



MINING

ENSURING PRODUCTIVITY AND PROTECTION
IN SURFACE AND UNDERGROUND MINING.

SICK
Sensor Intelligence.

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TASKS IN THE MINING INDUSTRY

From monitoring gas levels and air quality in mines to collision avoidance for vehicles at mine sites, SICK offers a wide range of sensors and systems to increase safety and to monitor potentially dangerous situations. SICK offers solutions for the analysis and control of underground mining atmospheres. The solutions supply the mine operator valuable safety and ventilation information, as well as data that identifies mine production areas in which people may or may not be working. SICK's wide range of sensors also include solutions for transporting and handling bulk material from the pit to port. In addition, SICK offers solutions for tracking of mobile equipment, driver assistance, and tunnel warning systems in underground and surface mining operations.

More information → www.sick.com/Mining



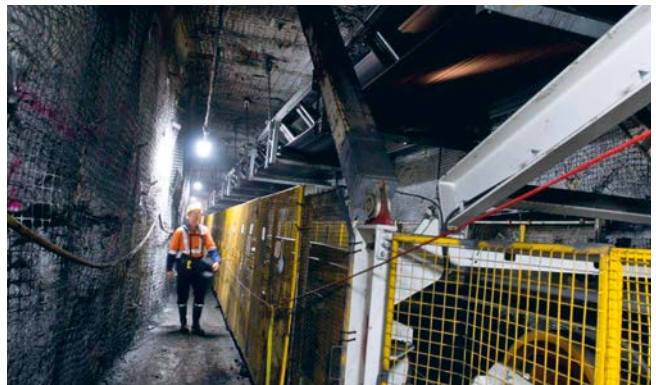
Monitoring and controlling

Analyzers and analyzer solutions monitor and control emission limit values, the atmosphere in underground mines as well as the emission of pollutants to the environment. In the mining industry, SICK's solution for carbon monitoring is one of the examples which controls the greenhouse gas emissions.



Measuring

Sensors and sensor systems from SICK are ideal for precise and direct measurement of volume and mass flow. For optimal management of conveyor belt usage and reduction of incidents, the speed, loading height and distribution of bulk material are monitored.



Protecting

The protection of personnel, machines and objects is the highest priority in a mine. Sensor solutions protect hazardous areas, machine positions and movements. SICK offers innovative and groundbreaking products, to fulfill these tasks.

Service

Competent consulting, qualified planning support, detailed project planning and engineering, installation and start-up – SICK provides all of these services with our own personnel. SICK is also available to provide service support of the equipment during scheduled outages and in emergency situations.





Applications in focus

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① Collision warning on the rear of an excavator with 2D LIDAR sensors

In medium-sized diggers, the machine operator's view is significantly restricted, thus increasing the risk of accidents. The LMS1xx 2D LiDAR sensor mounted on the excavator detects objects within collision range of the vehicle and alerts the machine operator in good time. This allows any possible collisions with objects to be detected and avoided. Less damage is caused to the machine and its surroundings, and digger availability is increased. Repair costs are decreased at the same time.



LMS1xx → p. 57



② Collision warning on the rear of an excavator with 3D LiDAR sensors

On construction sites, excavators can often collide with objects while maneuvering or reversing due to reduced visibility around the rear of the vehicle. The driver assistance system's sensors must, therefore, be able to classify objects and their relevance to the collision warning system. They do this by calculating object volume. The MRS1000

3D LiDAR sensor features an IP67 enclosure and detects up to 55,000 measuring points across four layers, enabling it to recognize objects located in the vehicle's travel path in plenty of time. Cutting-edge HDDM+ technology with multi-echo evaluation guarantees precise measurements, regardless of the weather conditions.



MRS1000 → p. 58



③ Protecting shovel and bucket excavators

Drivers loading and unloading their vehicles in close proximity to moving trucks and dozers and working in areas where space for moving and maneuvering is restricted by embankments must be highly aware of their surroundings. The MINESIC100 EPS is a high-precision collision awareness system that monitors

the area around a shovel. It guides truck operators safely to the correct loading position. The operator display shows all obstacles in the corresponding warning fields. If a collision is imminent, the operator will be warned by an audible alarm so that the current maneuver can be stopped safely and in good time.



MINESIC100 EPS → p. 47

④ Protecting wheel loaders and bulldozers

When operating a wheel loader or bulldozer, there is a risk of colliding with other moving vehicles when reversing. Infrastructure such as embankments, stockpiles, and ROM (run-of-mine) bins, also pose significant collision risks. While loading and unloading, a wheel loader is constantly moving back and forth, with the operator's primary focus being on the bucket. The MINESIC100 WPS is a high-precision collision awareness system which monitors critical areas surrounding the rear end of the vehicle. The system warns of impending collisions and provides operator assistance in critical maneuvers.



MINESIC100 WPS → p. 48



⑤ Bulldozer rear protection

Small dozers or crawlers are used for construction and maintenance within the mine. They may be used for clearing and grading lots, sloping, and up-keep of the road, back filing of material, etc. The dozers generally work in areas with high traffic near workshops or in close

proximity to stockpiles and infrastructure. The Visionary-B driver assistance system alarms when there is potential collision with stationary or moving objects and when reversing or maneuvering in confined areas.



Visionary-B → p. 55



⑥ Protecting dump trucks

The size, height, and speed of trucks combined with continuously changing operating conditions often make for very poor visibility for drivers. Front-end and rear-end collisions and leaving the road unintentionally are not uncommon occurrences in a mine. The MINESIC100 TPS is a high-precision col-

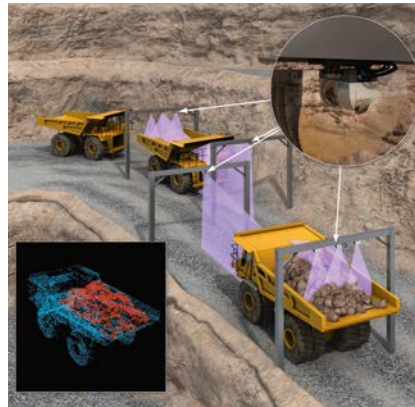
lision awareness system that monitors critical zones surrounding a vehicle and also takes the current driving situation into account. A road departure warning provides guidance to the truck operator along the haul road and outputs a warning if the truck is about to leave the safe driving path.



MINESIC100 TPS → p. 48

⑦ Measurement of the load volume on dump trucks

Dump trucks are used in surface mining for transporting large volumes of overburden, coal, or ore. The use of the dump trucks can be improved by maximizing the volume that is taken up on the load bed without overloading the vehicle. It is also necessary to monitor whether the load bed has been fully emptied before the truck is reloaded. Using LiDAR technology, it is possible to directly measure the in-situ volume of the load. The load volume measurement system mounted above the vehicle scans the loaded bed and determines the volume based on the time-of-flight principle without requiring the dump truck to come to a stop. The time difference between the emission of a signal and receipt of the signal by the LiDAR sensor after it has been reflected from the moving load provides the necessary information for the volume measurement. LiDAR sensors from SICK are rugged, reliable, and accurate and therefore ideally suited for the harsh conditions in mining.



Load Volume Measurement System → p. 50



⑧ Collision avoidance of automated guided mining trucks

When using automated guided mining trucks, all aspects of personal safety, localization and collision avoidance as well as the handling and identification of the transported material need to be taken into consideration. 3D LiDAR sensors such as the MRS6000 or LD-MRS can take care of all these tasks. They capture their environment with a high scanning point density, thereby enabling objects of interest to be reliably detected. With

the aid of multi-echo technology, the sensors scan through rain, dust, and fog while at the same time multiplying the point density which is particularly useful for creating a gap-free 3D point cloud. These features are essential for tackling demanding automated guidance applications at a mine site, including collision avoidance. A Visionary camera can also be used as a collision avoidance solution on mining vehicles.





⑨ Detecting obstacles and objects on the road

Detecting obstacles and objects such as potholes, bund walls, and even low obstructions while driving on site reduces the risk of accidents and increases productivity. 2D LiDAR sensors help the driver – or an autonomous vehicle – see unseen hindrances and barriers, and are reliable and highly accurate even over long distances. Furthermore, they are rugged in harsh environments and

their low power consumption minimizes the total cost of ownership. Yet another technology especially designed for obstacle detection in harsh environments is the 3D snapshot camera Visionary-B PS. The driver is actively warned about possible hazardous objects or larger holes within the camera’s customized 3D detection zones.



LMS15x → p. 57
 Visionary-B PS → p. 55

⑩ Wrong way detection

Driving in the wrong direction at a mine site can have serious consequences. The ability to detect a vehicle moving in the incorrect direction is therefore highly advantageous. An object detection system enables early detection of dangerous situations with a high potential for collision. The data recorded by the radar sensor is then evaluated multiple times to rule out incorrect detection and to unambiguously identify objects. This ensures a high detection reliability even in difficult weather conditions. The system solution thus helps increase safety and prevent accidents. The unit responsible for evaluation and warning is the integrated TDC-E200 gateway system, which has a wireless communication interface in addition to industrial interfaces. When combined with an optional solar extension, a completely autonomous operation of the AOS Radar is possible.



⑪ Haul truck tire handlers

Mine haul trucks require tires and suspension to be regularly maintained. Each tire assembly weighs up to several tons and requires a special vehicle to assist in this maintenance. The Visionary-B driver assistance system provides

the operator with a real time field of view of the front and rear of the vehicle allowing the driver to maneuver correctly to position the tire on the haul truck. The Visionary-B can be fitted to all tire change handlers.





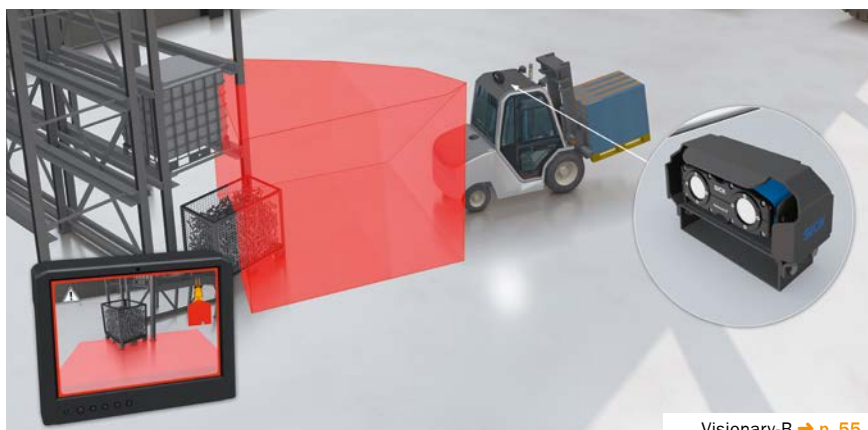
12 Forklift protection

Forklifts are regularly used inside and outside the workshop area for various jobs; stocking supplies, moving equipment or parts, etc. Reversing in a relatively confined environment, due to close proximity of big mining vehicles, equipment and workshop personals can be a huge driving challenge for forklift operators. The Visionary-B driver assistance system simplifies parking and tricky maneuvers by providing the

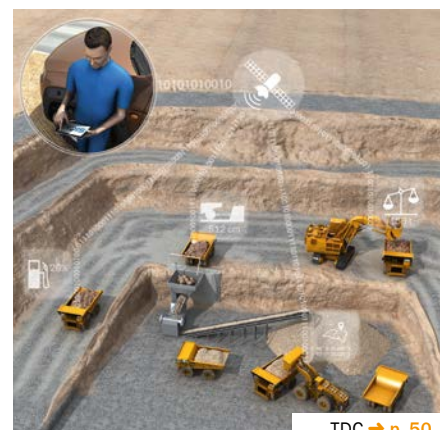
operator with a rear view of potential obstacles in real time by visual feedback and audible warnings. As an alternative the compact and advanced 2D laser scanner TiM3xx can be used. This scanner actively monitors the area behind the forklift and provides the driver with real time feedback via audible warnings when the forklift comes close to stationary or moving objects.

13 Asset tracking in mine sites

Knowing exactly where a specific vehicle is or where a valuable tool is located within an extensive mine site is critical. Ultra wide band tags together with a gateway system offer a solution for localization of assets over the entire mine site. While the bands track, the TDC gateway transmits the space-time coordinates to a central database. Regardless if the asset is above or below ground, the TDC monitors and communicates in real time.



Visionary-B → p. 55



TDC → p. 50

14 Access protection to areas with mobile machines

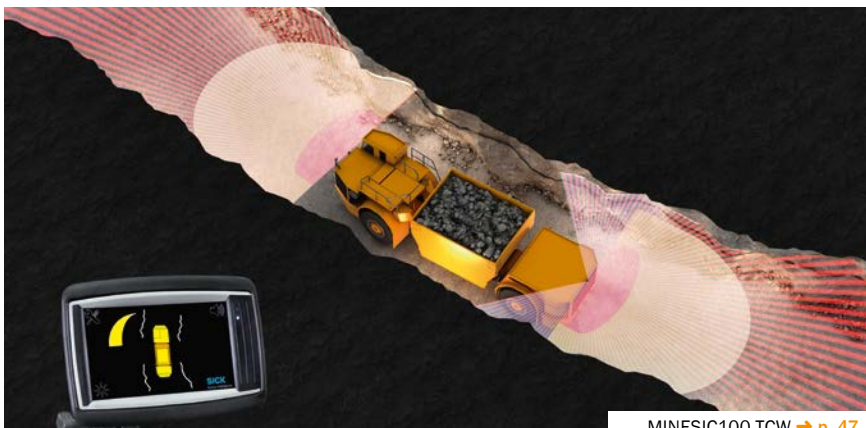
In underground mines, safeguarding people is paramount. Access to where mobile machines are working is forbidden. Multiple light beam safety devices can protect and issue an alarm in dangerous areas if a person has entered a prohibited zone. Rugged and reliable safety technology is very important. In the event that the mine poses an explosion hazard where a single spark can be disastrous, SICK offers multiple light beam devices certified for Ex zone 1 / 21 and 2 / 22. With these special versions deTem4 Core Ex II 3GD and deTem4 Core Ex, a mine operator can ensure compliance with the high safety requirements in explosive areas.



15 Tunnel collision warning system

The risks in operating underground machinery lay in turning, cornering, and reversing in close proximity to walls or other equipment. Mistakes can result in machine damage. The MINESIC100 TCW or, for hazardous areas, the MINESIC100 TCW Ex (Ex d mb) are mounted in underground vehicles. These are high precision proximity

detection systems that monitor the distance to the tunnel's surroundings and identify potential collision hazards. The MINESIC100 TCW and MINESIC TCW Ex provide guidance to the operator through the tunnel and offer accurate assistance for safe and efficient driving and maneuvering.



MINESIC100 TCW -> p. 47



16 Over height and narrowness detection in hardrock shafts

Space underground is limited. Underground mining trucks, rigs, and loaders must work in narrow areas. To avoid collisions with low roofs and in cramped locations, they rely on compact 2D LiDAR sensors to prevent accidents. The multi-echo technology of the sensors

increases the ability to detect obstacles, and makes them ideal for use in the harsh environments of copper and iron ore mines. Similarly, the Visionary-B CV 3D camera can also detect underground tunnel walls and therefore avoid collisions.



① Continuous analysis of air quality – monitoring CH₄, CO₂, CO, and O₂

Potentially hazardous gases can occur in underground coal mines. These gases must be monitored in order to enable controlled operation of the mine. The automated measurement system of oxygen (O₂), carbon dioxide (CO₂), methane (CH₄), and the ppm (parts per million) value for carbon monoxide (CO) provide information on short-term and long-term trends in the mine. The MINESIC700 TBS takes continual gas samples at various sampling points in the mine. Vacuum pumps transport these samples to the surface via PE-LD hoses (PE-LD = low-density polyethylene). The samples are then analyzed using an extractive gas analyzer.



