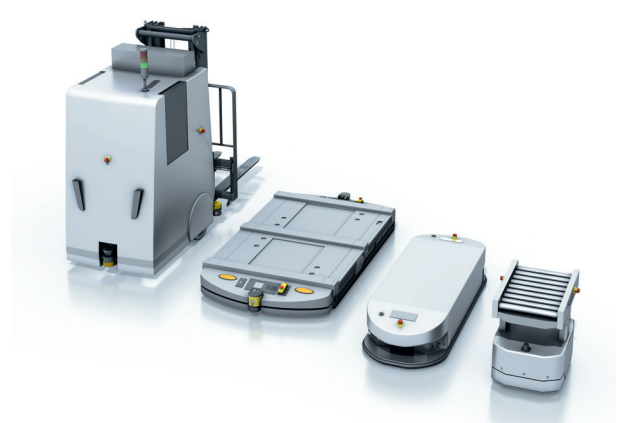# INDUSTRIAL VEHICLES

SENSOR SOLUTIONS FOR AUTOMATED GUIDED VEHICLES

Move more with intelligent sensors.

SICK
Sensor Intelligence.

TASKS FOR AUTOMATED GUIDED VEHICLES AND SYSTEMS

Automated guided vehicles (AGVs) and systems (AGVS) are nowadays used in practically every industry. Whether for production supply, as a transport platform in flow production or an integrated component of warehouse logistics, the potential applications for AGVSs and their status as flexible, economical, future-proof solutions have grown considerably in the last few years. SICK is an independent, world-leading developer and manufacturer of intelligent sensor systems and offers the largest portfolio of products for automating various types of mobile platforms. Our sensor solutions make transport tasks safer, quicker and more transparent. SICK uses its extensive expertise in sensor and systems technology to provide impressive solutions for all phases of the production and logistics process, whatever your industry.

Read more about sensor solutions for industrial vehicles
➔ www.sick.com/industrial_vehicles
➔ www.sick.com/mobile-platforms

Personnel detection and machine safety

Since their introduction more than 30 years ago, automated guided vehicles are mobile, collaborative machines which share traffic routes with manned industrial trucks and persons. Reliable person detection systems are required to prevent danger to persons in these surroundings. Due to international standards such as DIN EN 1525 and ANSI B56.5, high requirements are placed on person detection systems. SICK safety laser scanners are the standard-compliant solution which can be integrated flexibly into vehicle design and adapts dynamically to the current direction of travel.

Environment perception

Collisions between automated guided vehicles and objects can be extremely costly and significantly reduce system throughput. Even safe sensing devices do not detect objects such as suspended loads or goods protruding from a shelf. 3D sensor systems, such as multi-layer LiDAR sensors or vision cameras with TOF technology, on the other hand, are able to detect all objects. 3D sensors also measure the position of goods in real time, optimizing the load handling process of goods.

## Localization and navigation

Industrial truck automation concentrates on how the vehicle navigates. If the vehicle is unable to localize its position, it is unable to navigate. The vehicle can determine its position on a physical track or with the aid of a map-based localization system. SICK's sensor portfolio includes sensors for all industry-standard localization principles.

Load handling and identification

Load handling requires high demands not only on automated vehicles, but on sensors as well. The sensors need to be able to detect different surfaces and load geometries so that the load can be correctly identified and positioned. Non-contact identification systems offer full traceability for goods transported with automated vehicles.

PERSONNEL DETECTION AND MACHINE SAFETY
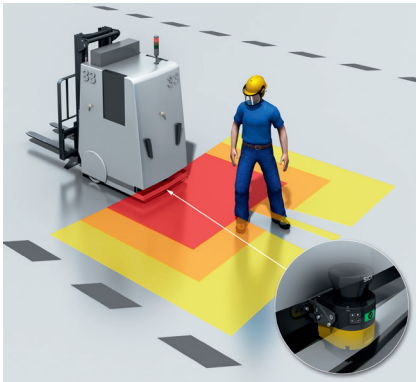
Complete safety system for automated guided vehicles

Automated guided vehicles need safe personnel protection systems to prevent collisions. SICK's non-contact, compact, adaptive safety laser scanners provide the solution. The S300, S3000 and microScan3 product families offer a variety of different scanning ranges and fittings to suit any format of vehicle. With up to 128 freely definable protective fields, human presence detection parameters can be perfectly tailored to any driving scenario.

