:** For further processing in a horizontal packaging machine, it must be checked that the manufactured products (e.g. chocolate bars) run separately on the conveyor belt. For this purpose, monitoring is performed to determine whether the defined product height (e.g. overlapping objects) is maintained.



**Solution:** The ODT 3C sensor is installed above the conveyor belt, looking down at the products. It detects the objects (switching sensor function) and simultaneously measures their height (measuring sensor function). This ensures that products run separately on the conveyor belt. The measurement data is output via the IO-Link interface of the sensor.

## Detection of splices

**Requirement:** Splices that occur when changing the packaging film rolls must be reliably detected and discharged in the process. The detection of the splice should be as independent of color and surface as possible, since the printing on the packaging film can be very diverse.



**Solution:** IGSU14E SD fork sensors reliably detect splices. Due to the ultrasonic principle, it is possible to work with any type of printing. The sensors can be taught quickly and easily with the aid of the teach function. A diagnostics function is possible via the integrated IO-Link interface.

### Code identification on flowpacks

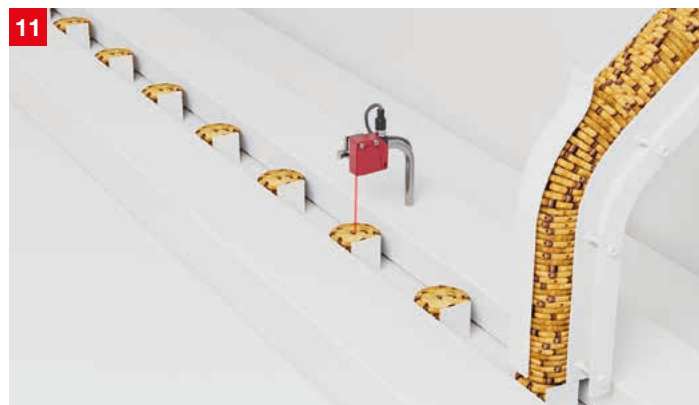
**Requirement:** In packaging processes, an attached code must be used to ensure that the packaging material and product are correctly assigned. Sensors must control different types of codes and the readability of the code. A camera-based code reader can be used for this purpose.



**Solution:** The DCR 200i camera-based code reader decodes 1D- and 2D-codes. With the aid of the integrated reference code function, the sensor can compare the read code with the reference or target code. The result is output in real-time via digital IOs. Alternatively, the code content can be transferred to the machine control via the fieldbus interface.

### Product height monitoring

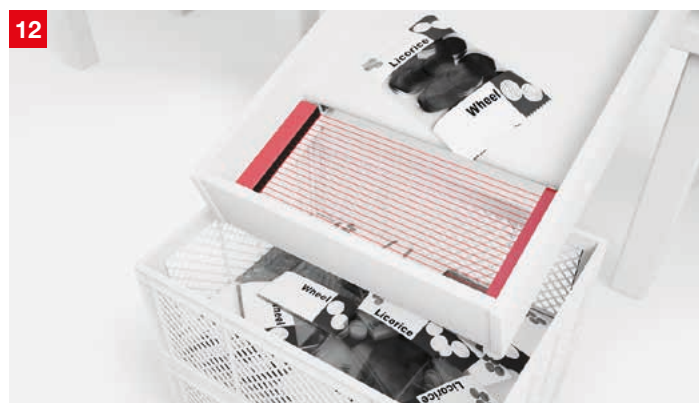
**Requirement:** If several flat products are stacked on top of each other, the stack height must be monitored so as not to impair the subsequent packaging process. At the same time, the number of stacked products can be controlled.



**Solution:** Thanks to their different measurement ranges and resolutions, the ODS 9 measuring distance sensors are suitable for fill-level monitoring. Due to the parameterizable analog current or voltage output and the IO-Link interface, they can be easily adapted to the control environment used.

### Ejection monitoring and product count

**Requirement:** Defective or incomplete products are ejected without sorting or alignment on a packaging machine. Switching light curtains can detect these products. Alternatively, a fast switching light curtain can be used at the outlet of the machine to count the properly packaged products.



**Solution:** The CSL 710 switching light curtain is suitable for monitoring larger ejection openings thanks to its various lengths and resolutions. The compact CSL 505 light barrier is a space-saving solution for simple applications. The CSR 780 retro-reflective light curtain is suitable for fast object counting due to its short response time.

# Confectionery and bakery packaging

## Detection of cut marks in film feed

**Requirement:** Products are packed in packaging films in horizontal packaging machines. Sensors must detect the printed registration marks and thus control the precise cutting process. Common challenges are the limited installation space and the frequent format changeovers due to films and printed registration marks of different colors.



**Solution:** The compact KRT 3C contrast sensor is available in three models: the flexible version with RGB LEDs, a universal version with white light, and a version for larger distances with laser-generated red light. The sensors can be taught via the integrated teach button, IO-Link, or cable.

## Monitoring of sealed seams

**Requirement:** For food packaged in film, a correctly executed sealed seam ensures the shelf life of the packaged products. For this purpose, the sealed seam must be continuously checked in the horizontal process. The sensors used must be adapted to the space available in the machine.



**Solution:** The KF and KFX fiber optics with different optical outlets and mounting options can be used flexibly in confined installation situations. Combined with amplifiers with high optical power, LV463.XR is a solution tailored to the application. Further advantages are the analog output and the IO-Link interface.

## Detection of packaging content

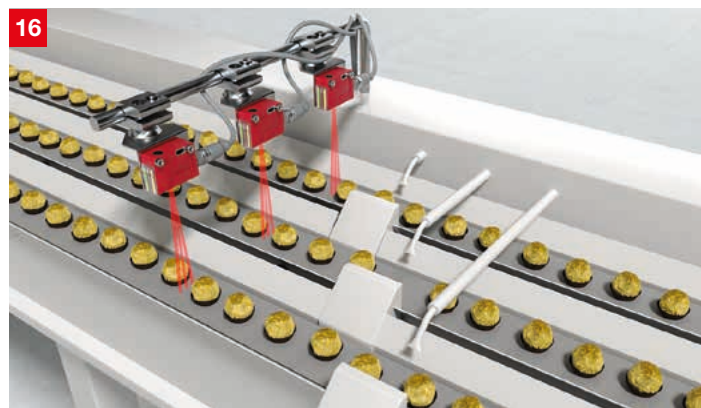
**Requirement:** Chocolate bars, for example, are packed in film in a horizontal packaging line. The packaging film mostly has a colorful print and is opaque. To ensure that sealing occurs at the correct point on the film tube, the front edge of the bar located inside the film tube needs to be reliably detected.



**Solution:** The high-performance LS25CI.XXR super power and LS25CI.XR high power throughbeam photoelectric sensors effortlessly transilluminate most metallized and dark-colored films. Even in the sealed film tube, the front edges of the products in the packaging are reliably detected.

### Detection of packaged products

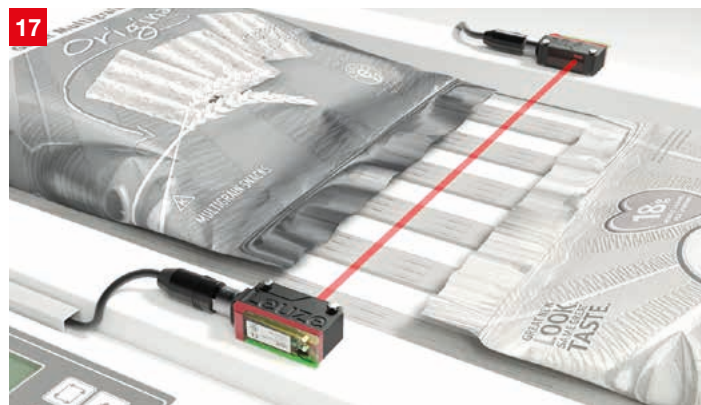
**Requirement:** If several conveyor belts are arranged next to each other at a close distance, it is necessary to detect objects from above. In production plants, adaptations to sensors should ideally not be necessary during format changes in order to avoid downtimes.



**Solution:** Using the conveyor belt as a reference and the processing of diffuse reflection and distance, the DRT 25C detects all objects. One teach event during commissioning is sufficient – no adaptation is required for format changes.

### Detection of products on conveyor belts

**Requirement:** At a food manufacturer, products are packed in high-gloss primary packaging. The packages are then transported further on a conveyor belt where they are to be reliably detected. Sensors with short response time can detect even small gaps between products.



**Solution:** The sensors of the 5B series can be mounted horizontally on the conveyor line. The advantage of the throughbeam photoelectric sensor is the very high function reserve, even with critical surfaces.

### Alignment control

**Requirement:** At the outflow of a horizontal packaging machine, the correct alignment of the products must be checked before they are automatically packed into a carton. For this purpose, a camera-based Vision sensor is to be used that looks down on the conveyor belt from above.



**Solution:** The IVS 1048i Simple Vision sensor can check the position of the products on the conveyor. The evaluation tools that can be selected in the sensor, e.g. pattern detection or position detection, are used for this purpose. In addition, bar codes or 2D-codes on the product can also be read and checked.



# Dairy packaging

In the case of filling and packaging milk and dairy products, the hygiene requirements on automation systems are particularly high. Furthermore, there are also large temperature differences between the operating periods and the regularly performed cleaning cycles. During the cleaning process, all components of the packaging machines must withstand high pressures and temperatures as well as aggressive cleaning agents.

In production areas where there is direct contact with the food, only sensors with stainless steel housing and plastic screens are allowed to be used. We have a wide range of products for hygiene-sensitive food packaging applications. Our stainless steel sensors of the 53C and 55C series with ECOLAB certification have been developed for challenging detection tasks. The MLC 500-IP safety light curtains in an additional protective tube are also designed for these application areas and environmental requirements. Encapsulation of the devices in a protective tube means that they achieve the high degrees of protection IP 67 and IP 69K. To safeguard doors or flaps, the L250 safety locking devices with hygienic design and the appropriate degree of protection can be used.







**1** Container detection during transport

**2** Filling level measurement

**3** Detection of soft packaging

**4** Detection of outer packaging

**5** Code reading for process monitoring

**6** Detection of splices

# Dairy packaging

## Container detection during transport

**Requirement:** In a filling system for yogurt jars or milk bottles, their position on the conveyor belt is to be reliably detected. Sensors for this application must withstand the demanding environmental conditions in the clean zone.



**Solution:** The PRK 55C retro-reflective photoelectric sensor reliably detects transparent containers. The sensitivity can be set via a teach button. An optional tracking function automatically compensates for soiling on the reflector or sensor. The robust stainless steel housing in wash-down design has a degree of protection IP 69K.

## Filling level measurement

**Requirement:** The fill level should be exactly the same in all bottles – underfilling of bottles must be prevented. Optical sensors can be used for reliable detection of the fill level of aqueous liquids in any container type in demanding environmental conditions.



**Solution:** The LS55CI.H2O and LE55CI.H2O throughbeam photoelectric sensors are suitable for the detection of aqueous liquids due to the wavelength of the LEDs. The transmitter and receiver system of the 55C stainless-steel series in wash-down design has a high radiation capacity and also detects liquids in colored containers and containers with plastic labels.

## Detection of soft packaging

**Requirement:** The flow of goods is to be detected for transport control of a single-lane transport line of soft packaging. Optical sensors can detect even the smallest gaps between soft packages.



**Solution:** The PRK 55CL retro-reflective photoelectric sensor with a small laser light spot is suitable for detecting small gaps. A matching reflector in the MTKS.5 stainless steel housing is available in several sizes. The sensor and reflector are ECOLAB-certified.

## Detection of outer packaging

**Requirement:** If identical products are combined into larger packages, they must be reliably detected independent of shape, color and surface. High-performance sensors are an important prerequisite for a high degree of automation.



**Solution:** The PRK 46C retro-reflective photoelectric sensors are suitable for detecting outer packaging thanks to their high function reserve and good optical properties. The sensors have a degree of protection IP 69K and ECOLAB certification. Other models with different light spot geometries are available.

## Code reading for process monitoring

**Requirement:** For process monitoring and traceability, the printed code on a bucket lid can be read with a code reader. As the orientation of the code often cannot be guaranteed, image-based code readers should be used.



**Solution:** The DCR 200i code reader in a stainless steel housing is suitable for these environments thanks to various lens covers, for example made of glass or plastic. The integrated web browser and various Industrial Ethernet interfaces make the code reader flexible to use.

## Detection of splices

**Requirement:** For a safe production process, splices in the sealing film must be detected and subsequently discharged. Detection should be as independent of colors or surfaces as possible.



**Solution:** The IGSU 14E SD ultrasonic fork sensor is optimized for splice detection. The ultrasonic technology used can be applied with transparent and non-transparent material, as well as with any adhesive tapes. Adjustment to the base material is possible using a simple teach event.

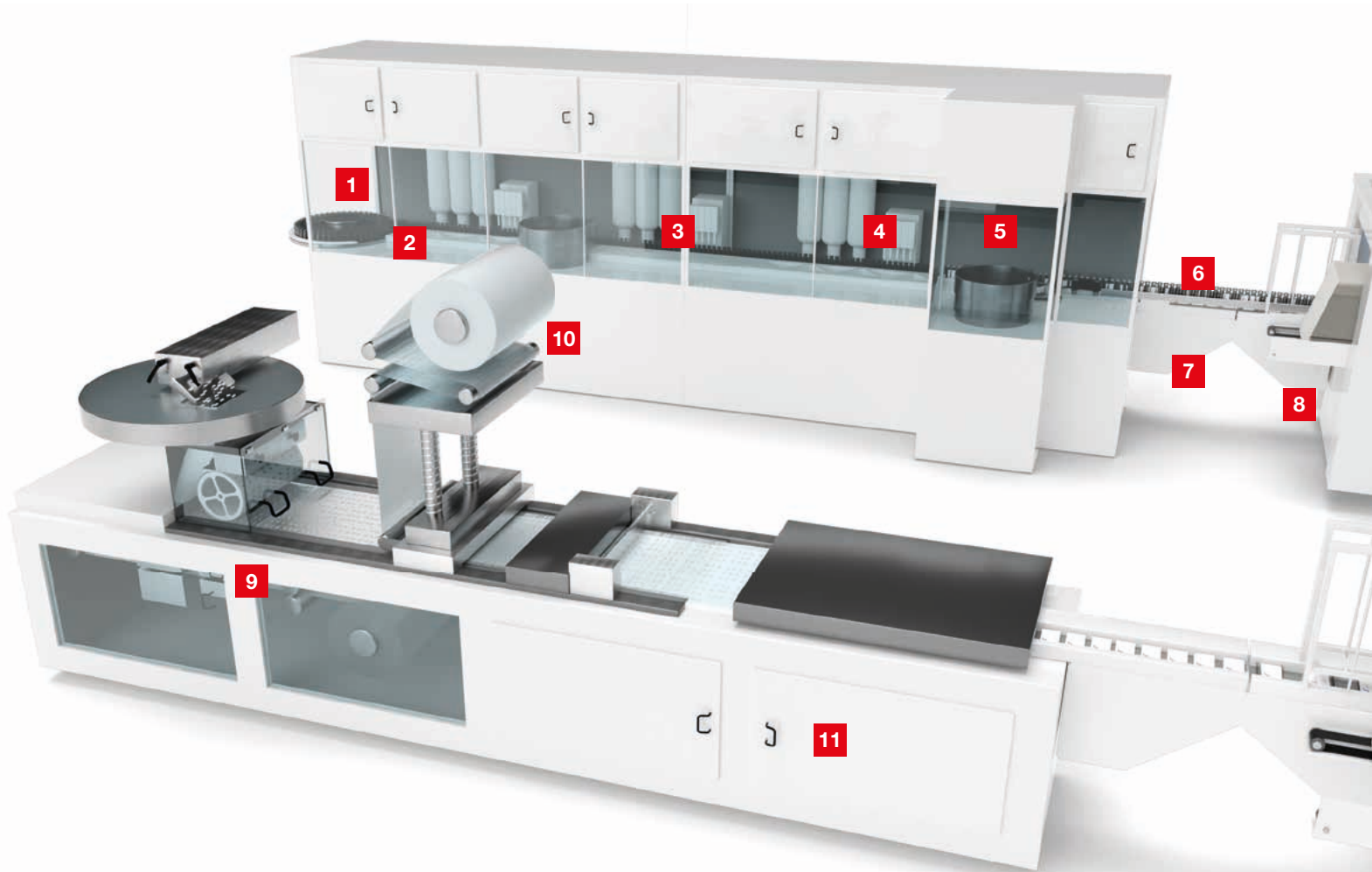
# Pharmaceutical packaging

In the pharmaceutical industry, packaging processes are usually performed under cleanroom conditions, for example when vials are filled with vaccine doses or blister packaging is filled with tablets. Here, the requirements on hygiene, product safety and reliability are extremely high.