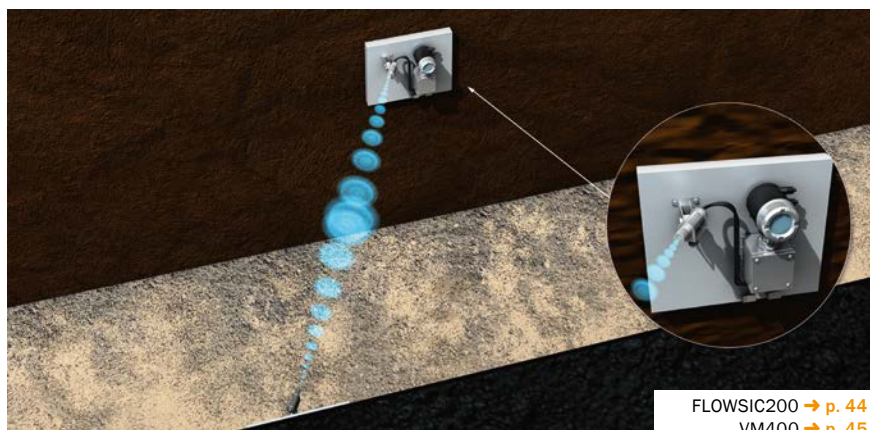
MINESIC700 TBS → p. 46
 FLOWSIC100 → p. 44



② Air flow measurement – ventilation

Ventilation is important for maintaining safe operations underground. Correct levels of ventilation must be ensured at all times. Therefore, the supply and exhaust air flows must be measured regularly. Based on the ultrasonic measurement principles, the FLOWSIC200 can continuously measure air velocity across the entire tunnel cross-section. The FLOWSIC offers maximum reliability

in harsh environments and provides real-time measurements at various points, allowing adjustments to be made based on the results taken. The VM400 is a compact air velocity sensor designed to continuously measure the air velocity at a single point within a mine tunnel. The VM400 is a cost-effective solution with user-friendly set-up for real-time flow measurement.



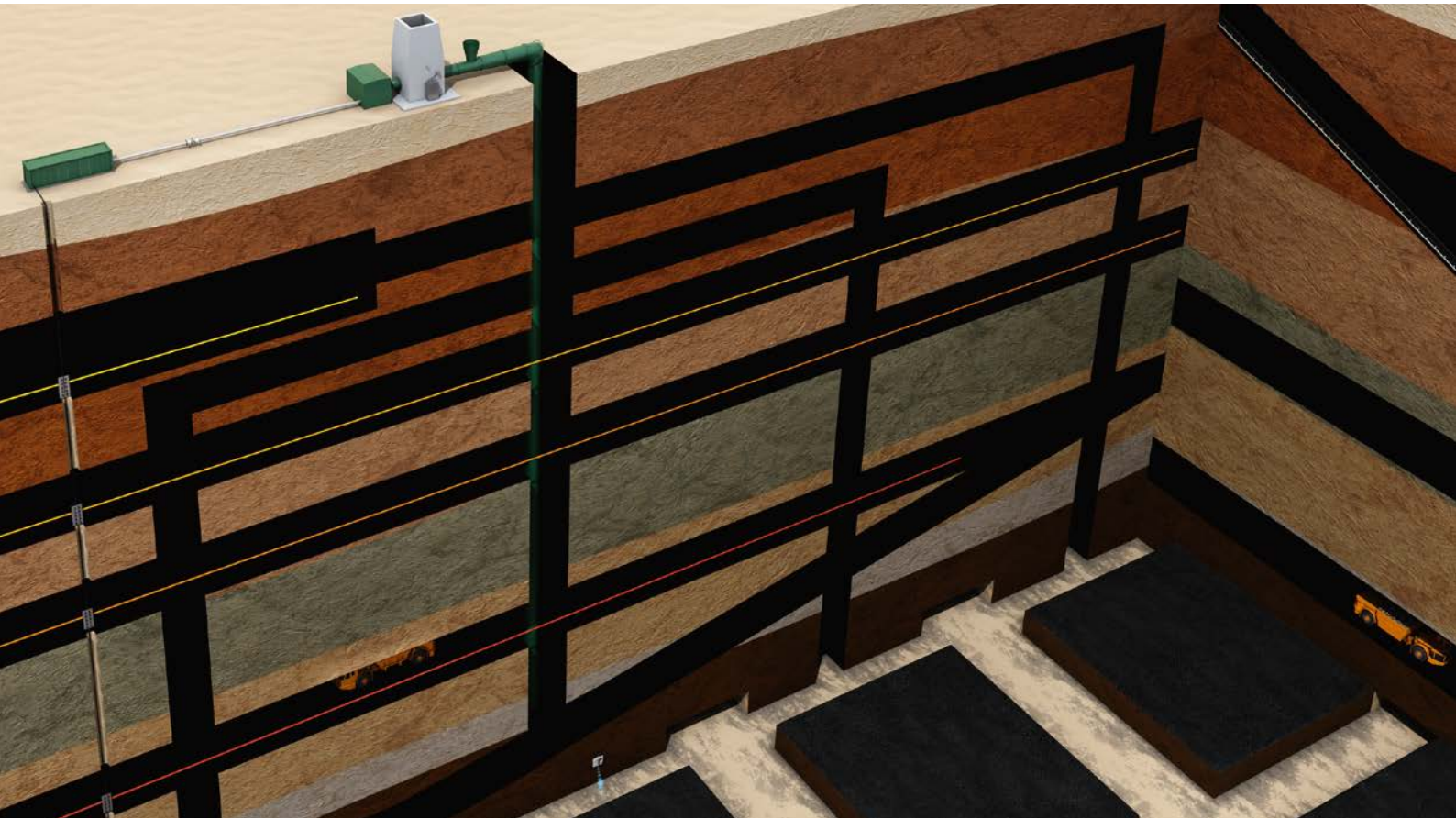
FLOWSIC200 → p. 44
 VM400 → p. 45

③ Dust measurement in underground mining

Safety in underground mines is a primary concern for miners and mine operators. Visibility of people and assets is also essential to optimize workflow and maximize output. A transmittance dust measuring device measures dust at medium to high concentrations, alerting operators when defined limits are imminent. This allows sufficient time to increase fan speeds to extract the dust or even evacuate the mine.



DUSTHUNTER T200 → p. 43



④ Monitoring carbon emissions – GHG measurements or calculation of carbon tax

The greenhouse gas emissions (GHG) of a mine are continuously monitored. The measurements are taken in the ventilation shaft. Precisely measuring GHG emissions provides data which is used as the basis for calculating the tax liability. The MINESIC700 GHG uses the S715 extractive gas analyzer and the FLOWSIC100 ultrasonic gas flow

measuring device to continuously record GHG emissions from underground coal mines. High-precision sensors also measure temperature and pressure. An option to measure moisture can also be integrated. Customer-specific reporting software can be deployed to create emissions reports for submission to the tax authorities.



MINESIC700 GHG → p. 46

① Detection of truck position on the crusher

As haul trucks unload their cargo, it is imperative that they are properly positioned above the crusher. Too far away means the load will be dumped at the edge of the crusher, while too close could land the truck in the crusher. The RMS3xx radar sensor assists the driver to properly align the vehicle with the crusher's opening, even in harsh conditions like snow, fog and dust. The RMS3xx, mounted at the rear of the truck can detect both static and moving objects, allowing the driver to correctly and efficiently unload the haul into the crusher. Alternatively, installed on the crusher, the Visionary-B CV can be configured to issue an alert if haul trucks deviate from the optimal positioning. The Visionary solution can also monitor the danger zones around the crusher to ensure that no vehicles or personnel are present in the area before starting to operate.



Visionary-B CV → p. 55
RMS3xx → p. 60



② Detection of tray position for dust suppression

Once a truck unloads its haul, a sprinkler system should be triggered to suppress the resulting dust cloud. Knowing when to initiate the suppression system and optimizing this elimination process relies on exact timing. Mounted on the frame at the crusher's tray, the RMS3xx radar sensor can be configured to monitor movement. The sensor can activate the crusher's sprinklers, thereby increasing the rate at which subsequent trucks can unload their payload.



RMS3xx → p. 60

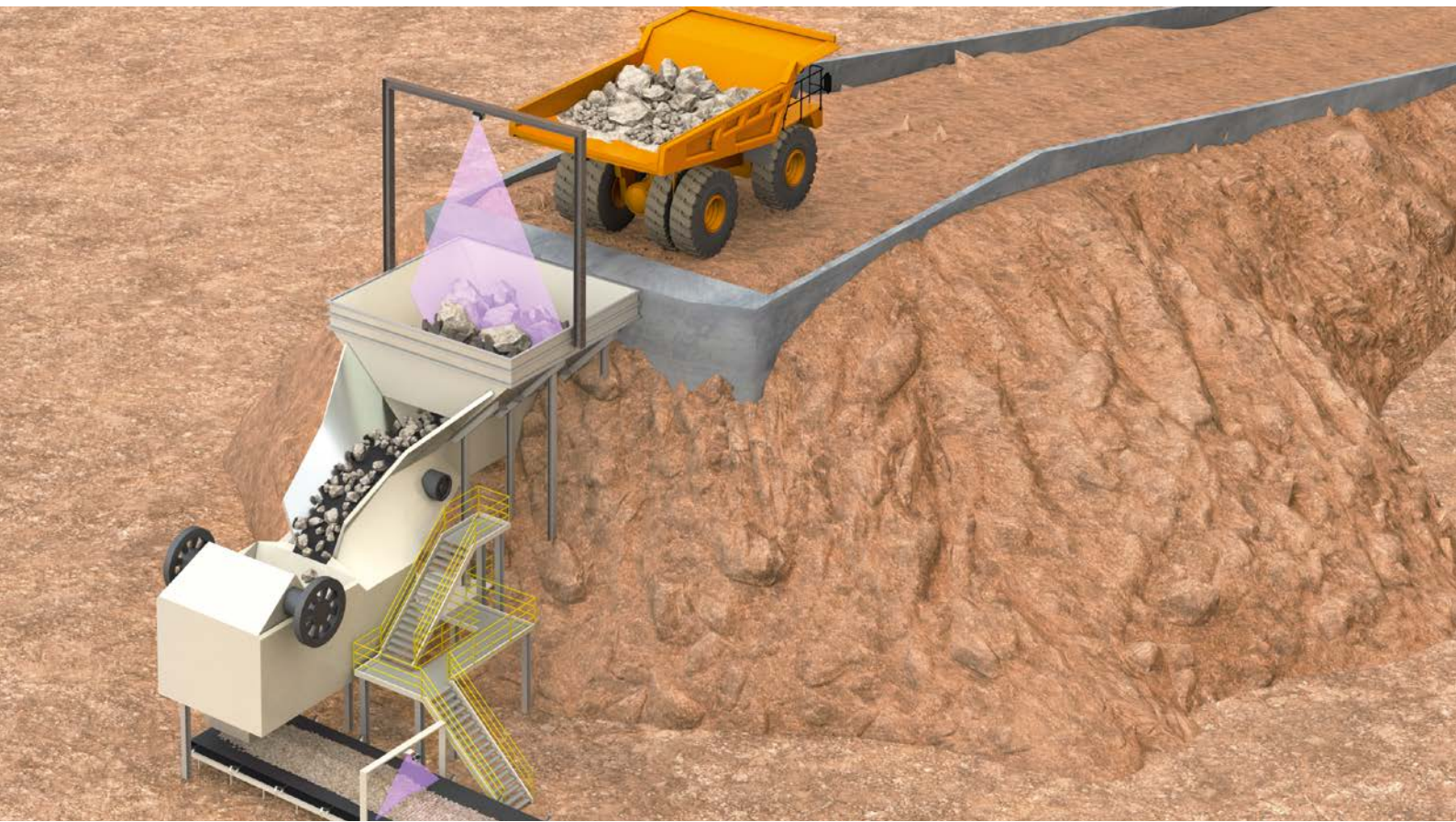
③ Crusher monitoring and overflow protection

An overfilled crusher is not efficient for optimal unloading of material. An MRS6000 LiDAR sensor mounted on the frame above the crusher monitors the fill level while also being linked to a warning system that issues an alert in the event of a jammed or overfilled hopper. The MRS6000 generates a 3D point cloud

of the crusher's load, concentrating on the region of interest and compacting all scan points to the front of that point, thus allowing a better integration and processing. Its special mirror technology results in a highly regular spot pattern and uniform measurement.



MRS6000 → p. 59



④ Level monitoring in silos

A radar level sensor LBR SicWave installed on silos, brilliantly measures the actual material fill level. The non-contact radar technology allows for more accurate monitoring of the material quantity in each silo, thereby optimizing material management.

⑤ Protecting the coal mill by monitoring CO and O₂

Carbon monoxide (CO) and oxygen (O₂) measurement in the coal pulverizer is important for early warning of a smoldering fire and/or a leak in the inertization system. The MKAS analyzer system equipped with an explosion-protected sampling probe is the ideal

solution for this measuring task. The SIDOR gas analyzer provides simultaneous measurements of O₂ and CO. An important feature is the stability of the optical measuring systems, which allows routine adjustments to be made using only ambient air or inert gas.



LBR SicWave → p. 60



SIDOR → p. 43
MKAS → p. 45

① Monitoring belt tension on the conveyor belt

To prevent spilling, down time, and material waste, the tension of the conveyor belt cannot be too high or too low. The IMB18 inductive proximity sensor is perfectly suited for this task, and prevents extensive wear and overstretching of the belt. It also reliably performs its task in the roughest environments, and ensures a safe operation of the conveyor belt. Thanks to the visual adjustment aid and self-locking nuts, installation on-site is quick and easy.



IMI → p. 39
IMB → p. 39



② Monitoring conveyor belt operation

Belts transport excavation materials to the crusher. During this process, volumes must be measured and an appropriate delivery rate maintained in order to control the delivery of ore and carbon to the pulverizer and optimize throughput. The Bulkscan® LMS511 laser volume flowmeter provides non-con-

tact detection of the volume flow on conveyor belts. The built-in center of gravity calculator maximizes transportation performance and detects one-sided or uneven loading of the belt. The belt is monitored so that unevenness can be detected in good time, thereby reducing downtimes and cutting belt wear costs.



Bulkscan® → p. 61
DFV60 → p. 52



③ Conveyor belt drift detection

When bulk materials are irregularly loaded, the tensioners and runners of the conveyor belt can deviate from the optimal alignment and cause conveyor belt drift. When this occurs, the signal edge of the conveyor belt overshoots the support roller. Bulk materials can be lost or, in extreme cases, derail the belt. Compact Dx35 distance sensors on both sides of the conveyor belt monitor the lateral movements of the

belt and put out a warning before belt drift occurs. The Dx35 uses HDDMTM time-of-flight technology, either with red or infrared emitted light, and is insensitive to ambient light and dust. It results in almost no maintenance costs after installation and setup. With its flexible interfaces and easy installation, the Dx35 is an economical measurement solution.



Dx35 → p. 56

④ Monitoring conveyor belt operation

When the actual speed of a conveyor belt differs from the required speed, production yield changes and production steps can be misaligned. Maintaining the proper speed and taking periodic measurements to prevent interruptions or failures are therefore essential for maintaining production throughput. A safety encoder continuously monitors conveyor belt operations to maximize performance, while an encoder for functional safety furthermore supports safety functions.



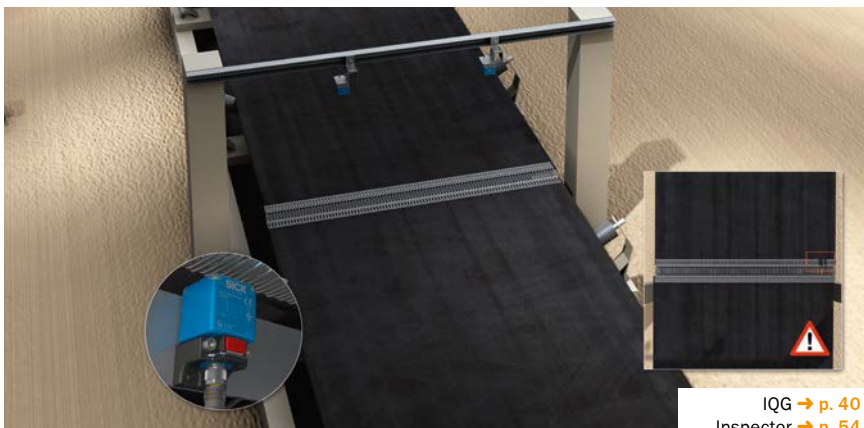
DFS60S Pro → p. 52



⑤ Conveyor belt staple tear inspection

Belt staples are robust and quick to install for joining bulk material conveyor belts together. However, with the harsh requirements of long high tension conveyor belts, tears near the staples cause belt failure and catastrophic downtime losses. Human inspection for belt faults near the staples is tedious, time-consuming and requires a non-moving belt. This is very costly process and is subject

to the pitfalls of human error. Using the robust IQ40 inductive sensor to trigger the Inspector PIM60, the inspection can be automated on a running belt, even at speeds above 6 m/s. The Inspector PIM60 triggers an alarm, or other function, if a tear appears or if staples are missing. This system is capable of uploading inspected images to an FTP server for historical data collection.



