ASME B89.1.9-2002

[Revision of ANSI/ASME B89.1.9-1984 (R1997)]

REAFFIRMED 2012

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GAGE BLOCKS

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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Errata
to
ASME B89.1.9-2002
Gage Blocks

The errata corrections listed below apply to ASME B89.1.9-2002. Corrected figures and tables follow.

Page	*Location*	*Change*
3	Fig. 1B	Dimensions revised; reference point added to second and last drawings
4	Table 1a	Entries in last three columns revised
5	Table 1b	Entries in last three columns revised
	Fig. 5	(1) ϕ deleted from top callout (2) *0.02* and *0.03* revised to read *0.2* and *0.3*, respectively
14	Table B1	$\forall$ replaced by $\pm$ in four places
	Table B3	$\forall$ replaced by $\pm$ in six places
26	Table G1	(1) In last column, 18th through 29th entries revised (2) In last row, first five entries revised

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Three Park Avenue, New York, NY 10016-5990

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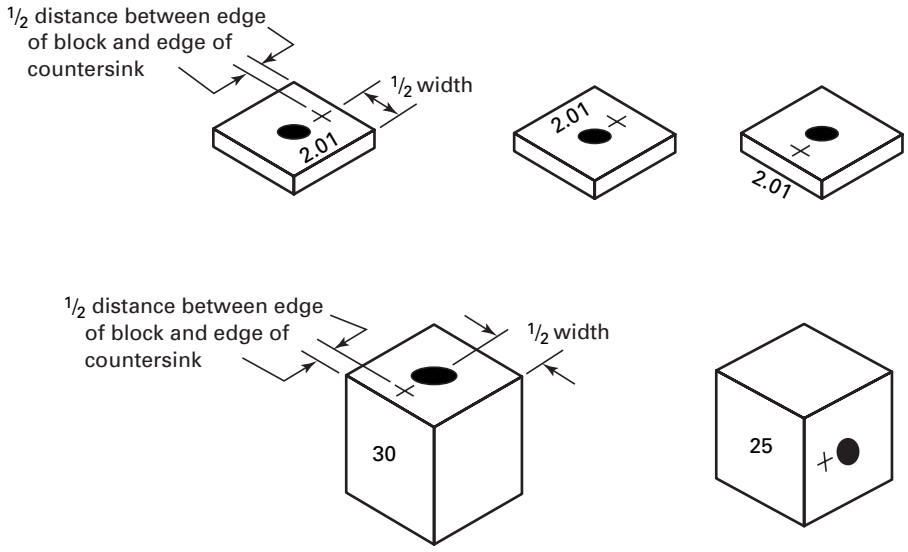

FIG. 1B REFERENCE POINTS OF SQUARE GAGE BLOCKS

TABLE 1a
DIMENSIONS IN MILLIMETERS

Cross Section	Nominal length, l_n	*a* (width) Nominal	*a* (width) Tolerance	*b* (depth) Nominal	*b* (depth) Tolerance
Square	0 to 1000	24.1	±0.2	24.1	±0.2
Rectangle	0.5 up to 10	30	+0.0/–0.3	9	–0.05/–0.20
	Over 10 up to 1000	35	+0.0/–0.3	9	–0.05/–0.20

GENERAL NOTE: Square gage blocks have a 6.7 mm ±0.1 mm center hole. The hole is countersunk on both sides 70 deg to 84 deg for blocks 5 mm and longer. Blocks under 5 mm are not countersunk.

TABLE 1b
DIMENSIONS IN INCHES

Cross Section	Nominal Length, l_n	*a* (width) Nominal	*a* (width) Tolerance	*b* (depth) Nominal	*b* (depth) Tolerance
Square	0 to 40	0.95	± 0.01	0.95	± 0.01
Rectangle	0.01 to 0.2	1.181	+ 0.074	0.355	+ 0.020
			– 0.084		– 0.010
	Over 0.2 up to 40	1.378	+ 0.010	0.355	+ 0.020
			– 0.207		– 0.010

GENERAL NOTE: Square gage blocks have a 0.265 ±0.010 in. center hole. The hole is countersunk on both sides 70 deg to 84 deg for blocks 0.2 in. and longer. Blocks under 0.2 in. are not countersunk.

