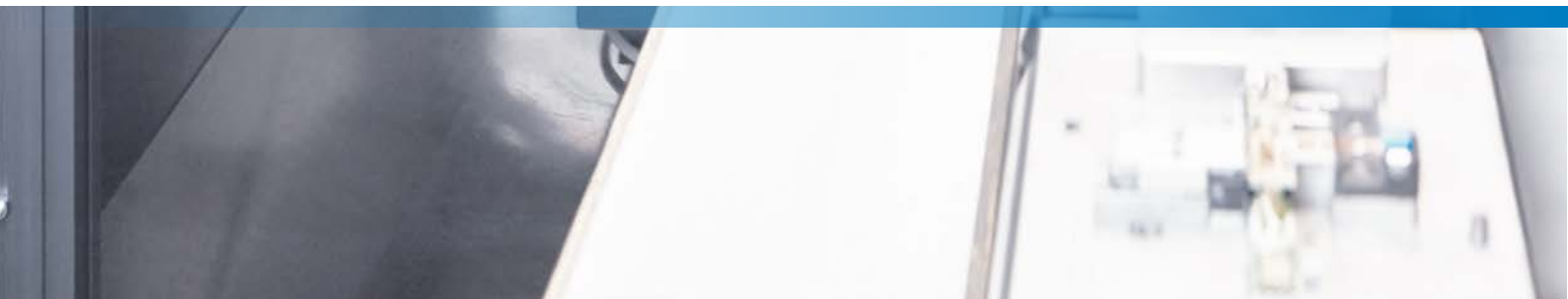# Sensor solutions for robotics
## WORKING TOGETHER AS EQUALS

SICK
Sensor Intelligence.

CHALLENGES FOR ROBOTICS

Humans and robots are working more closely together. Sensors help robots make more intelligent decisions and give them the ability to sense objects, the environment, or their own position. Thanks to sensors from SICK, robots perceive more precisely - the prerequisite for close collaboration. For all challenges in the field of robotics: Robot Vision, Safe Robotics, End-of-Arm Tooling, and Position Feedback. Flexible automation solutions thanks to Robot Vision technology and freely accessible robotics applications - this is the future that has already begun. Sensor solutions from SICK make this future possible. Humans and machines work hand in hand - just like SICK together with its customers.
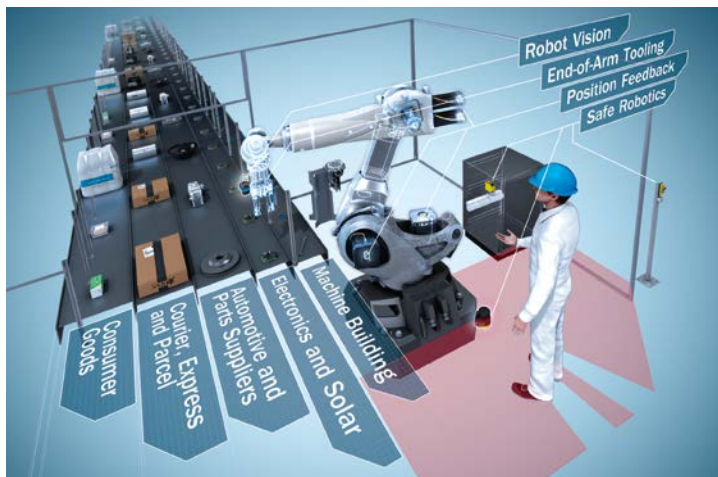
➜ www.sick.com/robotics

ROBOT VISION

Image-based solutions which enlarge the field of vision of the robots are increasingly becoming the focus. Thanks to vision technology from SICK, the robot localizes and identifies defined objects in advance and decides by itself how to grip the respective part. Thereby, there is no need for mechanical attachments such as object guides. Even measurements and quality inspections can be carried out. For example, optical monitoring systems can monitor the position and quality of products and harmonize the sequence during the joining process.

SAFE ROBOTICS

The close and, at the same time, safe collaboration between humans and robots on an equal footing is the prerequisite for high productivity, increasing efficiency, and improved ergonomics. Safety technology thereby plays a key role. SICK's extensive portfolio of safety solutions enables unimpaired and safe human intervention into the robot system and reduces downtime in production. This can be achieved with an adaptive perception of the environment with the aid of intelligent, rugged, and reliable sensors and safe systems.

