ASME B18.2.4.5M-2008
[Revision of ANSI B18.2.4.5M-1979 (R2003)]

Metric Hex Jam Nuts

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

ASME
SETTING THE STANDARD

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FOREWORD

The B18 Standards Committee for the standardization of bolts, screws, nuts, rivets, and similar fasteners was organized in March 1922, as the B18 Sectional Committee under the aegis of the American Engineering Standards Committee (later the American Standards Association, then the United States of America Standards Institute and, as of October 6, 1969, the American National Standards Institute, Inc.), with the Society of Automotive Engineers and the American Society of Mechanical Engineers as joint sponsors. B18 Subcommitee 2 was subsequently established and charged with the responsibility for technical content of standards covering wrench head bolts and nuts.

At its meeting on December 4, 1974, the B18 Committee authorized preparation of a series of standards for metric fasteners. B18 Subcommittee 2 was assigned responsibility for developing standards for metric hex bolts, screws, and nuts.

At a meeting on September 22, 1976, B18 Subcommittee 2 organized the contents of a standard covering six different styles of hex nuts. Actual drafting was postponed until ISO/TC2 could reach final decisions relating to basic dimensions and characteristics of hex bolts, screws, and nuts. At ISO/TC2 meetings held in April 1977, final actions were taken. The B18 Committee affirmed the TC2 decisions at a meeting on June 29, 1977 and drafting of this Standard was started.

In February 1978, the B18 Committee established a cooperative program with the Department of Defense to draft American National Standards for metric fasteners in such a way that they could be used directly by the Government for procurement purposes. The Department of Defense requested that each of the six nut products be covered in separate standards and B18 Subcommittee 2 accepted this approach at its meeting on June 27, 1978.

The previous Edition of this Standard was approved by ballot of the B18 Committee on July 2, 1979 and was subsequently approved by the secretariats and submitted to the American National Standards Institute for designation as an American National Standard. This was granted on December 6, 1979.

ASME B18.2.4.5M-2008 was balloted and approved by the B18 Standards Committee and B18 Subcommittee 2 on August 4, 2008. The proposal was submitted to the American National Standards Institute and designated as an American National Standard on November 11, 2008.

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Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners

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

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Secretary, B18 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.

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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.
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 may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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METRIC HEX JAM NUTS

1 SCOPE

(a) This Standard covers the complete general and dimensional data for metric hex jam nuts recognized as American National Standard.

(b) The inclusion of dimensional data in this Standard is not intended to imply that all of the nut sizes in conjunction with the various options described herein are stock items. Consumers should consult with suppliers concerning lists of stock production hex jam nuts.

2 COMPARISON WITH ISO STANDARDS

(a) Hex jam nuts, as covered in this Standard, have been coordinated to the extent possible with ISO 4035. The dimensional differences between this Standard and ISO 4035 are very few and relatively minor, except those of the M10 size. None affect the functional interchangeability of nuts manufactured to the requirements of either.

(b) At its meeting in Varna, May 1977, ISO/TC2 studied several technical reports analyzing design considerations influencing determination of the best series of width across flats for hex bolts, screws, and nuts. A primary technical objective was to achieve a logical ratio between underhead (nut) bearing surface area (which determines the magnitude of the compressive stress on the bolted members) and the tensile stress area of the screw thread (which governs the clamping force that can be developed by tightening the fastener).

M10 nuts with 15 mm width across flats are currently being produced and used in the U.S. and many other countries of the world. This size, however, is not an ISO standard (see Table 1).

NOTE: When M10 nuts are ordered, nuts with 16 mm width across flats shall be furnished, unless 15 mm width across flats is specified.

(c) Letter symbols designating dimensional characteristics are in accordance with those used in ISO standards, except where capitals have been used instead of lowercase letters in ISO standards.

3 REFERENCED STANDARDS

Unless otherwise specified, the referenced Standard shall be the most recent issue at the time of order placement. The following is a list of publications referenced in this Standard.