IQG → p. 40
Inspector → p. 54



⑥ Monitoring safety switches on conveyor belts over long distances

A conveyor can run for several kilometers over desolate land. When trouble strikes, it is important to have a way to quickly and safely stop the conveyor in order to minimize loss and safeguard assets. A solution that incorporates a modular SIL-rated software programmable safety controller optimizes scalability

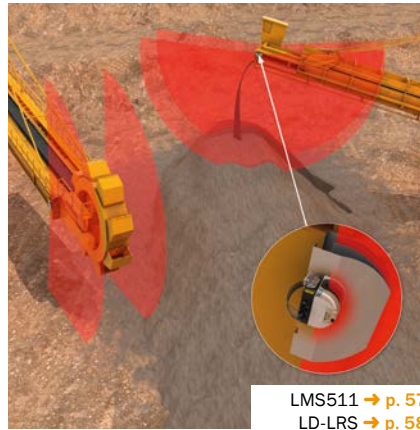
thanks to its master/slave configuration. Flexi Line enables a mine site to reliably network up to 32 Flexi Soft safety controllers. Additionally, safe remote monitoring allows efficient servicing of the conveyors when necessary. This solution is a necessity when dealing with kilometers of belts.



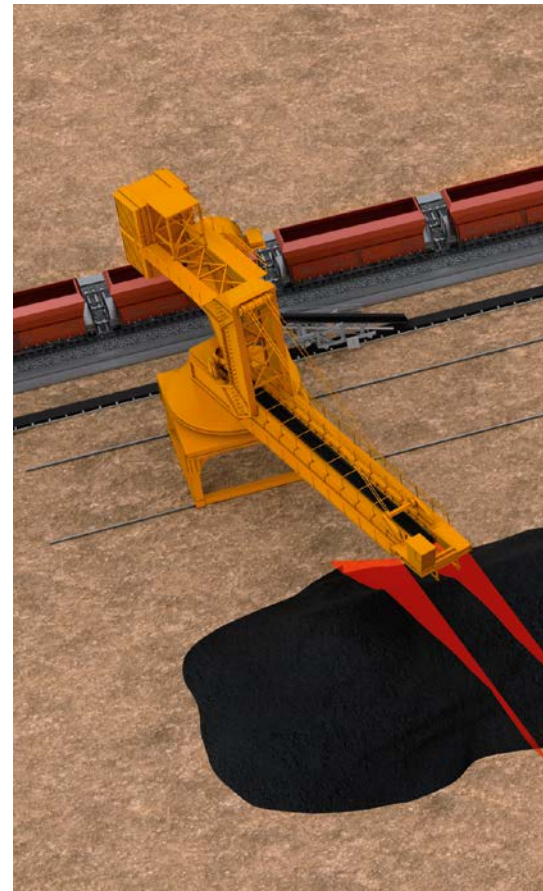
Flexi Soft → p. 42

① Collision avoidance on stackers and reclaimers

Stackers and reclaimers with bucket-wheels at the boom tips are giant pieces of equipment with no eyes of their own. A 2D LiDAR sensor, such as the LD-LRS or LMS511, mounted on the boom optimizes the processes of material handling in outdoor stockpiles regardless of environmental and weather conditions. The sensor also prevents collisions between the bucket-wheel and objects on the ground or other booms.



LMS511 → p. 57
LD-LRS → p. 58



② Collision avoidance in the path of stackers and reclaimers

A reliable solution for preventing stacker-reclaimer collisions on the ground is the AOS LiDAR object detection system, which consists of a 2D LiDAR sensor and a safety controller. The 2D LiDAR sensor helps prevent collisions between stacker-reclaimers and other objects along its path, as well as assists the operator in monitoring the route to be taken and during cross travel.



AOS LiDAR → p. 49

③ Detection of bulk materials profile in stockpile

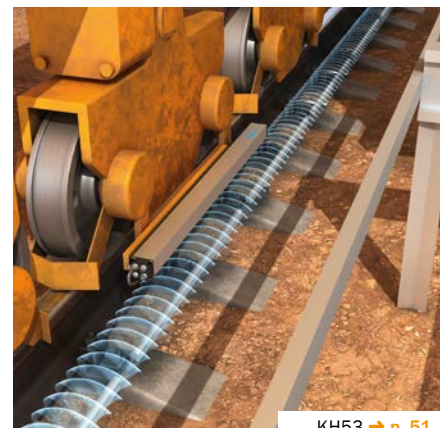
The irregularity of a stockpile makes it difficult to accurately calculate the volume of bulk materials stored. The LMS151 and LMS511 laser scanners, which have been classified with IP67 enclosure rating for outdoor applications, generate an accurate 3D profile of the stockpile as it travels on a stacker or a reclaimer.



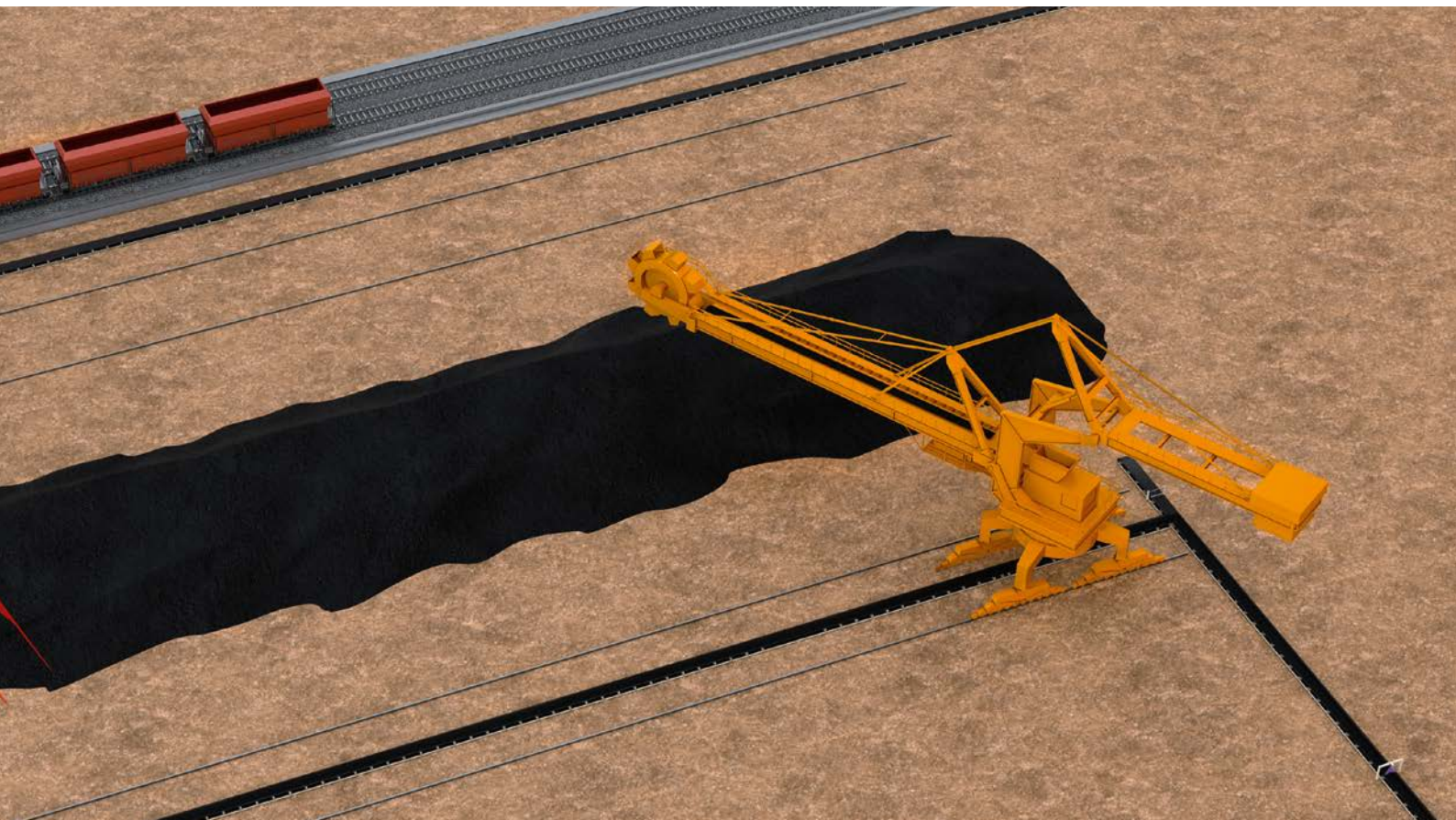
LMS1xx → p. 57
LMS5xx → p. 57

④ Detection of the crane position

The non-contact KH53 linear encoder for measuring length makes it possible to detect the position of the crane portal precisely over a distance of up to 1,700 m. Thanks to the absolute position detection, a reference run is not required. Furthermore, the linear encoder also works under difficult ambient conditions without displaying signs of wear.



KH53 → p. 51



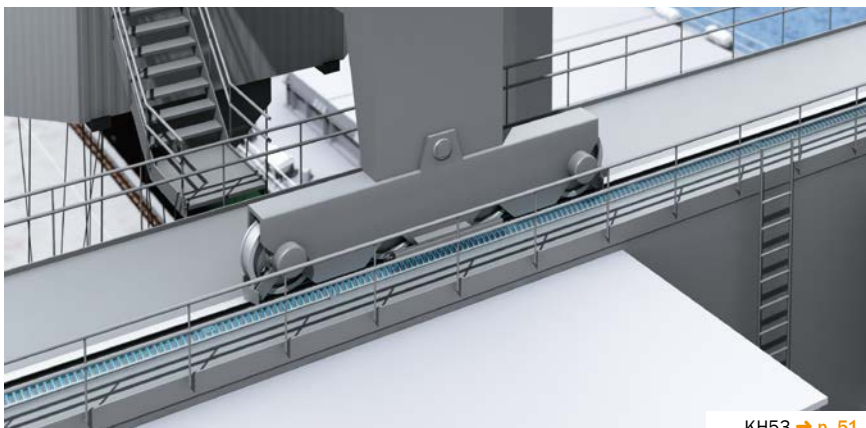
⑤ Positioning the crane's trolley

The KH53 is perfectly suited for positioning the traveling trolley on a crane. It provides good repeatability of up to 0.3 mm, and long reading distances of up to 55 mm. It is extremely rugged in the event of shocks and vibrations, and stands up to the affects of severe weather. With the position data of the

traveling crane, it is possible to very precisely load flexible intermediate bulk containers with little deviation. Due to its wear-free measurement design, the positioning systems can be reliably used for many years and enable high productivity of the crane with low maintenance costs.

⑥ Access protection

Access to a hazardous area on the crane must be restricted when there are dangerous movements. The i110 Lock electro-mechanical safety locking devices monitor access points and prevent unauthorized entry. Thanks to a wide selection of actuators, the safety switch is also suitable for use with almost any type of door. Additional contacts are provided for door monitoring purposes.



KH53 → p. 51



i110 Lock → p. 41

① Bin and chute level detection

Coal is stored temporarily in storage bins at various process lines in a mine. Knowing the exact storage capacity available in a storage bin, surge bin, or train loadout bin is crucial for receiving a constant supply of the mined material. Overfilling or minimal bulk material reduces production supply and productivity. To ensure the conveyor belt is continuously loaded without interruption, using a single or multiple long range distance DT1000 sensor can show the real-time level of the bin. The versatile DT1000 is a robust IP65 sensor using time-of-flight technology provides reliable measurements of the bin level which can be passed to the control room. Additional measurements can be used to prevent overfilling of the bins or chute.



Dx1000 → p. 56



② Retraction of clam shell when locomotive approaches

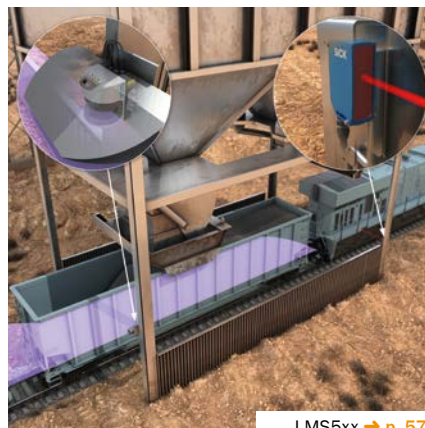
Moving train wagons are loaded with iron ore or coal from a surge bin connected to a clam shell. However the locomotives are taller than the cargo wagons. The clam shell must therefore be retracted before a collision ensues. A PowerProx WTT12L photoelectric sensor detects the locomotives, and signals that the clam shell must pull back to avoid collision and damage.

③ Position monitoring of the wagons during loading and unloading operations

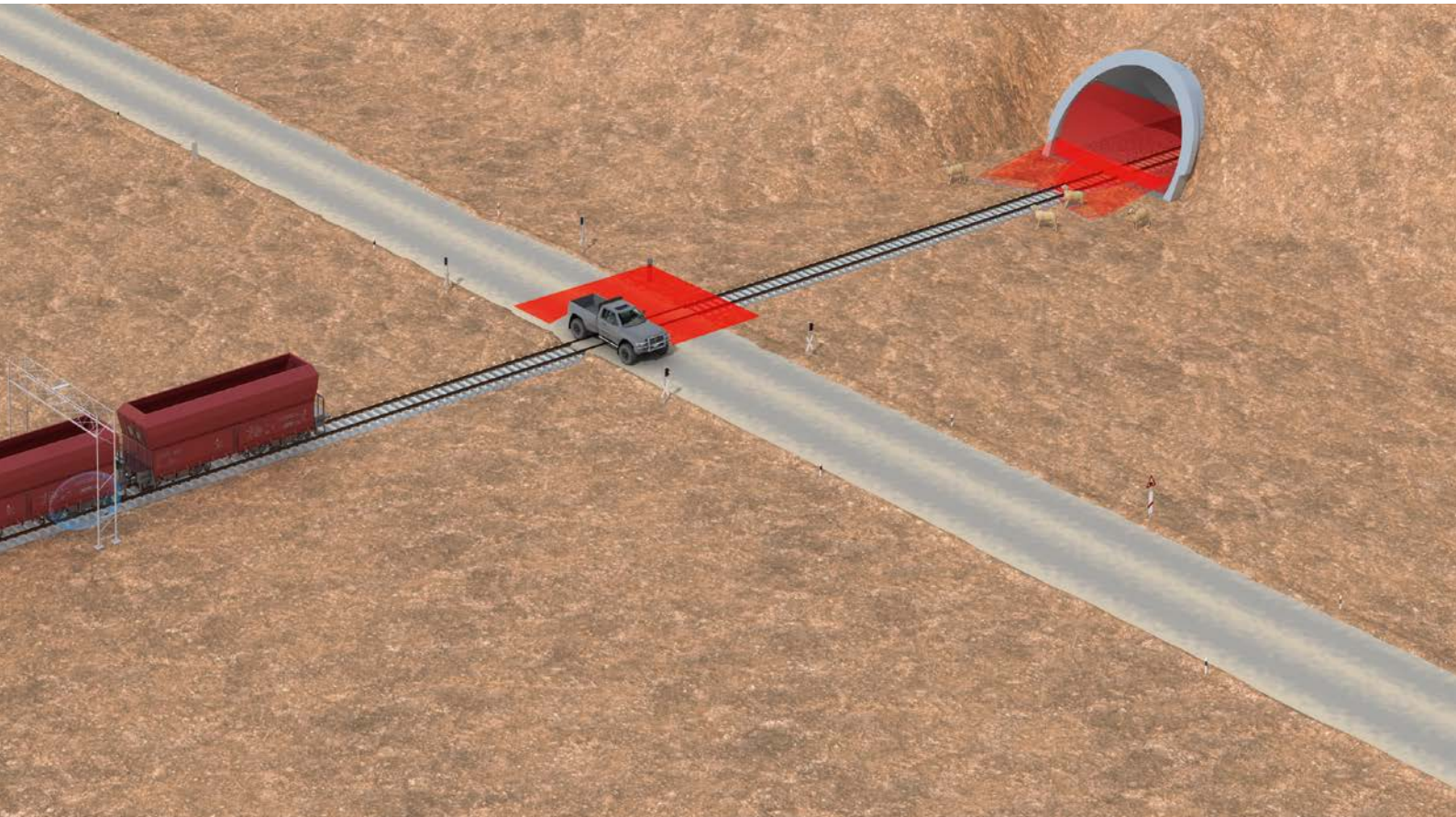
When wagons are being loaded, trains must be properly positioned under the discharge chute in order to minimize spillage and waste. An interconnected system of 2D LiDAR sensors and photoelectric sensors ensures the moving train wagons are present and accurately located before the clam shell opens to charge the load.



