ASME B89.1.7-2009

REAFFIRMED 2024

Performance Standard for Steel Measuring Tapes

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

ASME SETTING THE STANDARD

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Date of Issuance: September 18, 2009

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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. Because steel measuring tapes are widely used for the measurement and comparison of some of these features, the Chair of the B89 Division 1 — Length authorized the formation of Project Team B89.1.7 to prepare this Standard.

The overall scope of Dimensional Metrology Measuring Tape Project Team B89.1.7 is to define the requirements for steel measuring tapes for all units of measures in U.S. Customary units and SI units with respect to graduations, numbering, designations, and accuracy.

This Standard provides guidance to users and manufacturers of steel measuring tapes with respect to quality standards and preferred measuring units by specifying only the requirements that are essential for satisfactory performance. Presently, both SI (metric) and U.S. Customary (inch-based) graduations are in popular use.

Nonmandatory Appendices A and B discuss tape calibration uncertainties and provide general guidance and awareness regarding the determination and application of calibration uncertainties relative to tape calibrations. Nonmandatory Appendix A treats the subject of calibration of a tape by comparison to a master tape; Nonmandatory Appendix B discusses calibration of a tape using a laser interferometer.

Drafts of this Standard were proposed and discussed during project team meetings from January 1996 through October 2008.

This Standard was approved by the American National Standards Institute on June 15, 2009.

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

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B89 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Code, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Code to which the proposed Case applies.

Interpretations. Upon request, the B89 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B89 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B89 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B89 Standards Committee.

PERFORMANCE STANDARD FOR STEEL MEASURING TAPES

1 SCOPE

This Standard specifies the requirements for steel measuring tapes, with respect to units (SI and U.S. Customary), graduations, numbering, designations, and accuracy requirements.

2 DEFINITIONS

accuracy: closeness of agreement between a measured quantity value and a true quantity value of a measurand. Accuracy is a qualitative concept. (VIM 2.13)

graduations: marks or lines perpendicular to the edge of a measuring tape denoting increments of measure.

intermediate graduation: a graduation mark denoting an increment of measure that falls between the major and the minor graduations (e.g., inch or centimeter).

major graduation: a graduation mark denoting the largest increment of measure (e.g., feet or meter).

maximum permissible errors (MPE): extreme value of measurement error, with respect to a known reference quantity value, permitted by specifications or regulations for a given measurement, measuring instrument, or measuring system. (VIM 4.26)

minor graduation: a graduation mark denoting the smallest increment of measure (e.g., fraction of an inch, decimal inch, or millimeter).

plumb bob: when used with a measuring tape, a weight with a tapered or flat tip on the bottom that is suspended from the tape.

tension: a force that tends to stretch or elongate something, or a measure of such a force.

NOTE: The measure of force in the U.S. Customary system is the pound (lbf); the measure of force in the SI system is the newton (N). Traditionally, the tension (a force) has been referred to in units of pounds and kilograms. Pound (or pound-force) is proper. In the SI system of units, the kilogram is the unit of mass and the newton is the unit of force. In this Standard, the tension for tapes graduated in SI units is specified in kilograms, in order to maintain continuity of reference to master tape calibration data. The corresponding force in newtons is equal to the applied mass in kilograms multiplied by the acceleration due to gravity, g. By convention, $g = 9.80665\ \mathrm{m/s^2}$ exactly. Thus, the force exerted on a tape by a 1 kg load is 9.80665 N. For highest accuracy, the local value of g should be used.

validity conditions: the set of values or range of values of the relevant influence quantities, e.g., environmental conditions, under which the performance specifications are valid.

zero reference mark: the location from which all graduation and numbering of the measuring tape is dimensioned.

3 REFERENCES

3.1 Normative References

If the American National Standard Institute (ANSI) and ISO standards referred to in this document are superseded by a revision, the revision shall apply.

IEEE/ASTM SI 10-2002, Standard for Use of the International System of Units (SI): The Modern Metric System

Publisher: Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Lane, Piscataway, NJ 08854-4141 (www.ieee.org)

ISO 1:2002, Geometrical Product Specifications (GPS) — Standard Reference Temperature for Geometrical Product Specification and Verification

ISO/IEC Guide 98-3:2008, Uncertainty of Measurement — Part 3: Guide to the Expression of Uncertainty in Measurement (GUM:1995)

Publisher: International Organization for Standardization (ISO), 1 ch. de la Voie-Creuse, Case postale 56, CH-1211, Genève 20, Switzerland/Suisse (www.iso.org)

JCGM 200:2008, International Vocabulary of Metrology — Basic and General Concepts and Associated Terms (VIM)

Publisher: Bureau International des Poids et Mesures (BIPM), Pavillon de Breteuil, 92312 Sèvres cedex, France (www.bipm.org)

3.2 Additional References

API MPMS 3.1A 2005, Manual of Petroleum Measurement Standards Chapter 3 — Tank Gauging Section 1A — Standard Practice for the Manual Gauging of Petroleum and Petroleum Products

Publisher: American Petroleum Institute (API), 1220 L Street, NW, Washington, DC 20005-4070 (www.api.org)

ASME B89.6.2, Temperature and Humidity Environment for Dimensional Measurement

ASME B89.7.3.1-2001, Guidelines for Decision Rules: Considering Measurement Uncertainty in Determining Conformance to Specifications

ASME B89.7.5-2006, Metrological Traceability of Dimensional Measurements to the SI Unit of Length, Technical Report