ASME B1.3M, Screw Thread Gaging Systems for Dimensional Acceptability

ASME B1.13M, Metric Screw Threads — M Profile

ASME B18.12, Glossary of Terms for Mechanical Fasteners

ASME B18.18.1, Inspection and Quality Assurance for General Purpose Fasteners

ASME B18.18.2M, Inspection and Quality Assurance for High-Volume Machine Assembly Fasteners

ASME B18.24, Part Identifying Number (PIN) Code System Standard for B18 Fastener Products

ASME Y14.5M, Dimensioning and Tolerancing

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

ASTM A 563M, Carbon and Alloy Steel Nuts [Metric]

ASTM F 467M, Nonferrous Nuts for General Use [Metric]

ASTM F 812/F 812M, Surface Discontinuities of Nuts, Inch and Metric Series

ASTM F 836M, Stainless Steel Metric Nuts

ASTM F 1941M, Electrodeposited Coatings on Threaded Fasteners (Metric)

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

ISO 4035, Hexagon Thin Nuts Chamfered, Product Grades A & B

Publisher: International Organization for Standardization (ISO), 1 rue de Varembé, Case Postale 56, CH-1211, Genève 20, Switzerland/Suisse (www.iso.org)

4 TERMINOLOGY

For definitions of terms relating to fasteners or component features thereof used in this Standard, refer to ASME B18.12.

5 DIMENSIONS

(a) Unless otherwise stated, all dimensions in this Standard are in millimeters and apply before any coating. When a plating or coating is specified, the finished product dimensions shall be agreed upon between the supplier and purchaser.

(b) Symbols specifying geometric characteristics are in accordance with ASME Y14.5M.

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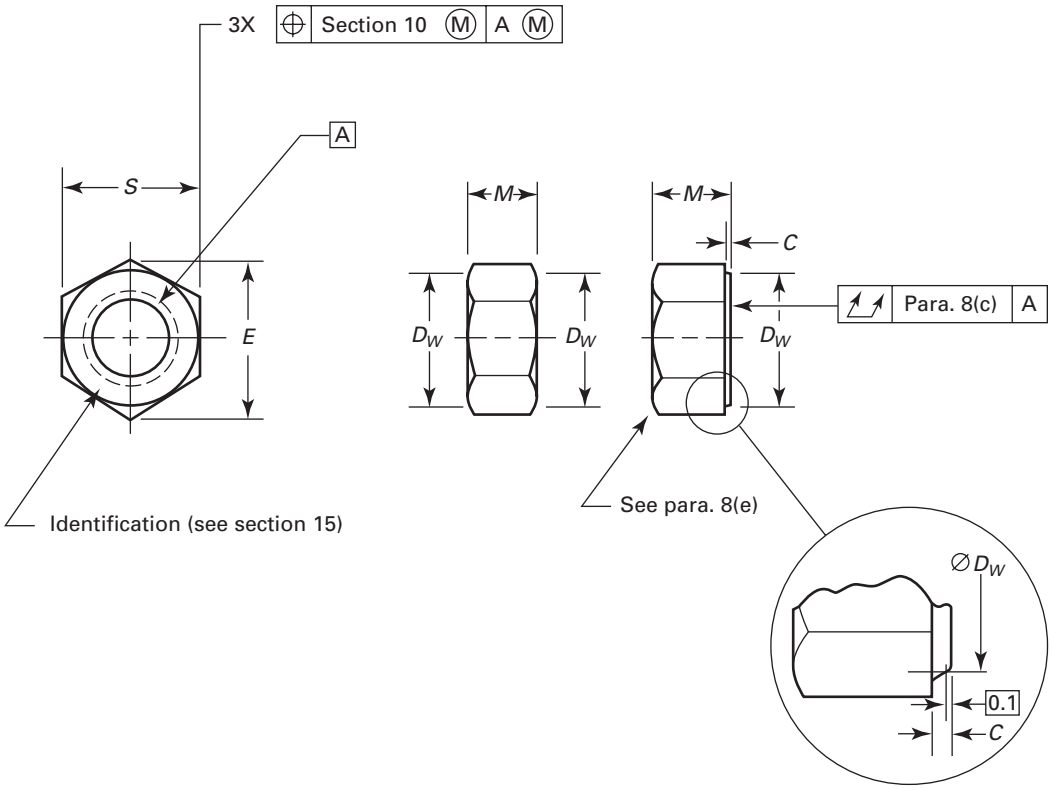
Table 1 Dimensions of Hex Jam Nuts



