

Kinematic Parameter-Independent Modeling and Measuring of Three-Axis
Machine Tools

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Abstract

The primary objective of this paper was to construct a “kinematic parameter-independent modeling of three-axis machine tools for geometric error measurement” technique. Improving the accuracy of the geometric error for three-axis machine tools is one of the machine tools’ core techniques. This paper first applied the traditional method of HTM to deduce the geometric error model for three-axis machine tools. This geometric error model was related to the three-axis kinematic parameters where the overall errors was relative to the machine reference coordinate system. Given that the measurement of the linear axis in this model should be on the ideal motion axis, there were practical difficulties. Through a measurement method consolidating translational errors and rotational errors in the geometric error model, we simplified the three-axis geometric error model to a kinematic parameter-independent model. Finally, based on the new measurement method corresponding to this error model, we established a truly practical and more accurate error measuring technique for three-axis machine tools.

Keyword : Three-axis machine tool, Geometric error, HTM,