

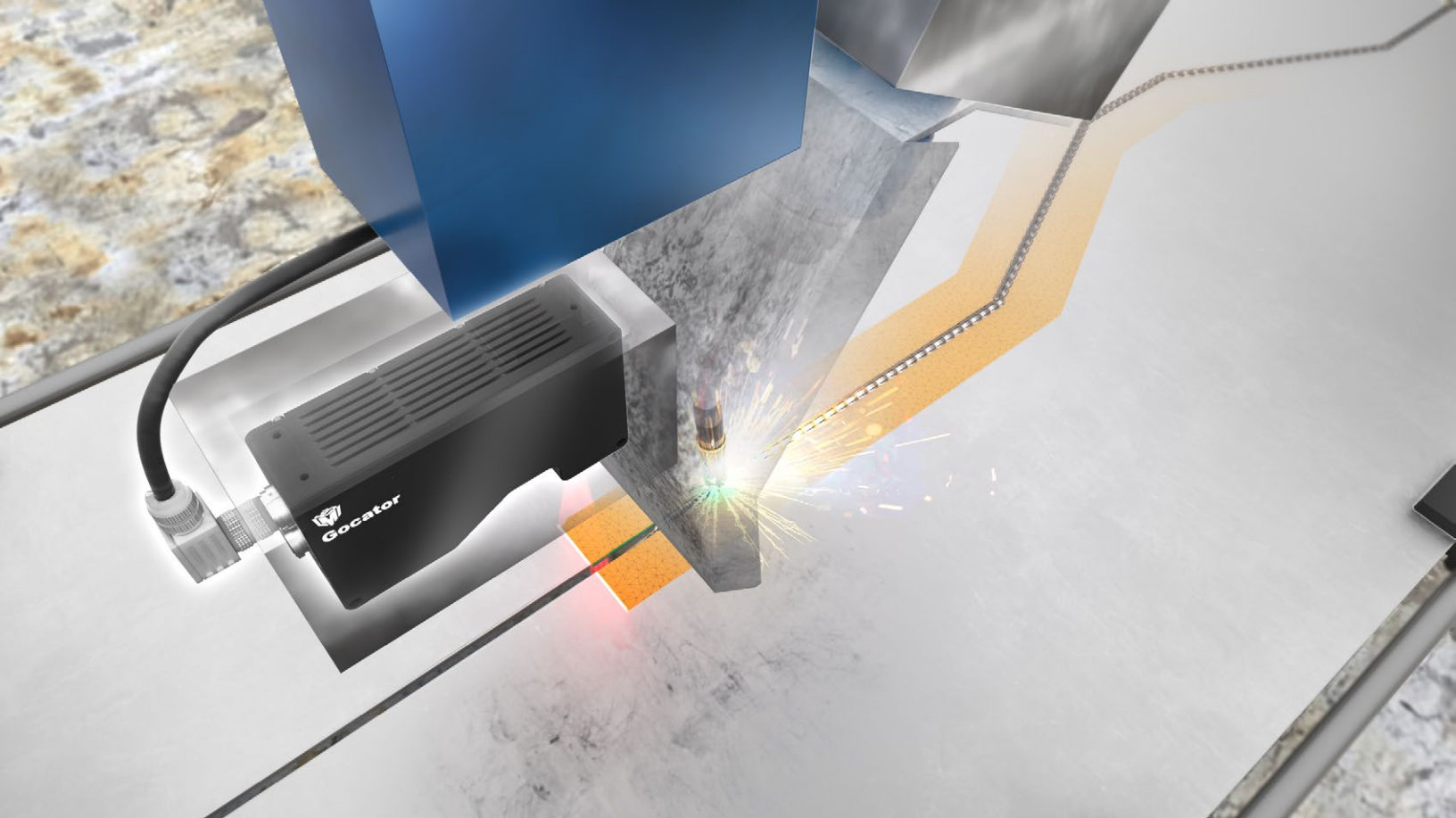
ROBOT VISION GUIDANCE FOR AUTOMATED ASSEMBLY APPLICATIONS



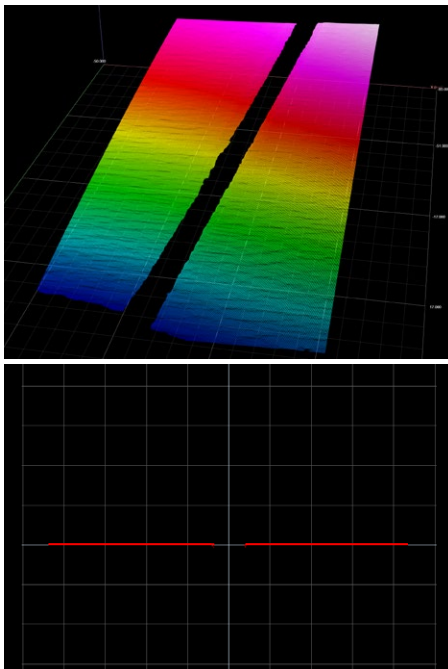
Today's industrial robots require a pre-programmed motion plan. This is because without machine vision, parts must be exactly positioned in order for the robot to locate them in space. In many assembly applications, however, part tolerance stackups lead to levels of variation that make effective automated assembly with robots difficult to achieve. These types of applications are better solved by adding smart 3D machine vision to the industrial robot.

Application Example - Adding 3D Vision to Arc Welding Robots

In automated arc welding applications, a robot is precision-programmed to follow a weld path where torch positions and torch angles are specified according to narrow mechanical tolerances on the workpiece setup. To achieve a high-quality weld, any mechanical deviations must be prevented on workpieces and fixtures, and all seam locations must be 100% correct. The main challenge in this approach has been meeting the tight tolerances required to produce high-quality welds over long periods of time.



Seamfinder for arc welding



Sensor output showing the gap between two surfaces

The Smart 3D Solution

Gocator® uses non-contact laser line profiling technology, within a compact design that allows it to fit into small work areas. The sensor's visible laser light makes it easy to precisely position the robot for initial system setup. The sensor head is easily integrated with a robot controller over a standard digital interface for maximum flexibility in order to provide vision guidance to the robot. This simplifies part fixturing issues and improves weld positioning for improved joint quality.

In addition, Gocator® sensors have an embedded processor and onboard software to transform signals from the sensor head into calibrated digital data and determine the actual position of the weld seam. When Gocator® has located the seam position, the position is communicated directly to the robot controller. The robot then corrects the movement according to the actual position and executes a perfect weld every time. With this closed loop system capability, welding quality is substantially increased and costs for rework, trimming, and scrap are minimized.