END-OF-ARM TOOLING

The sensitivity of gripper arms is becoming increasingly important, especially when it comes to flexible production and batch size 1. Intelligent object detection is the key to complex automated applications Light sources and detection functions can be customized and preset in line with special object properties relating to material, surface, or form, for instance. The intelligent sensors from SICK cover all applications for End-of-Arm Tooling and the respective feed systems.

POSITION FEEDBACK

Motor feedback systems in the field of robotics deliver the data on speed and position as well as on the condition of the drives to the control system. They thereby create the sensory foundation for all robot movements. These Smart Motor Sensors from SICK are right in the center of the action and provide the necessary data for the efficient control of the robot and the plant.

COMPLETE SAFETY SOLUTIONS

Planning, development and implementation from a single source

- Do you know the safety risks of your robot application?
- Have you done a risk assessment and must now take suitable action to reduce risks?
- Are you familiar with the guidelines and standards that are applicable to robot applications
- Do you need assistance with how these guidelines and standards apply to your robot application?
- Is the interaction between human and robot in your application so close that the stringent safety requirements and validation for a human-robot collaboration must be applied?

Our certified safety experts are ideally placed to answer all of these questions. Tailored to your individual requirements, they implement your projects quickly and efficiently at every stage – from the concept to acceptance. At SICK, you will receive the most up-to-date technical protective devices, the associated services as well as professional product management, all from a single source.

FROM THE CONCEPT TO ACCEPTANCE

Machine manufacturers and users   **User**
Construction, modification, chain-linking of machines and systems

Risk assessment → Safety concept → System design → Installation and commissioning → Overall validation → C E → Safety equipment check

Significant change

Specialists on-site, wherever you are.

ROBOT VISION

Robot-assisted picking of individual parts in an assembly plant

To manufacture a torque transducer, components are transported on a pallet to a work station. The PLOC2D robot guidance system distinguishes between these parts by means of its 2D object localization capability and feeds them to the assembly facility in the correct sequence. There they are assembled into a complete torque transducer. The image processing unit of the system locates the exact position of the parts and guides the robot to the correct location. This eliminates the need for part-specific compartments on the pallet as the parts can be located in different positions on the pallet.
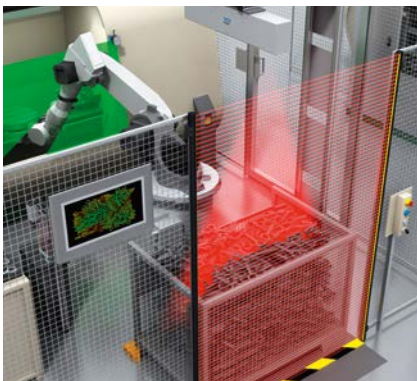
➜ www.sick.com/PLOC2D
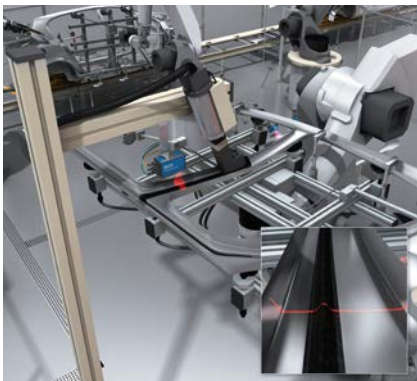
3D monitoring of adhesive beads

The inline quality inspection for glue – from applying the glue to the glue quantity check and up to checking for bubbles – is one of the main tasks in the glueing process. The 3D vision sensor TriSpectorP1000 enables reliable implementation of sophisticated 3D contour checks.

➜ www.sick.com/TriSpectorP1000

Part location in boxes

Piston rods are delivered in boxes as bulk materials. The rods must be separated from the boxes for further processing. The PLB system solution supplies the robot with the necessary information to take the parts out of the box individually. The connecting rods are then placed into the machine at the specified position and aligned accordingly.

➜ www.sick.com/PLB
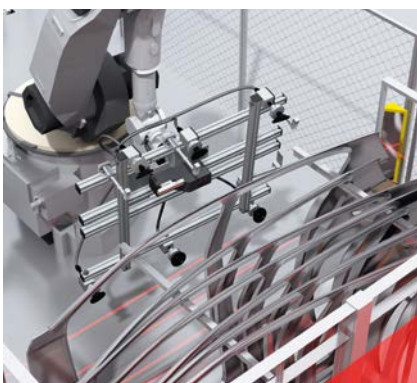
Pick up of raw body components for mounting

The robots grip the parts autonomously out of the rack. The vision system finds the gripping position and provides an output to the robot to move to the corresponding location, irrespective of the position tolerances in the rack. The parts are inserted into machine with high accuracy for further processing. Device replacement is an easy operation: the vision system has integrated tools for calibration and communication with the robot. The calibration image is used to determine the robot's position.