We have supported packaging machine and pharmaceuticals manufacturers for decades and know the challenges of these sectors: Our sensors and the pharmaceutical reflectors specially developed for them are made of high-quality stainless steel and withstand intensive cleaning processes. The 53C series miniature sensors in hygienic design prevent the accumulation of deposits by using housings with smooth contours and no fastening holes, thereby reducing the risk of bacterial carry-overs. To be able to track production batches at all times using pharmacodes or Data Matrix codes, compact code readers such as the DCR 200i in stainless steel housing are a suitable solution. Sensors with integrated IO-Link interface, e.g. the 53C series or our fork sensors, reduce the need for external intervention in machine operation because they enable the sensors to be operated without the cleanroom having to be opened.







**1** Precise positioning of vials

**2** Detection of vials

**3** Monitoring disposable syringes

**4** Tube alignment by print mark detection

**5** Detection of small parts

**6** Detection of vials in screw conveyor

**7** Code information

**8** Package insert presence control

**9** Detection of splices

**10** Measurement of roll diameter

**11** Monitoring of safety doors with locking device

# Pharmaceutical packaging

## Precise positioning of vials

**Requirement:** For optimal speed control during transport, vials made of transparent or non-transparent glass must be reliably detected on the conveyor line. Even the smallest gaps must be used. Hygiene requirements are particularly high in aseptic systems.



**Solution:** The PRK 53CL1.T3 retro-reflective photoelectric sensors with a small laser light spot, in combination with an MTKS stainless steel reflector, enables high-precision detection and positioning of vials. The compact sensor can be easily integrated even in confined spaces. The sensor and reflector have a hygienic design.

## Detection of vials

**Requirement:** After filling the vials in a packaging machine, the containers are often transported in a constrained space at high speeds and with minimal distance. Due to the constrained space, the sensors used should be particularly small and easy to integrate into the machine.



**Solution:** KF plastic fiber optics or GF glass fiber optics with different beam exits and LV 463 amplifiers are a variable solution for the detection of vials. Glass fiber optics are particularly well suited for high ambient temperatures. The amplifiers, which can be conveniently set via the menu, are available with analog output as well as IO-Link interface.

## Monitoring disposable syringes

**Requirement:** Hanging disposable syringes are transported to an assembly station at high speeds via a feeder unit. Plastic caps are to be fitted on the disposable syringes at this station. In addition, the very thin needles of the syringes are to be reliably detected.



**Solution:** The GSL 08B laser fork photoelectric sensor detects even thin syringe needles. The V4A stainless steel housing is suitable for clean rooms and ECOLAB certified, making it ideal for areas with strict requirements regarding hygiene and resistance to cleaning agents. The sensors operate reliably in a temperature range between -25 °C and 60 °C.

### Tube alignment by print mark detection

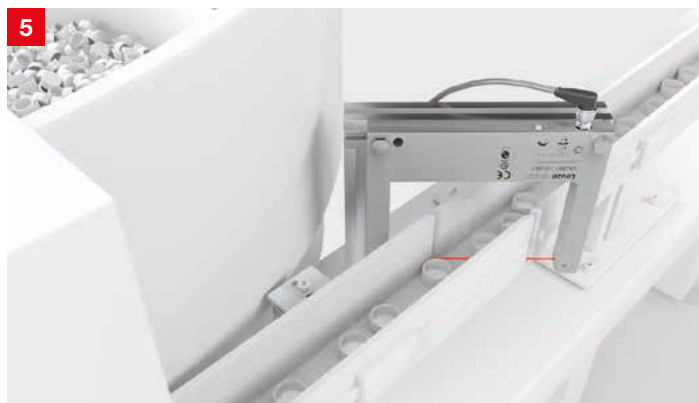
**Requirement:** In a tube filling and sealing machine, a paste-like product is filled into tubes. During the process, it is important that the plastic tubes are aligned precisely after filling so that the tube fold is pressed in exactly the right place. Space is usually constrained in these machines.



**Solution:** The compact KRT 3C contrast sensor saves a lot of space during mounting. It highly precisely detects contrast markers of different colors even on round objects with a short response time of just 50  $\mu$ s. A time-saving format change can be implemented via the IO-Link interface. For higher requirements, the KRT 55 is available in a stainless steel housing.

### Detection of small parts

**Requirement:** After filling the vials or bottles, other small parts such as caps, locking rings or dosing aids are required, which are often fed to the machine via vibratory conveyors. For the detection of small parts, specially optimized sensors should be used.



**Solution:** GS 08B or GSL 08B fork sensors in stainless steel housings with laser light are easy to integrate and reliably detect small objects and even the smallest gaps. Alternatively, KF plastic fiber optics with a suitable LV amplifier can be used to detect small parts.

### Detection of vials in screw conveyor

**Requirement:** A screw conveyor adapted to the vials is used for collision-free infeed of the vials into the downstream machine. The rotation of the screw in the background requires very precise background suppression from the sensor when detecting the vials.



**Solution:** The special V-optics integrated in the HT55C.V diffuse sensor enable very precise background suppression. At the same time, partially transparent objects can be reliably detected. The compact sensor in the stainless steel housing of the 55C series meets the high degree of protection IP 69K.

# Pharmaceutical packaging

## Code information

**Requirement:** When packaging blisters in folding boxes, it must be ensured that the correct package insert is in the box. For this purpose, both codes on the folding box and the package insert must be read and compared with each other in the process.



**Solution:** Two DCR 200i camera-based sensors are used to ensure that the package insert is assigned to the folding box. The sensors can reliably decode Data Matrix codes or Pharmacodes. The code content is output via an Industrial Ethernet interface.

## Package insert presence control

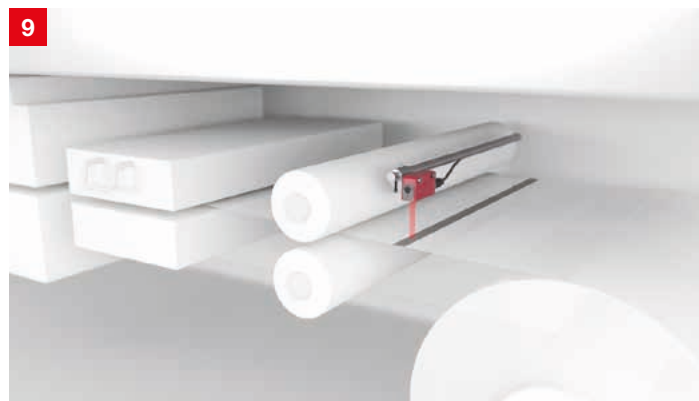
**Requirement:** When packaging tablet blisters in folding boxes, it must be ensured that the package insert is also packed. Since the package insert is made of paper, it can be reliably detected with the aid of a luminescence sensor.



**Solution:** The LRT 8 luminescence sensor detects luminescent materials by means of UV illumination. Thanks to its small design, it is easy to integrate. Different operating ranges, light spot sizes, and filters make these sensors flexible in use.

## Detection of splices

**Requirement:** Splices on forming films must be reliably detected for a smooth process and must be discharged in the subsequent process. The detection of the splices should be independent of color and surface as much as possible.



**Solution:** The KRT 3C, KRT 18B or KRT 55C contrast sensors are optimized for the detection of splices. The color of the adhesive tape and the background is adapted using the teach button. The IGSU14E SD ultrasonic fork sensor detects splices independently of color on sealing films with different printing.



### Measurement of roll diameter

**Requirement:** Plastic film for forming blisters is provided in large rolls. To ensure uniform and even unrolling, the roll is often motor-driven. This requires a permanent distance signal from a sensor to determine the diameter.



**Solution:** DMU 318 or DMU 418 ultrasonic distance sensors are developed for accurate distance measurements. They provide an analog signal as information on the roll diameter. Alternatively, measuring sensors of the ODS 9 series with different measurement ranges can be used. The integrated IO-Link interface offers further possibilities.

### Monitoring of safety doors with locking device

**Requirement:** Safety doors on fast-running machines in pharmaceutical packaging must be monitored by safety switches with a locking device to prevent unintentional access and to stop the process only at defined points. The accessibility to the machine should not be impaired in the process.



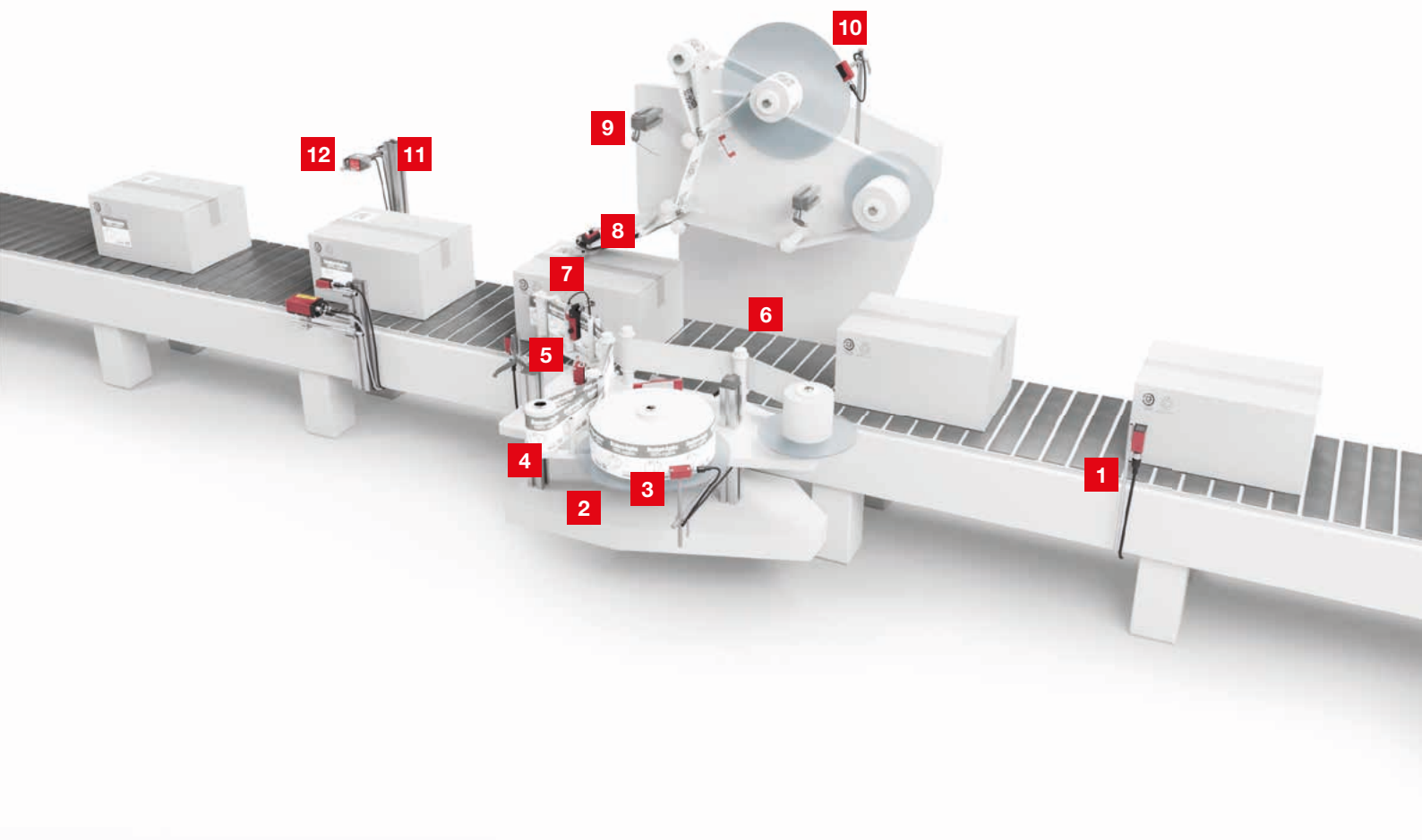
**Solution:** The L250 and L300 safety locking devices keep safety doors locked until the control sends an electrical release signal. Thanks to their RFID-coded actuators, they offer optimum protection against manipulation. The optional emergency stop and command buttons make it easier to set up the complete safety function.

# Labeling

Labels identify foods, beverages and pharmaceuticals and give products an attractive brand appearance. The variety of labels is growing constantly: New, sustainable materials are used and many manufacturers make their products stand out by using eye-catching prints, metalized labels or labels with transparent areas.

With our range of innovative sensors consisting of fork sensors, diffuse reflection sensors, retro-reflective photoelectric sensors, cut mark sensors, code readers or Vision sensors, we are able to provide solutions for all applications along the process chain of a labeling machine. The world's first optical label fork was a Leuze invention. Through the introduction of the first ultrasonic label fork we again laid the foundation for the further developments in the market. With the GSX combined fork sensor, unique worldwide, we go a step further and combine both detection principles – light and ultrasonics – in one compact housing. This fork sensor is the flexible solution for all labeling machines that process many different label types.





