

# The Solution for Any Measurement Task

## Measuring Economically with Multisensor Coordinate Measuring Machines

**PRACTICAL TIP** Quality assurance tasks at companies have become more and more diverse as the range of products and geometric properties to be captured increases. With efficient, automated measurements, multisensor coordinate measuring machines provide the flexibility that this requires. One single machine can be used for many different measurement tasks and, with modular design, can always be updated to continue to be state of the art.

Bernd Weidemeyer

**SOME COMPANIES** still use one or more single-purpose machines for cumbersome measurements. Examples include handheld measuring devices, such as calipers and micrometers, automated roughness measuring machines, contour tracers, measuring microscopes, and comparators, along with coordinate measuring machines equipped only with image processing or purely tactile sensors. Multisensor coordinate measuring machines (multisensor CMMs) allow differ-

ent measuring principles to be used and combined to suit the measurement task. The image processing sensor is likely the most commonly used optical sensor. It allows for high measuring speed and easy operation, such as measurement functions that automatically detect geometric elements on the workpiece. With the patented raster scanning HD method, large areas can be captured at a high resolution and then simply analyzed "in the image." The Werth 3D-Patch

is based on the same hardware as image processing and expands the area of application to include measuring surface topography with high point density.

Laser distance sensors, such as the Werth Laser Probe (WLP) or Laser Line Probe (LLP) allow for rapid scanning of contours on the workpiece surface. Chromatic and confocal point, line, or area sensors are especially independent of the workpiece surface, so they can be used on optical surfaces or high-

Figure 1. Multisensor measurement using a fiber probe, image processing sensor, and chromatic focus point sensor; – the fiber probe is placed in front of the beam path of the image processing sensor with zero offset. (© Werth)



ly reflective metal components. Using the Werth Interferometer Probe (WIP), a fiber-optic measurement probe, it is possible to enter small holes and measure geometry, shape, and roughness.

Conventional touch probe systems expand the range of applications of multisensor CMMs to include capturing undercuts and other 3D geometries. The Werth Fiber Probe (WFP) tactile/optical micro-stylus offers the same flexibility, such as for highly accurate scanning of micro-structures. Also patented is the Werth Contour Probe (WCP), which can be used to measure contours and roughness, thus adding the functions of a contour tracer to the CMM.

### **Solve Many Measurement Tasks with One Machine**

It is often necessary to use several sensors to measure various geometric properties on a workpiece. For example, the image processing sensor achieves a high measuring speed for edge measurements, while the WFP can be used to measure areas and enter holes in order to determine 3D position deviations such as coaxiality (Figure 1). Because the sensors are calibrated to each other, the multisensor CMM can be used to determine the desired geometric properties in the same reference system with a single setup. When capturing contours and comparing actual results to nominals and for measuring edges and undercuts, one single machine replaces all the single-purpose machines for determining length, wall thickness, and roughness.

Not only various geometric properties, but also a variety of different workpieces can be measured using the same CMM. For example, the free-form surfaces of plastic injection molds can be captured rapidly using optical line or area sensors, and the functional dimensions can then be measured using conventional touch probe systems. All measurement tasks for plastic injection molds, from first article inspection to series measurements during production, are also covered by the multisensor CMM. Using WinWerth measurement software, it is possible to select inspection features in the measurement program for first article inspection and create the series measure-

ment program in just a few steps. In addition to the image

processing sensor and conventional tactile-electric sensors, the WLP is used for rapidly measuring flatness and the WFP for highly accurate measurements of micro-geometries.

### **Process Optimization Using Multisensor Systems**

A multisensor CMM not only saves the cost of additional machines, but also minimizes measurement time with the selection of the optimal sensor for each case. Money can be saved in comparison to the purchase of a contour tracer, for example, by retrofitting the WCP for roughness measurements (Figure 2) in an existing multisensor coordinate measuring machine. Because there is no need to change setups and measure each workpiece manually, the contour measurement for each workpiece takes just seconds instead of minutes. Another advantage is that a consistent overall report is produced.

If both the image processing sensor and a touch probe system are required, then one base machine can be equipped with both sensors. This not only has a lower procurement cost, but also brings about lower operating costs than several single-purpose machines for service work or specification reviews. With several single-purpose machines, in contrast, various measurements can be performed simultaneously. This does, however, require several employees. The measurement sequence for automated measurement of the complete workpiece using the multisensor CMM needs to be programmed only once by one single operator.

Because the same measurement software is used for all measurements on the multisensor CMM, the operator just needs basic training and brief expansion courses for new sensors. Modular design thus allows simple, low-cost adaptation to the latest technology. With software updates and

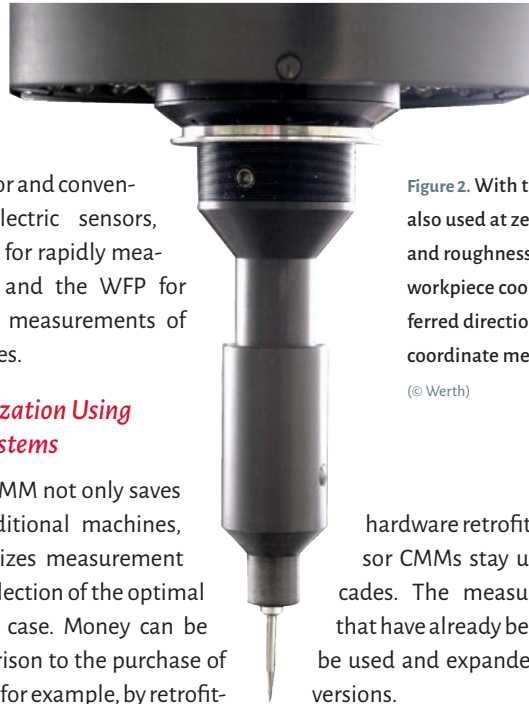


Figure 2. With the contour probe, also used at zero offset, contours and roughness can be measured in workpiece coordinates, with no preferred direction, on the multisensor coordinate measuring machine.

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hardware retrofits, Werth multisensor CMMs stay up to date over decades. The measurement programs that have already been created can also be used and expanded in new software versions.

A multisensor CMM reduces time and effort with automated series measurements of all desired geometric properties in one single machine. The measured values are available for statistical process control (SPC), thus allowing further rationalization of quality assurance. Automated documentation in an easy-to-read measurement report and measurement results that can be traced to worldwide quality standards ensure the trust of the purchaser. ■

*Translated by Werth Messtechnik GmbH*

## **INFORMATION & SERVICE**

### **CONTACT**

Werth Messtechnik GmbH  
Dipl.-Phys. Bernd Weidemeyer  
T 0641 7938-0  
mail@werth.de  
www.werth.de

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