D-07-03

AMERICAN NATIONAL STANDARD

Metric Hex Nuts, Style 2

ANSI B18.2.4.2M - 1979

Government Key Words:
Nut, Plain, Hex, Style 2 –
Metric

SECRETARIAT

SOCIETY OF AUTOMOTIVE ENGINEERS
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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FOREWORD

American National Standards Committee B18 for the standardization of bolts, screws, nuts, rivets and similar fasteners was organized in March 1922, as Sectional Committee B18 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. 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, Committee B18 authorized preparation of a series of standards for metric fasteners. Subcommittee 2 was assigned responsibility for developing standards for metric hex bolts, screws and nuts.

At a meeting on September 22, 1976, 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, Committee B18 affirmed the TC2 decisions at a meeting on June 29, 1977, and drafting of this standard was started.

In February 1978, Committee B18 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 Subcommittee 2 accepted this approach at its meeting on June 27, 1978.

This standard was approved by letter ballot of Committee B18 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.

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ANSI B18.2.4.2M-1979

AMERICAN NATIONAL STANDARD

METRIC HEX NUTS, STYLE 2

GENERAL DATA

1. Scope

1.1 This standard covers the complete general and dimensional data for metric hex nuts, style 2, recognized as an American National Standard.

1.2 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. Purchasers are requested to consult with manufacturers concerning lists of stock production hex nuts, style 2.

1.3 Hex nuts, style 2, purchased for Government use shall conform to this standard, and additionally to the requirements of Appendix I.

2. Comparison with ISO Standards

2.1 Hex nuts, style 2, as covered in this standard have been coordinated to the extent possible with ISO 4033. The dimensional differences between this ANSI standard and ISO 4033 are very few and relatively minor. None affect the functional interchangeability of nuts manufactured to the requirements of either.

2.2 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 under head (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). Table 1 lists the sizes selected by ISO/TC2 to be ISO standard.

M10 nuts with 15 mm width across flats are currently being produced and used in U.S.A. and many other countries of the world. This size, however, is not an ISO standard. Unless M10 nuts with 15 mm width across flats are specifically ordered, M10 nuts with 16 mm width across flats shall be furnished.

2.3 Letter symbols designating dimensional characteristics are in accord with those used in ISO standards, except capitals have been used for data processing convenience instead of lower case letters used in ISO standards.

3. Dimensions. All dimensions in this standard are in millimeters, unless otherwise stated.

4. Width Across Flats

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

4.2 Regardless of nut material or manufacturing process, no transverse section through the nut between 25 and 75 percent of the actual nut thickness as measured from the bearing surface shall be less than the minimum width across flats specified in Table 1.

4.3 Maximum width across flats shall not be exceeded, except that for milled-from-bar nuts made of non-ferrous materials the specified maximum width across flats may be exceeded to conform with the commercial tolerances of cold finished bar stock material.

4.4 For milled-from-bar nuts, the nominal bar size used shall be the closest commercially available size to, but not greater than, the specified maximum width across flats of the nut.

5. 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 shall exclude raised identification markings where they are permitted.

6. Tops and Bearing Surface

6.1 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.

6.2 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. For referee purposes, measurement of washer face diameter or washer faced nuts shall be taken at mid thickness of the washer face.

6.3 The bearing surface shall be flat and perpendicular to the axis of the thread within the total run-out limit specified in Table 1.

6.4 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 minus 15 percent.

6.5 The length of chamfer at hex corners shall be from 5 to 15 percent of the nominal thread diameter. The surface of the chamfer may be slightly convex and rounded.

7. 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 percent of the nominal thread diameter from the chamfered face.

8. True Position of Tapped Hole. The axis of tapped hole shall be located at true position with respect to the axis of nut body within a tolerance zone having a diameter equivalent to 4 percent of the maximum width across flats, regardless of feature size.

9. 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.

10. Threads

10.1 Threads shall be metric coarse threads with class 6H tolerances in accordance with ANSI B1.13M.

10.2 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 assembleability shall have overtapped threads in conformance with requirements specified in ASTM A563M.