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|---|--|
| <b>1</b> Detection of transparent objects           | <b>7</b> Detection of non-transparent labels         |
| <b>2</b> Monitoring of label tape                   | <b>8</b> Detection of transparent labels             |
| <b>3</b> Measurement of roll diameter               | <b>9</b> Code reading for identification and testing |
| <b>4</b> Detection of the tension roll end position | <b>10</b> Monitoring of tape end                     |
| <b>5</b> Detection of cut marks                     | <b>11</b> Label presence detection                   |
| <b>6</b> Checking of bottle alignment               | <b>12</b> Checking of label alignment                |

# Labeling

## Detection of transparent objects

**Requirement:** For precise labeling, the objects must be detected with as much precision as possible in order to activate the dispensing process. In doing so, a sensor should reliably detect all types and shapes of objects, including transparent ones. A change of products should have no effect on the labeling process.



**Solution:** The PRK53C.T retro-reflective photoelectric sensor is developed for the detection of transparent objects. The sensor in a stainless steel housing for hygiene-sensitive production processes has a short response time and an integrated IO-Link interface.

## Monitoring of label tape

**Requirement:** In labelers with a longer tape path, e. g. as a buffer between the roll and the dispenser, it is necessary to detect a possible tape tear.



**Solution:** Diffuse sensors with particularly long light-spot geometry, such as the HT3C.XL, are suitable for monitoring the label tape. The sensor tolerates fluctuations and reliably detects only the actual tape tear. The compact design makes it easy to integrate the sensor.

## Measurement of roll diameter

**Requirement:** In high-performance labelers, the label roll is motor-driven. The diameter of the label roll should be permanently detected, e.g. in order to be able to adapt the speed to the decreasing roll diameter.



**Solution:** The ODS 9 measuring sensor provides an analog distance signal for optimal adaptation of the drive. The distance sensors are available with different distance ranges, parameterization options as well as an integrated display. Thanks to the integrated IO-Link interface, the sensors can be used universally.



## Detection of the tension roll end position

**Requirement:** In order to regulate the carrier tape tension for self-adhesive labels evenly, deflection rollers pretensioned with springs are usually used. This so-called tension roll should ideally always be between the two end positions.



**Solution:** The IS 200 inductive sensor detects the predominantly metallic roll mount and thus the two end positions of the tension roll. The IS 288, IS 212 or IS 218 inductive sensors offer the appropriate switching distances for embedded or non-embedded installation.

## Detection of cut marks

**Requirement:** Sleeve labeling is frequently used in the beverage industry. Here, the label comes off the roll as a continuous film and is cut to the required length using print marks. This task requires special color mark sensors or contrast sensors that are optimized for high precision and speed.



**Solution:** KRT 18B contrast sensors with signal display and multicolor transmitter LEDs provide high flexibility for the detection of cut marks. The integrated IO-Link interface simplifies commissioning as well as the adjustment of the contrast sensor when changing labels.

## Checking of bottle alignment

**Requirement:** Labels should be applied at specified positions on the bottle.

In addition, the alignment of the bottle must be detected and corrected on the basis of small features, such as embossing lugs or the joining seam. In compact machines, there is usually little installation space available for sensor systems.



**Solution:** The GF glass fiber optics with different optical outlets and the LV 463 amplifiers are very suitable for checking the bottle alignment. Fiber optic sensors are particularly sophisticated and powerful at the same time. The sensors have an IO-Link interface and an optional analog output.

# Labeling

## Detection of non-transparent labels

**Requirement:** Non-transparent labels should be dispensed on packaging. To do this, the gap between two labels on the carrier tape must be precisely detected. The sensor should also reliably detect labels with complex shapes in order to avoid inaccurate dispensing or machine downtimes.



**Solution:** The GS61 and GS63B optical fork sensors reliably detect the complete range of non-transparent labels. The sensor can be adjusted either with a potentiometer or via a teach function. The slimline design of the lower fork enables installation directly at the dispensing edge.

## Detection of transparent labels

**Requirement:** For a position-accurate dispensing process of labels onto products or objects, the labels must be detected on the carrier tape. Transparent, partially transparent or metallized labels in different shapes are also to be detected precisely. The sensor should be easy to set for all types of labels.



**Solution:** The GSU12, GSU14E and IGSU14E ultrasonic fork sensors detect transparent and partially transparent labels. The GSX14E sensor combines an ultrasonic and an optical detection system in one housing and can even process labels made of inhomogeneous cavitated BOPP material. The IO-Link interface simplifies the setting.

## Code reading for identification and testing

**Requirement:** Primary packaged products are often provided with directly printed labels for high process flexibility. After printing, the readability of the codes on the labels as well as the plausibility should be checked.



**Solution:** The DCR 200i universal code reader is suitable for identifying and checking bar codes or 2D-codes on labels. For use in the food industry, the sensor is also available in a stainless steel housing with plastic screen.

### Monitoring of tape end

**Requirement:** The roll diameter of self-adhesive labels is to be monitored with a sensor in order to warn the operator of the labeling system in good time before a roll end. The sensor should be able to be adjusted according to the roll diameter.



**Solution:** Sensors of the 3C series, such as the HT 3C diffuse sensor or the PRK 3C retro-reflective photoelectric sensor – with or without laser light – with a precise switching point are very well suited for checking the roll diameter in compact labeling machines.

### Label presence detection

**Requirement:** On containers such as bottles or vials, it is often necessary to check that the paper labels are on the objects after the dispensing process. The labels should be detected independently of the bottle or filling.



**Solution:** The LRT 8 luminescence sensor detects paper labels very reliably on different objects, even at large distances. An alternative solution are energetic diffuse sensors with infrared light and special parameterization, e. g. the FT328I P1 or FT5I P1.

### Checking of label alignment

**Requirement:** For high-value products or decorative labels, it should be ensured that the label is positioned correctly. Products with incorrectly aligned labels are to be detected and discharged.



**Solution:** Simple Vision sensors of the IVS 1048i series can easily detect labels on products with their large field of vision and check whether they have been attached correctly. Parameterization is performed via the Leuze Vision Studio software. An integrated, switchable LED high-performance illumination ensures an optimal image.

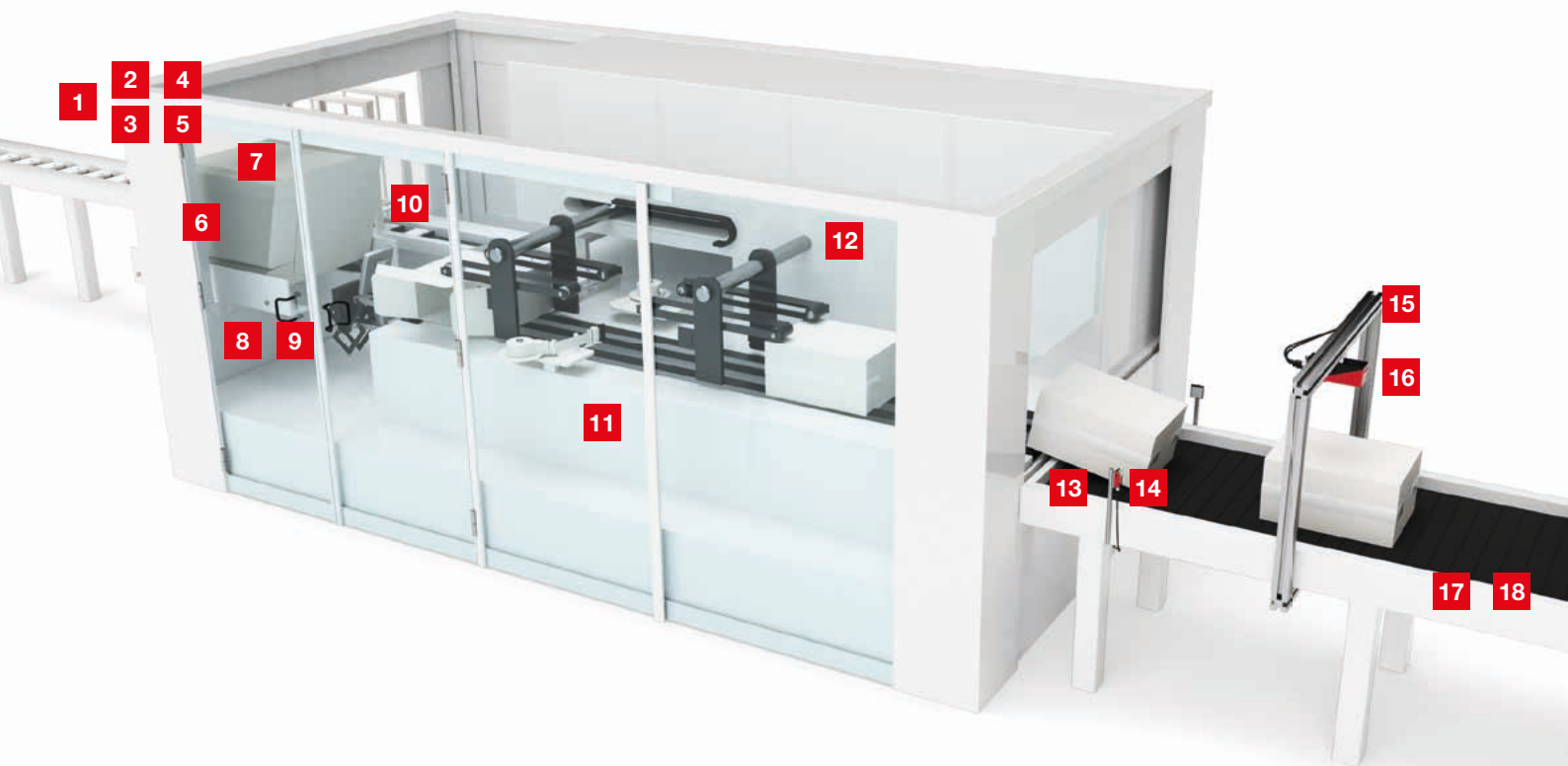
# Carton and container packaging

In secondary packaging, primary-packaged individual products are packed into cartons or grouped into packages to facilitate handling. Here our sensors have a wide range of applications: Before final packing takes place, it must be checked whether the contents in the respective packaging are complete, whether the packages are aligned correctly for transport or whether cartons have been sealed properly. In cartoning machines, correct filling of the outer packaging is detected, a stack height is measured or the position of stacks is detected and checked.

Switching and measuring light curtains can detect or measure objects in small resolutions across the entire conveyor width. The CML 730 measuring light curtains as PS variant have been specially developed for detecting objects inside packaging film. The CMS 700i modular volume measurement system, available as a complete system, determines the volume of shipping cartons during transport. By doing so, it assists the palletizer system further along the process in creating a correct layer pattern for the product stack on the pallet. The light-band sensor of the 46C series (VarOS) uses a 45 mm wide light-band to detect e. g. defective pallets or containers with openings such as mesh baskets on a conveyor.







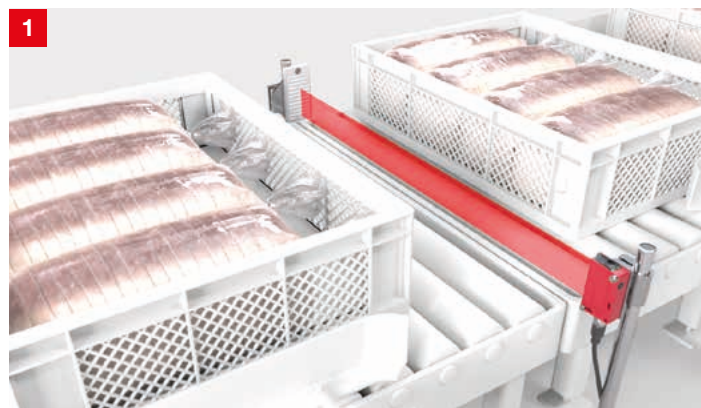
- 1 Detection of objects with openings
- 2 Monitoring of package combination
- 3 Checking of content
- 4 Monitoring completeness
- 5 Documentation of carton content
- 6 Pile positioning
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# Carton and container packaging

## Detection of objects with openings

**Requirement:** Food is transported in plastic baskets between individual process steps. Sensors with suitable light-spot geometry are required for reliable detection of the baskets. Small interruptions, different colors, surfaces or container heights must not impair detection.



**Solution:** The RK46C.DXL VarOS light-band sensor reliably detects objects with a 45 mm wide light-band. Detection takes place at any point within the light-band. Irregular front edges or interrupted containers, e.g. baskets, are thereby reliably detected. Standard reflectors can be used on the opposite side.

## Monitoring of package combination

**Requirement:** Several objects are to be combined and packed together in a secondary packaging. To prevent missing parts in the packages, the presence of the objects is to be checked.



**Solution:** The ODS 9 measuring sensor provides distance values of objects on stacked tracks to the machine. With an evaluation on a difference range, objects that belong together can be detected.

## Checking of content

**Requirement:** It should be checked whether the carton has been filled as intended. In the case of opaque packaging, this is an extremely challenging task for which capacitive sensors are well suited.



**Solution:** The LCS capacitive sensors check for content through the carton during single-lane transport. The cylindrical design of the sensors allows for space-saving integration.

### Monitoring completeness

**Requirement:** In the feed of a sealing machine, the completeness and the presence of several products is to be detected. Incomplete packages are to be discharged.



**Solution:** The IVS 108 Simple Vision sensor detects missing products via reference images or/and via pattern matching. With integrated software tools, the sensor can be easily and quickly adapted to different inspection tasks.

### Documentation of carton content

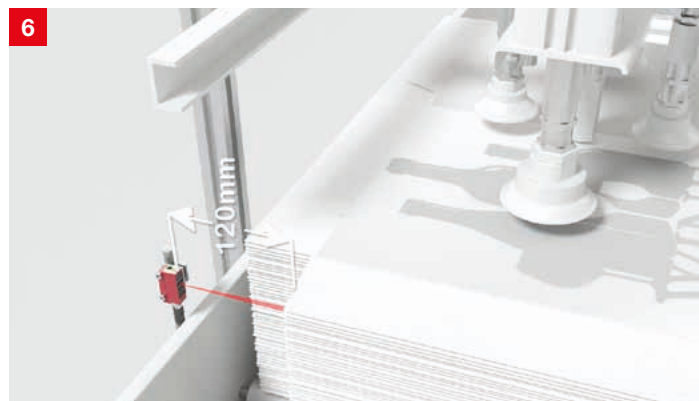
**Requirement:** Before a shipping carton is sealed, the content should be documented for tracking purposes. For this purpose, an image of the content is to be recorded and saved.



**Solution:** The LCAM 308 industrial webcam records a single color image via external activation. In this way, the carton content can be documented and transmitted to a higher-level control via the Ethernet interface. Settings can be made via the integrated web browser.

### Pile positioning

**Requirement:** The pre-cut cartons prepared on a stack must be automatically removed from the stack, separated and then provided for the gluing and folding process. To ensure optimum performance of the downstream process steps, the carton stack must be positioned at a specific point on the conveyor belt.



**Solution:** The compact ODT 3C measuring sensor checks the presence of the carton stack with the switching sensor function. The exact position of the stack can be output with the measuring sensor function via the IO-Link interface.

