

# Error Characteristic Analysis of a Standard Model for Geometric Metrology Digital Measuring Instruments

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*The goals of this study were to devise a standard digital measuring instrument for geometric metrology, analyze its fundamental errors, and provide a crucial basis for subsequent precision measurements. By adhering to preliminary accuracy requirements, we first formulated a theoretical standard model. Additionally, we designed a surface random point generation method and point cloud generation error model for model construction and analysis, respectively. By employing voxel filtering, we successfully reduced the original point cloud density and implemented a filtering error model. The maximum and average errors of each voxel centroid point on one face of the filtered standard model digital measuring instrument were constrained within circular radii of 0.0322 mm and 0.0076 mm, respectively. This established a benchmark for the precise measurement of model dimensions and positional errors. By exploring digital measuring instruments for geometric metrology, this study contributes significantly to the ongoing digital transformation in the field.*

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