- microScan3 Pro, S300 Expert, S3000 Expert safety laser scanners

→ www.sick.com/microScan3_Pro
→ www.sick.com/S300_Expert
→ www.sick.com/S3000_Expert

Protecting a transport cart with safety laser scanners

Flexible material transportation to the production line is carried out with small automated guided vehicles, known as transport carts (AGC). Thanks to its compact dimensions, the S300 Mini safety laser scanner can be fully integrated into small vehicles. It delivers non-contact detection of people and objects located in the path of an AGC, avoiding the mechanical damage that can be caused when using switching bars or bumpers.

- S300 Mini Standard safety laser scanner

→ www.sick.com/S300_Mini_Standard

All-round protection for automated guided vehicles

The automated guided vehicle's main driving direction is not the only area requiring protection: The vehicle's sides do as well. The S300 safety laser scanner features a scanning angle of 270°. When installed on the two corner areas of the vehicle, the laser scanners also provide protection to people located along the vehicle's sides.

- S300 Expert safety laser scanner

→ www.sick.com/S300_Expert

## Safe speed and steering angle detection on automated guided vehicle systems

In order to adapt the automated guided vehicle's protective fields to its exact driving scenario, the steering angle and speed must be captured by the drive and scanning units. The complete system, which comprises the Flexi Soft safety controller, MOC motion control module and DFS60S Pro safety encoders, enables dynamic protective field switching.

- Flexi Soft, MOC safety controller
- DFS60S Pro safety encoder

→www.sick.com/Flexisoft
→ www.sick.com/DFS60S_Pro

ENVIRONMENT PERCEPTION
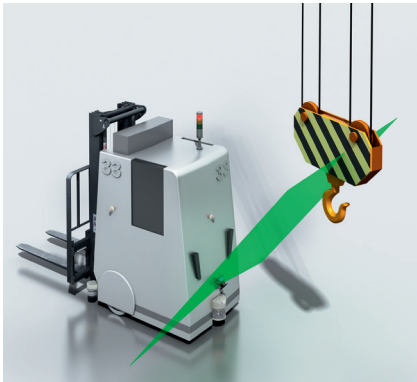
Avoiding collisions between AGVs and loose hanging objects

The upwards angled installation of a compact TiM3xx 2D LiDAR sensor allows loose hanging objects to be detected in time. The monitoring fields can be flexibly defined, enabling any objects inhibiting the sides of the vehicle to be detected, too.

- TiM3xx 2D LiDAR sensor

→ www.sick.com/TiM3xx

Collision avoidance of AGVs in complex environments

Configuring monitoring fields diagonally in the direction of travel is not always possible – or enough. The compact LMS1xx 2D LiDAR sensor can be installed on the sides of automated guided vehicles, offering reliable detection of objects protruding from shelves, thus preventing collisions.

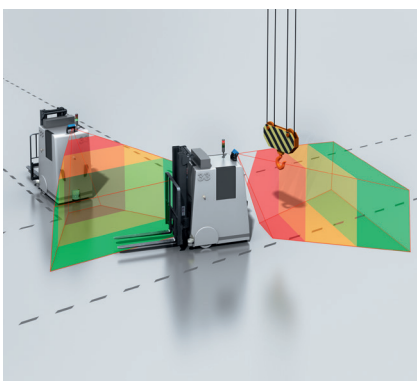- LMS1xx 2D LiDAR sensor

→ www.sick.com/LMS1xx

Optimizing system availability with 3D LiDAR sensors for collision avoidance

The MRS1000 3D LiDAR sensor scans four angularly offset layers simultaneously, offering reliable detection of very flat objects, located close to the floor. The sensor's integrated ground reference evaluation detects declines and stairways or loading ramps. Smart evaluation across all levels of switching fields means that any accidental triggering of individual levels can be ignored, increasing reliability.

