



Flexible Multisensor Systems

Multiple Sensors Measure Without Limits

PRACTICAL TIP Multisensor systems in coordinate measuring technology can be used to capture all dimensions on a single machine, usually in a single setup. Innovative concepts such as the use of a new multisensor interface or independent sensor axes provide greater flexibility and open up new areas of application. This also increases the cost-effectiveness of the coordinate measuring machine.

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COORDINATE MEASURING MACHINES with multisensor systems can apply the optimal sensor system for each feature to be measured. Consider the example of measuring various features on a large plastic injection-molded component such as an instrument panel segment. The positions and dimensions of the installation openings can be measured quickly, with no contact, using contour image processing. In a single workpiece setup, while the geometry and spatial locations of assembled components can be measured using tactile sensors.

Integration of the sensor systems in the coordinate measuring machine is a challenge, because the full potential of each sensor

should be put to optimal use. On conventional machines, the different sensors are spaced a few centimeters apart from each other. This sensor offset reduces the shared measuring volume that can be reached by all sensors.

If a coordinate measuring machine with a 400 mm x 400 mm measurement range has a probe system mounted 130 mm away from an image-processing lens, then the measurement range covered by both sensors is now only 270 mm x 400 mm. For larger workpieces, the advantages of multisensor systems can no longer be fully utilized. In the worst case, the different sensors may get in each other's way, or features may be difficult or impossible to access due to inactive sensors.

On the instrument panel segment, for example, deep or covered features can no longer be reached by the probe because the lens would collide with the workpiece. Even accessible features have a higher risk of collision due to the sensor systems that are always present in the measurement range but inactive.

Novel machine concepts now provide even greater flexibility in the use of multisensor systems.

Variety of Sensors With No Loss of Measurement Range

The loss of common measurement range can be prevented if the machine has no off-

set between the sensors—that is, all sensors are located in the same position. In Werth multisensor systems (title illustration), the various sensors are mounted in modules that are attached directly in front the beam path of the image processing sensor with a magnetic coupling.

In order to be able to measure fully automatically using multiple sensors, the individual sensor modules are placed in parking stations and loaded in the machine as needed. For measuring the instrument panel segment in the example, this means that first the features that can be captured using image processing are measured quickly without contact. For the subsequent tactile measurements, the probe module loaded in the parking station is automatically attached at the interface and all features that require tactile measurement can be measured with no offset throughout the entire measurement range.

In addition to tactile systems, the multisensor system also supports the entire range of modern multisensor systems. The patented Werth Fiber Probe WFP/S is used to measure sensitive and/or very small features, a contour probe captures roughness in a standardized manner, and the laser distance sensor integrated in the beam path of the image processing sensor captures contours without contact. Because inactive sensor modules are safely stored in their parking stations, there is practically no risk of collision.

Greater Flexibility With Dual Ram Design

Another path to greater flexibility in the coordinate measuring machine is provided by the use of several rams. Here the sensors are distributed over independent sensor axes in order to prevent them from interfering with each other (Figure 1). Before the ram with the selected sensor (such as a probe system) can be positioned in the measurement range, the inactive sensor system on the second ram (such as the image processing sensor) is moved upward out of the measurement range. For the example measurement of the instrument panel segment, this solution means that features in deep positions that are difficult to access can be

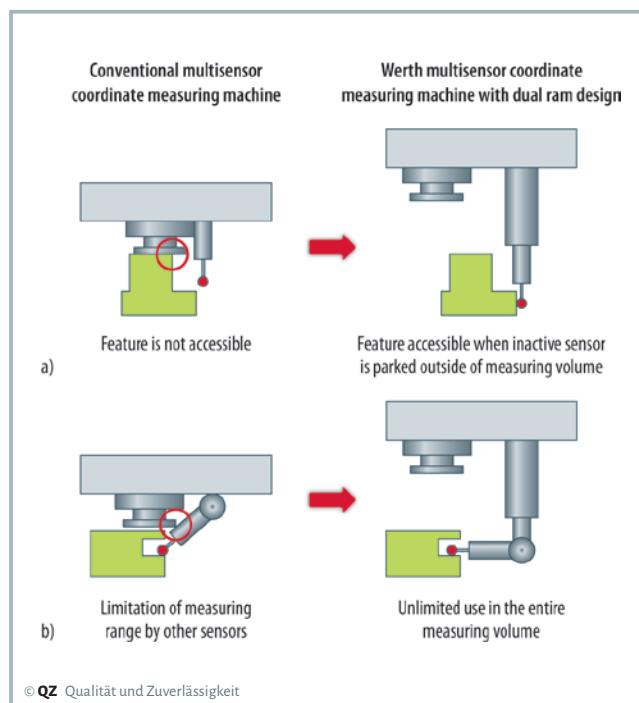


Figure 1. The dual ram design (dual Z = two Z rams) allows measuring with no spatial limitations and minimal risk of collision (a). The two independent sensor axes allow probe systems and other sensors to be used with a rotary/tilt joint that covers the entire hemisphere with no limitations (b). (© Source: Werth Messtechnik)

measured with tactile sensors with no spatial limitations (Figure 1, top), while measurements using the image processing sensor have no chance of collision with inactive probe systems.

A sensor offset between the lens and the probe cannot be completely avoided with this solution, but the slender design of the probe rams reduces this to a minimum. This also allows the use of a rotary/tilt joint in order to be able to use the probe system in any spatial orientation. Because the components of the image processing sensor are not in the way, the rotary/tilt joint can be moved through its entire hemisphere (Figure 1, bottom). The measurement time is further reduced, as there is no need to move to a parking station.

Measuring Economically With Multisensor Systems

The use of the multisensor system or a second ram also increases the cost-effectiveness of the machine. If the entire measuring volume of a coordinate measuring machine can be reached by all sensors with the use of the multisensor system, then the same measurement task can be handled on a smaller machine than would be the case for a conventional machine with a sensor offset. This results in lower costs for main-

tenance work and a smaller footprint, in addition to the lower purchase price. Upgrades with additional sensors are also available as a plug-and-play solution.

The improved accessibility of features when using machines with several independent sensor axes also saves time when creating measurement sequences and series production measurements. Perfect integration of multisensor systems in the coordinate measuring machine thus provides a cost-effective, future-proof solution in addition to maximum flexibility within the entire measurement range. ■

Translated by Werth Messtechnik GmbH

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