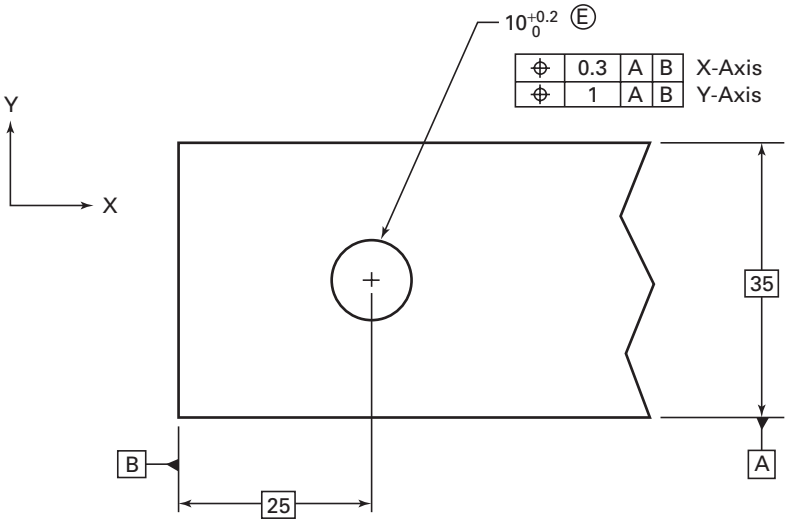

FIG. 5 DIMENSIONS OF COUPLING HOLES (mm)

TABLE B1 EXAMPLE OF TOLERANCE CHANGES

Size	GGG-G-15C	This Standard
1 mm	Grade 2, +0.10/–0.05 μm	Grade 0, ±0.12 μm
75 mm	Grade 3, +0.45/–0.22 μm	Grade AS-1, ±0.50 μm
0.1 in.	Grade 2, +4/–2 μin.	Grade 0, ±5 μin.
2.0 in.	Grade 3, +16/–8 μin.	Grade AS-1, ±16 μin.

TABLE B3 LENGTH TOLERANCE COMPARISON

Size	GGG-G-15C	This Standard
1 mm	Grade 1, ± 0.05 μm	Grade AS-1, ±0.20 μm
75 mm	Grade 2, + 0.25/–0.12 μm	Grade AS-2, ±1.00 μm
0.1 in.	Grade 1, ± 2 μin.	Grade AS-1, ±8 μin.
1.0 in.	Grade 2, +4/–2 μin.	Grade AS-2, ±24 μin.

TABLE G1 INCH GAGE BLOCK SIZES (IN INCHES)

0.0055	0.0202	0.052	0.1007	0.130	0.20008
0.006	0.0203	0.053	0.1008	0.131	0.20009
0.0065	0.0204	0.054	0.1009	0.132	0.250
0.007	0.0205	0.055	0.101	0.133	0.300
0.0075	0.0206	0.056	0.102	0.134	0.350
0.008	0.0207	0.057	0.103	0.135	0.400
0.0085	0.0208	0.058	0.104	0.136	0.450
0.009	0.0209	0.059	0.105	0.137	0.500
0.0095	0.021	0.060	0.106	0.138	0.550
0.010	0.022	0.0625	0.107	0.139	0.600
0.01005	0.023	0.070	0.108	0.140	0.650
0.0101	0.024	0.078125	0.109	0.141	0.700
0.0102	0.025	0.080	0.109375	0.142	0.750
0.0103	0.026	0.090	0.110	0.143	0.800
0.0104	0.027	0.09375	0.111	0.144	0.850
0.0105	0.028	0.100	0.112	0.145	0.900
0.0106	0.029	0.10001	0.113	0.146	0.950
0.0107	0.030	0.10002	0.114	0.147	1.000
0.0108	0.03125	0.100025	0.115	0.148	2.000
0.0109	0.040	0.10003	0.116	0.149	3.000
0.011	0.046875	0.10004	0.117	0.150	4.000
0.012	0.050	0.10005	0.118	0.160	5.000
0.013	0.05005	0.10006	0.119	0.170	6.000
0.014	0.0501	0.10007	0.120	0.180	7.000
0.015	0.0502	0.100075	0.121	0.190	8.000
0.015625	0.0503	0.10008	0.122	0.200	10.000
0.016	0.0504	0.10009	0.123	0.20001	12.000
0.017	0.0505	0.1001	0.124	0.20002	16.000
0.018	0.0506	0.1002	0.125	0.20003	20.000
0.019	0.0507	0.1003	0.126	0.20004	. . .
0.020	0.0508	0.1004	0.127	0.20005	. . .
0.02005	0.0509	0.1005	0.128	0.20006	. . .
0.0201	0.051	0.1006	0.129	0.20007	. . .

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GAGE BLOCKS

ASME B89.1.9-2002
[Revision of ANSI/ASME B89.1.9-1984 (R1997)]

Date of Issuance: July 12, 2002

The next edition of this Standard is scheduled for publication in 2007. There will be no addenda or written interpretations of the requirements of this Standard issued to this edition.