# Carton and container packaging

## Position and presence control

**Requirement:** In a cartoning machine, the fill level of the folding box magazine is to be detected. Detection should be independent of color and surface as much as possible.



**Solution:** The precisely adjustable HT 3C diffuse sensor with background suppression or HT 25C with visible light spot are suitable for position and presence control. There are models with different light-spot geometries. A format changeover with distance changes is possible with the HT 3C.3 via the IO-Link interface.

## Measurement of stack heights

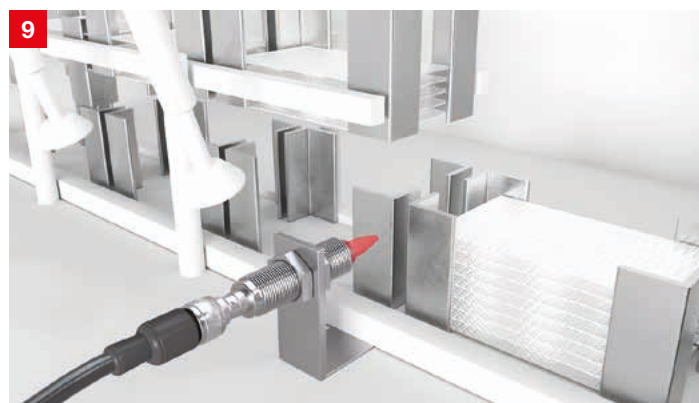
**Requirement:** Primary packaging is stacked in the magazine of a packaging machine. To ensure that the stack contains the correct quantity, its height must be monitored. This requires sensors with high resolution and accuracy as well as a precise and easy-to-position light spot.



**Solution:** The ODS 9 measuring sensors with staggered operating ranges and laser class 1 can be used easily and flexibly for measuring stack heights. The distance value is output as an analog current or voltage signal. The IO-Link interface ensures fast integration as well as additional parameterization options.

## Detection of positions

**Requirement:** Primary packaging is often stacked and fed in magazines. The position of these magazines or feeder fingers are to be detected in order to prevent collisions and to control the feed.

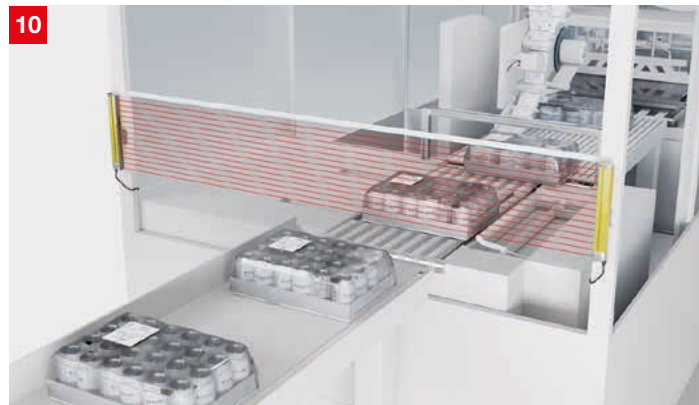


**Solution:** Inductive sensors detect the metal structures of the magazines reliably and precisely. With their small design and defined switching distances, sensors of models IS 288 or IS 208 are particularly well suited for this application.



## Safeguarding of points of operation in machines

**Requirement:** On packaging machines, openings are required at the machine infeed and outfeed. To prevent access to dangerous movements within the machine, the openings must be safeguarded mechanically or with optical safety sensors.



**Solution:** The ELC 100 and MLC 500 safety light curtains with their wide selection of protective field lengths and resolutions offer the right solution for safeguarding points of operation. Here, the ELC 100 devices focus on a cost-efficient machine design. The extensive MLC 500 series is also suitable for special application cases.

## Monitoring of safety doors

**Requirement:** For access to individual machine areas, machines are equipped with doors and flaps, e. g. to allow magazines to be changed or areas to be cleaned. While the machine is in operation, these doors and flaps must remain closed and monitored for safety-related reasons.



**Solution:** The RD 800 safety proximity sensors monitor doors and flaps and with their RFID-coded actuators provide maximum protection against tampering. Thanks to degree of protection IP 69K and an operating temperature up to 70 °C, the devices can be used for a wide variety of applications. OSSD outputs and performance level PL e ensure easy integration.

## Detection of objects in film

**Requirement:** Objects are to be detected in a packaging film to avoid collision with the weld bar. The objects to be packed can have any shape.



**Solution:** The CML 730PS measuring light curtains are developed for the detection of objects in film. With the aid of the power setting, different packaging films can be transilluminated in one or more layers and the products inside can be detected.

# Carton and container packaging

## Detection of packages

**Requirement:** If bottles and cans are shrink-wrapped into packages using film, they must also be detected on multitrack conveyors. Different types of packages with transparent film or different film printing are to be reliably detected.



**Solution:** The DRT25C.R unit pack sensor uses the surface of the conveyor belt as a reference. As a result, it reliably detects the complete range of package types. Therefore, no adaptations to the sensor are necessary when changing products.

## Gloss detection

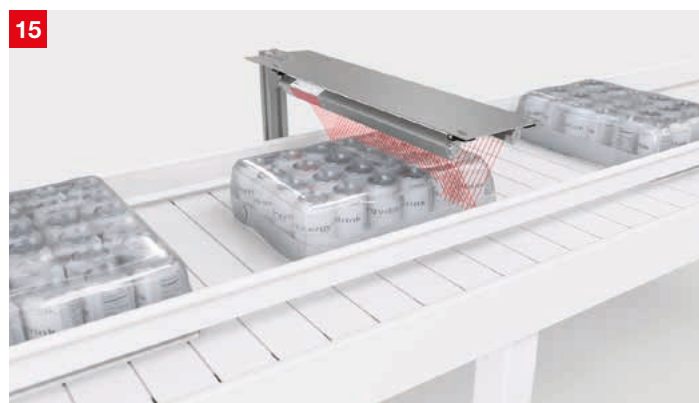
**Requirement:** Shipping cartons are automatically sealed with a self-adhesive tape after filling. A sensor must detect the presence of the adhesive tape.



**Solution:** The compact RK3C diffuse reflection sensor reliably detects the glossy self-adhesive tape on the shipping carton.

## Alignment monitoring of packages

**Requirement:** If different package widths are transported on a conveyor system, the alignment of the packages must be checked before palletizing. The sensor system used for this purpose must reliably detect the entire width of the packages and all variants occurring.



**Solution:** The CML 730i measuring light curtain in V-arrangement allows the width and completeness of packages to be evaluated from above. For this purpose, emitted light beams are reflected by the object onto the receiver. Various beam spacings and measurement lengths are available.

### Closure control of packaging

**Requirement:** After filling, the shipping cartons are automatically sealed. A testing device is to be used to detect whether the flaps are closed and glued.



**Solution:** The LRS 36 laser profile sensor can correctly detect closed cartons using a reference contour. Different reference contours can be saved in the sensor and selected via a digital interface. Due to the high accuracy of measurement, even small deviations can be detected.

### Monitoring of shipping labels

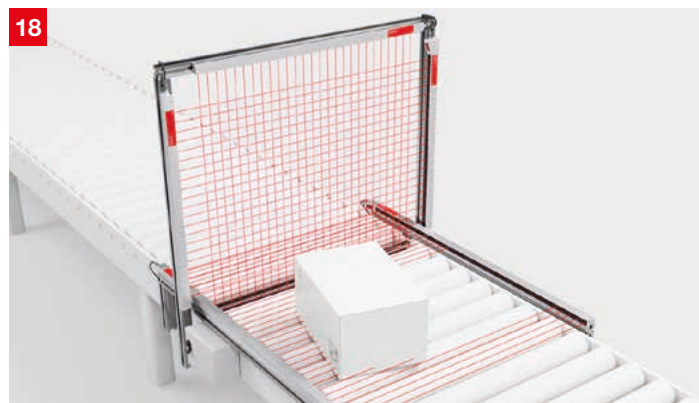
**Requirement:** After filling and sealing the shipping carton, a label is attached. The printed code must be checked for readability and correctness.



**Solution:** The DCR 200i code reader can decode both bar codes and 2D-codes independently of their alignment, making it a very flexible solution. The code content is output via the integrated Ethernet interface.

### Shipping carton volume measurement

**Requirement:** In order to correctly allocate shipping cartons, the volume is to be determined. For this purpose, the dimension of the shipping cartons passing through must be measured in all three dimensions.



**Solution:** As objects pass through, the CMS 700i contour measurement system determines their height, width, length, orientation angle and position relative to the edge of the conveyor. The complete system contains all components required for installation and operation. Communication is Ethernet-based via PROFINET and TCP/IP.

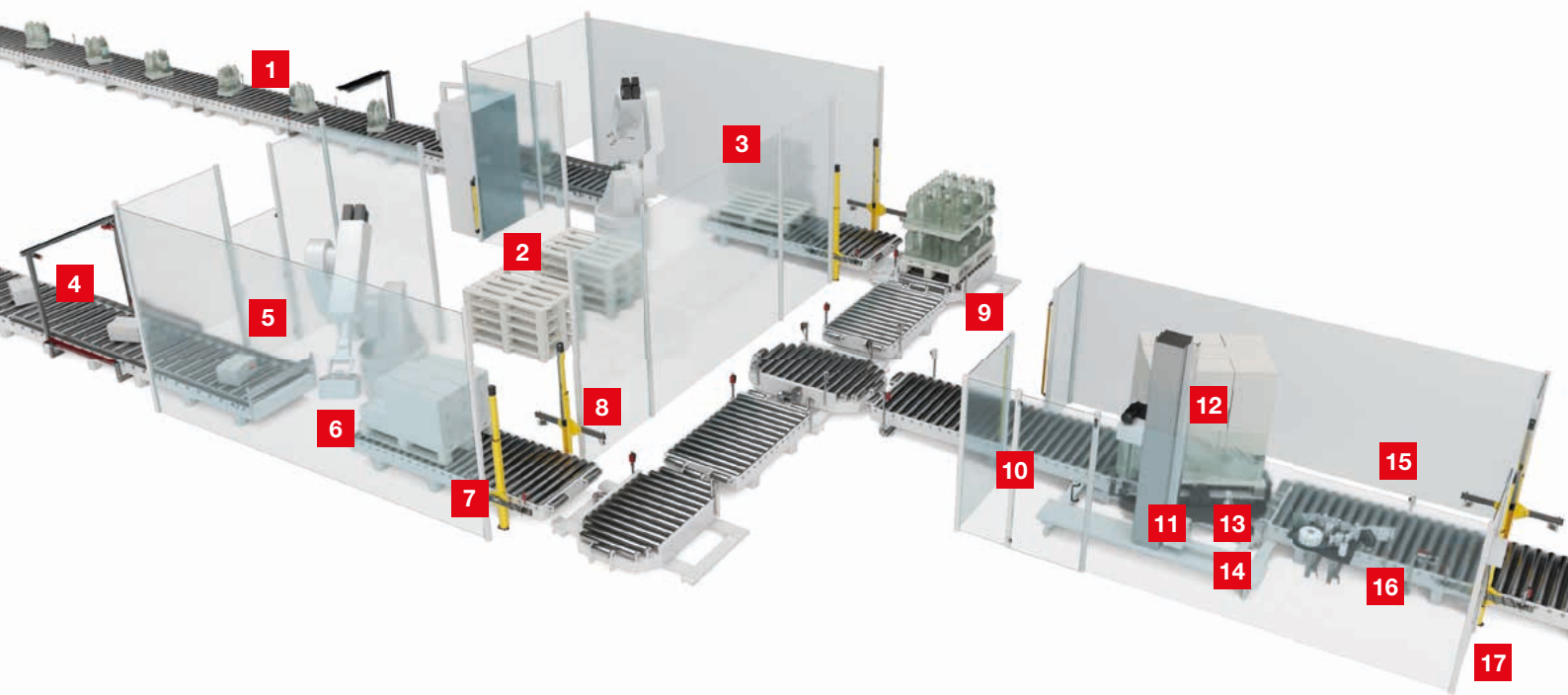
# Palletizing

In the final packaging step, cartons and packages are stacked on pallets and passed on to the subsequent storage or transport logistics. An efficient and reliable material flow as well as gapless machine safety determine the requirements in the end-of-line area.

The sensors used in these processes perform many different detection and identification tasks. For example, automated wrapping of pallets in stretch film to ensure safe transport: Here inductive sensors monitor the end positions of individual axes, diffuse sensors detect the upper edge of the pallets, polarized retro-reflective photoelectric sensors detect tears in the film, and diffuse sensors monitor the film supply. On conveyor lines, optical or mechanical access guarding ensures safe operation of the systems. Two function concepts for temporary and controlled bridging of the used electro-sensitive protective equipment each offer specific advantages: Multiple light beam safety devices such as the MLD 530 with predefined muting functions can be integrated quickly and easily into the system control. In the case of the MLC530-SPG safety light curtains with “Smart Process Gating”, bridging, i.e. the muting function, is implemented in combination with the process sequence and a control signal from the machine control. The space required is reduced to a minimum and additional muting sensors are no longer necessary.







- |   |   |
|---|---|
| 1 Detection of objects                      | 10 Access guarding of doors             |
| 2 Height measurement of pallet stacks       | 11 Monitoring of end positions          |
| 3 Monitoring of pallets                     | 12 Detection of winding height          |
| 4 Detection of objects on conveyor belt     | 13 Detection of film                    |
| 5 Detection and positioning of objects      | 14 Determination of residual quantities |
| 6 Detection of pallets from below           | 15 Code reading on the pallet           |
| 7 Access guarding with muting               | 16 Detection of film-wrapped pallets    |
| 8 Access guarding with Smart Process Gating | 17 Width and height monitoring          |
| 9 Detection of pallets                      |   |

# Palletizing

## Detection of objects

**Requirement:** In the final packaging or palletizing of packages, the presence of the objects is to be checked. Objects with gaps must also be reliably detected.



**Solution:** The PRK 46C retro-reflective photoelectric sensors have a long operating range and thus a very high function reserve. In other models, the sensitivity can be adjusted, and a Depol function increases the availability of the system. All sensors have a degree of protection IP 69K and ECOLAB certification.

## Height measurement of pallet stacks

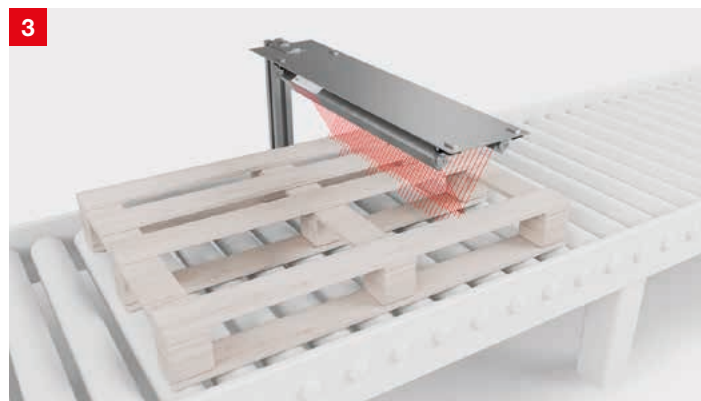
**Requirement:** In an automated palletizing process, it must be ensured that sufficient empty pallets are available in a buffer. For a reliable process, the stack height of the pallets must be monitored for this purpose.



