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Calipers

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

ASME B89.1.14-2018

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AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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FOREWORD

ASME B89 Standards Committee on Dimensional Metrology, under procedures approved by the American National Standards Institute, has the responsibility of preparing standards that encompass the inspection and the means of measuring characteristics of various geometrical parameters such as diameter, length, flatness, parallelism, concentricity, taper, and squareness. Since calipers are widely used for the measurement and comparison of some of these features, the B89 Consensus Committee authorized formation of Project Team B89.1.14 to prepare this Standard.

The International Organization for Standardization (ISO) also develops standards in dimensional metrology. ISO standards are applicable in the United States but may not address all the needs of American industry, such as the use of both the U.S. Customary and SI systems. This Standard has been developed to be consistent with ISO 13385-1:2011, which addresses the design and metrological characteristics of calipers. This Standard has also been developed to complement ISO 13385-1:2011 by providing additional information useful in the specification, verification, and calibration of calipers. This Standard is not intended to contradict ISO 13385-1:2011 but does include additional technical information and requirements that exceed ISO 13385-1:2011.

This Standard adopted some material from the obsolete Federal Specification GGG-C-111C, published by General Services Administration (GSA), as well as manufacturer's current practices and technologies. In addition, this Standard includes many of the uncertainty and traceability concepts developed and standardized by the ASME B89.7 Subcommittee.

This Standard was approved by the American National Standards Institute on February 27, 2018.

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Dimensional Metrology

(The following is the roster of the committee at the time of approval of this Standard.)

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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 or a case, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B89 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

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 to provide 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 Standard and 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 Standard to which the proposed Case applies.

Interpretations. Upon request, the B89 Standards 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.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at http://go.asme.org/InterpretationRequest. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may mail the request to the Secretary of the B89 Standards Committee at the above address. The request for an 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 in one or two words.
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. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable.
Proposed Reply(ies):	Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies.
Background Information:	Provide the Committee with any background information that will assist the Committee in understanding the inquiry. 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 the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

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 and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the B89 Standards Committee. Future Committee meeting dates and locations can be found on the Committee Page at http://go.asme.org/B89committee.

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CALIPERS

1 SCOPE

This Standard provides the essential requirements for the specification, verification, and calibration of calipers, including vernier, dial, electronic digital, and specialty calipers. ISO 13385-1 provides for the international definition of the design and metrological characteristics of calipers important in the specification, manufacture, and purchase of calipers; however, ISO 13385-1 does not provide specification values, detailed test methods, or sufficient discussion of traceability and measurement uncertainty to ensure consistent practice in the calibration of calipers. This Standard is intended to complement, not contradict, ISO 13385-1. For the verification or calibration of calipers, this Standard provides sufficient detail such that the user does not require access to ISO 13385-1.

2 DEFINITIONS

The definitions in ASME B89.7.1, ISO 13385-1:2011, and JCGM 200 apply in the use of this Standard.

3 REFERENCES

ASME B89.6.2-1973 (R2003), Temperature and Humidity Environment for Dimensional Measurement

ASME B89.7.1-2016, Guidelines for Addressing Measurement Uncertainty in the Development and Application of ASME B89 Standards (Technical Report)

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

ASME B89.7.3.2-2007, Guidelines for the Evaluation of Dimensional Measurement Uncertainty

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

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990 (www.asme.org)

ISO 1:2016, Geometrical product specifications (GPS) — Standard reference temperature for the specification of geometrical and dimensional properties

ISO 13385-1:2011, Geometrical product specifications (GPS) — Dimensional measuring equipment — Part 1: Callipers; Design and metrological characteristics

ISO 14253-5:2015, Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 5: Uncertainty in verification testing of indicating measuring instruments

Publisher: International Organization for Standardization (ISO), Central Secretariat, Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland (www.iso.org)

JCGM 100:2008, Evaluation of measurement data — Guide to the expression of uncertainty in measurement (GUM)

JCGM 200:2008, International vocabulary of metrology — Basic and general concepts and associated terms (VIM, third edition)

Publisher: Joint Committee for Guides in Metrology, Bureau International des Poids et Mesures (BIPM), Pavillon de Breteuil, F-92312 Sèvres Cedex, France (www.bipm.org)

4 CALIPER DESIGN

4.1 General

As defined in ISO 13385-1, calipers shall incorporate the use of a movable slider with a measuring jaw that moves along a frame or beam with a stationary jaw to provide outside, inside, and when designed, step and/or depth measurements. The general design and workmanship of calipers shall be such to ensure compliance with the requirements of this Standard and ISO 13385-1 across the measuring range of the caliper and in any orientation, unless otherwise specified by the manufacturer.

4.2 Least Count

(a) Vernier calipers using SI units shall provide readings to a least count of 0.05 mm or 0.02 mm. Dial calipers using SI units shall provide readings to a least count of 0.05 mm, 0.02 mm, or 0.01 mm. Electronic digital calipers using SI units shall provide readings to a least count of 0.01 mm.

(b) Vernier or dial calipers using U.S. Customary units shall provide readings to a least count of 0.001 in. Electronic digital calipers using U.S. Customary units shall provide readings to a least count of 0.001 in. or 0.0005 in.

5 MAXIMUM PERMISSIBLE ERRORS

5.1 General

The maximum permissible errors (MPE) are specified limit values for errors that apply to all measurements permitted for use of the caliper as defined by the manufacturer and following proper operation and zero setting with the outside measuring faces. For general guidance on good operating procedures involving calipers, see Nonmandatory Appendices A and B.