PowerProx Distance → p. 38



LMS5xx → p. 57



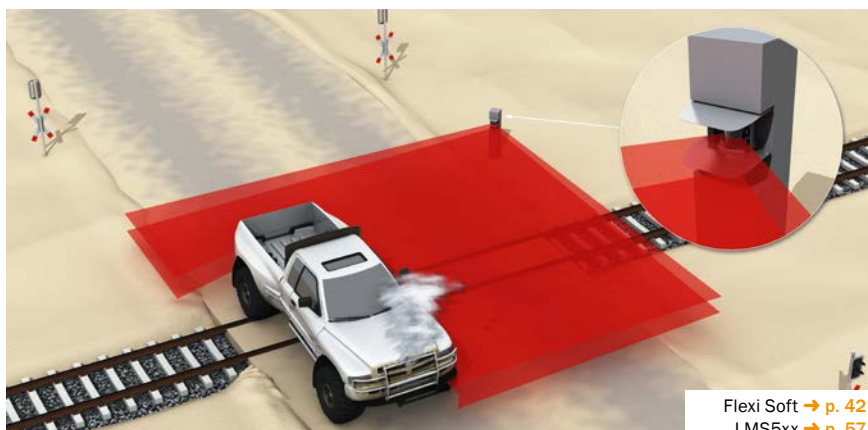
④ Train level crossing monitoring

In remote locations, level crossings may not be properly guarded. Therefore operators would need to rely purely on visual monitoring. To reduce the risk of collision, a LMS511 laser scanner in conjunction with a Flexi Soft safety controller can provide the operator with

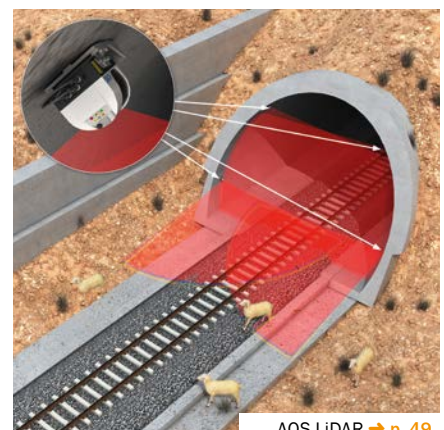
an all-clear signal. The LMS511 is able to operate in all weather conditions. Combined with the dual channel Flexi Soft safety controller, which continuously monitors the operational state of the laser scanner, a reliable system is provided for level crossing monitoring.

⑤ Monitoring tunnel portals

Trains travel into tunnels on a regular basis during normal operation. The AOS LiDAR object detection system monitors the area in front of the tunnel portal using 2D LiDAR sensors. When an object such as a person or an animal approaches the tunnel, it is detected and an alarm is issued. This avoids collisions and prevents vandalism or terrorist attacks. Trains are recognized as such and can travel into the tunnel without triggering an alarm.



Flexi Soft → p. 42
LMS5xx → p. 57



AOS LiDAR → p. 49

⑥ Train wagon RFID tracking

Automatic tracking and identification of loaded wagons is an important task in the asset management and production chain from pit to port. SICK's RFID readers offer the ruggedness and range necessary for the provision of reliable track-and-trace data.



RFU63x → p. 53



⑦ Inspection of train components

The Ranger3 or Ruler 3D streaming cameras are installed in wayside train monitoring systems. These cameras take cross-sectional profiles of the components of the passing train at very high speed and compile them into a 3D image. Visual inspections can thereby be performed while trains are in operation. This increases the availability of the train while at the same time lowering maintenance costs.

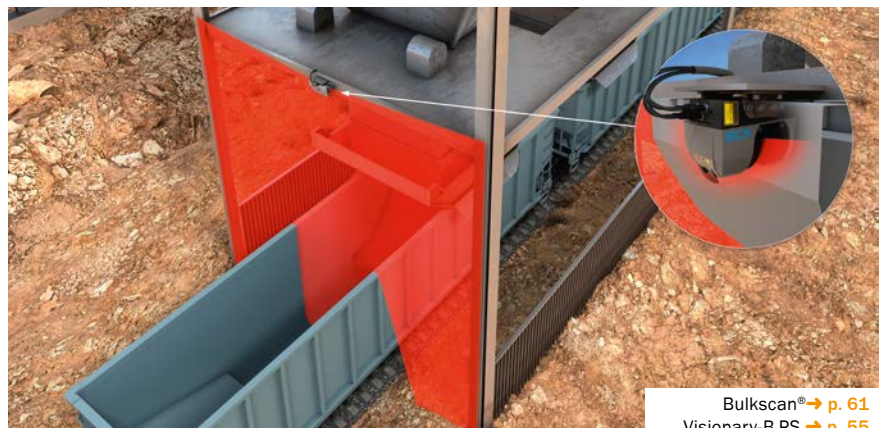


Ranger3 → p. 54

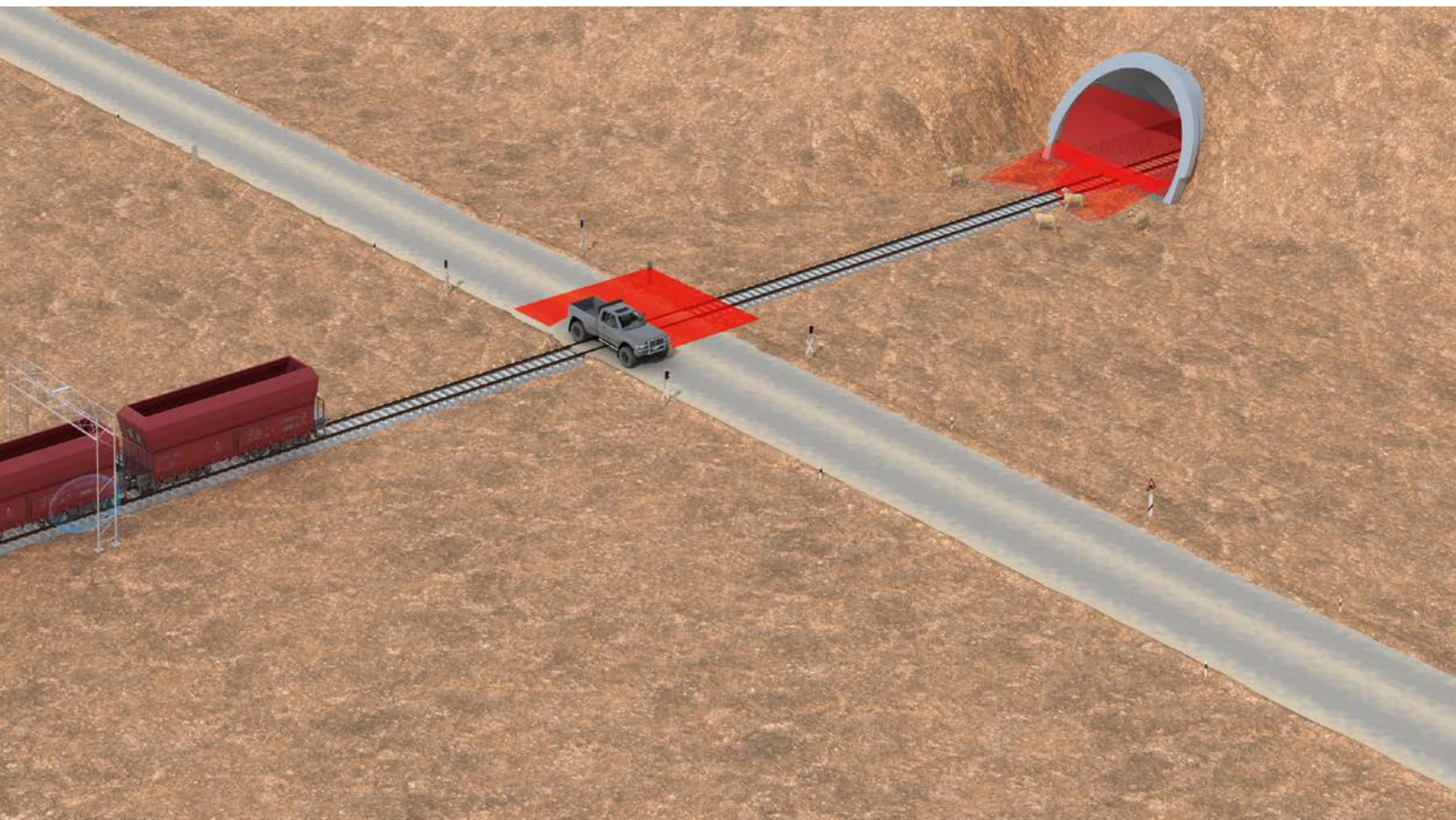
⑧ Monitoring train unloading operations

A train wagon which has product remaining on board after unloading is not efficient, and could even be dangerous. Unevenly loaded wagons could swing and oscillate as the train travels, causing the wagon to derail. Accurate detection of a wagon's content, location, and load profile is necessary to prevent derailment and maximize output efficiency.

The measurement can be performed by a Bulkscan® LMS511. In both moving and stationary wagon scenarios, the Visionary-B PS 3D camera can check if individual wagons are empty. If the wagons are not completely discharged, the Visionary camera can determine which volume is currently occupied.



Bulkscan® → p. 61
Visionary-B PS → p. 55



9 Monitoring unloading operations via a wagon tippler mechanism

Efficient, fast unloading of filled wagons via a tippler mechanism is required for maximum productivity. Determining the wagon's precise position for the tippler mechanism to properly function is essential. An interlinking system of rugged inductive proximity switches to establish the wagon's exact position, and a dynamic inclination sensor to determine the tipping angle, combine to expedite the offloading process and maximize output for the operating entity.

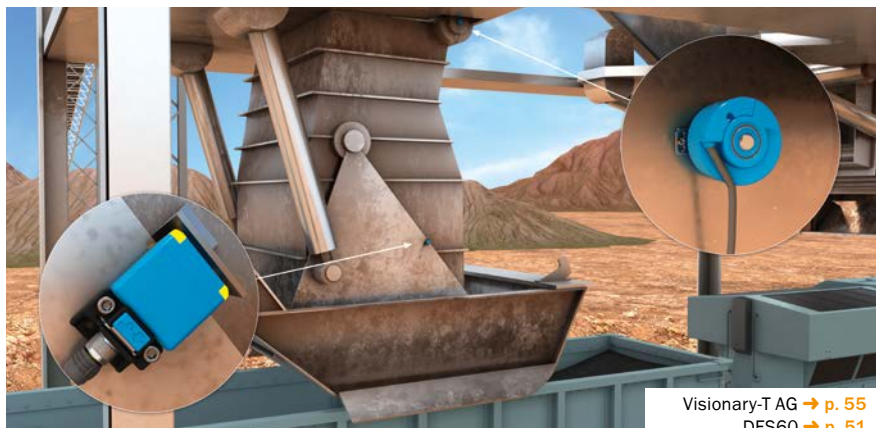
10 Monitoring train loading and unloading operations

Filling each wagon with coal or metal ore requires precise loading. Too much material results in spillage and waste, while too little is not efficient. The clam shell dispenses the load into the wagon based on its location under the chute. A rugged inductive proximity sensor determines the wagon's exact position

while a durable high-resolution incremental encoder regulates the opening and closing of the clam shell's chute for accurate and optimal loading. Additionally, the Visionary-T AG can monitor the filling process by measuring the volume of material filling each wagon.



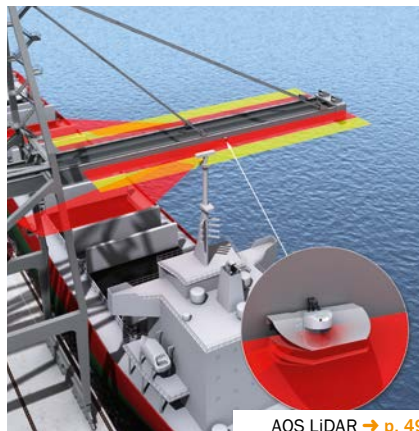
IMS → p. 40
TMS/TMM88 → p. 53



Visionary-T AG → p. 55
DFS60 → p. 51

① Collision avoidance on booms and between neighboring cranes

The AOS502 STS mounted on a gantry crane provides a safe and reliable method of detecting ship superstructures, such as radar systems. By analyzing the various 2D LiDAR sensor warning and stopping fields, the AOS502 STS provides collision avoidance from crane to crane as well as from boom to object. The safety controller and integrated control software monitor the system functions and ensure reliable operation.



AOS LiDAR → p. 49

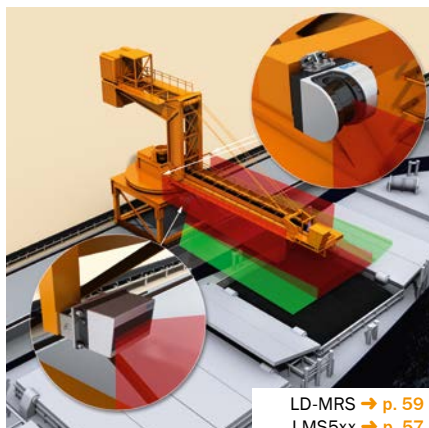


② Protection of ship loaders

Safe loading of ships requires monitoring of many locations at the port and on the ship. Locations such as hatches, deck structures, ship loader booms, and mobile equipment are all potential hazardous areas. 2D LIDAR sensors and 3D LIDAR sensors minimize the risk of collision, and maximize productivity.