Nominal Nut Diameter and Thread Pitch	Width Across Flats, *S*		Width Across Corners, *E*		Thickness, *M*		Bearing Face Dia, D_W	Washer Face Thickness, *C*		Maximum Total Runout of Bearing Surface FIM
	Max.	Min.	Max.	Min.	Max.	Min.	Min.	Max.	Min.	
M5 × 0.8	8.00	7.78	9.24	8.79	2.70	2.45	6.9	...	...	0.30
M6 × 1	10.00	9.78	11.55	11.05	3.20	2.90	8.9	...	...	0.33
M8 × 1.25	13.00	12.73	15.01	14.38	4.00	3.70	11.6	...	...	0.36
M10 × 1.5	16.00	15.73	18.48	17.77	5.00	4.70	14.6	...	...	0.39
M12 × 1.75	18.00	17.73	20.78	20.03	6.00	5.70	16.6	...	...	0.42
M14 × 2	21.00	20.67	24.25	23.35	7.00	6.42	19.6	...	...	0.45
M16 × 2	24.00	23.67	27.71	26.75	8.00	7.42	22.5	...	...	0.48
M20 × 2.5	30.00	29.16	34.64	32.95	10.00	9.10	27.7	0.8	0.4	0.56
M24 × 3	36.00	35.00	41.57	39.55	12.00	10.90	33.2	0.8	0.4	0.64
M30 × 3.5	46.00	45.00	53.12	50.85	15.00	13.90	42.8	0.8	0.4	0.76
M36 × 4	55.00	53.80	63.51	60.79	18.00	16.90	51.1	0.8	0.4	0.89
Refer to section	6		9		7		8	8		8
M10 × 1.5 [Note (1)]	15.00	14.73	17.32	16.64	5.00	4.70	13.6	...	...	0.39

NOTE:
(1) See section 2.

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6 WIDTH ACROSS FLATS

(a) The width across flats shall be the distance, measured perpendicular to the axis of the nut, between two opposite wrenching flats.

(b) The minimum width across flats does not apply for 25% of the minimum nut thickness as measured from either face.

(c) On nonferrous products where milled-from-bar materials are used, the dimensional specifications outlined may be modified. These dimensional allowances shall be agreed upon between the purchaser and supplier.

7 THICKNESS

The nut thickness shall be the overall distance, measured parallel to the axis of the nut, from the top of the nut to the bearing surface, and shall include the thickness of the washer face where provided, but exclude raised identification markings where they are permitted.

8 TOPS AND BEARING SURFACE

(a) M16 and smaller nuts shall be double chamfered. M20 and larger nuts, at the manufacturer's option, shall be either double chamfered or have a washer-faced bearing surface and a chamfered top.

(b) The diameter of the bearing surface shall not exceed the width across flats, nor be less than the bearing face diameter specified in Table 1.

(c) The bearing surface within a diameter equal to 0.8 times the maximum width across flats shall be flat and perpendicular to the axis of the thread pitch diameter within the total runout limit specified in Table 1.

(d) The tops of washer-faced nuts shall be flat, and the diameter of the chamfer circle shall be equal to the maximum width across flats within a tolerance of −15%.

(e) The length of chamfer at hex corners shall be from 5% to 15% of the nominal thread diameter. The surface of the chamfer may be slightly convex or rounded.

9 CORNER FILL

A rounding or lack of fill at the junction of hex corners with the chamfer shall be permissible, provided the width across corners is within specified limits at and beyond a distance equal to 17.5% of the nominal thread diameter from the chamfered face.

10 TRUE POSITION OF HEXAGON TO THE TAPPED HOLE

At maximum material condition (MMC), the axis of the hexagon shall be located at true position with respect to the axis of the thread pitch diameter within a tolerance zone having a diameter equivalent to 4% of the maximum width across flats.