**Solution:** Optical measuring sensors ensure reliable height measurement. The ODS 110 distance sensor can output the distance either via an analog value or the integrated IO-Link interface. Thanks to the small, clearly visible laser spot with laser class 1, the sensor is eye-safe and easy to position.

## Monitoring pallets

**Requirement:** When standard pallets are used, the condition of each pallet is to be checked before it is used again. Among other things, it is necessary to check whether the running boards as well as the pallet blocks are present.



**Solution:** With the aid of the single-beam evaluation of the CML 730i measuring light curtains in V-arrangement, the running boards can be detected and evaluated. The sensor array detects any gaps or missing boards and thus enables defective pallets to be removed early on.

### Detection of objects on conveyor belt

**Requirement:** Packages or cartons that are shrink-wrapped with film are transported on a conveyor belt and are to be reliably detected.



**Solution:** The PRK25C.D retro-reflective photoelectric sensor is optimized for the detection of shrink-wrapped objects and thus offers a high function reserve. If limited installation space is available, the PRK 5B.D sensors with smaller housing are used.

### Detection and positioning of objects

**Requirement:** Along transport segments or at transfer points, objects are to be detected or the respective stop positions detected. For this purpose, the sensors used must have good alignment capability and high repeatability. Variations of the objects and possible contamination must also be tolerated.



**Solution:** The detection and positioning of packages can be solved with different retro-reflective photoelectric sensors. Depending on the required function reserve and dimensions, the PRK 28, PRK 25C or PRK 46C in cubic form and the PRK 328 in cylindrical form are suitable. All sensors have a degree of protection IP 69K and ECOLAB certification.

### Detection of pallets from below

**Requirement:** Different types of pallets are transported using a pallet conveyor system. To be able to set up the conveyor segments completely and ready to use, the pallets are to be detected from below. Any high-frequency LED hall lighting or dirt particles must not affect the sensor.



**Solution:** The SET-HT25CI mounting system combines a special holder with a HT 25C diffuse sensor. The holder has an integrated front screen positioned at an angle so that any falling dirt particles are deflected automatically. The special parameterization of the sensors efficiently suppresses possible ambient light sources.

# Palletizing

## Access guarding with muting

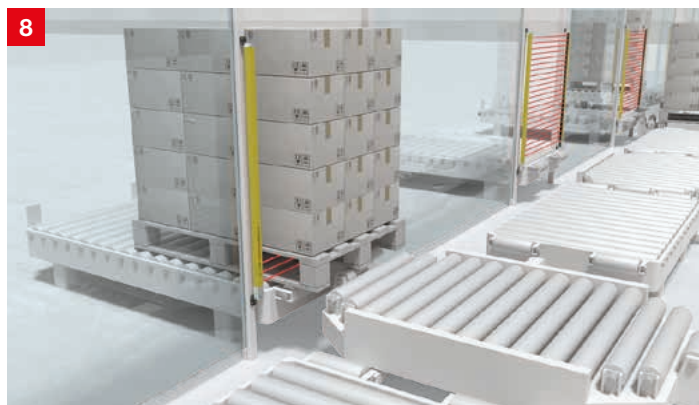
**Requirement:** Access guarding on conveyor lines is to prevent persons from accessing a potential danger zone, while at the same time allowing the transported goods to pass through.



**Solution:** The muting function bridges the safety sensor during the passage of the transported goods. This function is already integrated in the MLD 530 multiple light beam safety devices and the MLC 530 safety light curtains. The MLDSET protective sensor sets offer complete solutions for access guarding with muting function.

## Access guarding with Smart Process Gating

**Requirement:** Access guarding on a conveyor line is to prevent persons from accessing a potential danger zone, while at the same time allowing the transported goods to pass through. Ideally, the safety system used for this requires as little space as possible.



**Solution:** With Smart Process Gating, the safety sensor is bridged by means of a control signal from the PLC. The function is included in the MLC 530-SPG system. Additional muting sensors are not required and the systems can be designed to be particularly space-saving as well as tamperproof thanks to the SPG function.

## Detection of pallets

**Requirement:** All types of pallets should be reliably detected over the entire length. Damaged pallets or chipped pallets should also be allowed.



**Solution:** The RK 46C VarOS retro-reflective photoelectric sensors also reliably detect objects with irregular shapes and openings. For this purpose, the devices use a homogeneous, clearly visible 40 mm wide light-band and a standard TKS50x100 reflector. The sensors can be adjusted quickly and easily using a teach button.



## Access guarding of doors

**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.



**Solution:** The robust L100, L250 and L300 safety switches with locking device keep safety doors securely locked until access is released by an electric signal. The series includes standard designs, devices with integrated operational controls as well as devices with RFID-coded actuators.

## Monitoring of end positions

**Requirement:** For transport safeguarding, pallet loads are often automatically wrapped in stretch film. In pallet wrapping machines, the respective final position of the film carriage must be monitored to prevent collisions.



**Solution:** Inductive sensors detect the metallic construction of the film carriage. IS 244 cubic sensors with turnable active head and a terminal or M12 connection can be mounted flexibly and cover operating ranges up to 40 mm.

## Detection of winding height

**Requirement:** For a correct winding process, the maximum height of the pallet is to be detected. The upper edge of the pallet must be detected in order to control the film carriage.



**Solution:** The HT 46C diffuse sensor detects the upper edge of the full pallet at an operating range of up to 3 m with defined fading independent of the objects that are on the pallet.

# Palletizing

## Detection of film

**Requirement:** During the winding process, the presence of the film used must be monitored. Any film tears that occur must be reliably detected. A suitable sensor is important for detecting the often transparent or partially transparent film.



**Solution:** The polarized PRK3C.A or PRK25C.A retro-reflective photoelectric sensors are suitable for the detection of transparent films. The integrated IO-Link interface provides extensive diagnostic options as well as the possibility to parameterize the devices remotely. MTKS reflectors or REF6 reflective tapes are used as reflectors.

## Determination of residual quantities

**Requirement:** For a reliable winding process, the film supply is to be monitored in order to receive a signal in time for a required film change. A sensor is to be used that can reliably detect the residual quantity independent of the type of film.



**Solution:** The HT3C and HT25C diffuse sensors with highly visible red light spot allow fast alignment in the machine and detect the film roll independent of color and surface. The sensors can be adjusted either with a potentiometer or via the integrated IO-Link interface.

## Code reading on the pallet

**Requirement:** After palletizing and successful load securing, the goods code on the attached bar code labels is to be read in and transferred to the higher-level goods management system.



**Solution:** A bar code reader of the BCL 500i / BCL 600i series is used to read the pallet label. Integrated fieldbus networkability is one of the key features of this series and enables fast connection to different controls. The CRT technology enables damaged codes to be read reliably.

### Detection of film-wrapped pallets

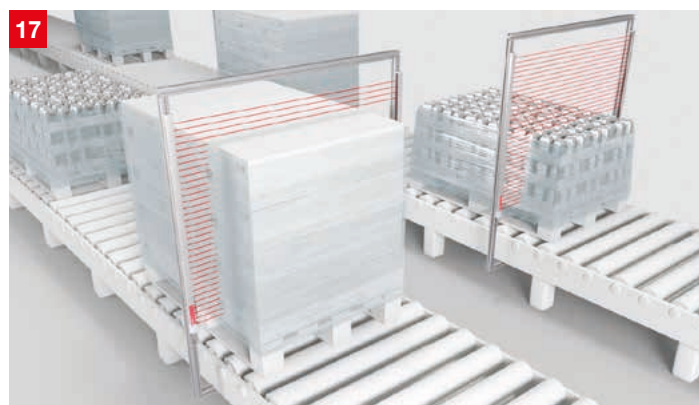
**Requirement:** The film-wrapped or shrink-wrapped pallets should be reliably detected over the entire pallet length. The sensor used must not generate any switching errors.



**Solution:** The PRK 46C.D retro-reflective photoelectric sensors are optimized for use on roller conveyors. They offer high functional reliability especially for film-wrapped and shrink-wrapped pallets. The sensors with a degree of protection IP 69K are mechanically very robust and very reliable due to the high function reserve with an operating range of 16 m.

### Width and height monitoring

**Requirement:** Before a loaded pallet can be conveyed into the conveyor system or into an automatic storage system, the external dimensions and any projecting edges of the pallet must be checked.



**Solution:** The CSL 710 switching light curtains or the CML 720i measuring light curtains check the dimensions of the loaded pallet during transport. Different resolutions and measurement field lengths as well as several configurable outputs allow the devices to be optimally adapted to the application.

# Switching sensors

## Photoelectric sensors/diffuse sensors









**18B series**  
Metal, detection of  
transparent objects



**25C series**  
Universal



**3C series**  
Universal, mini

Technical data	Dimensions excl. connector, W×D×H	15 × 47 × 32.5 mm	15 × 42.7 × 30 mm	11 × 32 × 17 mm
	Operating voltage	10–30 V DC	10–30 V DC	10–30 V DC
	Switching outputs	PNP, NPN, analog	PNP, NPN, push-pull, IO-Link	Push-pull, PNP, NPN, IO-Link
	Connection type	M12, cable	M8 / M8+snap / M12, cable, cable+M8 / M12	M8, cable, cable+M8 / M12
	Degree of protection	IP 67, IP 69K	IP 67, IP 69K	IP 67, IP 69K
	Certifications	  US	 CDRH  US	 CDRH  US
	Housing	Metal	Plastic	Plastic
Throughbeam photoelectric sensors	Operating range*		0–30 / 0–800 m (radiation through films)	0–10 m
	Light source		Red light, infrared	Red light / laser (class 1)
	Switching		Light, dark	Light, dark, antivalent
	Switching frequency		1,500 Hz	1,000 / 3,000 Hz
Retro-reflective photoelectric sensors	Operating range*	0–6 m	0–10 / 0–12 / 0–25 m	0–7 / 0.02–5.5 / 0–3 m
	Light source	Red light	Red light / laser (class 1 and 2)	Red light / infrared / laser (class 1)
	Switching	Light, dark, antivalent	Light, dark, antivalent	Light, dark, antivalent
	Switching frequency	5,000 / 1,500 Hz	1,500 / 2,500 Hz	1,000 / 1,500 / 3,000 Hz
Diffuse sensors with background suppression	Operating range*		0–1,200 / 0–1,300 mm	5–600 mm
	Light source		Red light / infrared / laser (class 1 and 2)	Red light / laser (class 1)
	Switching		Light, dark, antivalent	Light, dark, antivalent
	Switching frequency		1,000 / 2,500 Hz	1,000 / 3,000 Hz
Dynamic reference diffuse sensor	Operating range*		200 / 450 mm	
	Light source		Red light	
	Switching		Push-pull	
	Switching frequency		750 / 300 Hz	
Additional functions	Transparent media	X	X	X
	Protective sensors category 2/4		X (type 2)	
	Warning output	X	X	X
	Activation input		X	X
	Active ambient light suppression A <sup>2</sup> LS	X	X	X
Features		Bottle detection   Film detection <20 µm   Target mark detection   Aligned optics   Tracking   EasyTune   User guidance   Trigger function with reduced signal jitter   IO-Link interface   Contrast sensors	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   Throughbeam photoelectric sensor with extremely high light power	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





## 46C series

Universal, long range

### 53C series







Stainless steel, Hygienic design

### 55C series

Stainless steel, Wash-down design

## 5B series

Standard

20.5 × 76.3 × 44 mm	14 × 35.4 × 20.4 mm	14 × 35.4 × 25 mm	11 × 32.4 × 20 mm
10–30V DC	10–30V DC	10–30V DC	10–30V DC
PNP, NPN, push-pull	Push-pull (IO-Link)	Push-pull (IO-Link), PNP	PNP, NPN
M12, cable, cable+M12	Connector, M8	M8, cable+M12, cable	M8, cable, cable+M8 / M12
IP 67, IP 69K	IP 67, IP 68, IP 69 K	IP 67, IP 68, IP 69 K	IP 67
 CDRH  US	 CDRH  US	 CDRH  US	  US
Plastic	Stainless steel 316L	Stainless steel 316L	Plastic
0–150 m	0.05–10 m	0–80 m	0–15 m
Red light / infrared	Red light	Red light, infrared	Red light, infrared
Light, dark, antivalent	Antivalent	Antivalent	Light, dark
100 / 500 Hz	1,000 Hz	1,000 / 350 Hz	900 Hz
0.05–30 m	0–5 m	0–6 m	0.02–6.5 m
Red light	Red light, laser (class 1)	Red light, laser (class 1)	Red light
Light, dark, antivalent	Antivalent	Antivalent	Light, dark
25 / 150 / 500 Hz	3,000 / 1,500 Hz	3,000 / 1,500 Hz	500 Hz
5–3,000 mm	0.005–0.45 m	0.005–0.6m	
Red light / infrared / red light laser (class 1/2)	Red light, laser (class 1)	Red light, infrared, laser (class 1)	
Light, dark, antivalent	Antivalent	Antivalent	
20 / 100 / 200 / 250 / 500 Hz	3,000 / 1,000 / 750 Hz	3,000 / 1,000 / 750 Hz	
	X	X	X
X			
X			
X	X	X	X
X	X	X	X
Retro-reflective photoelectric sensor with light-band for objects with openings / irregular shape   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	Bottle detection   Tracking   Sensor with different light-spot geometry and V-configuration   IO-Link   ECOLAB   CleanProof+   Johnson Diversey	Bottle detection   Tracking   Sensor with different light-spot geometry and V-configuration   IO-Link   ECOLAB   CleanProof+   Johnson Diversey	

# Switching sensors

## Ultrasonic sensors



### 300 series

Ultrasonic sensors, cylindrical

### 400 series

Ultrasonic sensors, cylindrical

Technical data	Dimensions excl. connector, W × D × H	M18 × 46.3 / 74.3 / 77.6 mm M30 × 88.8 mm	M12 × 70 mm M18 × 51.8 / 75 / 82.8 mm M30 × 75 / 142.5 mm
	Operating voltage	10–30 V DC / 12–30 V DC	10–30 V DC / 12–30 V DC
	Switching outputs	PNP, NPN	PNP, NPN
	Connection type	M12	M8, M12, cable
	Degree of protection		
	Certifications	CE cULus	CE cULus
	Housing	Plastic	Metal, plastic
Throughbeam photoelectric sensors	Operating range*		0–6,000 mm
	Light source		Ultrasonics (200 / 310 kHz)
	Switching		
	Switching frequency		7 / 8 Hz
Retro-reflective photoelectric sensors	Operating range*	0–300, 0–800, 0–400, 0–1,600 mm	
	Light source	Ultrasonics (300 / 230 kHz)	
	Switching	NC (object detected)	
	Switching frequency	8 / 5 / 1 Hz	
Diffuse sensors with background suppression	Operating range*	40–300, 50–400, 80–1,200, 150–1,600, 250–3,500, 350–6,000 mm	10–200, 40–400, 25–400, 150–1,300, 300–3,000, 600–6,000 mm
	Light source	Ultrasonics (200 / 230 / 300 kHz)	Ultrasonics (200 / 310 kHz)
	Switching	NO/NC (object detected)	NO/NC (object detected)
	Switching frequency	1 / 2 / 5 / 8 / 10 Hz	7 / 8 / 20 / 50 Hz
Features		Configurable via PC   Teach-in   Design with angle head   1 or 2 switching outputs   Synchronization and multiplex function   Temperature compensation	Configurable via PC   Teach-in   Design with angle head   1 or 2 switching outputs   IO-Link interface   Synchronization and multiplex function   Temperature compensation

