Baumer

Sensor Solutions
Motion Control
Vision Technologies
Process Instrumentation

Application report:

Difference sensors – a new chapter in sensor technology

In order for products to withstand cost pressure, their manufacturing processes must continually become faster and more reliable. And yet, these same products must always remain one step ahead of the competition with regards to precision. While production continues to operate ever more quickly and with ever shrinking tolerances, the number of faulty products cannot increase, but instead must be decreased. Baumer provides a broad range of high-precision digital and analog laser sensors designed to measure, monitor and control these fast, precise processes. Between these there is now a new series of difference sensors which open up entirely new solutions in the field of object testing and detection.

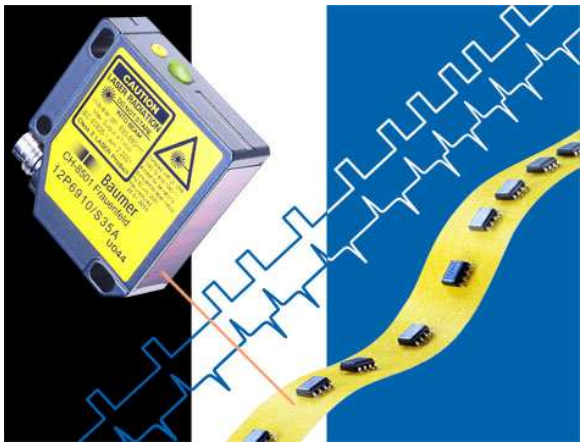

Figure 1: Counting small components moving along a swaying conveyor belt presents no problems for difference sensors.

This new series of difference sensors combines many years of practical experience in the area of precision laser sensors with the latest in technology and software. In this case, the term “difference” refers to a difference in distance. The difference is processed in various ways depending on the specific sensor. The result is then compared with a learned value in order to set the digital output accordingly. The exact distance is determined using the triangulation principle where the angle of incidence of the received light corresponds directly to the distance to the object. In this regard, the volume of light is inconsequential, something which makes the receiving sensor practically unsusceptible to color changes. It is therefore up to the software to reach the right decisions on the basis of all this information and to set the output accordingly. Differential sensors allow entirely new tasks and previously unfulfilled customer demands to be practically resolved in the simplest manner.

New Options Thanks to Difference Sensors

As an example, until now it has been extremely difficult to acquire and count small objects moving along a swaying conveyor belt. This was particularly true when the swaying motion exhibited the same magnitude as the component height. The OBDM 12 contains an algorithm that allows it to accurately register these types of parts and to set its digital output accordingly. To achieve this, the sensor measures and analyzes the change in distance over a given timeframe. If the determined change exceeds a previously learned value, the sensor reports this using a 1 ms long pulse. The smallest, teachable difference of 0.2 mm is achieved at a distance of 16 mm. The entire working range lies between 16 and 120 mm. The teaching sequence can be used to select whether the change being analyzed is in the positive or negative direction. Additional applications include: counting uniformly colored samples in a shingle stream, positioning sheet metal based on an embossed or stamped mark, and detecting weld seams or adhesion points. These sensors can also be employed to carry out surface monitoring, monitoring installation tolerances for assembly robots, checking the concentricity of a wheel and monitoring the radial runout of a disk.

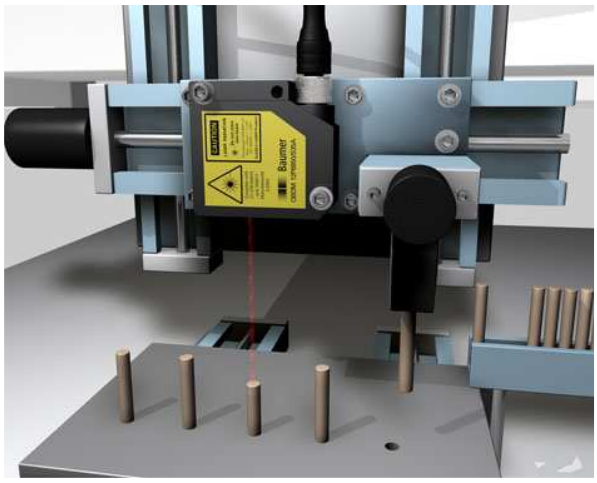

Figure 2: Head of a handling robot equipped with difference sensors to immediately check the insertion depth of contrasting shafts.

Even bakeries provide opportunities for difference sensors. If a strip of dough must retain a specific thickness when being rolled out, the sensor is provided with a tolerance window, allowing it to report immediately once the dough falls outside the specified values. If the next piece of pastry requires somewhat thicker dough, the new basic spacing is simply taught and the process continues.

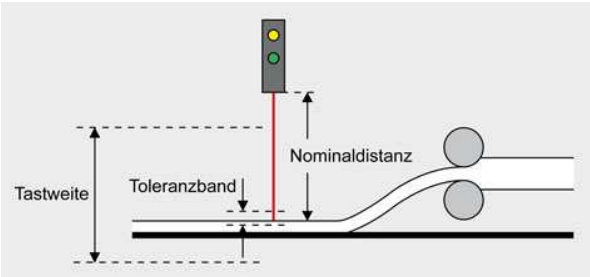

Figure 3: Downstream from the rollers, thickness is measured on the basis of a tolerance window.

Analog Sensors Provide An Infinite Amount of Information

Laser distance sensors give distance sensors upward mobility. If more than a mere Y/N signal is required, these analog sensors provide the machine controller with a high resolution signal to permit process analysis and monitoring down to the µ-level. This permits an optimization of manufacturing processes and allows faults to be detected in advance of the final check. The maximum resolution is 2 µm with a 900 µs measuring instrument, regardless of the object's color being measured.

Proven Precisions Sensor Technology

Baumer also offers a broad line of laser sensors for other applications as well. Our Series 10 offers the smallest laser sensors (10.4 x 27 x 16.3 mm). These sensors can be easily installed in even the most confined spaces. The OPDM 12 retro-reflective sensor is equipped with coaxial optics. The transmission and receptor beam lie on the same axis. The OHDM 12 diffuse sensor exhibits a black to white shift of less than 1 % across its entire 120 mm range. The advantages of a laser sensor such as repeatability, precise edge acquisition or the rapid detection of small components can be employed for a wide range of applications.