PORT

SENSOR SOLUTIONS FOR CONTAINER TERMINALS

Automation and risk reduction at ports and terminals are not at odds

SICK

Sensor Intelligence.

TASKS FOR THE CONTAINER TERMINAL

Automation and risk reduction at ports and terminals are not at odds

A high level of terminal automation and risk reduction are increasingly driving port operators worldwide. SICK offers support in connection with the identification, detection, measurement, protection and collision prevention of goods, cranes, crane booms, containers, and essential port equipment. With its comprehensive and detailed industry knowledge, SICK has become the number one partner for sensor solutions in port processes. Innovative, fast development and implementation of comprehensive customer-tailored solutions – this is where SICK's strength resides.

➜ www.sick.com/Ports

Protection

Avoiding collisions involving containers, cranes, and other objects is the highest priority when it comes to port logistics. Specific demands are placed on sensors in order to guarantee the level of outdoor safety and security required in ports, and SICK is perfectly placed to respond with its many years of experience and the innovative solutions it has to offer.

Position detection

SICK's sensors assist in correctly positioning and detecting freight and other objects. They determine data and transmit it to the relevant controller to ensure that every item of cargo reaches its destination in one piece.

Measurement

Sensors and sensor systems measure the dimensions, contours, speeds, and distances involved in freight positioning, thereby optimizing transport routes and increasing handling safety for crane operators.

Detection

SICK's sensors provide assistance for controlling and maneuvering cranes and other vehicles. They detect containers and bulk materials that are to be picked up by transportation equipment and can determine whether there are objects in the vicinity of moving vehicles.

INTELLIGENT PORTS: INCREASED EFFICIENCY AND PRODUCTIVITY WITH INDUSTRY 4.0 SOLUTIONS IN PORTS AND TERMINALS

➜ www.sick.com/TDC

The availability of sensor technology in ports and terminals has a major influence on their productivity. Transparent insight into automated processes can shorten ship idle times or optimize the handling of containers in the yard as well as the processing of rail and road transport.

Condition Monitoring, enabled by the Monitoring Box from SICK, can be used to monitor such port applications and the sensors used to execute them. The Monitoring Box web application visualizes ambient conditions in ports and irregularities in port processes. For example, port operators can display environmental influences acting on sensors, such as dirt or excessive positive or negative temperatures, in real time on a dashboard and track them using the data history.

Thanks to the notification function, the user does not miss any events. For example, unplanned maintenance on quay cranes can be prevented. The Monitoring Box can be used not only for SICK sensors, but also for external data sources, such as weather stations.

Settings or processes are optimized with data analyses and unplanned downtime is reduced even more with prediction models. For example, the monitoring and analysis of object detection of the LiDAR sensor technology reduces unwanted stops. Weather conditions can also be considered, which allows for data analysis and predictions about sensor and system conditions. This not only increases the availability of sensors and port facilities, but also reduces ship idle times. Predictive services help prevent unwanted downtime in the quay area or yard area.

➜ SICK Monitoring Box
➜ Monitoring App AOS LiDAR
➜ Monitoring App outdoorScan3

# FLEXIBLE AUTOMATION AND ASSISTANCE SERVICE

Determining the profile of ship loads

The LD-LRS 2D LiDAR sensor is installed on the trolley to help position the spreader on the quay crane. The trolley's position and the laser scanner's distance measurements are combined to create a dynamic 2D profile of the current cargo load on each ship. This data is then used together with control software to assist the crane operator in handling containers smoothly and efficiently.
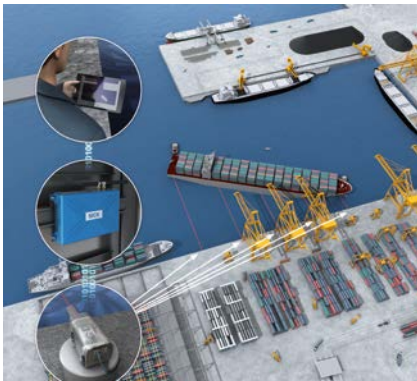- LD-LRS 2D LiDAR sensor
- TDC gateway systems

