Welding nut sensors from Turck replace expensive optical control process

Double Agent

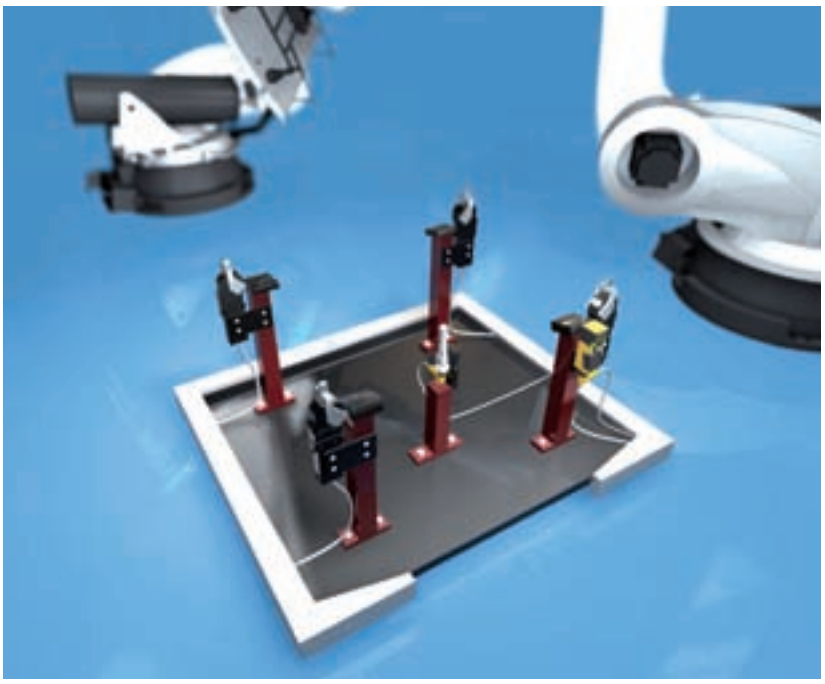
Location bolt with integrated sensor reliably identify and secure welding nuts and sleeves

Spacer sleeves and welding nuts are used to ensure that vehicle components such as frames, U-beams, car seats or tanks are assembled to meet the design requirements. If even one single nut or bushing is missing from its intended location, production comes to a standstill and the work goes into the scrap pile. Considerable costs are incurred if errors are not detected and the faulty parts remain on the production line. Even a complete chassis can become unusable for further assembly if the stabilizing elements are not welded on.

Visual checking is prone to errors

To avoid these considerable costs, it is critical to continually check that the welding nuts and sleeves are present. Fiber-optic sensors or vision systems detect the metal bolts which retain either a nut or a sleeve at a determined position.

One approach to solving the component inspection problem is the use of fiber optics which can sense the bolts laterally. However, because the weld spatter that builds up can impair the fiber optic functions and even disable them, this process is



The new welding nut sensors are primarily used in chassis construction in the automotive industry

The magnetic field sensor forms the heart of the “smart location bolt”

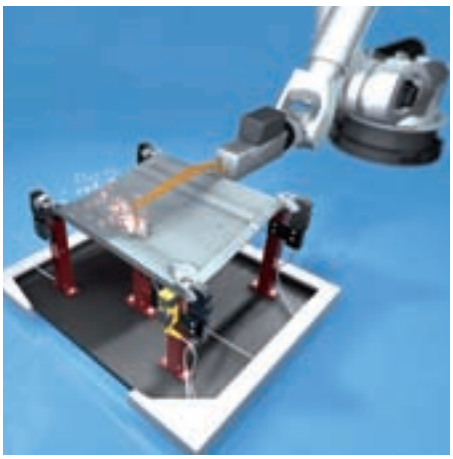
expensive and unsuitable. Laser sensors are widely used for this purpose, but this too is an expensive and unreliable process. Adjusting the sensors is relatively time-consuming and the dirt build-up caused by the welding functions can also lead to the optics rapidly becoming blocked. Image processing systems repre-

Quick read

To join sheet metal, the automobile industry frequently uses spacer sleeves. In order to ensure a smooth and zero-error production process, continuous monitoring is necessary to ensure the presence of these parts. With the new welding nut sensor, Turck is now offering an affordable and process reliable alternative to previously used and expensive optical detection methods that are prone to error or malfunction.

A sheathed stainless steel centering bushing secures the welding nuts and provides additional mechanical protection

After the operator has placed a welding nut on the location bolt, the sensor sends a signal to the PLC



After release by the PLC, the welding robots score the nuts and bushings on the sheet metal

sent the most expensive solution. In addition, they are very time-consuming to program and particularly sensitive to changing light conditions. This method uses optical sensors or cameras and can guarantee process reliability only on a very limited basis.

Process reliable sensors

Because all optical systems are prone to malfunction, customer requests for an affordable and process reliable sensor became more and more frequent. This was incentive enough for Turck to develop a robust sensor for detecting welding nuts.
An ingenious solution has been developed that not only detects metal, but also replaces the location bolt. The sensor is designed for damping caused by welding nuts and detects ferro-magnetic components such as bushings, nuts, and disks. It has a brass housing and meets the requirements for IP67 protection. LEDs reliably indicate the current switching status, including both the presence of the target as well as errors that have occured.

Because the welding nut query takes place in a harsh environment and employees do not always work carefully, the sensor must be sufficiently protected mechanically. Protection is provided by a stainless steel centering bushing that is inserted onto the sensor and secured by the nut. Together, the sensor and the stainless steel bushing form the location bolt. The welding nut sensors can detect ferro-magnetic material through non-ferro-magnetic stainless steel bushings so that they emit a signal only in the case of magnetic metals. Because the welding nuts are made of steel, they represent an excellent target for sensors.

The new Turck sensor can be programmed to sense only the nut and not the sheet metal via pin 2 of the M12 x 1 plug-in connector and an additional teach adapter (VB2-SP1). At the press of a button, the sensor “learns” both the status of just the sheet metal as well as the status of the sheet metal and welding nut so that it can reliably detect their presence. Once the programing has been learned, it remains intact until a new teach process is initiated. The major temperature changes caused by the welding process are intercepted by temperature compensation.

The “welding nut sensors” come in two different designs with various sensor signal strengths and diameters. This allows components with heavily varying material properties and diameters to be detected. A component to be detected must be located within the so-called sensitive zone in order to be detected.

The welding process

The chassis sheet metal part to be processed is first placed in the corresponding machine. After a clamp has secured the sheet metal, the operator places the nut or a sleeve on the centering pin. The sensor now has to detect the welding nut or the sleeve so that a missed welding position can be immediately displayed on the control unit. As soon as all welding nuts are in their proper places, the robots begin to score the welding nuts on to the sheet metal.

Summary

Turck’s welding nut sensor was developed for harsh environmental conditions in the welding zone so that it can be reliably used in the automobile industry. The sensor can be easily integrated into production lines and adapts to the environmental conditions in no time through an uncomplicated teach-in process. The sensor detects the welding nuts just as easily as sleeves. This guarantees a smooth production run without software, expensive programming and other electronics.

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