

Tilting influence on error characteristics of a probe for CNC machine tool

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Summary. Probes for CNC machine tools enable coordinate measurements on the machine. Their main tasks are workpiece setup before machining and its dimensional inspection during and after machining, but they can also be used to determine machine tool's kinematic errors [1]. Knowledge of the probe's triggering radius characteristic is important, especially for application of the probe in the last mentioned task.

Because spindle of a CNC machine tool not only may be vertical or horizontal, but, in case of 5-axis machine tools, can change its angular position, it's necessary to know the influence of angular position of used probe on its characteristics. Existing model of mechanical action of probes for coordinate measuring machines (CMMs) [2], with fact that probes for CNC machine tools are, generally, bigger and heavier than probes for CMMs, suggested that this influence might be significant and had to be taken into account.

Probe's triggering radius characteristic can be determined using dedicated setup developed in Institute of Metrology and Biomedical Engineering of Warsaw University of Technology [3]. This setup enables testing of probes both in vertical and horizontal position, as well as in any intermediate position, but do not enables determination of their characteristics offsets caused by the angular position's change. That's because change of angular position of the setup causes deflection of the setup's frame.

To overcome this problem, a CMM can be used to determine offset of master artifact, eg. gauge ring, in neutral position – which is equal to the offset of the probe's characteristic – in reference to the probe's body. The results of testing an exemplary probe using both the dedicated setup and CMM are presented, as well as modifications of the setup which enable easier application of a CMM.

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