→ www.sick.com/LD-LRS
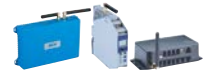
→ www.sick.com/TDC

Monitoring of the quay area

Smart Sensor Solutions from SICK monitor the dock in the quay area. With the help of this sensor technology, container ships can be reliably detected and their respective current position and speed are transmitted to the pilots and tug masters as the ships dock at the quay of the port terminal. The current position of a ship is displayed in real time on a portable HMI. This enables the ship to quickly and safely dock at the quay. The sensor solution also detects any undesired vessels in the container port, e.g. recreational boats.
- Dx1000 long range distance sensor
- TDC gateway systems

→ www.sick.com/Dx1000

→ www.sick.com/TDC

Environment perception for terminal tractors

Intelligent driver assistance systems for collision awareness with geofencing functionality contribute to an increase in efficiency of the transport process and reduce the risk of unplanned machine downtimes and accidents. Modularly designed systems offer an environment perception capability of up to 360° for terminal tractors and their trailers. Equipped with dynamically adjusted scan fields and geofancing functionality for specific yard areas, the system provides maximum convenience and optimal warnings - acoustically and/or visually.
- LMS5xx 2D LiDAR sensor
- TDC gateway systems

→ www.sick.com/LMS5xx

→ www.sick.com/TDC

Advanced Assistance System

Intelligent assistant systems prevent hazardous states arising from the load level of a vehicle or the driving behavior of the driver. These modular systems can be used to provide either active or passive assistance. Whereas active assistance systems directly intervene in the motion of the vehicle, passive systems provide the driver with an acoustic or visual warning. The example shows a modular selection of sensors that are combined and individually adapted to the respective customer requirements as a smart system solution.
- Visionary-B 3D machine vision, TMS/TMM88 inclination sensor, LMS5xx 2D LiDAR sensor, AFS/AFM60S Pro safety encoder, MAX® linear encoder

→ www.sick.com/Visionary-B

→ www.sick.com/TMS_TMM88

FLEXIBLE AUTOMATION

Identification and destination determination for trucks within the terminal

At the terminal entrance, the truck driver receives a tag with all relevant logistics data for his cargo as well as his destination within the terminal. RFID antennas at the transfer points of the container blocks read the tag and inform the control system and the truck driver about the correct destination. The LMS5xx laser scanners at the yard crane detect the truck and his load underneath the crane and provide precise position information to the truck driver for the loading and unloading process.
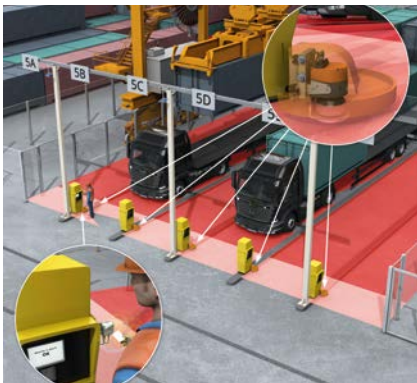
- LMS5xx 2D LiDAR sensor
- RFU63x RFID

→ www.sick.com/LMS5xx

→ www.sick.com/RFU63x

Container handling: monitoring of hazardous areas

The outdoorScan3 safety laser scanner (SIL2/PLd) monitors the parking slots and detects any trucks or their drivers. Furthermore it provides precise parking position information and supports the Anti-Truck-Lifting function. The laser scanner also monitors the kiosk area, where truck drivers congregate while their trucks are being loaded and unloaded. The system can be extended with RFID functionality to identify the carrier, freight, weight, driver and destination within the transfer areas.