③ Mine ports vehicle protection

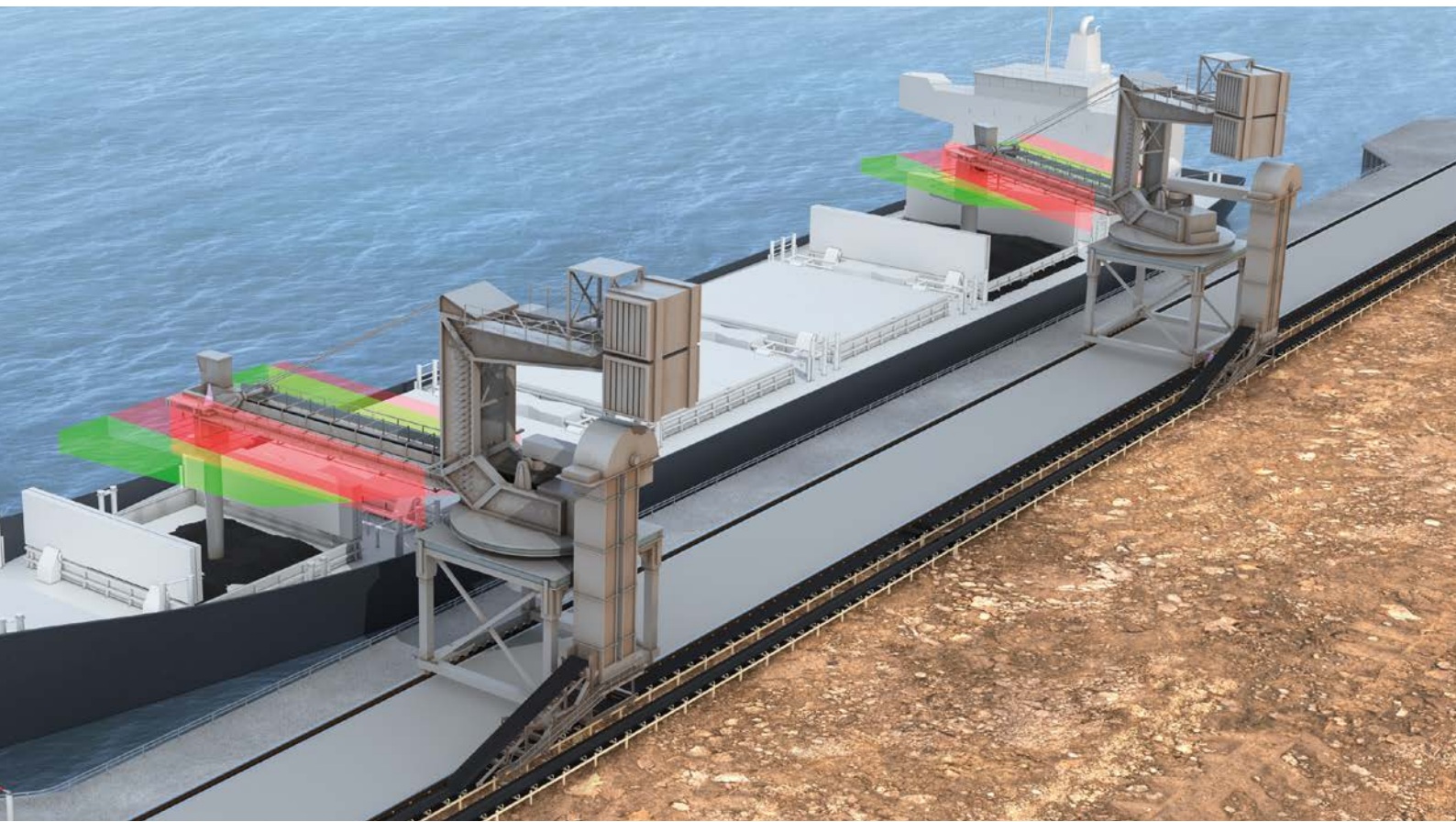
The Visionary-B driver assistance system monitors the area behind the reach stacker. If there is an object in this area, the Visionary-B driver assistance system warns the driver with visual and acoustic signals. In addition to these active warning signals, the camera provides the driver with a rear view showing the positions of the obstacles in all driving situations.



LD-MRS → p. 59
LMS5xx → p. 57



Visionary-B → p. 55



④ Detection of 6 degrees of pitch of ships

When a ship is in port, it is imperative to know its exact position. A 3D LiDAR sensor uses its multilayer detection capability, a high scanning point density, and an aperture angle of 120° to reliably detect its environment. A special mirror technology ensures a high scanning field stability. With the aid of multi-echo

technology, the sensor scans through rain, dust, and fog while at the same time multiplying the point density. These properties are particularly useful for creating a gap-free 3D point cloud that allows the precise and rapid detection of a large working range, such as a ship.



MRS6000 → p. 59
LD-LRS → p. 58

⑤ Detection of ship position in ports

Properly detecting ships in port is immensely important for loading and unloading bulk materials, as well as for avoiding collisions. The DT1000 long range distance sensor is extremely versatile. Its multi-echo technology suppresses undesirable reflections, and enables distance measurements to be taken with great accuracy, even in the presence of ambient light, rain, snow, and fog. With its infrared measurement laser, it is perfect for use on cranes, and for detecting ships and their cargo openings.



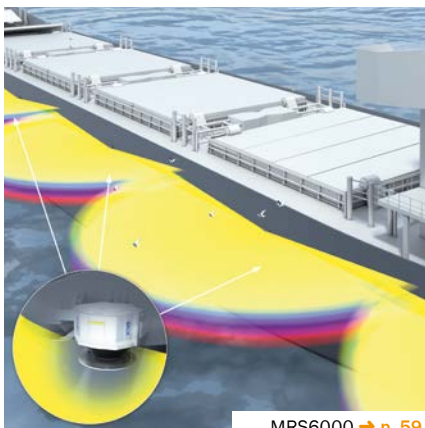
Dx1000 → p. 56



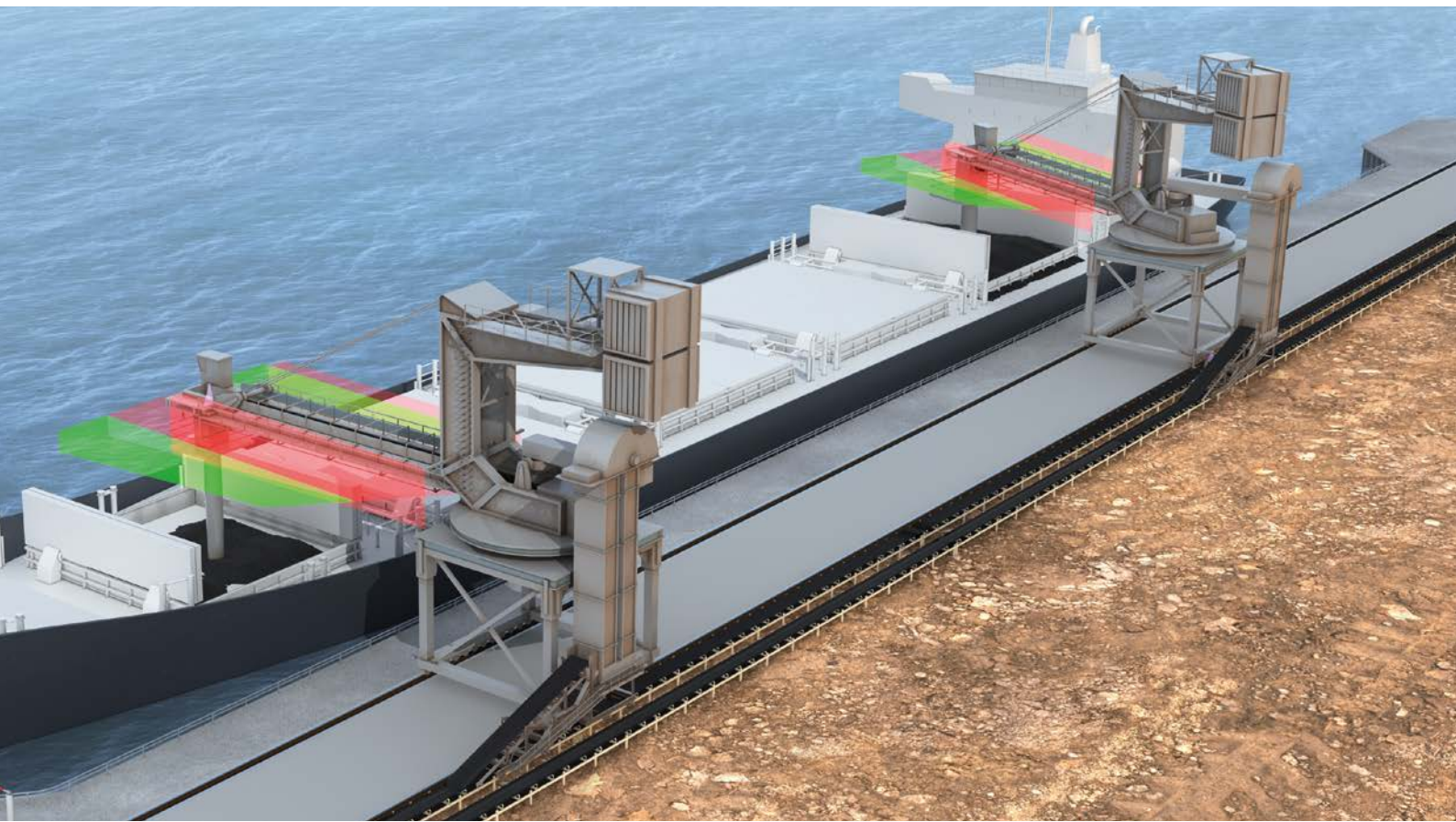
⑥ Man overboard detection

Video cameras are frequently used for monitoring the outdoor areas of ships. They continuously record events, but do not trigger alarms. When MRS6000 3D LiDAR sensors are installed, a defined area around the ship is scanned. As soon as a denoted object falls through the multi-layered scan area, the crew

is notified immediately via an alarm. This enables the crew to promptly view the video recordings and take action, if necessary. The intelligent MRS6000 sensors mask out features such as spray, waves and birds, thereby preventing faulty alarms.



MRS6000 → p. 59



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MINING



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W26 – At a glance

- Technologies: ClearSens, LineSpot, TwinEye with OptoFilter
- BluePilot: Optical alignment aid, adjustment of the sensing range via Teach-Turn adjustment with optical sensing range indicator or via IO-Link

- PinPoint LED: Light-intensive red sender LED
- Smart Sensor: Enhanced Sensing, IO-Link, Diagnostics, Smart Tasks

Your benefits

- Usability and uniform operation thanks to optical quality display on the housing or conveniently via IO-Link
- Simplification when aligning the light beam to the reflector, the receiver or to an object thanks to the highly-visible light spot of the PinPoint LED combined with the optical LED display

- Very high reliability thanks to new detection technologies as well as high optical ruggedness
- The Smart Sensor makes machine processes quicker, more efficient and transparent, enables predictive maintenance and is thereby a trailblazer for Industry 4.0 applications

→ www.sick.com/W26

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



PowerProx – At a glance

- Time-of-flight technology
- Laser class 1, red and infrared light
- Sensing range: 5 cm to 4 m
- Very small background range: 6 mm
- Switching frequencies of up to 1,000 Hz

- The option of up to three adjustable digital outputs or one IO-Link analog output: for up to eight switching points, distance value and smart sensor functionality

Your benefits

- Reliable object detection over long sensing ranges and at large detection angles
- Precise, simple adjustment using a potentiometer, teach-in button or display
- Excellent functionality with IO-Link
- The rugged VISTAL® sensor housing ensures high availability and a long service life

- Suitable for a wide range of applications: the variants of the photoelectric sensors are designed to cover a variety of detection requirements
- Compact sensors allow for significant flexibility in machine design

→ www.sick.com/PowerProx

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





IMB – At a glance

- Types: M8 to M30
- Extended sensing ranges: 2 mm to 20 mm
- Electrical configuration: DC 3-/4-wire, DC 2-wire
- Enclosure rating: IP 68, IP 69K
- Temperature range: –40 °C to +100 °C

- Rugged stainless-steel housing; plastic sensing face
- Optical adjustment indicator, IO-Link-ready
- Resistant to oils and cooling lubricants; suitable for use outdoors

Your benefits

- Straightforward product selection as fewer sensor variants are required – one sensor suits a whole range of applications
- Stable processes thanks to extended, highly precise sensing ranges enabled through the use of the latest SICK ASIC technology
- Reduced machine downtimes thanks to longer sensor service life, even in harsh working conditions

- Quick and easy installation thanks to optical adjustment indicator and self-locking nuts
- High degree of flexibility and communication options thanks to IO-Link
- Easy to implement customer-specific variants within the standard product portfolio

→ www.sick.com/IMB

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



IMI – At a glance

- Types: M8 to M30
- Large sensing ranges: 2 mm to 40 mm
- Enclosure rating: IP68, IP69K
- Temperature range: –25 °C to +85 °C
- Option of rugged housing or housing suitable for the food industry made completely out of stainless steel

- IO-Link and visual adjustment indicator
- Resistant against oils, cooling lubricants and cleaning products

Your benefits

- Very long service life due to closed stainless-steel housing, resistance to oils, cooling lubricants and cleaning products
- Large sensing ranges and IO-Link for stable processes and high plant availability
- Quick and easy installation thanks to visual adjustment indicator and self-locking nuts

- Flexible and cost-optimized implementation of application solutions. thanks to large product portfolio
- Easy implementation of special customer-specific variants

→ www.sick.com/IMI

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





IMS – At a glance

- Thread sizes: M12 to M30
- Large sensing ranges: 4 mm to 20 mm
- Electrical configuration: DC, 3-wire
- Enclosure rating: IP68, IP69K
- Ambient temperature: -40 °C to +100 °C
- Rugged stainless-steel housing; plastic sensing face
- Load dump protection and high electromagnetic compatibility of 100 V/m
- E1 type approval

Your benefits

- Maximum operating times due to rugged sensor technology, even in harsh environments that are subjected to severe weather conditions
- Stable and fault-free processes thanks to high electromagnetic compatibility and very precise detection
- Extensive portfolio with application-specific special variants
- Worldwide availability due to global SICK sales network and countless approvals

→ www.sick.com/IMS

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



IQG – At a glance

- Type: 40 mm x 40 mm
- Extended sensing ranges: 20 mm to 40 mm
- Electrical configuration: DC 3-/4-wire
- Enclosure rating: IP 68, IP 69K
- Temperature range: -25 °C to +85 °C
- Plastic housing
- Push-lock mounting system
- Sensor head can be rotated in five directions

Your benefits

- Easy to mount in only two seconds without the need for additional tools
- Reliable, cost-effective detection
- The four corner LEDs ensure that the sensor status can be identified from any viewing direction, whatever the mounting position
- Can be easily adapted to numerous applications
- Long sensor service life, even in harsh environments that are subjected to severe weather conditions
- Stable processes thanks to extensive sensing ranges

→ www.sick.com/IQG

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





deTem – At a glance

- Smart Sensor: diagnostic data via IO-Link or NFC and the SICK Safety Assistant app
- Compact housing, standardized connectivity, compatible accessories
- Integrated alignment aid with status LEDs directly on the device
- Configuration of all functions without software
- Variants for explosion-hazardous areas as well as enclosure rating IP69K

Your benefits

- Increase productivity in access protection as well as entry and exit monitoring with muting thanks to the processing of sensor data
- Minimize installation work and profit from standardized implementation of the deTem into your machine design
- Take advantage of the benefits of quick and easy device alignment
- Save time and money thanks to easy commissioning and configuration
- You can also count on the deTem in harsh environments

→ www.sick.com/deTem

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



i110 Lock – At a glance

- Narrow plastic housing
- Metal actuator head
- Rigid or mobile actuators
- Available with M20 X 1.5 cable entry glands or Flexi Loop-compatible M12 plug connector (depending on variant)
- Power to lock or power to release variants
- Lock and door monitoring

Your benefits

- Small design simplifies installation and makes it easy to mount directly on the guard door frame
- Flexible electrical connectivity due to three cable entry glands
- Improved diagnostics due to additional contacts for door monitoring
- Simple adjustment due to various actuators that are suitable for any door
- Different switching elements offer the appropriate solution for electrical installation
- Rugged metal housing provides increased machine reliability, even when the guard has a mechanical offset
- Flexi Loop now enables a safe series connection with enhanced diagnostics capabilities and minimal wiring effort.