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

CONTENTS

Tables

Nonmandatory Appendices

FOREWORD

The United States gage block standard has not changed substantively since GGG-G-15B of 1970. During the intervening years there have been a number of very important shifts in the use of gage blocks, a large growth of internationalization in design and manufacture of parts, and even changes to basic concepts like uncertainty and traceability. With all of these factors in mind, the B89.1.9 Committee began to consider a total rewrite of the standard in the early 1990s. Our basic criteria were to adhere to the International Standard ISO 3650 as closely as possible, while making necessary additions to adapt the standard to measuring practice in the United States.

The most obvious additions were specifications for inch system gage blocks. We have avoided the more traditional term “English” system because the metric system is the legal system of units in England. The International Standard also only defines rectangular gage blocks, the United States being perhaps the only country to have square “Hoke” style blocks in significant numbers. Since the new grades have some of the same designations as the old standard we have added prefix “AS” to the names of Grades 1 and 2 to prevent misidentification. We have also added a Grade 00 with tolerances near those of the current U.S. Grade 1. While the committee basically agreed with the logic behind the ISO 3650 grade tolerances, we also recognized that the use of graded sets is deeply imbedded in some industries, and the loss of the high accuracy grade would be a hardship for some users.

There are a large number of appendixes to the standard. Most of these appendixes have information that is not in the current ISO 3650, but was in GGG-G-15C or previous editions of B89.1.9. The two largest and most important of these describe the differences between this Standard and its predecessors in Nonmandatory Appendix B, and the definition and tolerances on gage block accessories in Nonmandatory Appendix H.

The committee would also like to acknowledge the large number of people who, while not members of the committee, were kind enough to attend an occasional meeting or send comments on the early drafts of the standard. These interactions increased the committee’s knowledge of actual gage block use in industry, and were very important in drafting the changes made to ISO 3650 to correspond to U.S. practice.

This Standard was approved as an American National Standard on January 14, 2002.

ASME STANDARDS COMMITTEE B89
Dimensional Metrology

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

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General. ASME Codes and 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 Main Committee
The American Society of Mechanical Engineers
Three Park Avenue
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Proposed 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.

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 Main 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 Main Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B89 Main Committee.

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GAGE BLOCKS

0 INTRODUCTION

Gage blocks are length standards representing specific fractions of the unit of length, the meter, of the international system of units (SI). Depending on the kind of application and the required quality, gage blocks are offered in several grades. The calibration of gage blocks includes the measurement of the length value at a specified point of the measuring face and the evaluation of the measurement uncertainty.

1 SCOPE

This Standard specifies the most important design and metrological characteristics of gage blocks with a rectangular or square cross-section and a nominal length l_n ranging from 0.5 mm to 1 000 mm for metric sizes and 0.010 in. to 40 in. for inch sizes. It is not the intent of this Standard to preclude the use, by contractual agreement, of gage blocks of other shapes, grades or materials.

Limit deviations and tolerances are stated for the calibration Grade K and for the Grades 00, 0, AS-1, and AS-2 for various measuring purposes.

NOTE: To avoid confusing Grades 1 and 2 with previous definitions, the prefix "AS" for "American Standard" should be used for all sets using the grade tolerances in this Standard.

NOTE: The characteristics of Grades K, 0, AS-1, and AS-2 are identical to those of the same name in ISO 3650: Gage Blocks, with the exception that in this Standard the length of the block is defined when measured in the vertical orientation. Grade 00 has been added to conform more closely to the current U.S. Standard (see section A1).

2 NORMATIVE REFERENCES

The following standards contain provisions that, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. ANSI maintains registers of currently valid International Standards and U.S. National Standards.

ASME Y14.5-1994, Dimensioning and Tolerancing

Publisher: The American Society of Mechanical Engineers (ASME International), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

ASTM E 18-94, Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

ASTM E 140-95, Standard Hardness Conversion Tables for Metals

Publisher: The American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

ISO 1: 1975: Standard reference temperature for industrial length measurements

ISO 6507-1: 1997, Metallic materials - Vickers hardness test - Part 1: Test method

ISO 3650: 1998, Gauge Blocks

ISO, International Vocabulary of Basic and General Terms in Metrology (VIM), 1993

ISO, Guide to the expression of uncertainty in measurement: 1993, corrected and reprinted in 1995 (GUM)

Publisher: International Organization for Standardization (ISO), 1 rue de Varembé, Case Postale 56, CH-1121, Genève 20, Switzerland, Suisse

3 DEFINITIONS

3.1 Gage Block

A gage block is a block of rectangular or square section, made of wear-resistant material, with one pair of planar, mutually parallel measuring faces. The measuring faces shall have surfaces that can be wrung (see para. 3.7) to the measuring faces of other gage blocks to make composite assemblies, or to similarly textured surfaces of auxiliary plates for length measurements.

3.2 Length of a Gage Block *l*

The length of a gage block at a particular point of the measuring face is the perpendicular distance between this point and the planar surface of an auxiliary plate of the same material and surface texture upon which