- RFU63x RFID
- outdoorScan3 safety laser scanners

→ www.sick.com/RFU63x

→ www.sick.com/outdoorScan3

Detecting the trolley position and determining the height position of the spreader

The KH53 linear encoder operates magnetically and is the ideal solution for use in harsh environments and when large distances need to be traversed. The position data of the trolley determined by the KH53 makes it possible to stack containers with as little offset as possible. The DT1000 long range distance sensor also delivers the exact height position and speed of the spreader, which enables it to quickly and at the same time carefully approach its target position.
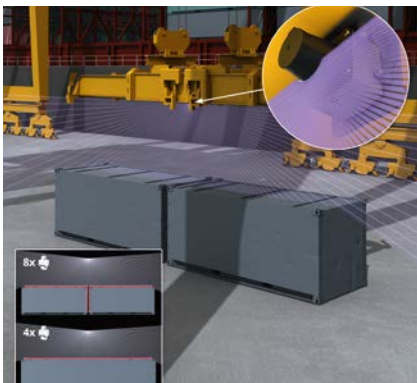
- KH53 linear encoder, AFS/AFM60 SSI absolute encoder
- Dx1000 long range distance sensor

→ www.sick.com/KH53

→ www.sick.com/AFS_AFM60_SSI

Differentiation of containers of different lengths

"Twin-Twenty-Detection" with the TiM581 2D LiDAR sensor can distinguish between one 40 foot container and two 20 foot containers by detecting the gap between two 20 foot containers and by measuring the total length of the container on the spreader. The crane control receives the relevant sensor data to check that the spreader size and the twistlocks are correctly aligned for each container size.

- TiM5xx 2D LiDAR sensor

→ www.sick.com/TiM5xx

COLLISION PREVENTION AND SMART DATA SERVICES

Collision avoidance for quay cranes

The AOS502 STS object detection system safely and reliably detects ship superstructures to ensure that quay cranes do not collide. The system evaluates data from various warning and stopping fields around the crane so that it stops at collision risks. Flexible field settings on the laser scanner allow to cover boom and crane to crane anti-collision at once. Combined with the TDC-E mobile gateway and Monitoring Box software, the system provides smart data transfer to the terminal systems such as real-time data, predictive services and analytics data.
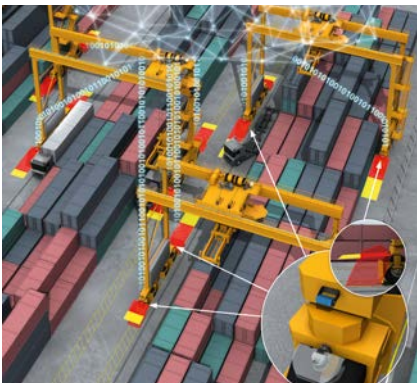
- AOS LiDAR object detection system
- SICK Monitoring Box Digital Services for Integration

➔ www.sick.com/AOS_LiDAR

➔ www.sick.com/Monitoring_Box

Monitoring of crane paths and cross travel

The AOS104 RTG laser-based object detection system and 3D snapshot (TOF camera) monitor objects and vehicles along the path of cranes, such as twistlocks or service vehicles, reliably and with no blind zones. The warning and protective fields of the laser scanner in the system are freely configurable. Cameras with object detection can also be used. The system transmits the acquired process and diagnostics data directly to the central data management system of the port terminal with the help of the TDC-E mobile gateway and Monitoring Box software.

- AOS LiDAR object detection system
- Visionary-T 3D machine vision

➔ www.sick.com/AOS_LiDAR

➔ www.sick.com/Visionary-T

Pathway with container block monitoring

To avoid collisions, the MRS6000 3D LiDAR sensor monitors not only the travel path of a crane but also any overruns of container blocks. This enables any containers that have slipped, for example due to gusts of wind, and are projecting into or have slid into the path of an automated gantry crane to be safely and reliably detected and submitted to the crane control. The TDC-E mobile gateway transmits smart sensor data and status messages to MES, ERP and cloud-based systems.