→ www.sick.com/i110_Lock

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





ER12 – At a glance

- Thin housing with snap-lock connection
- Illuminable pushbuttons
- Lock function
- M12 plug connector

Your benefits

- Easy installation with quick disconnect mounting clip
- Quick commissioning and easy replacement with an M12 plug connector
- User-friendly status indication

→ www.sick.com/ER12

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



Flexi Soft – At a glance

- Safety controller with modular hardware platform
- Configuration saved in the system plug
- Safe controller networking with Flexi Line
- Safe series connection with Flexi Loop
- Safe drive monitoring
- Safe analog value monitoring
- Flexi Soft Designer license-free configuration software

Your benefits

- Modular adaptation to the particular requirement means optimum scalability and therefore cost savings
- Intuitive configuration software featuring comprehensive functions for straightforward engineering
- Rapid verification of the safety application: The configuration software provides documentation and a wiring diagram
- The main module's diagnostics interfaces and the configuration storage facility in the system plug enable rapid commissioning, component replacement, and troubleshooting, resulting in minimum downtimes

→ www.sick.com/Flexi_Soft

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





SIDOR – At a glance

- Detector with high long-term stability
- Paramagnetic or electrochemical O₂ measurement
- Automated adjustment with component-free ambient air
- Immune to contamination

Your benefits

- Automated readjustment, self-monitoring, and fault diagnosis
- Test gas only needs to be checked every 6 months
- Long maintenance intervals
- TÜV suitability testing and MCERTS certification according to EN 15267
- Can be repaired on-site in many cases
- Replacement of components without complicated factory temperature calibration



→ www.sick.com/SIDOR

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



DUSTHUNTER T200 – At a glance

- Integrated contamination check for sender/receiver and reflector unit
- Automatic self-alignment of the optical assembly
- Automatic check of zero and reference point
- For medium to high dust concentrations
- For small to large measuring distances

Your benefits

- Easy installation, commissioning and operation
- Measurement independent of gas velocity, humidity and particle charge
- Low maintenance due to self-monitoring and contamination check
- Approved according to EN 15267



→ www.sick.com/DUSTHUNTER_T200

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





FLWSIC100 – At a glance

- Rugged titanium converters for long service life
- Corrosion-resistant material for use with aggressive gases (option)
- Integrated measurement via duct diameter for types H, M, and S
- Probe version PR for cost-saving, single-sided installation in duct
- Automated operational check with zero and reference point test

Your benefits

- Reliable flow measurement for ducts with small up to very large diameters
- High durability of the device
- No purge air required for applications with gas temperatures up to 260 °C
- Minimum operating and maintenance costs
- Accurate measuring results under difficult measuring conditions
- Measurement without pressure loss, therefore no influences on the process
- User-friendly operation via SOPAS ET software
- Reliable function monitoring due to enhanced diagnosis

→ www.sick.com/FLWSIC100

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



FLWSIC200 – At a glance

- Very large measuring distances possible
- Non-contact measurement
- Extremely rugged components made of titanium, stainless steel, or die cast
- Versions for very corrosive tunnel atmospheres
- Determination of flow direction
- No mechanical moving parts

Your benefits

- Representative measurement across total tunnel width
- Very reliable measurement, compared with punctual measurement methods
- Accurate measurement even of very low flow velocities
- Long maintenance intervals of up to 5 years
- Low operating costs due to reliable operation and low maintenance
- High availability of devices and, therefore, of measurement data also

→ www.sick.com/FLWSIC200

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





VM400 – At a glance

- Modern ultrasonic technology for non-contact measurement
- Large measuring range
- Compact device design
- Very easy mounting and commissioning
- Immune to contamination

Your benefits

- Minimal wear and long maintenance intervals
- Reliable measurement even at low air velocity
- Low investment costs
- Minimum installation costs
- Easy integration into monitoring systems

→ www.sick.com/VM400

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



MKAS – At a glance

- Analyzers and measured parameters can be retrofitted at any time
- Available in a standard size or as a space-saving compact version
- Meets the requirements for an automated measurement system (AMS) according to EU standards
- Sample gas bypass for very short response times

Your benefits

- Customizable to the measuring task thanks to the modular design
- Proven system components ensures high reliability
- Comprehensive service packages available (incl. installation and commissioning)

→ www.sick.com/MKAS

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





MINESIC700 GHG – At a glance

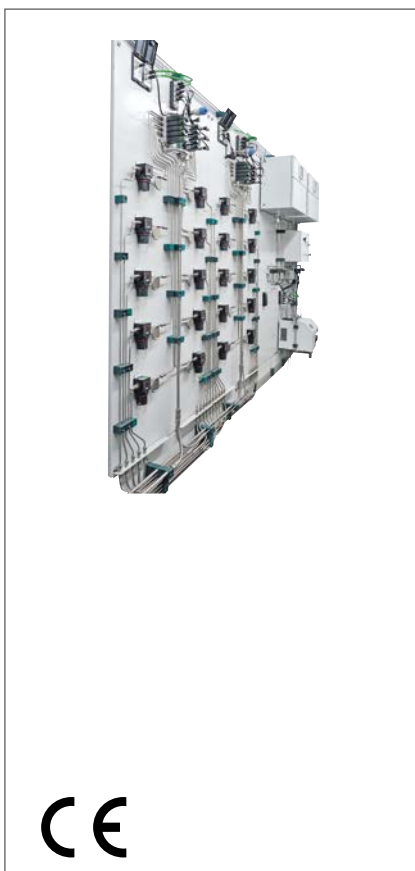
- Reliable measurement with low measurement uncertainty.
- Automated switching between up to 5 sample points
- Software package for calculating and recording the total greenhouse gas emission
- Flow rate, pressure, and temperature measurement using IECEx Zone 1 devices
- Available as a standalone cabinet or integrated into MINESIC700 TBS

Your benefits

- Proven greenhouse gas measurement with reliable ultrasonic flow rate and gas measuring technology
- Precise measurement and reporting in line with legal requirements
- Reduced tax charges, as exact costs are calculated with minimal measurement uncertainties
- Low operation costs as the system is easy to operate and maintain
- No unexpected costs due to extensive service package including support options provided by SICK LifeTime Services

→ www.sick.com/MINESIC700_GHG

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



MINESIC700 TBS – At a glance

- Certified according to IECEx and ANZEx
- Reliable, continuous measurement (24/7)
- Automated switching between modular expandable measuring points for up to 40 sites
- Automated alarm and alarm report
- Self-contained, transportable system

Your benefits

- Advanced alarm and alarm reporting system
- Increased mine safety as the long-term trends of the mine atmosphere at every measuring point are recorded
- Easy remote control from the central control room
- Low operation costs due to easy maintenance and tailored service packages
- Extensive service package including support options provided by SICK LifeTime Services
- Sound system knowledge thanks to comprehensive user training

→ www.sick.com/MINESIC700_TBS

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



MINESIC100 EPS – At a glance

- Provides the operator with warnings to prevent collisions with other vehicles and the highwall face
- Position and loading assistance for excavator and haul truck operators
- Vehicle and wall outlines are displayed on a touchscreen
- Configurable safety distances and warning fields
- Event logging and monitoring of system status

Your benefits

- Prevention of collisions resulting in reduced repair costs and downtime
- Excellent excavator availability enables smooth and efficient loading
- Detection and tracking of moving and stationary obstacles without the need for RFID tags
- Integrated installation wizard simplifies installation and operation
- Self-diagnostics function makes system maintenance easy



→ www.sick.com/MINESIC100_EPS

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.

**MINESIC100 TCW – At a glance**

- Front and rear-end tunnel collision warning
- Corner cutting and over shooting warning
- Active assistance for maneuvering in confined spaces – displays the tunnel wall outline
- Visual feedback (touch screen operator display) and audible alarm
- Open interface to fleet management / dispatch systems & event logging
- Full functional operation across speed range (0... v_{max})

Your benefits

- Reduction of incidents, downtime and repair costs
- Detection and tracking of moving and stationary obstacles without the need for RFID tags
- Active situation dependent warning with low false alarm rates
- Simple installation, easy to operate
- Easy to maintain – Integrated test function and reporting
- Configurable to mine site operational requirements
- Full service package provided by SICK LifeTime Services
- Sound system knowledge thanks to comprehensive user training



→ www.sick.com/MINESIC100_TCW

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





MINESIC100 TPS – At a glance

- Frontal collision and lane departure warning as well as reverse assistance
- Visual and audible feedback
- Configurable safety distances and warning fields
- Event logging and monitoring of system status
- Self-diagnostics function for straight-forward troubleshooting and maintenance

Your benefits

- Prevention of collisions resulting in reduced repair costs and downtime
- High machine availability for trouble-free operation
- Active situation-dependent warning with low false alarm rates
- Detection and tracking of moving and stationary obstacles without the need for RFID tags
- Integrated black spot warning (geo-fencing) for hazardous areas
- Integrated installation wizard simplifies installation and operation
- Self-diagnostics makes system maintenance easy

→ www.sick.com/MINESIC100_TPS

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



MINESIC100 WPS – At a glance

- Full coverage rear-end collision warning
- Visual feedback (touch screen operator display) and audible alarm
- Open interface to fleet management / dispatch systems & event logging
- Full functional operation across speed range (0...v_{max})
- Active reverse assist for maneuvering in confined spaces
- Displays accurately all obstacles behind the vehicle (windrows, vehicles, personnel) in real time

Your benefits

- Reduction of incidents, downtime and repair costs
- Detection and identification of mobile and stationary obstacles without the need for RFID tags
- Active situation-dependent warning with low false alarm rates
- Easy to install and operate
- Easy to maintain, integrated test function and reporting
- Can be configured to meet on-site operational requirements at the mine
- Full service package provided by SICK LifeTime Services
- Sound system knowledge thanks to comprehensive user training

→ www.sick.com/MINESIC100_WPS

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





AOS LiDAR – At a glance

- Non-contact detection due to LiDAR technology
- Adjustable, application-specific monitoring areas
- Automated self-test cycles
- Customized control configurations
- Easy implementation of new functions
- Optional gateways for remote diagnosis or data analyses

Your benefits

- Reliable detection in any environmental conditions and even at long distances
- Avoidance of downtime and costs associated with accidents or vandalism
- Flexible monitoring areas that can be adjusted precisely for a diverse range of applications
- Defined alarm outputs for predetermined objects helps to reduce false alarms
- Easy integration and wiring to a machine control
- Automated monitoring of sensors and connecting cables
- High degree of diagnostic coverage supports individual safety certifications for machinery
- Modular system construction gives flexible extension options
- Control function for peripheral devices as well as safety-related signals

→ www.sick.com/AOS_LiDAR

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



AOS Radar – At a glance

- Non-contact measurement process with radar technology
- Can be expanded to max. two radar sensors
- Evaluation and alarming using the TDC-E200 (Telematic Data Collector)
- Application-specific parameterization
- Wireless communications interface and optional solar kit
- Web-based user interface

Your benefits

- High detection reliability and performance in any weather conditions
- Individual determination of objects with high potential for collision
- Flexible installation location
- Simple system expansion
- All common interfaces for connection to the customer system
- Standalone operation and quick alarming without cable connection to the customer system
- Global access via web browser and user data

→ www.sick.com/AOS_Radar

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





Load Volume Measurement System – At a glance

- Automated and non-contact load volume and remaining volume measurement
- 3D visualization including calculation of the vehicle dimensions
- Customer-specific integration of HD cameras, ANPR, WIM, RFID possible
- Web-based user interface for convenient remote access

Your benefits

- Shorter measurement process thanks to the automated volume calculation without the vehicle stopping
- Single pass – no comparative measurement required
- Effective volume values thanks to the exclusion of irrelevant vehicle parts through intelligent detection of the loading area
- Volume data for further processing available in a matter of seconds
- Easy installation, maintenance, and operation
- No installations in the road surface necessary
- Ready for use around the clock and without operators

→ www.sick.com/Load_Volume_Measurement_System

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



TDC – At a glance

- Open end-to-end IIoT architecture with support for Yocto Linux
- Support for standardized interfaces and protocols for data communication
- Configuration via browser-based user interface
- User-defined real-time alarms
- Indoor and outdoor localization

Your benefits

- Simple, rapid, cost-effective, profit-producing data use
- Flexibility brought by a wide range of connection and communication options
- Future-proofed thanks to the use of open standards
- Maximum availability of sensors and machines through real-time monitoring with user-defined alarms
- Possibility of increasing productivity and efficiency through transparent sensor and process data

→ www.sick.com/TDC

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





DFS60 – At a glance

- Short installation depth
- High resolution of up to 16 bits
- Optional programming: Output voltage, zero pulse position, zero impulse width, pulse number and counting direction
- Connection: Radial or axial cable connection, M23 or M12 male connector, axial or radial.
- Electrical interfaces: 5 V & 24 V TTL/RS-422, 24 V HTL/push pull, 5 V sin/cos 1 Vss
- Mechanical interfaces: Face mount flange or servo flange, blind hollow shaft or through hollow shaft
- Remote zero set possible

Your benefits

- Reduced storage costs and downtime due to customer-specific programming
- Variety of different mechanical and electrical interfaces enable the encoder to be optimally adjusted to fit the installation situation
- Excellent concentricity even at high speeds
- High resolution of up to 16 bits ensures precise measurements
- Permanent and safe operation due to a high enclosure rating, temperature resistance and a long bearing lifetime
- Programmability via the PGT-08 programming software and the PGT-10-Pro display programming tool allow the encoder to be adapted flexibly and quickly according to customer needs
- Programmable zero pulse position simplifies installation

→ www.sick.com/DFS60

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



KH53 – At a glance

- Non-contact length measurement – maintenance-free, rugged, long service life
- High reproducibility (0.3 mm / 1 mm), high system resolution (0.1 mm)
- SSI and PROFIBUS interfaces
- Determination of absolute position
- Measuring lengths of up to 1,700 m possible
- Can be used in harshest ambient conditions
- High traversing speeds of up to 6.6 m/s
- Distance tolerance between read head and measuring element: up to 55 mm ± 20 mm possible

Your benefits

- After installation, the system is immediately available and completely maintenance-free, which leads to time and cost savings
- Reliable determination of position under harshest ambient conditions such as the effects of dirt, dust, fog, shock, and vibration
- High efficiency and productivity
- Time savings – no reference run necessary on initial commissioning due to absolute position measurement
- Accurate positioning even with high mounting tolerances

→ www.sick.com/KH53

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





DFS60S Pro – At a glance

- Encoders for functional safety technology: SIL2 (IEC 61508), SILCL2 (EN 62061), PL d (EN ISO 13849)
- Electrical interface: 4.5 V ... 32 V; sine/cosine 1 V_{PP}; 1,024 periods
- Clamping flange or servo flange, blind hollow shaft or through hollow shaft (assembly options with feather key)
- Universal cable connection, M23 or M12 male connector, axial or radial
- Enclosure rating: IP65
- Operating temperature range: -30°C ... +95°C (depending on type)

Your benefits

- Certified safety solution that ensures the best possible protection for persons, machinery, and systems
- Easy and practical implementation of safety functions with complex solutions using an all-in-one solution, safety functions with the Flexi Soft FX3-MOC motion control modules from SICK: safe stop 1 (SS1), safe stop 2 (SS2), safe operating stop (SOS), safe speed monitoring (SSM), safely limited speed (SLS), safe direction (SDI), safe brake control (SBC)
- Positive and non-positive connections for mechanical reliability
- Certified safety products reduce the scope of safety engineering
- Versatile connection options for high levels of flexibility and straightforward implementation
- Compact size for compatibility with applications in which installation space is limited

→ www.sick.com/DFS60S_Pro

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



DFV60 – At a glance

- Rotatable spring arm for universal use
- 300 mm wheel circumference with o-ring made from NBR70
- Mounting arm and measurement wheels made from aluminum
- Programmable output voltage, zero pulse position, zero pulse width and number of pulses
- Connection: radial M12 male connector connection or radial/axial cable connection
- Electrical interfaces: 5V & 24V TTL/RS-422, 24 V HTL/push pull
- Remote zero setting possible

Your benefits

- Universal-use spring arm ensures fast and simple mounting
- The high level of spring tension enables use in harsh environmental conditions
- Reduced storage costs and downtime due to programmability
- Connector-in cable connection in radial or axial direction enables customer-specific cable solutions
- Excellent concentricity even at high speeds
- Permanent and safe operation due to a high enclosure rating, temperature resistance and a long bearing lifetime
- Programmability via the PGT-08 programming software and the PGT-10-S display programming tool allow the encoder to be adapted flexibly and quickly according to customer needs
- Programmable zero pulse position simplifies installation

→ www.sick.com/DFV60

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





TMS/TMM88 – At a glance

- Inclination sensor with measuring range of 360° (single-axis) or ±90° (dual-axis)
- Compensated cross sensitivity and configurable vibration suppression
- Freely configurable current or voltage interface or convenient CANopen interface
- Accuracy up to ±0.02°
- Plastic or aluminum housing
- Programmable with the PGT-12-Pro

Your benefits

- Inclination measurement in two axes without mutual interference
- Single-axis inclination measurement over 360° with configurable zero point
- Flexible adaptation to the application via the CANopen interface or PGT-12-Pro handheld programming tool
- Reliable output signal thanks to configurable digital filters
- Suitable for precise leveling tasks thanks to high accuracy over the entire measuring range and exceptional temperature stability
- Can also be used in the harshest ambient conditions thanks to fully encapsulated electronics

