

Dimensional Consistency Check with Multi-SpinScan

White paper

Sensorik

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Abstract

Dimensional Consistency Check with Multi-SpinScan from Pepperl+Fuchs GmbH and VMT GmbH

When engines are manufactured in the automotive industry, a mold is made for each individual casting process and subsequently destroyed when casting is complete. The SpinScan 3D system is used to accurately verify the compliance of the entire mold with the target dimensions from the CAD design, so that any deviations can be detected before the costly and time-consuming casting process takes place. The SpinScan 3D system enhances a laser light sensor to include an additional rotational axis. This device performs individual light section triangulation measurements in a rotary movement at a high scanning rate to produce 3-D data that is free from undercuts.

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Classification

Sensorik4.0® Solutions for Industrie 4.0 Applications

Industrie 4.0 is the pioneering concept of totally interconnected production systems that support the exchange of small or large amounts of data within a process – via the cloud – and can also communicate with higher-level information systems outside conventional corporate boundaries. In contrast to the classical strategy of hierarchically structured communication (horizontally, vertically), this modern interconnected methodology offers the advantage that communication can occur anytime, between any participant, on any hierarchical layer. Sensors having the ability to communicate is a significant characteristic of Sensorik4.0®. This term embodies Pepperl+Fuchs' innovative sensor solutions for applications within the Industrie 4.0 framework.

The Solutions Park Brings Industrial Sensors to the Internet of Things

The Solutions Park demonstrates real-world sensor solutions that highlight the customer benefits of Industrie 4.0. The customer benefits of Industrie 4.0 stem from the availability of process and diagnostic data from sensors and actuators within a company's internal or external IT systems. For instance, using this data, these IT systems can perform visualization, realize model-based optimization processes, and schedule demand-based preventive maintenance processes. For such applications, Pepperl+Fuchs and our IT partners offer solutions that allow sensing technologies to be directly connected to a company's IT infrastructure.

Pepperl+Fuchs offers a wide range of products designed to collect data from spatially dispersed sensors. Then, we make that data available to application-relevant databases on the Internet. This data is accessible on these Internet portals through mobile devices or can be used by downstream processes. In the context of Industrie 4.0, the idea of continuous engineering throughout the entire product life cycle plays a crucial role: All of the data must first be collected in a digital format, then made available for electronic processing. To this end, Pepperl+Fuchs has developed a system that directly compares quality data obtained during the manufacturing process to the design data – deviations are automatically identified.

The Industrial Sensor in the Internet of Things

The Internet of Things extends the applications of industrial sensors beyond the realm of classical machine solutions. Remote and highly distributed measurement points can be networked, their information collected centrally, and then used for subsequent operations.

Description

Benefits of the SpinScan System in Sand Core Inspection

One specific application in which complex multisensor systems are used is engine production in the automotive industry. Engine blocks are cast using “lost molds,” i.e. molds that can only be used for a single casting and then have to be destroyed. A new mold must therefore be produced for every engine block to be cast. Dimensional deviations in the mold can lead to the cast engine block subsequently being unusable.

The SpinScan system is used to accurately verify the compliance of the entire mold with the target dimensions from the CAD design, so that any deviations can be detected before the costly and time-consuming casting process takes place. The verification process is so fast that no significant cycle time is lost.

The SpinScan 3D

The SpinScan 3D sensor enhances a laser light sensor to include an additional rotational axis. Individual light section triangulation measurements are taken in a rotary movement at a scanning rate of 300 readings per second.

Each light section measurement delivers a snapshot of the height profile of the object to be measured, relative to an angled position of the rotational platform. When combined, the individual measurements create a high-resolution 3-D data set that depicts the section to be measured with absolute accuracy in the form of a point set.

The special geometric design of the SpinScan sensor ensures significant advantages in terms of recording measured values. A laser in the rotational axis projects a laser line through an optical prism; this laser line rotates precisely around the sensor’s rotational axis. The laser line is tracked by two cameras attached to a cantilever that circle around the sensor’s center point.

