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MEASUREMENT OF PLAIN EXTERNAL DIAMETERS FOR USE AS MASTER DISCS OR CYLINDRICAL PLUG GAGES

AN AMERICAN NATIONAL STANDARD

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FOREWORD

(This Foreword is not part of ASME B89.1.5-1998.)

It was beyond our imagination that a standard was not yet in place when we, Working Group 1.5 of the ASME B89 Standards Committee, were formed. Today we are humbled by the complexity and work necessary to complete the task. We consider this a start to an ongoing need to improve our techniques in outside diameter measurement. With this Standard we hope to improve correlation in measurement across the country and the world. Revisions to come will only improve the state of the art.

This Standard is dedicated to Dr. Richard Zipin, Eli Whitney Laboratory, Dayton, Ohio. It was approved by the American National Standards Institute on March 4, 1998.

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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 approval of a proprietary design or situation. The inquirer may also include any plans or drawings which 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 question.

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MEASUREMENT OF PLAIN EXTERNAL DIAMETERS FOR USE AS MASTER DISCS OR CYLINDRICAL PLUG GAGES

1 SCOPE

This Standard is intended to establish uniform practices for the measurement of master discs or cylindrical plug gages to a given tolerance using vertical or horizontal comparators and laser instruments. The Standard includes requirements for geometric qualities of master discs or cylindrical plugs, the important characteristics of the comparison equipment, environmental conditions, and the means to assure that measurements are made with an acceptable level of accuracy. This Standard does not address thread or gear measuring wires.

2 DEFINITIONS

circularity (roundness): a condition of a surface of revolution where:

(a) for a cylinder or cone, all points of the surface intersected by any plane perpendicular to a common axis are equidistant from that axis;

(b) for a sphere, all points of the surface intersected by any plane passing through a common center are equidistant from that center.

cosine error: the measurement error in the measurement direction caused by angular misalignment between a measuring system and the gage or part being measured.

cylindricity: a condition of a surface of revolution in which all points of the surface are equidistant from a common axis.

diameter: the length of a straight line through the center of a circular cross section of an object. In the case of a cylinder, the line is considered to be perpendicular to the axis.

dimensional stability: ability of an object (e.g., measuring instrument or workpiece) to maintain its metrological characteristics with time.

NOTES:

(1) Where stability with respect to a quantity other than time is considered, this should be stated explicitly.

(2) Stability may be quantified in several ways, for example:

(a) in terms of the time in which a metrological characteristic changes by a stated amount; or

(b) in terms of the change in a characteristic over a stated time.

discrimination (threshold): largest change in a stimulus that produces no detectable change in the response of a measuring instrument, the change in the stimulus taking place slowly and monotonically.

elastic deformation: the nonpermanent (reversible) change in the size or geometry of a part due to an applied force.

gage block: a length standard with rectangular, round, or square cross section, having flat, parallel opposing gaging faces.

NOTE: The surface finish of the gaging faces should be such as to allow gages to be wrung together.

index of refraction: for a given wavelength, the ratio of the velocity of light in a vacuum to the velocity of light in a refractive material.

NOTE: As used in this Standard, the material is air.

line contact: the zone of contact between a flat surface and a cylinder.

lobing: systematic variations in the radius around a part (measured in the cross section perpendicular to the axis).

master cylinder: a known-size cylinder used for setup for comparison to the gage being measured.

master disc: a cylinder of known size, with insulating grips, used to set or verify another gage. The tolerance is typically bilateral.

measurand: particular quantity subjected to measurement.

EXAMPLE: Diameter of a cylindrical gage at 20°C.

measurement force: the amount of force exerted upon the object being measured by a measuring instrument