- MRS6000 3D LiDAR sensor
- TDC gateway systems

➔ www.sick.com/MRS6000

➔ www.sick.com/TDC

Collision avoidance between cranes and the end of the path

The DT1000 long range distance sensor constantly measures the distance between rail mounted cranes. If the gap is too small, the DT1000 sends a signal to the crane so that it can reduce its speed or come to a complete stop. The distance sensor measures gaps highly accurately and in a contactless manner. Alternatively, encoders such as the AFM60 can precisely record the position and speed of the wheels of the cranes in order to safely avoid collisions between adjacent cranes.

- Dx1000 long range distance sensor
- i110 Lock safety locking device

➔ www.sick.com/Dx1000

➔ www.sick.com/i110_Lock

FLEXIBLE AUTOMATION AND SMART DATA SERVICES

360° environment perception for AGVs/IGVs

The combined use of a LiDAR sensor and 3D snapshot (TOF camera) functionality for the front and rear area, along with ultrasonic sensors for protecting the sides of the automated guided vehicle (AGV) and intelligent guided vehicle (IGV) delivers an efficient 360° allround protection. A mobile gateway transmits the process and localization data to the central data management system of the port terminal. By evaluating the data from all vehicles, a comprehensive picture of the position and status of every AGV in the port terminal can be obtained.

• Visionary-T 3D machine vision, LMS5xx 2D LiDAR sensor,
• UM30 ultrasonic sensor, TDC gateway systems

➜ www.sick.com/Visionary-T
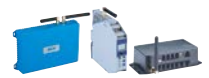
➜ www.sick.com/LMS5xx

Fill level management for terminal vehicles

The LFP Cubic and TDC-E can be used to monitor the fuel tank fill levels of the entire vehicle fleet in a port terminal. The sensors report the respective fill levels to the central data management system of the port terminal, e.g. ECS (Equipment Control System), via the TDC-E mobile gateway. There the fill levels are evaluated by an intelligent software and optionally visualized. Besides the fill level, the GSM/GPS integrated into the TDC-E transmits localization data as well as other sensor signals in real time.
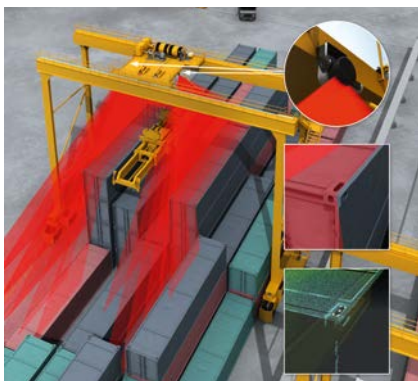
• LFP Cubic level sensor
• TDC gateway systems

➜ www.sick.com/LFP_Cubic

➜ www.sick.com/TDC

Container stack profiling with corner recognition

The high-resolution LMS5xx 2D LiDAR sensor mounted on the trolley of the crane system generates a detailed image of the container stack contour. Beside the actual profile of the containers, the LMS5xx also precisely detects its corners and any twistlocks present. The TDC-E mobile gateway reports the already pre-processed process and service data to the central data management system of the port terminal thereby ensuring a very high system availability.

• LMS5xx 2D LiDAR sensor
• TDC gateway systems

➜ www.sick.com/LMS5xx

➜ www.sick.com/TDC

Contour detection of stacks of containers

The DT1000 long range distance sensor detects the container stack contours below a gantry crane. Two additional, diagonally arranged DT1000s mounted on the trolley also detect any displacement of the containers relative to one another. In the event of displacement, the process can be stopped or slowed down in a timely manner and the spreader realigned to the containers. The TDC-E mobile gateway supplies the visualization and process data to the crane driver or the central data management system of the port terminal.

• Dx1000 long range distance sensor
• TDC gateway systems

➜ www.sick.com/Dx1000

➜ www.sick.com/TDC

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**

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