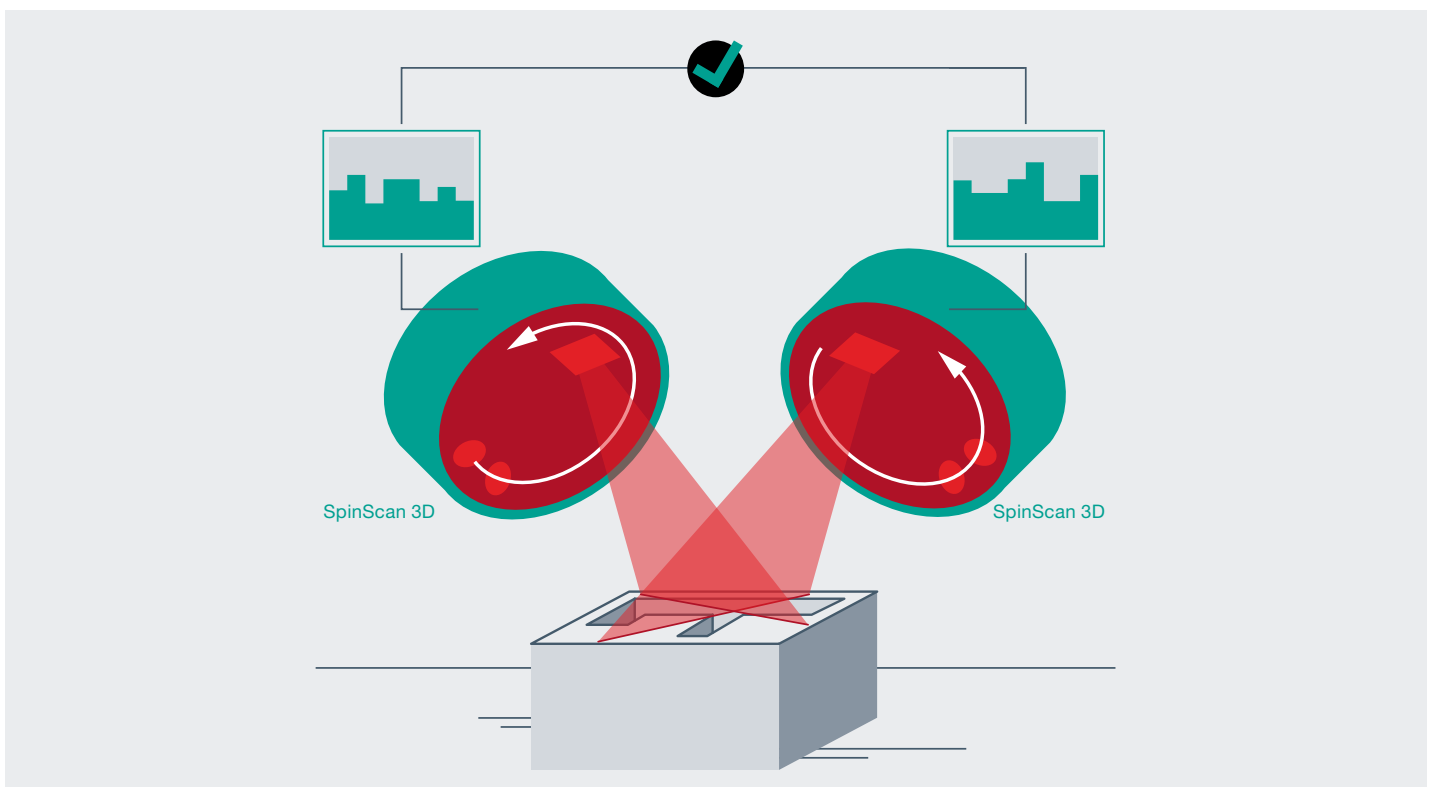
This circular movement of the imaging cameras represents the heart of this new measurement technology and creates much less measurement shadowing than conventional laser triangulation sensors that can only view the object from one side on the basis of a linear or one-sided movement. Less shadowing means more measured values and therefore a more accurate scan of the object.

Outlook

By arranging multiple SpinScan 3D sensors together, 3-D objects can be measured in extremely short time frames with a high level of accuracy and compared with the relevant target dimensions. The individual sensors are calibrated to one another so that the data produced can be combined to create a high-resolution image of the object’s surface.

This enables comparisons to be made between the actual values and the corresponding CAD data and relationships to be established between the real and virtual worlds.

Using multiple SpinScan systems is ideal for automating complex, 3-D measurement tasks where tactile methods are too slow or cannot be used.



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- Wireless Solutions
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- Industrial Monitors and HMI Solutions
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Industrial Sensors

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- Ultrasonic Sensors
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