→ www.sick.com/TMS_TMM88

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



RFU63x – At a glance

- Antenna and data processing integrated in the sensor
- Read range up to 10 m
- Linkage option to superior control systems or directly to the cloud
- Up to 4 external antennas
- Configuration via SOPAS ET or integrated web server
- Can be used with SICK AppSpace
- Rugged design in accordance with IP67

Your benefits

- External antenna for cost-effective extension of the detection range
- Easy configuration through SOPAS ET or the integrated web server saves time and costs for commissioning
- Maximum flexibility when programming individual software solutions with SICK AppSpace
- The rugged design enables reliable operation - even in tough industrial environments
- Very little programming work needed in the control due to intelligent process logics in the device

→ www.sick.com/RFU63x

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





Inspector – At a glance

- High-speed positioning, inspection and measuring
- Powerful “object locator” tool, independent of position, rotation and scale
- Unique, interchangeable housing design supporting dome and various optical accessories
- Simple step-by-step configuration in PC including emulator
- Easy-to-use operator interfaces
- Flexible machine and HMI design interfaces

Your benefits

- The multi-functional vision toolbox offers smart camera-level performance but with sensor ease-of-use
- Unique, interchangeable housing design provides the easiest way to improve image quality
- The simple configuration in SOPAS, including emulator for offline configuration and testing, will reduce downtimes in production to a minimum
- The easy-to-use operator interfaces are optimized to make it easier for the operator to oversee daily work more efficiently
- Ethernet communication and web API gives excellent connectivity and freedom to customize user’s HMI

→ www.sick.com/Inspector

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



Ranger3 – At a glance

- CMOS sensor from SICK with ROCC technology for superior 3D performance
- Processing of up to 15.4 gigapixels/s.
- Full-format 3D profile at 7 kHz
- Sensor resolution: Up to 2,560 x 832 px
- GigE Vision and GenICam compliant
- 3D, reflective, and scattered light measurement in one device
- Industrial housing, optional IP65/67 enclosure rating

Your benefits

- Unique CMOS sensor enables fast 3D measurement speed for increased throughput
- Reliable and accurate measurements on dark and bright surfaces enable flexible production - an enabler for Industry 4.0
- High light sensitivity allows 3D inspection without higher laser power
- Accurate shape, volume and position measurements for a wide range of objects improving product quality
- Standardized software integration with GigE Vision and GenICam
- Easy mechanical integration thanks to a compact housing, the Proflex-Front, industrial connectors and 4Dpro accessories

→ www.sick.com/Ranger3

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





Visionary-B – At a glance

- Distance values: 250 × 496 pixels and 2D image: 544 × 828 pixels
- High temperature range from –40 °C to +75 °C
- Rugged housing: IP69K for the sensor head
- 2-in-1 solution: eight 3D and eight 2D images per second
- Intelligent image processing: classification and position determination of objects
- Activity recording for the most recent hours possible

Your benefits

- More than 120,000 distance and intensity values in just a single recording
- Designed for harsh outdoor conditions, e.g., strong sunlight, rain
- Intelligent data processing with object detection and classification allows, for example, object tracking and collision warning
- Visionary-B PS provides 3D data, 2D video images and object data via Gigabit Ethernet as well as a programming interface
- Visionary-B CV is an intelligent, easily configurable 3D driver assistance system with a monitor for the driver's cab that outputs active optical and acoustic warnings

→ www.sick.com/Visionary-B

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



Visionary-T – At a glance

- Record up to 50 3D images per second
- Distance values: 144 x 176 pixels per recording
- Output of 3D data via a Gigabit Ethernet interface and simple digital outputs
- Provision of application-specific data
- Temperature range: 0 °C ... 50 °C or 0 °C ... 45 °C (depending on the housing), enclosure rating: IP67

Your benefits

- More than 25,000 distance and intensity values in a single shot
- 3D information is also available for stationary applications
- Easy mounting and rapid sensor replacement
- Programming interface for the use of 3D data for additional evaluation on an external host
- The Visionary-T CX provides 3D data via Ethernet
- The Visionary-T AG offers intelligent data reduction
- The Visionary-T DT is a configurable plug and play 3D detection sensor
- The Visionary-T AP is based on the SICK AppSpace and makes it possible to create applications with SICK AppStudio as well as load application-specific Key Apps to the sensor using SICK AppManager

→ www.sick.com/Visionary-T

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





Dx35 – At a glance

- Highest reliability, ambient light immunity and best price/performance ratio thanks to HDDM technology
- Measuring range of 0.05 m to 12 m for natural objects or 0.2 m to 35 m for reflective tape
- Devices with analog and digital output, or just switching
- Infrared or red emitted light in laser class 1 or 2
- Repeatability: 0.5 mm to 5 mm
- Compact housing size
- IO-Link

Your benefits

- Precise and reliable measurement regardless of object color extends run time and process quality
- A small size and blind zone make flexible mounting possible when space is limited
- Optimum solution thanks to flexible settings for speed, range and repeatability
- Flexible interface use: 4 mA to 20 mA, 0 V to 10 V, PNP output, NPN output, or IO-Link – making machine integration simple
- Offering easy alignment, optimal performance or inconspicuous measurement, versatile light senders make it an ideal solution for all scenarios
- Low investment costs and high performance levels guarantee a quick return on investment
- IO-Link offers full process control, from commissioning to service
- A wide variety of control options ensures rapid commissioning and fast batch changes

→ www.sick.com/Dx35

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



Dx1000 – At a glance

- Long range distance sensor with infrared laser featuring HDDM+ technology
- Measures natural objects (DT1000) or reflectors (DL1000)
- Dust-proof and waterproof housing (IP 65 and IP 67) made of highly corrosion-resistant aluminum alloy
- Configurable digital inputs and outputs, analog output, RS-422/SSI
- Measures hot surfaces (DT1000)

Your benefits

- Reliable distance measurement indoors and outdoors enables high system availability
- Multi-echo technology can suppress undesirable reflections – enabling use in a wider range of applications
- Comprehensive options for adjustments enable perfect adaptation to the individual measuring task
- Fast, safe commissioning using a graphical touch display, convenient SOPAS ET user interface and red alignment laser
- A small number of device variants (standardization) accommodating a wide range of requirements keeps costs down
- Laser class 1 and therefore eye-safe

→ www.sick.com/Dx1000

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





LMS1xx – At a glance

- Efficient and cost-effective 2D LiDAR sensors for measuring ranges of up to 50 m
- Outstanding performance whatever the weather, thanks to multi-echo technology and intelligent algorithms
- Rugged, compact housing with enclosure rating up to IP 67, integrated heating, and a temperature range of $-40\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$
- Variants for security applications with relay outputs and VdS certification available
- Measurement data output via Ethernet interface in real time
- Number of digital outputs can be expanded via external CAN modules

Your benefits

- Straightforward integration and mounting due to compact design
- Low purchase and operating costs: One device monitors areas of over 5,500 m² in size
- Product family with many variants, which also provide solutions for demanding and specialized applications
- Extended filter options significantly reduce measurement errors caused by conditions such as fog, rain or snow
- Optional CAN I/O module increases number of digital outputs for greater application flexibility
- Ethernet interface makes for easy implementation and remote maintenance

→ www.sick.com/LMS1xx

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



LMS5xx – At a glance

- Powerful, efficient 2D LiDAR sensor for measuring ranges up to 80 m
- Excellent performance even under unfavorable weather conditions due to multi-echo technology
- Compact housing up to enclosure rating IP 67 and integrated heating for outdoor devices
- Low power consumption
- Quick signal processing
- Several inputs and outputs
- Synchronization of several sensors possible

Your benefits

- Extremely powerful in countless applications
- The smallest 2D LiDAR sensor with the highest accuracy in this sensor class
- Quick, reliable detection of objects under nearly any ambient conditions
- Extensive product family with various product series and types for all requirements regarding performance and cost
- Low power consumption minimizes the total cost of ownership
- Best price-performance ratio in this sensor class
- Quick and easy commissioning with SOPAS engineering tool
- Self-check function for increasing system availability

→ www.sick.com/LMS5xx

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





LD-LRS – At a glance

- Long sensing range even when detecting dark surfaces
- High angular resolution of up to 0.0625 degrees
- High immunity to solar radiation
- Synchronous monitoring of up to six different fields
- Small laser spot diameter even at long distances

Your benefits

- Reliable operation even in harsh ambient conditions
- Low installation costs due to large monitoring areas
- Reliable detection of small objects at long distances
- Easy installation options for excavators and crane systems

→ www.sick.com/LD-LRS

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



MRS1000 – At a glance

- Four spread layers and a 275° aperture angle
- High weather resistance and reliability through HDDM+ with multi-echo technology
- Field evaluation and measured data in one sensor
- Easy configuration, with the ability to adapt to a changing environment
- Convenient and customer-friendly diagnostics via web server

Your benefits

- Collecting more data in multiple dimensions leads to higher measurement accuracy
- HDDM+ with multi-echo technology for high availability when subjected to environmental influences like rain, dust, and fog
- Simultaneous measurement on 4 levels allows objects to be detected which are on the floor or obstructing the path
- High flexibility for installation thanks to rotating male/female connectors
- Integrated field evaluation and measured data output makes it possible to tackle various applications with one sensor
- Low setup costs: Identical telegram as for the 2D LiDAR sensors from SICK
- Fields that are easy to teach in save time during setup
- Low maintenance costs thanks to high weather resistance

→ www.sick.com/MRS1000

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





MRS6000 – At a glance

- Gap-free detection across 24 scanning layers at an aperture angle of 120°
- Fine angular resolution with high scanning point density
- Reliability thanks to multi-echo technology
- Convenient and customer-friendly web server interface for configuration

Your benefits

- The high scanning point density across 24 layers enables reliable detection
- Special mirror technology ensures high scanning field stability
- High resolution (vertical and horizontal) for the precise and rapid detection of a large working range
- Measurement data transferred in real time via the 1-Gbit Ethernet connection
- Compact and rugged design with IP67 enclosure rating for adverse ambient conditions

→ www.sick.com/MRS6000

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



LD-MRS – At a glance

- Simultaneous measurements on up to 8 scan planes
- Weatherproof thanks to multi-echo technology and IP69K enclosure rating
- Lightweight, compact design: Approx. 0.77 kg / 1 kg
- Wide temperature range: -40 °C to +70 °C
- Low power consumption: 8 watts
- Different angular resolutions in the scanning range are available
- Integrated object tracking

Your benefits

- Simultaneous measurement on up to 8 planes compensates for vehicle pitch
- Easy sensor integration due to light and compact design
- Low operating costs due to low power consumption
- Fast data output, even when processing a high amount of information
- IP69K-rated housing ensures accurate measurements in difficult environmental conditions
- Better detection due to flexible angular resolution in the scanning range
- Data preprocessing allows tracking of up to 64 objects

→ www.sick.com/LD-MRS

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





RMS3xx – At a glance

- Detection of static and movable objects
- 4 freely programmable transistor switching outputs
- Output of identification number, speed, direction of movement of the object via Ethernet
- Large scanning range for detection angles of $\pm 50^\circ$ (azimuth) and $\pm 8^\circ$ (elevation)
- Dust-free, waterproof housing (IP67)

Your benefits

- Quick and precise object detection
- Monitored areas can be adapted individually to applications
- Freely programmable transistor outputs for quick, break-free and stable data transmission
- Output of identification number, speed and direction of movement of the object via Ethernet
- Simultaneous determination of object distance and speed as well as the angle between sensor and object
- Simple configuration and installation

→ www.sick.com/RMS3xx

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



LBR SicWave – At a glance

- 80 GHz free-space radar with various antennas
- Measuring range: up to 120 m
- Process temperature: -40°C ... $+200^\circ\text{C}$
- Process pressure: -1 bar ... 20 bar
- Process connection: thread, flange, special brackets
- Housing: plastic (IP66 / IP67) or aluminum (IP66 / IP68)
- With or without display and WPAN
- Certificates: Ex d, Ex ia, Ex ta

Your benefits

- One device for all continuous level measurements in solids, simplifies spare part logistics
- Increased plant availability due to non-contact, continuous level measurement
- Quick to commission, saving time and costs
- Low costs and time expenditure as it is maintenance-free
- Rugged to external interference for high plant availability
- Insensitive to foam and dust, preventing unexpected plant downtime
- Ex-certificates available
- Simplified service and diagnostic via HART or WPAN

→ www.sick.com/LBR_SicWave

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





Bulkscan® – At a glance

- Efficient and cost-effective non-contact measurement of volume and mass flow of bulk materials
- Laser pulses with high angular resolution ensure outstanding image resolution
- Multi-echo pulse evaluation produces highly reliable measurements
- Integrated function for determining the center-of-gravity of the bulk material
- Rugged design for harsh ambient conditions
- Integrated heater allows measurement even at low temperatures
- Compact IP67 rated housing

Your benefits

- Maximizes conveyor throughput
- Reduces maintenance costs by preventing belt slippage when using the Bulkscan® LMS511
- Increases efficiency by optimizing belt capacity
- Simple installation
- Low maintenance costs
- Offers savings through minimized energy consumption
- The wide ambient operating temperature range makes it suitable for outdoor use

→ www.sick.com/Bulkscan

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



“SENSOR INTELLIGENCE.” IS A PROMISE

SICK’s dedication and experience are reflected in its intelligent sensor solutions. From development to service provision, every employee is fully committed to ensuring that sensors and system solutions from SICK are the perfect fit for the diverse functions they perform.

Company with a culture of success

With a variety of products and services, more than 10,000 employees help SICK sensor technology users to increase their productivity and reduce their costs. Founded in 1946, the company has its headquarters in Waldkirch, Germany, and it is globally active with over 50 subsidiaries and equity investments as well as numerous agencies.

SICK has been enjoying success for decades. The foundation for this is dedicated employees, whose ways of thinking and acting are reliable and geared toward the long term. This lively corporate culture holds strong appeal for qualified and skilled professionals. At SICK, they are part of a company that ensures an excellent balance between career progression and quality of life.

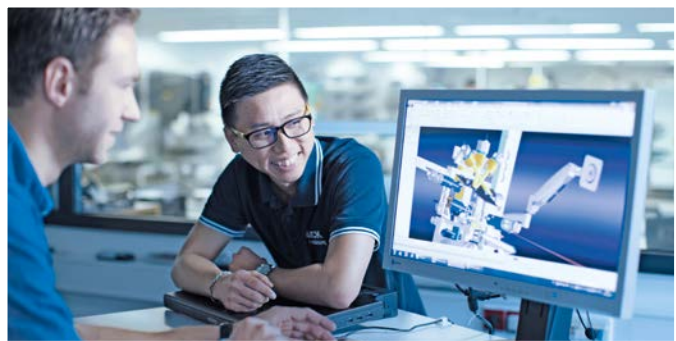


Innovation creates competitive advantages

Sensor technology from SICK simplifies procedures and optimizes processes to achieve sustainable production. For this purpose, SICK has research and development facilities in numerous locations across the globe. In discussion with its customers and in cooperation with higher education and research institutions, innovative sensor products and solutions are developed. These form the basis for reliable process control, the safety of people, and environmentally friendly production.