- MRS1000 3D LiDAR sensor

→ www.sick.com/MRS1000

Spatial collision avoidance for automated guided vehicles with 3D vision

Detecting objects with 3D vision sensors allows definable spaces to be constantly monitored. Previously, several 2D LiDAR sensors were needed to monitor the entire vehicle path. Now however, the Visionary-T DT 3D vision sensor can create a point cloud showing all the objects visible in a monitored space. Using 3D snapshot technology the sensor can also be used for fine positioning, e.g. for imaging pallets and identifying alternative routes around an obstacle.

- Visionary-T 3D vision sensor

→ www.sick.com/Visionary-T

# NAVIGATION, LOCALIZATION AND LINE GUIDANCE
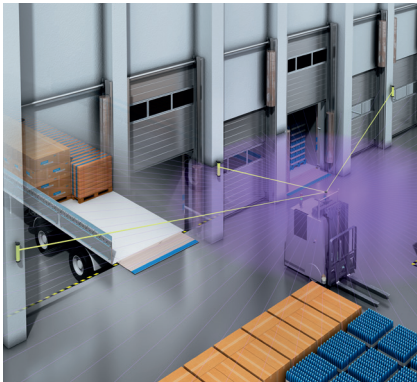
2D LiDAR sensors, specially designed for navigation and featuring integrated position calculation

Free laser navigation is the most flexible form of navigation technology. The NAV350 2D LiDAR sensor was specially developed for dynamic precision laser navigation in industrial applications. With a scanning angle of 360° and a scanning range of up to 250 m, it can even be used for automated guided vehicle (AGV) location in spacious environments. NAV350 detects natural contours as well as artificial landmarks (reflectors) and uses them to give a precise calculation of the vehicle's absolute position.

- NAV3xx 2D LiDAR sensor

➜ www.sick.com/NAV3xx
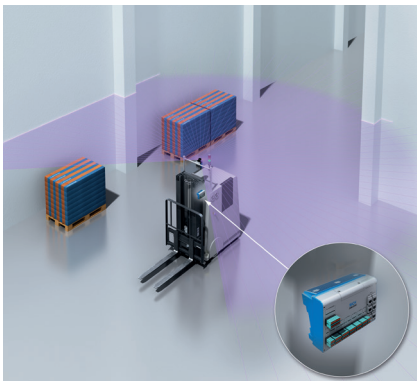
Position calculation for vehicle location based on natural contours

In contour navigation, a LiDAR sensor scans existing contours around the automated guided vehicle system's environment and saves the measurement data in a "map." On subsequent trips, the vehicle localizes its position by comparing the map with up-to-the-moment measurement data. Contour navigation requires the installation of no additional equipment, such as reflectors, meaning that the vehicle's routes can be altered at any time. NAV-LOC delivers absolute data on vehicle position and its orientation in an environment.

- NAV3xx 2D LiDAR sensor

➜ www.sick.com/NAV3xx
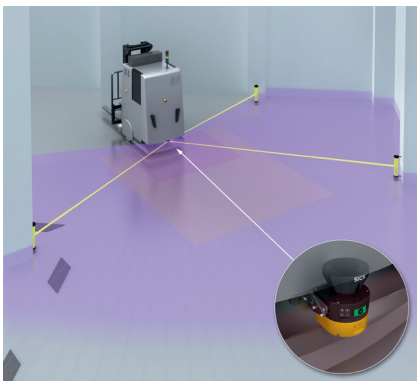
Laser navigation and safe personnel protection with safety laser scanners