➜ www.sick.com/PLR

SAFE ROBOTICS

Safety with cooperative robot applications

Safe Robotics Area Protection is a safety system for protecting cooperative robot applications. The system ensures safe, free access for the worker in the hazardous area of the robot. This optimizes work processes.

This is made possible with simple adjustment of the field sets of the safety laser scanner to the requirements of the respective production process step. The robot reduces its speed when approaching the worker, regardless of the distance. A two-stage reduction or increase in robot speed minimizes downtimes and results in higher productivity.

➜ www.sick.com/Safe_Robotics_Area_Protection
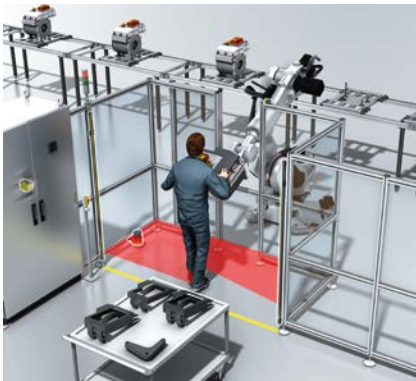
Safe human-robot cooperation in the final assembly of electric motors

A worker attaches non-rigid parts to an electric motor, e.g. a protective cover on a hybrid powertrain. A robot takes electric motors from a conveyor and passes them to the worker. Once the worker has applied the protective cover to the powertrain and exits the protected area of the robot, it starts up again automatically. This has been implemented by means of a safety concept comprising a safety laser scanner, microScan3, deTec4 Core safety light curtain, and a Flexi Soft safety controller.

➜ www.sick.com/Flexi_Soft
➜ www.sick.com/microScan3_Core
➜ www.sick.com/deTec

Linking handling robots

An increased level of automation brings about increased safety requirements for systems and processes. In the case of conveyor systems in particular, numerous safety switches and sensors are therefore installed in order to protect the systems. Flexi Loop from SICK enables a cost-saving, safe series connection of up to 32 safety sensors while maintaining the highest level of safety. Furthermore, Flexi Loop transmits detailed diagnostics information about the location of and reason for circuit protection events, guaranteeing system productivity at all times.

➜ www.sick.com/Flexi_Loop
➜ www.sick.com/Flexi_Soft
➜ www.sick.com/RE2

Safe robot platform for the end inspection of navigation systems

At a redundant final inspection station, a robot platform navigation grips navigation systems from a conveyor belt and leads them to the test machines for final quality control. After a successful inspection, the robot places the component back on the conveyor belt. Two S300 Advanced safety laser scanners and the Flexi Soft safety controller ensure safety in the cooperative operation between human and machine. When the safety fields are violated, the robot reduces the speed down to a stop and enables automatic restart as the protective fields are sequentially exited.
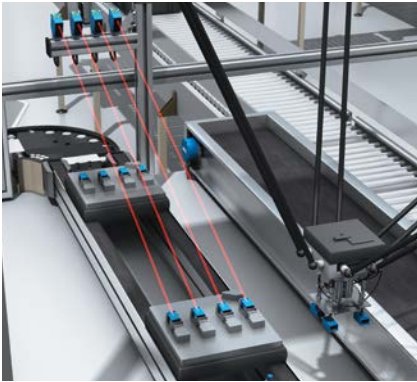
➜ www.sick.com/TR4_Direct
➜ www.sick.com/S300_Advanced
➜ www.sick.com/Flexi_Soft

END-OF-ARM TOOLING

## Detecting workpiece carriers and checking presence of parts

The IQ06 and IQ10 inductive proximity sensors monitor workpiece carriers along the production line and signal the presence of a carrier to the pick-and-place robot. The ASIC technology from SICK ensures high accuracy of the effective sensing range. The large sensing range and flexible mounting options allow for significant flexibility in terms of machine design. Using an output signal switching device, the PowerProx MultiTask photoelectric sensor (WTT12) can signal the presence of part on the workpiece carrier to the robot controller, even from greater distances.