This vision guided robotic system can handle seams such as fillets, butts, and edge/overlap joints. The robot is programmed with parameters such as joint type and plate thickness. During the search process, points along the joint are defined in 2 or 3 dimensions. Searches are accomplished without the arc being activated. Distance measurement can also be given for real-time Z height positioning.



Arc welding environment

Welding Environment

The arc welding environment is extremely hostile. Weld splatter, smoke, and dirt are generated by the weld operation. To protect the sensor during the actual weld, a pneumatic shutter over the sensor head provides mechanical protection. Standard cooling and air purge systems further enhance its use in harsh environments for optimum functionality and reliability.

Furthermore, an IP67-rated aluminum housing ensures Gocator® sensors are protected from moisture, dirt, and vibration.

Smart 3D In Action - Welding Car Door Hinges

Eight laser guidance systems are used to accurately locate the position of eight seam paths, which guide the spot welding process in robotic arc welding of door hinges onto car bodies.

Driven by Gocator® 3D sensors, these systems are able to guide the robot to properly position the door hinge within search times of under 1 second. With 3D location data, the robot can position the welding tip at the exact spot with a search accuracy of ± 0.1 mm. Quality welds are produced on every assembly, even when components and fixtures are not perfectly positioned.



Vision-guided assembly robot

Conclusion

Automating assembly operations such as arc welding requires the ability to determine the actual locations of one or more parts, and feeding location information to the robot controller to correct the robot path to complete a quality assembly.

Gocator® 3D smart sensors provide a solution to this challenge by delivering vision guidance in these robotic assembly applications, with the added communication ability to send position offsets to the robot controller.