

**ASME B89.4.19-2006**

# **Performance Evaluation of Laser-Based Spherical Coordinate Measurement Systems**

**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**



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**Three Park Avenue • New York, NY 10016**



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## FOREWORD

ASME Standards Committee B89 on Dimensional Metrology, under procedures approved by the American National Standards Institute (ANSI), prepares standards that encompass the inspection and the means of measuring characteristics of such various geometric parameters as diameter, length, flatness, parallelism, concentricity, and squareness.

Division B89.4 produces Standards and Technical Reports in the area of coordinate measuring technology, with particular focus on coordinate measuring machines (CMMs). This Standard, addressing the performance evaluation of laser trackers and similar large-scale measurement systems, is the work of the B89.4.19 Project Team on Optical CMM Evaluation.

Performance evaluation of a laser tracker presents challenges different from those associated with conventional Cartesian CMMs. Because of the very large working volume, no full-scale, three-dimensional calibrated artifacts exist, and the design of the laser beam steering system is such that individual parametric errors cannot, in general, be isolated and measured individually. For any coordinate measurement system, a fundamental requirement is a test of its ability to realize the SI unit of length, the meter. In a laser tracker, the length scale is often a laser interferometer and usually one does not have a significantly more accurate reference interferometer with which to perform such a test.

For these reasons, the performance evaluation tests in this Standard consist primarily of point-to-point length measurements using calibrated artifacts that can be realized in a number of ways. Measured lengths are compared with manufacturers Maximum Permissible Error (MPE) specifications in order to decide conformance. Realization of the SI meter can be evaluated in a number of ways, including calibration of the laser interferometer, measurement of a series of short calibrated reference lengths, or measurement of a series of long calibrated reference lengths. Procedures are also included for testing the absolute distance measurement (ADM) capability of laser trackers that include this option.

All reference lengths used in the performance evaluation tests are required to be traceable per ASME B89.7.5. Guidance is provided on how to demonstrate this traceability, as well as the traceability of subsequent point-to-point length measurements made with a laser tracker that has passed the performance evaluation tests of this Standard.

Suggestions for improvement of this Standard are welcome. They should be sent to The American Society of Mechanical Engineers, Secretary, B89 Standards Committee, Three Park Avenue, New York, NY 10016-5990.

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