→ www.sick.com/PowerProx
→ www.sick.com/IQ_Standard
→ www.sick.com/IQB
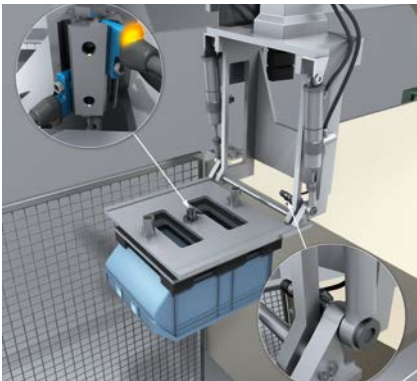
Gripper function monitoring

The MZCG magnetic cylinder sensor monitors the pneumatic cylinder in the gripper. The sensor features a short switching point optimized for gripper applications, which increases process efficiency due to higher PSDI times. The rugged mounting holds the sensor in the required position, even when exposed to shock and vibration, and increases the reliability. The MZCG fits into all standard C-slots, regardless of the cylinder profile or make. The IME08 inductive proximity sensor detects the end position of the flap axis integrated into the gripper.

→ www.sick.com/MZCG
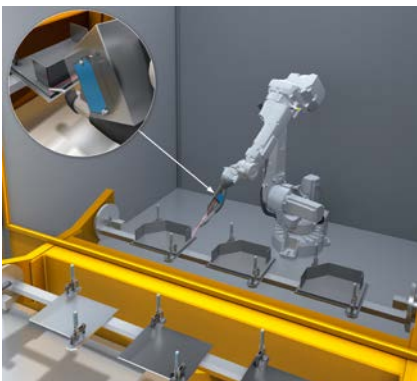
Optimizing welding lanes

During optimized welding, the OD1000 distance sensor measures the distances to objects such as components and transmits the acquired data directly to the robot control. The robot can optimize the welding lane based on this data.

→ www.sick.com/OD1000

Pressure monitoring in the vacuum removal gripper

Finished parts are removed from the mold by the vacuum removal gripper on a robot. With its positive and negative pressure ranges, the PAC50 pressure sensor is well suited for determining and monitoring the suction pressure in the gripper. The analog output signals of the PAC50 can be inverted specifically for negative measuring ranges.

→ www.sick.com/PAC50

POSITION FEEDBACK

Articulated arm robots

With its compact design, the EEM37 motor feedback system is suitable for all articulated arm robot versions. With HIPER-FACE-DSL® technology, it enables new applications such as safe robotics for optimal human-robot collaboration. The motor feedback system fulfills the safety requirements of SIL2/PL d and implements perfect condition monitoring up into the drive axis due to the electronic type label and usage chart. Thanks to the high resolution of 17 bit per revolution and 12 bit multiturn, high lane and positioning accuracy of the TCP can be realized.

➜ www.sick.com/
EES_EEM37

Linear robots (Cartesian)

The TTK50 and TTK70 motor feedback systems from SICK work with a non-contact measurement principle and are therefore wear-free. The axis position can be reliably identified even if the magnetic tape comes into contact with contamination or condensation. The motor feedback system thereby enables maintenance-free operation at a traversing speed of up to 10 m/s. Thanks to the absolute length measurement system, reference runs are no longer necessary. This makes the system ideal for linear applications for measurement lengths of up to four meters.

➜ www.sick.com/TTK70
➜ www.sick.com/TTK50

SCARA robots

SEM70 is a motor feedback system with HIPERFACE® interface for large hollow shaft and torque motors. With only 24 mm in height, its design is very flat, which simplified integration into the robots. 32 sine-cosine periods per revolution are available for position formation. The additional multiturn variant with mechanical gear mechanism can record up to 4,096 revolutions, making an external battery buffer unnecessary. The hollow shaft enables cables to be routed internally for SCARA robots.

➜ www.sick.com/
SES_SEM70

Delta robots

Due to its compact design, the SKM/SKS are well-suited for very dynamic applications such as delta robots. The motor feedback systems for the standard performance range achieve 128 sine-cosine periods per revolution. Absolute position determination is performed with a resolution of 4,096 increments per revolution and 4,096 revolutions with the multiturn system. The position value can be programmed. All variants feature an electronic type label and a HIPERFACE® interface and fulfill the safety requirements according to SIL2/PL d.

➜ www.sick.com/
SKS_SKM36

SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 8,800 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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