## Inductive switches



**IS 208, 212, 218, 230**  
Standard, cylindrical

**IS 208, 212, 218, 230**  
All stainless steel

**IS 240, 244/ISS 244**  
Standard, cubic

Technical data	Dimensions incl. connector, W × D × H	M8: 22–45 mm M12: 35–60 mm M18: 35–64 mm M30: 40.6–73.5 mm	M8: 45–60 mm M12: 50–60 mm M18: 51–63.5 mm M30: 50–63.5 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	10–30 V DC	10–30 V DC	10–30 V DC
	Operating range	2–40 mm	2–40 mm	4–40 mm
	Switching outputs	PNP, NPN	PNP, NPN	PNP, NPN
	Switching principle	NO, NC, NO + NC (antivalent)	NO, NC	NO + NC (antivalent)
	Switching frequency	Up to 5,000 Hz	Up to 600 Hz	Up to 1,400 Hz
	Connection type	M12, cable + M12, cable	M8, M12, cable	M8, M12, terminal, cable
	Degree of protection	IP 67	IP 67, IP 68, IP 69 K	IP 67, IP 68, IP 69 K
	Certifications	<b>CE cULus</b>	<b>CE cULus</b>	<b>CE cULus</b>
Features	Housing	Metal	All stainless steel (V2A & V4A)	Plastic
		Different versions available:   Short housing design   Increased range   AC/DC device versions   Antivalent switching output	Full stainless steel housing from a single piece (V2A & V4A)   Resistant against vibration and pressure shocks   Mechanically resistant against impacts on the active surface   Also available as a model with 316L stainless steel (ECOLAB) suitable for use in hygienic applications   Correction factor 1 (material-independent detection)	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

# Switching sensors

## Capacitive sensors



**LCS-1**  
Capacitive sensors, cylindrical

**LCS-1**  
Capacitive sensors, cubic

**LCS-2**  
Capacitive sensors, cylindrical

Technical data	Dimensions	M12: 53–75 mm M18: 73–88.5 mm M30: 66.5–79 mm/87.3 mm	54 × 20.3 × 5.5 mm 40 × 40 × 10 mm	M12: 55–68 mm M18: 70–85 mm M30: 85–98 mm
	Type of installation	Embedded / non-embedded	Embedded	Embedded / non-embedded
	Operating voltage	10–30 V DC / 12–35 V DC	10–30 V DC	10–30 V DC
	Operating range	1–30 mm	1–20 mm	1–30 mm
	Switching outputs	PNP, NPN	PNP, NPN	PNP, NPN
	Switching principle	NO (make-contact), NC (break-contact) partially switchable	NO (make-contact), NC (break-contact)	NO (make-contact), NC (break-contact)
	Switching frequency	100 Hz (10 Hz with IO-Link)	100 Hz	100 Hz
	Connection type	M12 connector / PUR cable 2 m / PTFE cable 2 m	M12 connector / PUR cable 2 m / PUR cable 0.3 m	M12 connector / PUR cable 2 m
	Degree of protection	IP 67	IP 67	IP 67
	Certifications	CE cULus	CE cULus	CE
Features	Housing	Metal / plastic / Teflon (PTFE)	Plastic	Metal / plastic
	IO-Link	M18 and M30 version		
		Adjustable switching distances   Versions with potentiometer or teach buttons   Models with chemical-resistant PTFE housing   IO-Link interface	Switching distances adjustable by means of potentiometer   Compact and flat design	Adjustable switching distances   Versions with potentiometer



## Fiber optic sensors



**LV46x**  
Fiber optic amplifiers

**GF**  
Glass fiber optics

**KF**  
Plastic fiber optics

Technical data	Dimensions excl. connector, W×D×H		Ø 4 × 250 / 500 / 1,000 / 3,000 / 5,000 mm	Ø 2.2 × 500 / 2,055 mm
	Operating voltage	10–30 V DC		
	Switching outputs	PNP, NPN, IO-Link		
	Connection type	M8, cable, cable+M8, cable+M12	Ø 2.2 plugged	Ø 2.2 plugged
	Degree of protection	IP 65	IP 65	
	Certifications	CE cULus		
	Housing	Plastic	Silicone, brass, stainless steel	Plastic, models with bending protection
Throughbeam photoelectric sensors	Operating range*		0–450 mm	0–1,700 mm
	Light source	Red light, infrared	Red light, infrared (with LV46x)	Red light, infrared (with LV46x)
	Switching	Light, dark		
	Switching frequency	250 Hz ... 50 kHz		
Energetic diffuse sensor	Operating range*		0–80 mm	0–270 mm
	Light source	Red light, infrared	Red light, infrared (with LV46x)	Red light, infrared (with LV46x)
	Switching	Light, dark		
	Switching frequency	250 Hz ... 50 kHz		
Features		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   Multiple fiber core   Various ancillary lenses   Heat resistant, highly precise, oil and chemical resistant	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

\* Typical operating range limit

# Switching sensors

## Fork sensors



### GS 61

Label detection, optical

### GS 63B

Label detection, optical

Technical data	Label types	Non-transparent, metalized, booklet, cavitated BOPP	Non-transparent, metalized, booklet, cavitated BOPP
	Detection principle	Optical	Optical
	Operating voltage	10–30 V DC	10–30 V DC
	Switching outputs	Push-pull	Push-pull
	Switching frequency	~ 10,000 Hz	~ 10,000 Hz
	Response time	< 0.05 ms	< 0.05 ms
	Operation	Teach button/potentiometer	Teach button/potentiometer
	Teach options	Manual teach, static teach	Manual teach, static teach
	Teach input	Yes	Yes
	IO-Link	–	–
	Automatic tracking of the switching threshold ALC function	–	Yes
	Warning output	–	Yes
	Housing dimensions	60 × 11 × 30 mm	80 × 11 × 30 mm
	Housing material	Plastic, PC	Metal, plastic, diecast zinc (chemically nickel-plated), PC
	Mouth width	3 mm	3 mm
	Mouth depth	41 mm	61 mm
	Connection	M8 (horizontal or vertical plug outlet), cable, cable+M12	M8 (horizontal or vertical plug outlet), cable, cable+M12
Additional functions	Degree of protection	IP 65	IP 67
	Approval	CE cULus	CE cULus
		Slimline-design (reduced fork height) for installation directly at the dispensing edge   Removable operating head on potentiometer version	Slimline-design (reduced fork height) for installation directly at the dispensing edge   Removable operating head on potentiometer version   Storage of up to 30 teach values in the sensor



**GSU 12**  
Label detection, ultrasonics

**GSU 14E**  
Label detection, ultrasonics

**IGSU 14E**  
Label detection, ultrasonics

**GSX 14E**  
Label detection, ultrasonics, optical

Non-transparent, transparent, metalized, booklet	Non-transparent, transparent, metalized, booklet	Non-transparent, transparent, metalized, booklet	Non-transparent, transparent, metalized, booklet, cavitated BOPP
Ultrasonics	Ultrasonics	Ultrasonics	Ultrasonic + optical
12–30 V DC	18–30 V DC	18–30 V DC	18–30 V DC
Push-pull	Push-pull	Push-pull	Push-pull
~ 1.75 kHz	~ 2 kHz	~ 2 kHz	Ultrasonics: ~ 2 kHz Optical: ~ 9 kHz
< 0.24 ms	< 0.2 ms	< 0.2 ms	Ultrasonics: < 0.2 ms Optical: < 0.05 ms
1 teach button	2 keys	2 keys	2 keys
Manual teach	Manual teach	EasyTeach, static teach	EasyTeach, static teach
–	Yes	Yes	Yes
–	V1.1 (SmartSensorProfile, COM3)	V1.1 (SmartSensorProfile, COM3)	V1.1 (SmartSensorProfile, COM3)
–	–	Yes	Yes
–	–	Yes	Yes
96 × 22 × 46.9 mm	96 × 22 × 46.9 mm	96 × 22 × 46.9 mm	96 × 22 × 46.9 mm
Metal, diecast zinc (powder-coated)	Metal, diecast zinc (galvanically nickel-plated)	Metal, diecast zinc (galvanically nickel-plated)	Metal, diecast zinc (galvanically nickel-plated)
4 mm	4 mm	4 mm	4 mm
80 mm	80 mm	80 mm	80 mm
4-pin M8, 5-pin M12 (horizontal plug outlet)	5-pin M12 (horizontal or vertical plug outlet)	5-pin M12 (horizontal or vertical plug outlet)	5-pin M12 (horizontal or vertical plug outlet)
IP 65	IP 65	IP 65	IP 65
CE c <sub>UL</sub> us	CE c <sub>UL</sub> us	CE c <sub>UL</sub> us	CE c <sub>UL</sub> us
–	easy-Tune for manual adaptation of the switching threshold	easy-Tune for manual adaptation of the switching threshold   Model for splice inspection	Detection principle can be selected and changed manually   easy-Tune for manual adaptation of the switching threshold

# Switching sensors

Technical data	Function
	Dimensions excl. connector, W×D×H
	Operating voltage
	Outputs
	Connection type
	Degree of protection
	Certifications
	Operating range
	Light source
	Switching frequency
	Transmitter color
	Light beam gate
	Light spot shape
	Light spot orientation
	Operation
Additional functions	



## Special sensors


**KRT 18B**

Contrast sensors

**KRT 55**

Contrast sensors

**KRT 3C**

Contrast sensors

**LRT 8**

Luminescence sensors

Contrast distinction	Contrast distinction	Contrast distinction	Luminescence detection
15 × 47 × 32.5 mm	14 × 35.5 × 25 mm	11 × 32 × 17 mm	15 × 48 × 38 mm
12–30 V DC	10–30 V DC	12–30 V DC	10–30 V DC
Push-pull, analog, IO-Link	PNP	Push-pull, PNP, NPN, IO-Link	PNP, NPN
M12	M8, cable+M12, cable	M8, cable, cable+M12	M12
IP 67, IP 69K	IP 67, IP 69K	IP 67, IP 69K	IP 67
		CDRH	
13 mm ± 3 mm	13 mm ± 2 mm	14.5 mm ± 2 mm	0–400 mm
LED	LED	LED, laser (class 1)	LED
15,000–22,000 Hz	10,000 Hz	4,000–10,000 Hz	1,500 Hz
RGB / white	RGB / white	RGB / white / red laser	UV / blue
Front	Front	Front	Front
Rectangular	Rectangular	Rectangular or round	Round
Lengthwise / sideways	Vertical	Lengthwise / sideways	
Multiturn potentiometer, buttons, teach button, IO-Link	Teach button, via cable	Teach button, cable, IO-Link	Potentiometer
easy-Tune for manual adaptation of the switching threshold	easy-Tune for manual adaptation of the switching threshold   Stainless steel housing in wash-down design	easy-Tune for manual adaptation of the switching threshold   ECOLAB   Small construction	Small construction   Sensitivity adjustment   ECOLAB   Detection of any kind of luminescence   Detection of white paper   Detection of printed luminescence marks   Detection of luminescence marks on wood

# Switching sensors

Fork sensors



**GS(L) 04B**  
Object detection, optical

**GS(L) 08B**  
Object detection, optical













Technical data	Operating voltage	10–30V DC	10–30 V DC
	Switching outputs	Push-pull (IO-Link), PNP, NPN	Push-pull (IO-Link)
	Connection type	3-pin M8	3-pin M8
	Degree of protection	IP 67	IP 67
	Certifications	CE CDRH cULus	CE CDRH cULus
Throughbeam sensors	Housing	Metal	Stainless steel (V4A)
	Mouth width	5 / 10 / 20 / 30 / 40 / 50 / 60 / 70 / 80 / 90 / 100 / 120 / 170 / 220 mm	30 / 50 / 80 / 120 mm
	Light source	Red light, infrared, laser (class 1)	Red light / laser (class 1)
	Switching	Light, dark	Light, dark
Additional functions	Switching frequency	5,000 / 10,000 Hz	5,000 Hz
	Operation	Potentiometer	Potentiometer
Features		Detection of small parts   Light/dark switching on device, IO-Link	Detection of small parts   Light/dark switching on device, IO-Link, ECOLAB

## Light curtains


**CSL 505**  
Switching

**CSL 710**  
Switching

**CSR 780**  
Switching

Technical data	Function	Throughbeam principle	Throughbeam principle	Reflection principle
	Dimensions excl. connector, W × D × H	10 × 27 × 150 ... 3,180 mm 12 × 58 × 120 ... 480 mm	29 × 35 × 168 ... 2,968 mm	28.6 × 34.2 × 142.8 ... 478.8 mm
	Operating voltage	24 V DC	18–30 V DC	18–30 V DC
	Outputs	2x outputs / push-pull	4 I/Os (configurable) + IO-Link	Push-pull
	Connection type	M8	M12	M12
	Degree of protection	IP 65	IP 65	IP 65
	Certifications	   	   	   
	Operating range*	Up to 5 m	Up to 3.5 ... 7 m	700 mm
	Light source	Infrared	Infrared	Infrared
	Cycle time	1 ms per beam	30 µs per beam	> 2 ms (depending on measurement field length)
	Measurement field length	35–3,100 mm	160–2,960 mm	96 / 432 mm
	Resolution	5**, 12.5, 25, 50, 100 mm	5, 10, 20, 40 mm	1 mm
	Number of beams	Max. 160	Max. 592	
Features	Operation	Autocalibration, configuration software, configuration by means of pin assignment	Control buttons on foil display, 5 languages, configuration software	Status displays for detection / interruption of first and last beam
		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	Detection of extremely small objects (1 mm)   Warning output for contamination display   High object speed (< 3.5 m/sec for 1 × 10 × 10 mm)   Robust metal housing   Optimal setting using reference teach, indicator LED   Reflective tape as reflector