The S300 Expert, S3000 Expert or microScan3 safety laser scanners send measurement data about the scanned environment to the navigation controller, which then uses this data for localization and navigation. Meanwhile and independently of this, the scanner monitors the protective fields. The safety laser scanner's intelligent dual use function gives the option to design compact, more cost-effective vehicles.
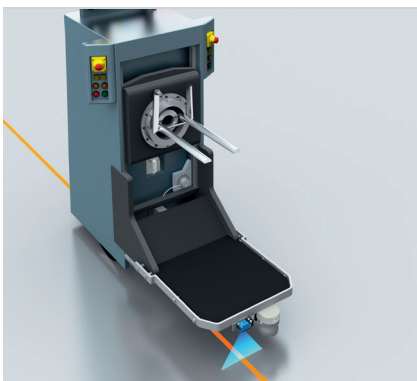
- S300 Expert, S3000 Expert, microScan3 Pro safety laser scanners

➜ www.sick.com/microScan3_Pro
➜ www.sick.com/S300_Expert
➜ www.sick.com/S3000_Expert

Line guidance for automated guided carts (AGC)

With optical line guidance, installing and maintaining lines is particularly easy and economical. The OLS optical line guidance detects conventional luminescent adhesive tape regardless of the background, contamination or surface defects. Magnetic line guidance is not sensitive to environmental conditions such as strong ambient light, condensing atmosphere or contamination of the line.

- MLS, OLS line guidance sensors

➜ www.sick.com/OLS
➜ www.sick.com/MLS

LOAD HANDLING AND MOTION MONITORING

Measuring fork height with wire draw encoders

The EcoLine wire draw encoder has a maximum measuring length of up to 10 m, perfect for positioning the lift height of forklift trucks. This wire draw encoder was especially designed to meet the industry's high demands. EcoLine encoders are defined by a slim, lightweight design, high modularity and flexibility of mounting. Special cable output nozzles protect the sensors from damage caused by knocks and vibrations.

- EcoLine wire draw encoder

➜ www.sick.com/EcoLine

Compact and wear-free: optical distance sensors for measuring fork height

With compact, precise DT50-2 Pro mid range distance sensors, the position of the fork on an automated forklift truck can be determined without contact. Thanks to the patented HDDM time-of-flight technology, SICK's optical distance sensors are extremely resistant to ambient conditions, such as ambient light and airborne particles.

- Dx50-2 mid range distance sensor

➜ www.sick.com/Dx50-2
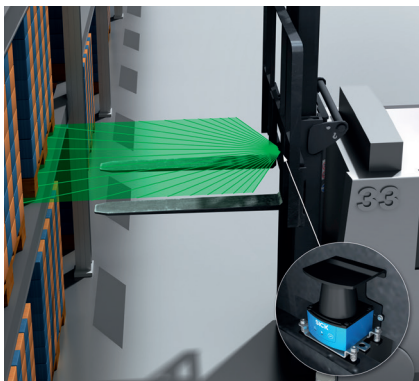
Empty bay detection for different load carriers

During storage bay checks, single-beam sensors are not always able to detect metal boxes reliably. This is where compact TiM1xx 2D LiDAR sensors excel. The laser scanner scans the entire width of the storage bay with its two-dimensional scanning surface and detects load carriers of all shapes and sizes. Alternatively, the TiM5xx 2D LiDAR sensor determines the profile of the shelf front, using the 2D point cloud as a positioning aid.

- TiM1xx, TiM5xx 2D LiDAR sensors

➜ www.sick.com/TiM1xx
➜ www.sick.com/TiM5xx

Steering angle and speed monitoring on automated guided vehicles

The steering angle drive features an AHS/AHM36 CANopen absolute encoder that records the active steering angle and determines the dynamic direction of movement. The DBS36 Core incremental encoder is used for speed measurement. Speed data, steering angle data and other parameters, such as load-carrying position and load weight, are important for monitoring vehicle stability.
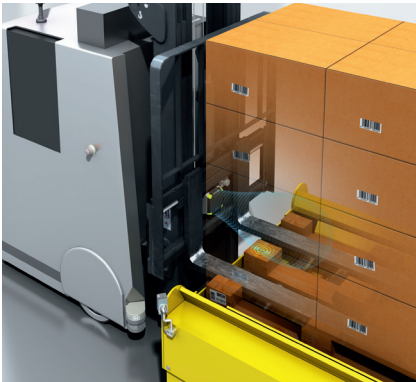
- AHS/AHM36 CANopen absolute encoder
- DBS36 Core incremental encoder

