



Standard Test Method for Evaluating the Performance of Systems that Measure Static, Six Degrees of Freedom (6DOF), Pose¹

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1. Scope

1.1 *Purpose*—In this test method, metrics and procedures for collecting and analyzing data to determine the performance of a pose measurement system in computing the pose (position and orientation) of a rigid object are provided.

1.2 This test method applies to the situation in which both the object and the pose measurement system are static with respect to each other when measurements are performed. Vendors may use this test method to establish the performance limits for their six degrees of freedom (6DOF) pose measurement systems. The vendor may use the procedures described in 9.2 to generate the test statistics, then apply an appropriate margin or scaling factor as desired to generate the performance specifications. This test method also provides a uniform way to report the relative or absolute pose measurement capability of the system, or both, making it possible to compare the performance of different systems.

1.3 *Test Location*—The methodology defined in this test method shall be performed in a facility in which the environmental conditions are within the pose measurement system's rated conditions and meet the user's requirements.

1.4 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

E456 Terminology Relating to Quality and Statistics

E2544 Terminology for Three-Dimensional (3D) Imaging Systems

2.2 ASME Standard:³

ASME B89.4.19 Performance Evaluation of Laser-Based Spherical Coordinate Measurement Systems

2.3 ISO/IEC Standards:⁴

JCGM 200:2012 International Vocabulary of Metrology—Basic and General Concepts and Associated Terms (VIM), 3rd edition

JCGM 100:2008 Evaluation of Measurement Data—Guide to the Expression of Uncertainty in Measurement (GUM)

IEC 60050-300:2001 International Electrotechnical Vocabulary—Electrical and Electronic Measurements and Measuring Instruments

3. Terminology

3.1 Definitions from Other Standards:

3.1.1 *calibration, n*—operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication. **JCGM 200:2012**

3.1.1.1 Discussion—

(1) A calibration may be expressed by a statement, calibration function, calibration diagram, calibration curve, or calibration table. In some cases, it may consist of an additive or multiplicative correction of the indication with associated measurement uncertainty.

¹ This test method is under the jurisdiction of ASTM Committee E57 on 3D Imaging Systems and is the direct responsibility of Subcommittee E57.02 on Test Methods.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.