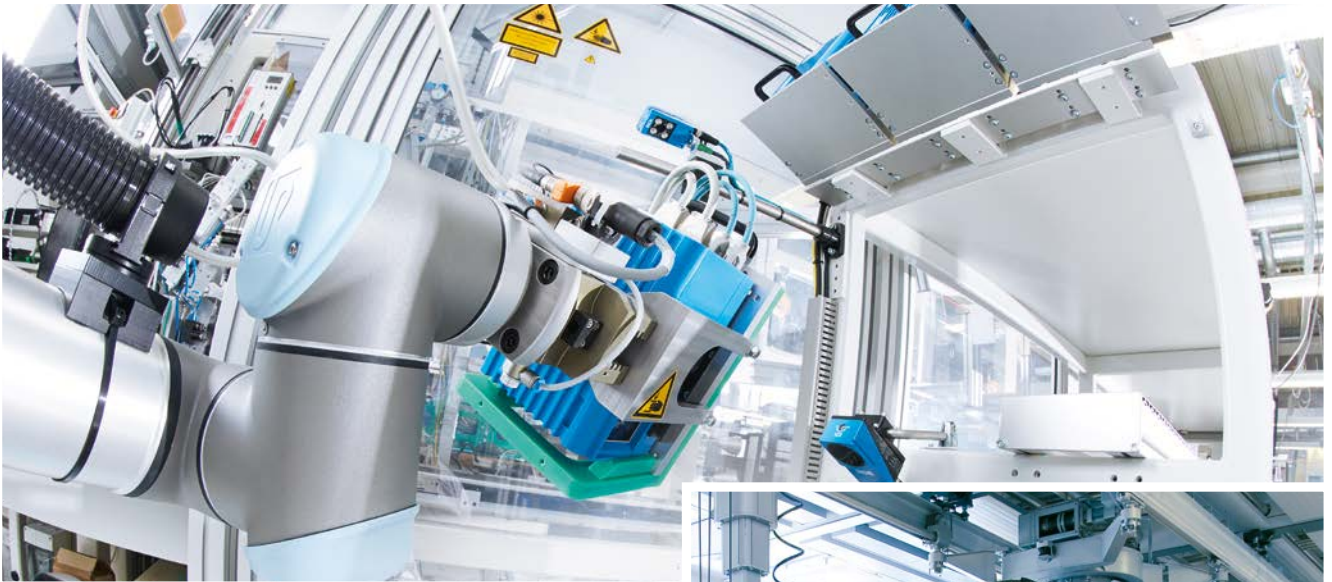
Mission statement with a far-reaching effect

SICK builds upon an established corporate culture, pursuing financial independence and technological openness. SICK's innovations have made the company a technology and market leader, showing that it takes targeted modernization and improvement to make universally applicable sensors a long-term success.



“SENSOR INTELLIGENCE.” FOR ALL REQUIREMENTS

SICK is a renowned expert in many industries, and is entirely familiar with the critical challenges they face. While speed, accuracy and availability take center stage in all industries, technical implementations vary greatly. SICK puts its vast experience to use to provide with precisely the solution you need.



For applications worldwide

Hundreds of thousands of installations and applications go to prove that SICK knows the different industries and their processes inside out. This tradition of uncompromising expertise is ongoing: As we move into the future, we will continue to design, implement and optimize customized solutions in our application centers in Europe, Asia and North America. You can count on SICK as a reliable supplier and development partner.



For performance across the board

SICK provides the right technology to respond to the tasks involved in industrial automation: measuring, detecting, monitoring and controlling, protecting, networking and integrating, identifying, positioning. Our development and industry experts continually create groundbreaking innovations to solve these tasks.



For your specific industry

With a track record of proven expertise in a great variety of industries, SICK has taken quality and productivity to new heights. The automotive, pharmaceutical, electronics and solar industries are just a few examples of sectors that benefit from our know-how. In addition to increasing speed and improving traceability in warehouses and distribution centers,

SICK solutions provide, for example, accident protection for automated guided vehicles. SICK system solutions for analysis and flow measurement of gases and liquids enable environmental protection and sustainability in energy production, cement production or waste incineration plants.

→ www.sick.com/industries



SERVICES FOR MACHINES AND SYSTEMS: SICK LifeTime Services

SICK LifeTime Services is a comprehensive set of high-quality services provided to support the entire life cycle of products and applications from plant walk-through to upgrades. These services increase the safety of people, boost the productivity of machines and serve as the basis for our customers' sustainable business success. LifeTime Services range from product-independent consulting to traditional product services and are characterized by extensive industry expertise and over 70 years of experience.





→ www.sick.com/service



Consulting and design

- Plant walk-through
- Risk assessment
- Safety concept
- Safety software and hardware design
- Validation of functional safety
- CE-conformance check



Product and system support

- Installation
- Commissioning
- Start-up support
- Calibrations
- Telephone support
- 24-hour helpline
- SICK Remote Service
- Troubleshooting on site
- Repairs
- Exchange units
- Extended warranty



Verification and optimization

- Inspection
- Stop time measurement
- Machine safety inspection
- Electrical equipment check
- Accident investigation
- Initial verification
- Performance check
- Maintenance



Upgrade and retrofits

- Upgrade services



Training and education

- Training
- Seminars
- Web training



VERSATILE PRODUCT RANGE FOR INDUSTRIAL AUTOMATION

From simple acquisition tasks to key sensor technology in a complex production process: With every product from its broad portfolio, SICK offers a sensor solution that best combines cost effectiveness and safety.

[→ www.sick.com/products](https://www.sick.com/products)

Photoelectric sensors

- Miniature photoelectric sensors
- Small photoelectric sensors
- Compact photoelectric sensors
- Hybrid photoelectric sensors
- Cylindrical photoelectric sensors
- Fiber-optic sensors and fibers
- MultiTask photoelectric sensors



Proximity sensors

- Inductive proximity sensors
- Capacitive proximity sensors
- Magnetic proximity sensors



Line guidance sensors

- Optical line guidance sensors
- Magnetic line guidance sensors



Magnetic cylinder sensors

- Position sensors
- Sensors for T-slot cylinders
- Sensors for C-slot cylinders
- Sensor adapters for other cylinder types



Registration sensors

- Contrast sensors
- Color sensors
- Luminescence sensors
- Fork sensors
- Array sensors
- Register sensors
- Glare sensors
- Pattern sensors



Automation light grids

- Measuring automation light grids
- Switching automation light grids



Opto-electronic protective devices

- Safety laser scanners
- Safety light curtains
- Safety camera systems
- Multiple light beam safety devices
- Single-beam photoelectric safety switches
- Mirror columns and device columns
- Upgrade kits for opto-electronic protective devices



Safety switches

- Electro-mechanical safety switches
- Non-contact safety switches
- Safety locking devices
- Safety command devices
- Mechanical bolts for safety switches



sens:Control – safe control solutions

- Safe series connection
- Safety relays
- Safety controllers



Safety systems and solutions

- Safety systems
- Safety solutions



Gas analyzers

- Gas transmitters
- In-situ gas analyzers
- Extractive gas analyzers



Dust measuring devices

- Scattered light dust measuring devices
- Transmittance dust measuring devices
- Gravimetric dust measuring devices



Analyzer solutions

- CEMS solutions
- Process solutions



Traffic sensors

- Tunnel sensors
- Overheight detectors
- Visual range measuring devices



Ultrasonic gas flow measuring devices

- Volume flow measuring devices
- Mass flow measuring devices
- Flow velocity measuring devices
- Gas flow meters
- Flow computers



Identification solutions

- Image-based code readers
- Bar code scanners
- RFID
- Hand-held scanners



Vision

- 2D vision
- 3D vision



Distance sensors

- Displacement measurement sensors
- Mid range distance sensors
- Long range distance sensors
- Linear measurement sensors
- Ultrasonic sensors
- Optical data transmission



Detection and ranging solutions

- 2D LiDAR sensors
- 3D LiDAR sensors
- Radar sensors



Motor feedback systems

- Motor feedback system rotary HIPERFACE®
- Motor feedback system rotary HIPERFACE DSL®
- Motor feedback system rotary incremental
- Motor feedback system rotary incremental with commutation
- Motor feedback system linear HIPERFACE®



Encoders

- Absolute encoders
- Incremental encoders
- Linear encoders
- Wire draw encoders
- Safety encoders
- Measuring wheel encoders



Inertial sensors

- Inclination sensors
- Dynamic inclination sensors



Fluid sensors

- Level sensors
- Pressure sensors
- Flow sensors
- Temperature sensors



Integration products

- Sensor Integration Machine
- 4Dpro connectivity
- Sensor Integration Display
- Sensor Integration Gateway
- Integration Solutions



System solutions

- Customized analyzer systems
- Driver assistance systems
- Robot guidance systems
- Object detection systems
- Profiling systems
- Gateway systems
- Quality control systems
- Security systems
- Track and trace systems
- Flow metering systems



Software products

- SICK AppSpace software
- Analytics Solutions
- Integrated Managing Solutions
- Integration Solutions



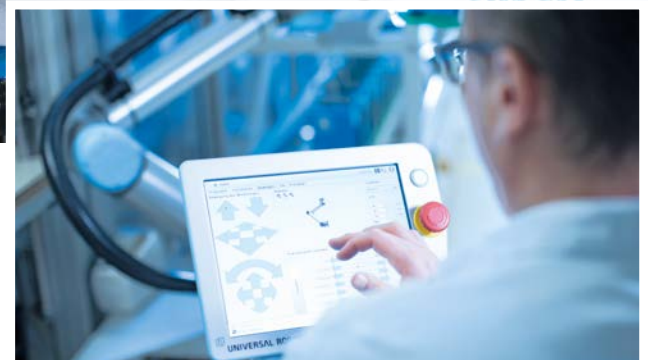
SICK AppSpace

- SICK AppSpace software
- Programmable devices
- SensorApps



INDUSTRY 4.0 – DIGITIZATION AND NETWORKING

Networked production and control processes in complex machine environments will determine the future. SICK is already laying the foundations for dynamic, real-time-optimized, and self-organizing industrial processes: As data suppliers, sensors are indispensable for intelligent factories.





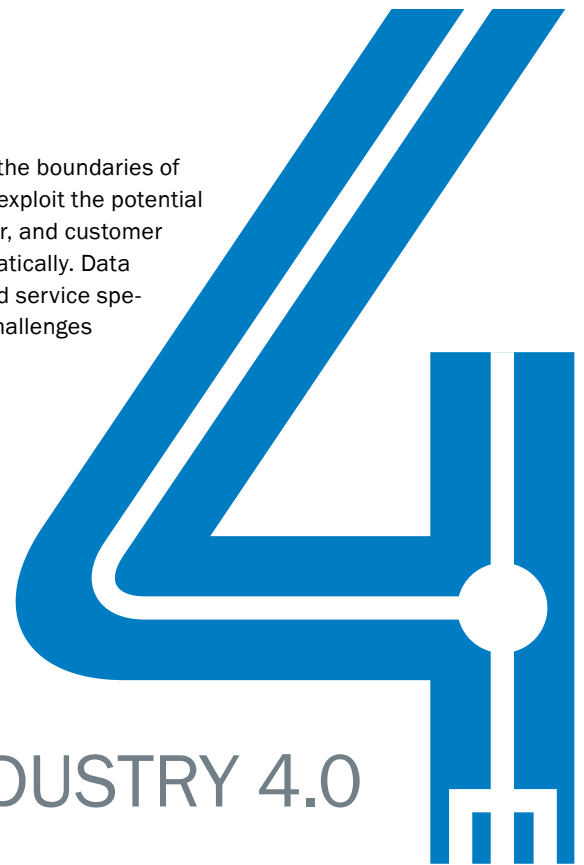
Human-robot collaboration

Production companies endeavor to design their production workflows to offer a high degree of automation and flexibility at the same time – and that includes closer interaction between humans and robots. This requires safety solutions which react completely reliably – even in unexpected situations. With over 70 years of experience in protecting machines and systems, SICK stands for solutions that are ready for the future challenges.

Networked reality

Only when the network of parties involved acts beyond the boundaries of their own production systems will it be possible to fully exploit the potential of Industry 4.0. For it is then that supplier, manufacturer, and customer processes will be able to link up seamlessly and automatically. Data security is the key to success. As a product, system, and service specialist, SICK develops personalized answers to future challenges together with its customers.

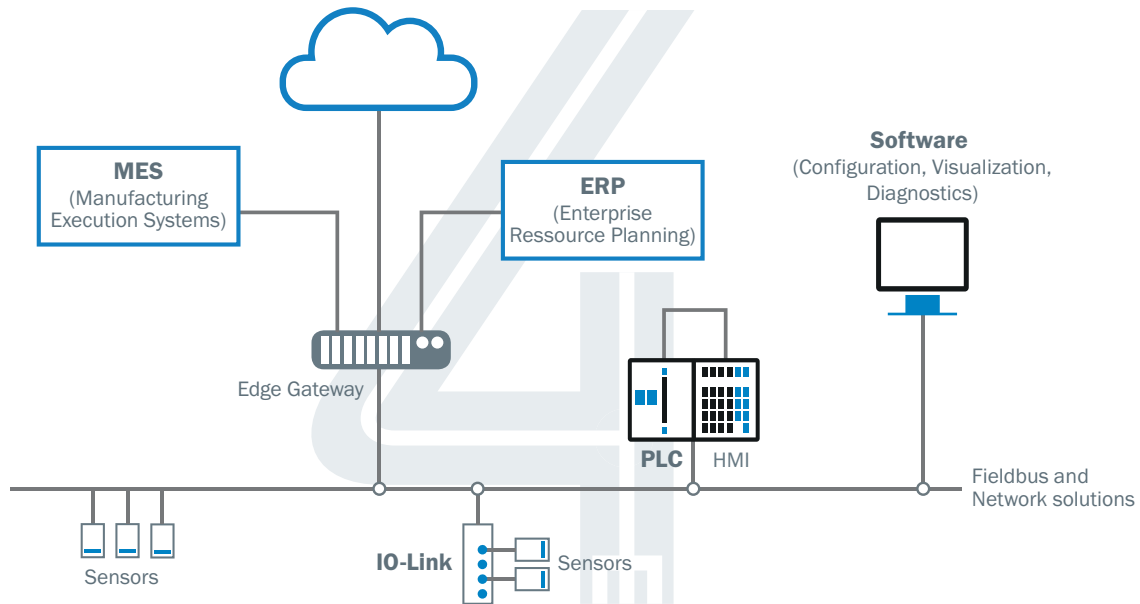
INDUSTRY 4.0



SEAMLESSLY NETWORKED

Networked production and control processes in complex machine environments determine the industrial future. Sensor intelligence is required for the highly complex process of converting physical signals into sensor information. Intelligent sensor systems from SICK are already being used to support

dynamic, real-time-optimized, and self-organized industrial processes. For reliable network communication, it is essential that the required data is clearly defined and integrated into the networked data world. Selecting the right type of communication for a defined path plays an important part.



Sensors intelligently networked

① Easy integration into the PLC, engineering tools, and HMI

SICK offers an exceptionally wide range of tools for integrating sensors and safety controllers. These tools are perfectly tailored to your requirements, which may include generic integration using device description files, a standardized interface (e.g., TCI, FDT/DTM) for configuration and diagnostics or integration into the PLC program using function blocks.

② ERP, MES, and cloud: vertical integration into higher-level systems

Especially when it comes to Industry 4.0, integration capability and continuity are important features of intelligent and future-proof communication structures. That is why SICK offers several options for integrating the process, status, and diagnostics information of sensors into visualization systems and automation networks. Integration tools from SICK enable straightforward and fast integration into your custom HMI solution, irrespective of the technology used.

Focusing on the right solution

③ Industrial communication, interfaces, and fieldbus solutions

Maximum flexibility and the right solution for any application: The fieldbus and network solutions from SICK allow you to connect sensors and safety controllers to any and all standard automation systems. Guaranteeing quick and easy access to the available data.

④ IO-Link: Industry 4.0 for everyone

Communication technology that is independent of manufacturer is considered an “enabling technology” for innovative sensor solutions and supports the global availability of data and information required by Industry 4.0. Switching devices and simple sensors, in particular, can benefit from this fast and cost-effective method of connecting to the data world.

⑤ Configuration, programming, visualization, and diagnostics

Our software tools support you when setting up the connection and when performing configuration and diagnostics on sensors and safety controllers from SICK. The intuitive user interface enables fast and simple design and implementation of the application.

→ www.sick.com/industrial-communication

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SERVICES FOR MACHINES AND PLANTS: SICK LifeTime Services

Our comprehensive and versatile LifeTime Services are the perfect addition to the comprehensive range of products from SICK. The services range from product-independent consulting to traditional product services.



Consulting and design
Safe and professional



Product and system support
Reliable, fast, and on-site



Verification and optimization
Safe and regularly inspected



Upgrade and retrofits
Easy, safe, and economical



Training and education
Practical, focused, and professional

SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 10,000 employees and over 50 subsidiaries and equity investments as well as numerous agencies worldwide, SICK is always close to its customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents, and preventing damage to the environment.

SICK has extensive experience in various industries and understands their processes and requirements. With intelligent sensors, SICK delivers exactly what the customers need. In application centers in Europe, Asia, and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes SICK a reliable supplier and development partner.

Comprehensive services round out the offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

That is “Sensor Intelligence.”

Worldwide presence:

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Hong Kong, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

Detailed addresses and further locations → www.sick.com