11 COUNTERSINK

The tapped hole shall be countersunk on the bearing face(s). The countersink-included reference angle shall be 90 deg to 120 deg. The maximum countersink diameter shall be 1.15 times the nominal thread diameter (major diameter) for nuts M4 and smaller, the nominal thread diameter plus 0.75 mm for nuts M5 through M8, and 1.08 times the nominal thread diameter for M10 and larger nuts. The minimum countersink diameter shall be the nominal thread diameter.

12 THREADS

(a) Threads shall be metric coarse threads with Class 6H tolerances in accordance with ASME B1.13M.

(b) Thread acceptability shall be in accordance with ASME B1.3M System 21.

(c) Nuts intended for use with externally threaded fasteners, which are plated or coated with a plating or coating thickness (e.g., hot-dip galvanized) requiring overtapping of the nut thread to permit assembly, shall have overtapped threads in conformance with requirements specified in ASTM A 563M.

13 MATERIAL AND MECHANICAL PROPERTIES

(a) Carbon steel nuts without specified heat treatment shall conform to the material and mechanical property requirements in the Appendix of ASTM A 563M for property class 04, as specified. Carbon steel nuts with specified heat treatment shall conform to the material and mechanical property requirements in the Appendix of ASTM A 563M for property class 05 nuts.

(b) Stainless steel nuts shall conform to the material and hardness requirements of ASTM F 836M.

(c) Nonferrous metal nuts shall conform to the material and hardness requirements of ASTM F 467M.

14 FINISH

Unless otherwise specified, nuts shall be furnished with a natural (as processed) finish, unplated or uncoated.

15 IDENTIFICATION SYMBOLS

(a) Carbon steel nuts shall be marked to identify the property class and manufacturer in accordance with the requirements specified in ASTM A 563M.

(b) Stainless steel nuts should be marked to identify the property class and manufacturer in accordance with the requirements specified in ASTM F 836M.

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(c) Nonferrous nuts shall be marked to identify the property class and manufacturer in accordance with the requirements specified in ASTM F 467M.

16 INSPECTION AND QUALITY ASSURANCE

The manufacturer may utilize any documented quality assurance system that results in the production of products conforming to the requirements of this Standard. If the manufacturer does not have a documented quality assurance system and the purchaser does not specify otherwise in the original inquiry, purchase order, and/or contract, product acceptability shall be determined using ASME B18.18.1.

17 DIMENSIONAL CONFORMANCE

(a) Unless otherwise specified, the following designated characteristics shall be inspected to the inspection levels shown according to ASME B18.18.2M, and shall be within specified limits.

Characteristic	Inspection Level
Width across corners	C
Thickness	C
Thread acceptability	C

(b) For nondesignated characteristics, the provisions of ASME B18.18.1 shall apply.

18 DESIGNATION

(a) Hex jam nuts shall be designated by the following data, preferably in the sequence shown: product name, designation of Standard (ASME B18.2.4.5M), nominal diameter and thread pitch, 15 mm width across flats for size M10, if applicable [see section 2], steel property class or material identification, and protective coating if required.

NOTE: It is common practice in ISO standards to omit thread pitch from the product designation when screw threads are the metric coarse thread series (e.g., M10 is M10 × 1.5).

EXAMPLE: Metric Hex Jam Nuts, ASME B18.2.4.5M, M10 × 1.5, ASTM A 563M Class 04, zinc plated per ASTM F 1941M Fe/Zn5C

(b) The recommended B18 part identifying numbering system (PIN) for metric hex jam nuts is included in ASME B18.24. This system may be used by any user needing a definitive part numbering system.

19 WORKMANSHIP

Nuts shall be free of surface irregularities that might affect their serviceability, such as burrs, seams, laps, loose scale, and other irregularities. When control of surface discontinuities is important for the application intended, ASTM F 812/F 812M should be specified.

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B18 AMERICAN NATIONAL STANDARDS FOR BOLTS, NUTS, RIVETS, SCREWS, WASHERS, AND SIMILAR FASTENERS

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