➜ www.sick.com/
AHS_AHM36_CANopen
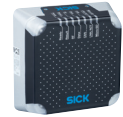➜ www.sick.com/
DBS36_Core

IDENTIFICATION

AGV identifies goods with RFID for complete goods flow traceability

RFU62x RFID read/write devices can detect tags at ranges of up to 1 m. This means that pallets or trolleys can be identified during the AGV's approach: once read, the tag data is verified via the warehouse management system, supporting consistent traceability of goods flows.

- RFU62x RFID read/write device

➜ www.sick.com/RFU62x
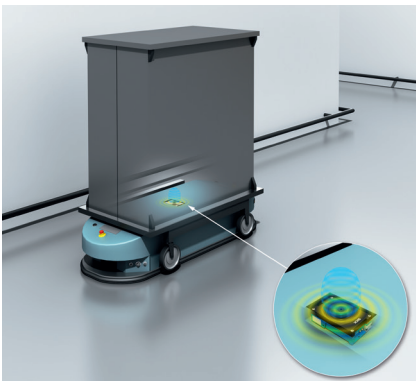
RFID read device for the accurate identification of load carriers

When the material flow is managed by automated guided vehicle systems, it is essential that the vehicle is able to identify load carriers accurately. To prevent loads from being placed in the wrong carrier, it is important that only the RFID-tag for the relevant load carrier is recorded. This task is achieved by the RFH6xx RFID read/write device, which has a working range of up to 80 mm.

- RFH6xx RFID read/write device

➜ www.sick.com/RFH6xx
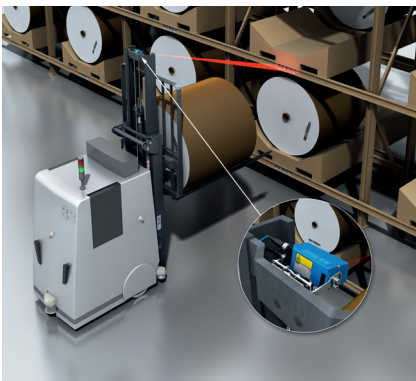
Goods identification and traceability with bar code scanners

The CLV65x bar code scanner reads the bar code on the shelf and delivers the data to a central computer. This assigns the automated guided vehicle (AGV) to the corresponding path so that the load can be incorporated into the production process as scheduled. The real-time autofocus function achieves a greater depth of field, enabling a high read rate, even when the vehicle is in motion.

- CLV65x bar code scanner

➜ www.sick.com/CLV65x
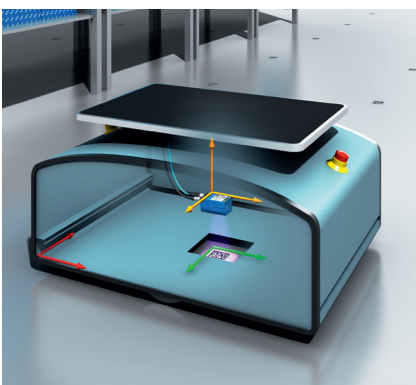
Identifying Points of Interest (POI) and fine positioning

Navigation solutions, such as line guidance or magnetic grids, are not able to permanently establish an absolute position. For this reason, AGCs need to receive additional information about their current location at the POI (workstations, crossings, loading stations, etc.). The POI is equipped with optical markers. The GLS smart vision sensor reads the 2D code and reports the exact positional deviation and angular position (pose) of the marker to the vehicle.

- GLS grid localization sensor

➜ www.sick.com/GLS

SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 9,700 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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