# Measuring sensors

## Light curtains



**CML 700i**  
Measuring

Technical data	Function	Size / contour detection, optical
	Dimensions excl. connector, W × D × H	29 × 35 × 168 ... 2,968 mm
	Operating voltage	18–30 V DC
	Outputs	Analog, CANopen, IO-Link, PROFIBUS, PROFINET, RS 485 (MODBUS)
	Connection type	M12
	Degree of protection	IP 65
	Certifications	CE cULus
	Operating range*	4.5 ... 9.5 m
	Light source / Measurement principle	Infrared
	Cycle time / measurement time	10–30 µs per beam + 0.4 ms
	Measurement field length / scanning angle	160–2,960 mm
	Resolution	5, 10, 20, 40 mm
	Number of beams	Max. 592
	Operation	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	

## Fork sensors



**GS 754B**  
CCD fork sensors

Technical data	Function	Edge/diameter measurement, optical
	Dimensions excl. connector, W × D × H	19.4 × 81.5 × 91 mm 20 × 155 × 91.5 mm
	Operating voltage	10–30 V DC (digital) 18–30 V DC (analog)
	Outputs	2 × 4–20 mA 2 × 0–10 V RS 232 / RS 422 / RS 485 1 × PNP, 2 × PNP
	Connection type	M12
	Degree of protection	IP 67
	Certifications	CE cULus
	Measurement range	
	Measurement principle	Optical / LED
	Measurement time	Min. 2.5 ms
	Measurement field width / Scanning angle	25 mm
	Ultrasonic frequency	
	Resolution	14 µm
	Mouth width	27 mm / 98 mm
	Mouth depth	42 mm
	Number of inspection tasks	5
	Operation	Terminal program via RS232 interface
Features	Detection of transparent media   Film detection > 0.1 mm   Turnable M12 connector   Wide-ranging evaluation functions   Perfect for thread and fiber measurement	

## Optical distance sensors



ODS 9

ODS 10

ODSL 96B

Technical data	Function	Distance measurement, optical	Distance measurement, optical	Distance measurement, optical
	Dimensions excl. connector, W×D×H	21 × 50 × 50 mm	25 × 65 × 55 mm	30 × 90 × 70 mm
	Operating voltage	18–30 V DC	18–30 V DC	10–30 V DC 18–30 V DC (analog, IO-Link)
	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, 0–10 V RS 232 / RS 485 Push-pull IO-Link
	Connection type	M12	M12	M12, cable
	Degree of protection	IP 67	IP 67	IP 67, IP 69K
	Certifications	CE CDRH cULUS	CE CDRH cULUS	CE CDRH cULUS ECOLAB
	Measurement range	50–650 mm	50–3,500 mm 50–8,000 mm (90 % diffuse reflection) 100–25,000 mm on reflective tape	150–2,000 mm 300–10,000 mm 300–25,000 mm on reflective tape
	Measurement principle	Optical / laser (class 1, 2)	Optical / laser (class 1)	Optical / LED / laser (class 1, 2)
	Measurement time	1 ms	3,4–1,020 ms (adjustable)	1–100 ms
	Ultrasonic frequency			
	Resolution	0.01–0.5 mm	1 mm	0.1–3 mm
Features	Operation	Teach-in Control buttons on foil display or Sensor Studio	Control buttons on foil display or Sensor Studio	Teach-in Configuration software Display
		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)	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



# Measuring sensors

## Measuring ultrasonic sensors



		300 series	400 series
Technical data	Dimensions without connector (Ø × L)	18 mm × 60.3 mm 18 mm × 88.3 mm 18 mm × 91.6 mm 30 mm × 98.8 mm	18 mm × 90 mm 30 mm × 90 mm 30 mm × 104.3 mm
	Thread size	M18   M30	M18   M30
	Measurement range	40 mm ... 6,000 mm	25 mm ... 6,000 mm
	Resolution	5 mm 6 mm < 2 mm	0.1 ... 0.5 mm 1.0 mm
	Switching frequency	1 Hz ... 10 Hz	1.6 Hz ... 8 Hz
	Ultrasonic frequency	75 kHz ... 300 kHz	75 kHz ... 310 kHz
	Supply voltage U <sub>B</sub>	10 V DC ... 30 V DC	15 V DC ... 30 V DC
	Switching outputs	Analog output, voltage Analog output, current Transistor, NPN Transistor, PNP	Analog output, voltage Analog output, current Transistor, push-pull Transistor, PNP
	Switching inputs	Teach input	Teach input
	Inputs / outputs selectable	1x	1x
	Interface		IO-Link
	Connection type	Connector, M12	Connector, M12
	Degree of protection	IP 67	IP 67   IP 68
	Operational controls	Control buttons	Control buttons
	Housing	Plastic	Metal
Features	Special version	Multiplex operation Synchronous operation Teach input	Multiplex operation Synchronous operation

# Safety

## Safety locking devices



L100



L200



L250



L300

General	Type in accordance with EN ISO 14119	Type 2 interlock device with guard interlocking	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 up to performance level PL e / SIL 3	For safety applications up to performance level PL e / SIL 3	Performance level PL e / SIL 3 with one device	Performance level PL e / SIL 3 with one device
	Housing, degree of protection	Technopolymer, IP 67	Metal, IP 67	Technopolymer, IP 67 / IP 69K	Metal, IP 67 / IP 69K, IP 65 for integrated operational controls
	Actuators	Mechanical tongue, with low coding level in accordance with EN ISO 14119	Mechanical tongue, with low coding level in accordance with EN ISO 14119	Mechanical tongue with RFID-encoded actuator in accordance with EN ISO 14119. Encoding: AC-L250-SCA: low AC-L250-UCA: high	Mechanical tongue with RFID-encoded actuator in accordance with EN ISO 14119. Encoding: 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, F <sub>1max</sub> 1,100 N	With either quiescent current principle or open circuit current principle, F <sub>1max</sub> 2,800 N	With either quiescent current principle or open circuit current principle, F <sub>1max</sub> 2,100 N	With either quiescent current principle or open circuit current principle, F <sub>1max</sub> 9,750 N
	Connection type	Cable entry M20 × 1.5 (3-way)	Cable entry M20 × 1.5 (3-way)	M12 connector Cable with M12 plug	Cable entry M20 × 1.5 (3-way) M12 (8- or 12-pin) M23 (19-pin)
	Certifications	CE, TÜV, cULus, UKCA	CE, TÜV, cULus, UKCA	CE, TÜV, ECOLAB, UKCA	CE, TÜV, ECOLAB, UKCA
Functions	Function	Safety switches with locking device	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	Positive-opening contacts for integration in the safety circuit	OSSD safety-related switching outputs	OSSD safety-related switching outputs
	Actuators	Multiple heavy-duty actuators	Multiple heavy-duty actuators	Contactless actuation through RFID technology	Contactless actuation through RFID technology
	Status indicator		LED status display	LED status display	LED status display
	Escape release		Models with integrated escape release button	Models with integrated escape release button	Models with integrated escape release button
	Special functions			Accessory: remote escape unlocking button with 5 m cable	Models with integrated command and E-Stop buttons
Features		Universal use with 5 actuator approach directions	Universal use with 5 actuator approach directions	Large center opening for actuator shaft	Large center opening for actuator shaft
			Robust design for big machinery and systems in harsh ambient conditions	Flexibly mounted actuator enables secure closing even with warped doors	Flexibly mounted actuator enables secure closing even with warped doors
			Variable installation options: Front and side mounting with just 2 screws	Variable installation options: Front and side mounting with just 2 screws	Variable installation options: Flexible and independent alignment of device / head and escape release
			Flexible and independent alignment of connection unit and escape release	Door handle for simple mounting of switches and actuators (optional)	Door handle for simple mounting of switches and actuators (optional)
				Lockout-tagout (optional)	Lockout-tagout (optional)

# Safety

## Safety light curtains

















ELC 100

MLC 310, MLC 320  
MLC 510, MLC 520

MLC 530



MLC 530-SPG

General	Type in accordance with EN IEC 61496	Type 4	MLC 300: type 2 MLC 500: type 4	Type 4	Type 4
	SIL in accordance with IEC 61508 and EN IEC 62061 (SILCL)	SIL 3	MLC 300: SIL 1 MLC 500: SIL 3	SIL 3	SIL 3
	Performance Level (PL) in accordance with EN ISO 13849-1	PL e	MLC 300: PL c MLC 500: PL e	PL e	PL e
	Resolution	17 / 30 mm	14 / 20 / 30 / 40 / 90 mm	14 / 20 / 30 / 40 / 90 mm	30 / 40 / 90 mm
	Operating range	3 / 6 m	6 / 15 / 10 / 20 / 20 m	6 / 15 / 10 / 20 / 20 m	10 / 20 / 20 m
	Protective field height	300 ... 1,500 mm	150 ... 3,000 mm	150 ... 3,000 mm	150 ... 3,000 mm
	Response time	4.5 – 21 ms	MLC 300: 3 – 51 ms MLC 500: 3 – 64 ms	3 – 64 ms	3 – 64 ms
	Profile cross section	34.7 mm × 39.3 mm	29 × 35 mm	29 × 35 mm	29 × 35 mm
	Temperature range	0 ... +50 °C	MLC 300: 0 ... +55 °C MLC 500: –30 ... +55 °C	–30 ... +55 °C	–30 ... +55 °C
	Degree of protection	IP 65	IP 65	IP 65	IP 65
	Safety-related switching outputs (OSSDs)	2 PNP transistor outputs	2 PNP transistor outputs	2 PNP transistor outputs	2 PNP transistor outputs
	Connection type	150 mm cable with M12 connector	M12 connector	M12 connector	M12 connector
Functions	Certifications	   	   	   	   
	Range reduction on the transmitter		X	X	X
	Switchable transmission channels		X	X	X
	LED indicator	X (additional alignment indicator)	X	X	X
	7-segment display		MLC 320, 520	X	X
	Configuration by means of wiring		X	X	X
	Automatic start / restart	X	X	X	
	Start / restart interlock (RES)		MLC 320, 520	X	X
	Contact monitoring (EDM)		MLC 320, 520		
	Beam blanking, fixed or movable			X	X
Versions for special applications	Muting function, integrated			X (2-sensor timing controlled)	X (Smart Process Gating)
	Linkage of safety output, multiscan			X	
	Cascadable (triple)		MLC 520		
	AIDA version		MLC 510		
	AS-i Safety interface		MLC 510		
	Ex marking acc. to EN 60079		MLC 520 (group II, cat 3D and 3G)		
	Degrees of protection IP 67 / IP 69K, mounted in protective tube		MLC 510		
	Extra shock / vibration resistant	X (standard for all devices)	MLC 500	X	

## Multiple light beam safety devices



**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**

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
Functions	Certifications				
	LED indicator	X	X	X	X
	7-segment display	MLD 320, 520	X	MLD 520, 530	
	Start / restart interlock (RES)	MLD 320, 520	X	MLD 520, 530	
	Contact 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 controlled		MLD 330, 530	MLD 530	
	2-sensor muting, 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		MLD 330, 530 MLD 335, 535	MLD 530	
	Shortened muting timeout (10 seconds)		MLD 531		
	Integrated status indicator (optional)	X	X		
	AS-i Safety interface	MLD 510		MLD 510	

# Identification

## Stationary bar code readers



		BCL 300i	BCL 500i	BCL 600i
Technical data	Reading distance (dependent on version)	20–700 mm	200–2,400 mm	400 ... 1,450 mm
	Modulus size	0.127 ... 0.8 mm	0.25 ... 1 mm	0.25 ... 0.5 mm
	Scanning rate	1,000 scans/s	1,000 scans/s	800 ... 1,000 scans/s
	Reading method	Line scanner Line scanner with deflecting mirror Raster scanner Raster scanner with deflecting mirror Oscillating-mirror scanner	Line scanner Oscillating-mirror scanner	Line scanner Oscillating-mirror scanner
	Selectable inputs / outputs	2	4	4
	Interfaces	EtherCAT   Ethernet   EtherNet IP   multiNet Plus   OPC-UA   PROFIBUS DP   PROFINET   RS 232   RS 422   RS 485	Ethernet   EtherNet IP   multiNet Plus   PROFIBUS DP   PROFINET   RS 232   RS 422   RS 485	Ethernet   PROFIBUS DP   PROFINET   RS 232   RS 422   RS 485
	Configuration / parameterization	Via web browser	Via web browser	Via web browser
	Supply voltage $U_B$	18–30 V DC	10–30 V DC	10–30 V DC
	Degree of protection	IP 65	IP 65	IP 65
	Ambient temperature, operation	–35 °C ... 40 °C	–35 °C ... 40 °C	–35 °C ... 40 °C
	Housing	Metal	Metal	Metal
	Certifications	CE CDRH cULus	CE CDRH cULus	CE CDRH cULus
Accessories	MA 200i connection unit	CANopen   DeviceNet	CANopen   DeviceNet   EtherCAT	CANopen   DeviceNet   EtherCAT
	Mounting devices	BT 56   BT 59   BT 300   BT 300 W	BT 56   BT 59	BT 56   BT 59
Features	AutoConfig	X	X	X
	AutoControl	X	X	X
	AutoRef/Act	X	X	X
	Code fragment technology	X	X	X
	Alignment mode	X	X	X
	LED indicator	X	X	X
	Reference code comparison	X	X	X
	Heating	X	X	X



## Stationary 2D-code readers



## DCR 200i

Technical data	Code types, readable	2D-codes Bar codes Stacked codes
	Reading distance (dependent on version)	40 mm ... 1,000 mm
	Modulus size	0.1 mm ... 1 mm
	Sensor	CMOS (Global Shutter)
	Resolution (pixel)	1,280 × 960
	Light source	LED, infrared LED, red
	Switching outputs	2
	Switching inputs	2
	Selectable inputs / outputs	2
	Interface	Ethernet   EtherNet IP   OPC-UA   PROFINET   RS 232   RS 422
	Configuration / parameterization	Configuration codes Teach-in Via web browser
	Supply voltage $U_B$	18 V DC ... 30 V DC
	Degree of protection	IP 65 IP 67 IP 69K
	Ambient temperature, operation	−30 °C ... 50 °C
	Dimensions, W × H × D	43 × 61 × 44 mm 46 × 61 × 46 mm
	Housing	Stainless steel Plastic Metal
	Compatibility of materials	ECOLAB
	Certifications	CE cULus
Accessories	MA 200i connection unit	CANopen   DeviceNet   EtherCAT   EtherNet IP   EtherNet TCP/IP   PROFIBUS   UDP
	MA 150 connection unit	Point to Point
	Mounting devices	BT 320M BTU 320M-D12
	Cover hood	
	Illuminations	
	Lenses	
Features	Features	Optionally with NPN switching inputs / outputs
	Special version	Heating Polarization filter

## Industrial IP camera



## LCAM 308

Technical data	Monitoring camera	Live-image transfer, image transfer recording
	Sensor / cameras	Color CMOS
	Resolution (pixel)	1,280 × 720
	Focal point	500 mm ... ∞
	Interface	Ethernet
	Digital inputs/outputs	1x IN
	Transmission rate	10/100 Mbit/s
	Additional functions	Trigger input, integrated memory, heating
	Optional	Cables, mounting devices, network switch
	Configuration / Operating system	Parameterization via PC using standard Web browser (webConfig tool)
Features	Dimensions, W × H × D	85 × 114 × 35 mm
	Certifications	CE UK CA
		Very well suited for industrial use through glass window and metal housing   Degree of protection IP 65   Megapixel color camera chip for live-image transfer in MJPEG format   Operating temperature −30 ... 50 °C

