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The development of 1-D nest bar measurement system

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The nest bar, or length bar, is a standard bar with two kinematic seats. The center-to-center length between seats is used as standard length for detecting geometric and thermal errors of an articulated arm coordinate measuring machine (Arm CMM) according to the guidance of ISO 10360-12:2016. Each seat shall be a kinematic seat where the center of the ball probe may be repeatedly positioned in the kinematic seats. A kinematic seat could also be a trihedral seat, conical seat or chamfered hole seat. Nowadays, a common technique for measuring the center-to-center distance is based on high accuracy CMM with 2-3 micrometer accuracy. In this paper, we introduce a new measurement method based on a combination of a 1-D length measuring machine and a He-Ne laser interferometer. The laser interferometer was aligned with the axis of a nest bar in order to eliminate the Abbe error from the measurement. A spherical probe was attached to 1-D machine's arm to represent the center point of seats when the probe was seated. The distance of bar was measured when probe was placed in each kinematic seatsby laser interferometer with compensation of the refractive index of air. The system canbe measured the nest bar with sub-micrometer accuracy.

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