ASME B89.1.13-2013

[Revision of ASME B89.1.13-2001 (R2006)]

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Micrometers

AN AMERICAN NATIONAL STANDARD



The American Society of
Mechanical Engineers

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The American Society of Mechanical Engineers

Two Park Avenue • New York, NY • 10016 USA

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FOREWORD

ASME Standards Committee B89 on Dimensional Metrology, under procedures approved by the American National Standards Institute (ANSI), 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 micrometers are widely used for the measurement and comparison of some of these features, the B89 Consensus Committee authorized formation of Project Team B89.1.13 to prepare this Standard.

This Standard is a revision of the first edition, ASME B89.1.13-2001. The 2001 edition was based in part on Federal Specification GGG-C-105C, published by the General Services Administration (GSA), as well as manufacturer's current practices and technologies. In 2010, the International Organization for Standardization (ISO) published a revision of ISO 3611, the ISO standard for outside micrometers. The goal of this revision to ASME B89.1.13 is to bring some harmonization between these ISO and ASME standards while not changing the fundamental concepts of ASME B89.1.13-2001. In particular, the terminology and definitions associated with specifications and testing methods have been harmonized. In addition, this revision has been updated with many of the concepts developed and standardized by the ASME B89.7 subcommittee.

This Standard was approved by the American National Standards Institute on February 20, 2013.

ASME B89 COMMITTEE
Dimensional Metrology

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

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Secretary, B89 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016
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.

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Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard, 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 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 provide a concise description.
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.

Requests that are not in this format may be rewritten in the appropriate 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 which 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 that are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B89 Standards Committee.

MICROMETERS

1 SCOPE

This Standard is intended to provide the essential requirements for micrometers as a basis for mutual understanding between manufacturers and consumers. Outside, inside, and depth micrometers are described in the Standard.

2 DEFINITIONS

backlash: a relative movement between interacting mechanical parts, resulting from looseness. (ASME B5.54-2005) In this Standard, backlash is further defined as the rotation of the spindle, in the opposite direction of the initial reading, before spindle moves in a linear direction. This condition is typically caused by looseness of fit between the lead screw and adjusting nut.

end shake: the amount of spindle movement when an axial force is applied in the direction of the spindle, alternating towards the anvil and away from the anvil, without rotating the spindle.

error of indication: for a measuring instrument, difference between an instrument indication and the quantity being measured.

NOTE: The error of indication can be written as $E = R - R_0$, where R is the indication and R_0 denotes the indication of an ideal measuring instrument measuring the same measurand. In the testing and verification of a measuring instrument, the error of indication is typically evaluated by measuring a calibrated reference standard. (Adapted from JCGM 106:2012)

flatness: the condition of a surface or derived median plane having all elements in one plane.

NOTE: A flatness tolerance specifies a tolerance zone defined by two parallel planes within which the surface or derived median plane must lie. (ASME Y14.5M-2009)

full measuring face contact: contact between the full area of the measuring face and a feature of a workpiece. (ISO 3611:2010)

maximum permissible error (of indication) (MPE): for a measuring instrument, maximum difference, permitted by specifications or regulations, between the instrument indication and the quantity being measured. (JCGM 106:2012)

partial measuring face contact: contact between a partial area of the measuring face and a feature of a workpiece. (ISO 3611:2010)

side shake: the amount of spindle side movement when a force is applied perpendicularly to the measuring end of the spindle, alternating from side to side, without rotating the spindle.

tolerance limit: specified upper or lower bound of permissible values of a property. (JCGM 106:2012)

3 REFERENCES

ASME B5.54-2005, Methods for Performance Evaluation of Computer Numerically Controlled Machining Centers

ASME B46.1-2009, Surface Texture (Surface Roughness, Waviness, and Lay)

ASME B89.1.9-2002, Gage Blocks

ASME B89.6.2-1973 (R2012), 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 B89.7.3.2-2007, Guidelines for the Evaluation of Dimensional Measurement Uncertainty

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

ASME Y14.5-2009, Dimensioning and Tolerancing

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900 (www.asme.org)

ASTM E18-08, Standard Test Methods for Rockwell Hardness of Metallic Materials

IEEE/ASTM SI 10-2010, American National Standard for Metric Practice

Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 (www.astm.org)

ISO 1:2002, Geometrical Product Specifications (GPS) — Standard reference temperature for geometrical product specification and verification

ISO 3611:2010, Geometrical product specifications (GPS) — Dimensional measuring equipment: Micrometers for external measurements — Design and metrological characteristics

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

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