# Identification

## Vision Sensors



### IVS 1048i / DCR 1048i

### IVS 108

Technical data	Software functions	Detect codes Locate codes Count codes DPM (directly marked codes) Reading of 1D codes Reading of 2D codes Locate: surface, edge, form Measuring: angle, circle, distance, point-to-point, point-to-line Parts detection: brightness, contrast, surface pixels, edge pixels Counting: surfaces, edges, forms	Presence control
	Sensor	Sony global shutter	
	Camera type	Monochrome	
	Resolution (pixel)	1,440 × 1,080 736 × 480	320 × 240
	Reading distance / working range	50 ... 2,000 mm, depending on lens	50 ... 150 mm
	Field of view		At 50 mm: 20 × 15 mm At 150 mm: 54 × 41 mm
	Modulus size	0.127 ... 0.5 mm	
	Focal length	8 mm	7 mm
	Electronic shutter speed	0.025 ... 2 mm	
	Interface	Ethernet PROFINET	Ethernet
	Configuration / parameterization	Vision Studio software	Switch Teach-in Via web browser
	Switching outputs	5 MOSFET semiconductor	3 Transistor
	Switching inputs	3	2
	Degree of protection	IP 67	IP 65 IP 67
	Supply voltage U <sub>B</sub>	18 ... 30 VDC	10 ... 30 VDC
	Dimensions excl. connector, W × D × H	45 × 85 × 35 mm	47 × 58 × 58 mm
	Housing	Diecast zinc	Aluminum
	Optics cover	Plastic / PMMA	Plastic / PMMA
Accessories	Mounting devices	BTK IVS 1048	
	Cover hood	ACIVS	
	Illuminations	L BA, IL AL, IL SP	
	Lenses	Lens S-M12	

# Connection technology



**Sensor-actuator  
supply cables**

**F+B cables for sensors**

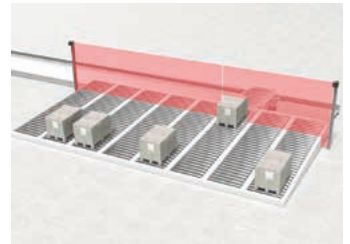
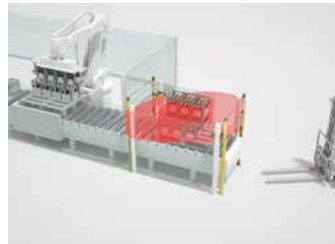
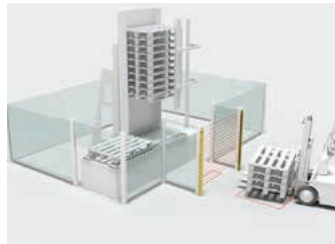
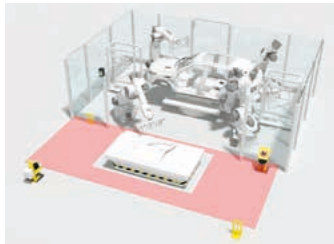
**Connectors for  
individual cable lengths**

Technical data	Interfaces	Voltage supply, CANopen, DeviceNet, SSI, Interbus-S, Ethernet, PROFIBUS DP, PROFINET	Voltage supply, signal transmission	Voltage supply, CANopen, DeviceNet, SSI, Interbus-S, Ethernet, PROFIBUS DP, PROFINET
	Thread size	M8, M12, M23	M8, M12	M8, M12
	Screw fitting	Nickel-plated brass	Stainless steel	Nickel-plated brass
	No. of pins	3-, 4-, 5-, 8-, 12-, 17-pin	3-, 4-pin	3-, 4-, 5-, 8-, 12-pin
	Shield	Shielded, unshielded	Unshielded	Shielded, unshielded
	Degree of protection (only in the screwed-down state with the correct tightening torque)	IP 65 / 67	IP 65 / 67 / 68 / 69K	IP 65 / 67
	Mechanical life time	> 100 mating cycles	> 100 mating cycles	> 100 mating cycles
	Sheath material	PVC, PUR	TPE	–
Functions		Sensor-actuator voltage supply, signal transmission	Sensor-actuator voltage supply, signal transmission	Sensor-actuator voltage supply, signal transmission
Features		Standardized product range for the connection of sensors   Connection and interconnection cables   Connectors with LED, straight and angled available	Product range for the connection of sensors in the food & beverage sector   FDA-compliant materials	Ready-made connectors for flexible use in the installation   Individual cable lengths possible

# Safety Solutions

## Efficient material flow and gapless 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.



### Advantages for you

- Save time and money with our pre-developed safety solutions
- All safety solutions are CE certified and compliant with standards. This gives you legal security.
- The intelligent and innovative safety concepts ensure smooth processes and seamless safety – even where classic concepts reach their limits
- Every safety solution is individually tailored to your system layout
- Our teams of certified safety experts are with you throughout the project

### Benefit from our experience

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



## Complete solutions for your systems

Our solutions are based on qualified safety concepts which, if necessary, can also be extended or created new. We take care of all the necessary process steps, from standards research to start-up support. And in the project, each solution is individually adapted to your system layout.

### Concept and design

The conceptualization and design of the safety solutions is carried out entirely by our Solutions Engineering Center. This includes:

- Directives and standard research
- Creation of the safety concept and the system architecture
- Software development and validation
- Comprehensive documentation, including CE declaration of conformity



### Services – Individual for your project

Each safety solution is individually adapted to your system and is supported by us in the project until handover:

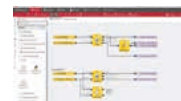
- Engineering services with parameterization according to project requirements
- Start-up support
- Final inspection



### Hardware and software components

Our safety solutions include all the necessary hardware and software components for integration into your system:

- Safety sensors
- Safety control
- Leuze safety program
- Compact switch cabinet, as required
- Wiring



### The path to your solution

**Gather requirements**

- Examine layout and danger zones, clarify processes
- Check risk assessment, define protective goals
- Clarify timing

**Safety inspection and acceptance**

- Validation of the safety function
- Initial inspection of the safety devices
- Creation of the acceptance documentation

**Selection of the safety concept**

- Evaluation of the requirements by our safety experts
- Selection of the appropriate safety concept and the required components

**Installation and commissioning**

- Provision of the mounting and installation instructions
- Mounting and installation of the system components
- Support during commissioning and the integration in the control

**Configuration and parameterization**

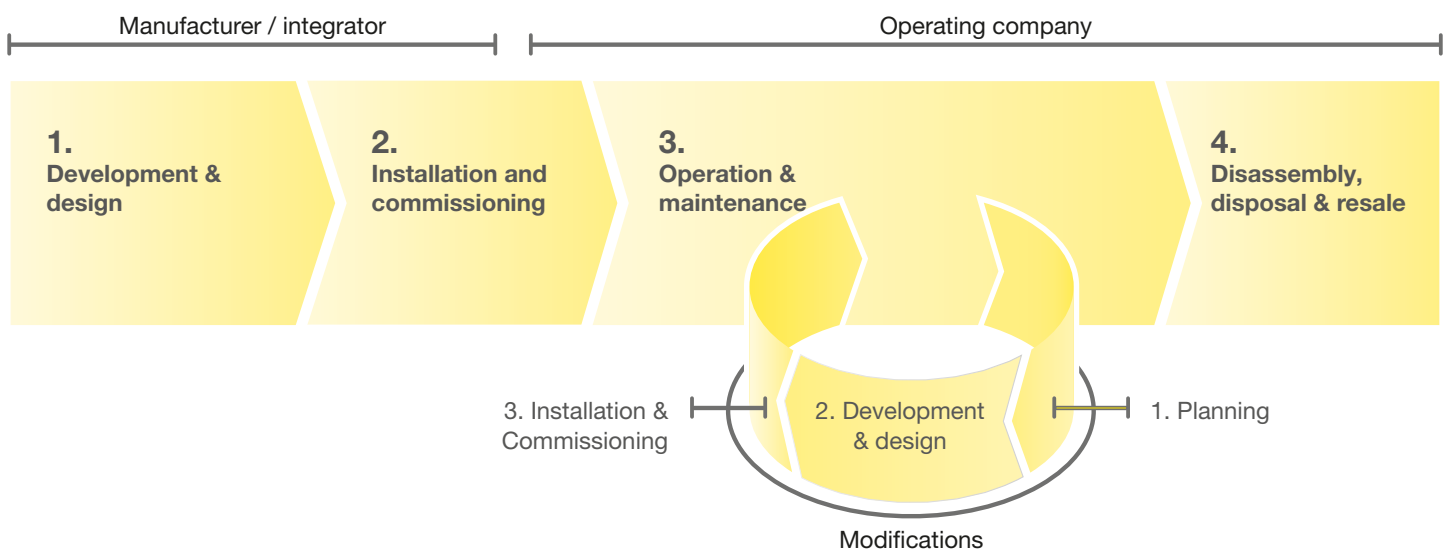
- Configuration of the safety system
- Programming and parameterization according to requirements
- Project-specific documentation



# 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.

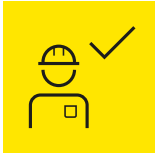
## Stages of a machine life cycle



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 as 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.

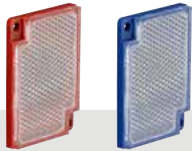


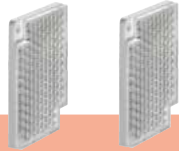
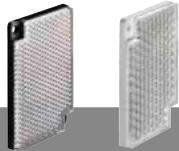





# Accessories and supplementary products

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/en/accessories](http://www.leuze.com/en/accessories)

## Reflectors

Just how reliably retro-reflective photoelectric sensors can detect depends upon the selected reflector, among other things. We offer reflectors with plastic or stainless steel housings as well as reflective tapes for different requirements: Reflectors in the advanced segment are often used in the food and pharmaceutical industry on account of their resistance against cleaning agents. The reflectors from the extended segment are suitable for production areas with high air humidity or large differences in temperature.

	For LED sensors with large light spot	For sensors with small light spot and clear-glass applications	
<b>Advanced segment</b> Ecolab (.P / red) Alcohol & H <sub>2</sub> O <sub>2</sub> (.Chem / blue) CleanProof+ (M5 / stainless steel)	TKS (example TKS 40 x 60) 	Micro-triad (MTKS...) 	Basic REF6 
<b>Extended segment</b> Anti-fog (.AF) UV coating (.UV) Heat-resistant (.HT)			
<b>Standard segment</b> Standard (., 1; .A)		    	



### 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.

### 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 freestanding 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.

### Hand-held scanners

Hand-held scanners read bar codes and 2D-codes at different positions omnidirectionally. Depending on the area of application, there are versions with cable-connected interface for RS 232 or USB interface as well as wireless scanners with Bluetooth interface.



# 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

<b>Foundation</b>	1963
<b>Company structure</b>	GmbH + Co. KG, wholly family-owned
<b>Executive management</b>	Salvatore Buccheri, Dr. Henning Grönzin, Helge Held
<b>Headquarters</b>	Owen, Germany
<b>Subsidiaries</b>	21
<b>Production locations</b>	6
<b>Technological competence centers</b>	3
<b>Distributors</b>	40
<b>Employees</b>	1,600

### 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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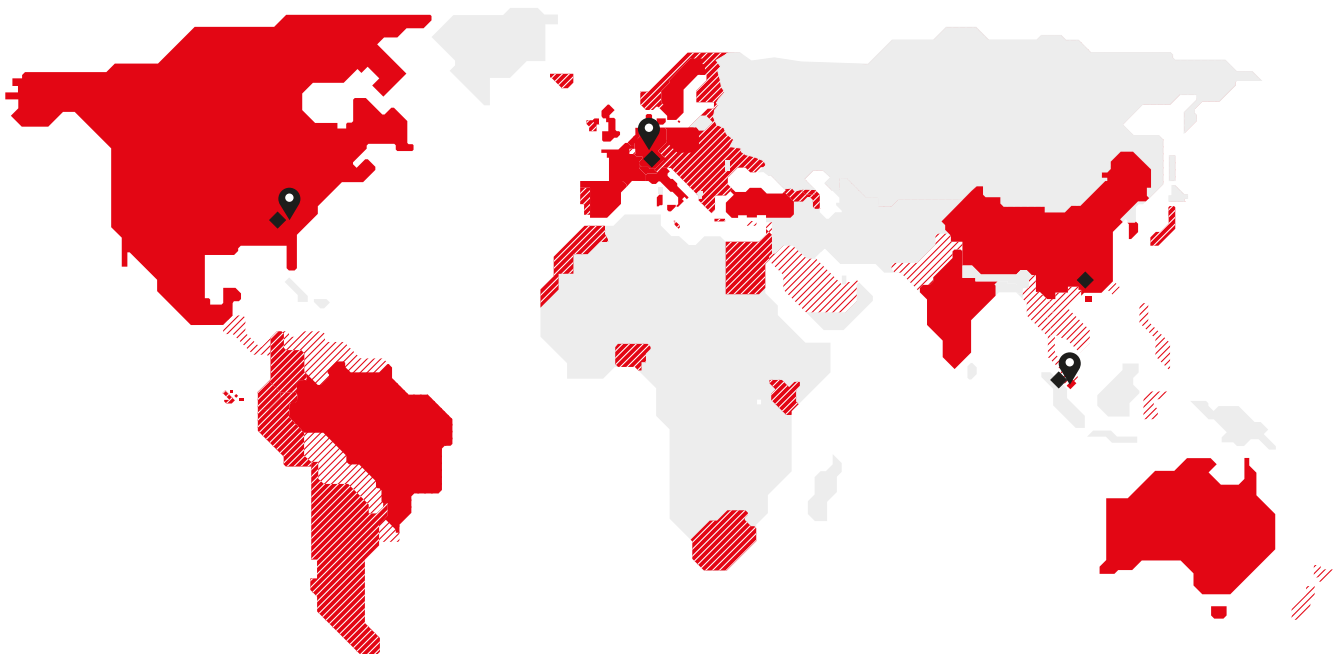




# Our Locations

## 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
- Subsidiaries
- ▨ Distributors
- ▨ Distribution through neighboring country

### Technological competence centers

Owen, Germany  
Duluth / Georgia, USA  
Singapore

### Production locations

Owen, Germany  
Unterstadion, Germany  
Duluth / Georgia, USA  
Shenzhen, China  
São Paulo, Brazil  
Malacca, Malaysia

### Subsidiaries

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

## 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 PLCs 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
- Industrial IP Cameras
- Vision Sensors

### Accessories and Supplementary Products

- Signaling Devices
- Mounting Systems
- Reflectors

## Your contact with us

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