11. Material and Mechanical Properties

11.1 Carbon steel nuts without specified heat treatment shall conform to the material and mechanical property requirements specified for property class 9 nuts in ASTM A563M. Carbon steel nuts with specified heat treatment shall conform to the material and mechanical property requirements specified for property class 12 nuts in ASTM A563M.

11.2 Nuts of other materials such as stainless steel, brass, bronze and aluminum alloys shall have properties as agreed upon by the manufacturer and purchaser. Properties of nuts of several grades of nonferrous materials are covered in ASTM F467M.

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

13. Identification Symbols

13.1 Carbon steel nuts shall be marked to identify the property class and the manufacturer in accordance with requirements specified in ASTM A563M.

13.2 Nuts of other materials shall be identified for property class and manufacturing source as agreed between the manufacturer and purchaser.

14. Designation

14.1 Hex nuts, style 2, shall be designated by the following data, preferably in the sequence shown: product name, nominal diameter and thread pitch, 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 x 1.5.)

Examples:

Hex nut, style 2, M10 x 1.5, ASTM A563M class 9, zinc plated.

Hex nut, style 2, M20 x 2.5, silicon bronze, ASTM F467M grade 651.

14.2 The Government part numbering system for metric hex nuts, style 2, is given in Appendix I. This system may be used by any user needing a definitive part numbering system.

15. Terminology. For definitions of terms relating to fasteners or component features thereof used in this standard, refer to American National Standard, Glossary of Terms for Mechanical Fasteners, ANSI B18.12.

16. Options. Options, where specified, shall be at the discretion of the manufacturer unless otherwise agreed between manufacturer and purchaser.

17. Workmanship. Nuts shall not contain an excess of surface imperfections which might affect their serviceability, such as burrs, seams, laps, loose scale and other irregularities.

18. Referenced Standards

18.1 Copies of referenced ASTM standards may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

18.2 Copies of referenced ISO standards may be obtained from the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

18.3 Copies of referenced ANSI standards may be obtained from the American Society of Mechanical Engineers, 345 East 47th Street, New York, N.Y. 10017.

AMERICAN NATIONAL STANDARD
METRIC HEX NUTS, STYLE 2

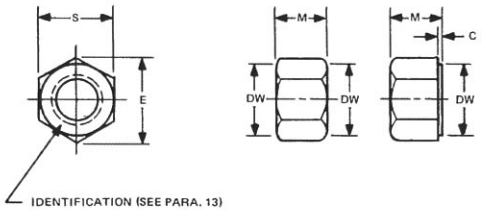


Table 1 Dimensions of Hex Nuts, Style 2

Nominal Nut Dia and Thread Pitch	S		E		M		Dw	C		Total Runout of Bearing Surface FIM
	Width Across Flats		Width Across Corners		Thickness		Bearing Face Dia	Washer Face Thickness		
	Max	Min	Max	Min	Max	Min	Min	Max	Min	Max
M3 x 0.5	5.60	5.32	6.35	6.01	2.90	2.65	4.6	–	–	–
M3.5 x 0.6	6.00	5.82	6.93	6.58	3.30	3.00	5.1	–	–	–
M4 x 0.7	7.00	6.78	8.08	7.66	3.80	3.50	5.9	–	–	–
M5 x 0.8	8.00	7.78	9.24	8.79	5.10	4.80	6.9	–	–	0.30
M6 x 1	10.00	9.78	11.55	11.05	5.70	5.40	8.9	–	–	0.33
M8 x 1.25	13.00	12.73	15.01	14.38	7.50	7.14	11.6	–	–	0.36
M10 x 1.5	16.00	15.73	18.48	17.77	9.30	8.94	14.6	–	–	0.39
M12 x 1.75	18.00	17.73	20.78	20.03	12.00	11.57	16.6	–	–	0.42
M14 x 2	21.00	20.67	24.25	23.35	14.10	13.40	19.6	–	–	0.45
M16 x 2	24.00	23.67	27.71	26.75	16.40	15.70	22.5	–	–	0.48
M20 x 2.5	30.00	29.16	34.64	32.95	20.30	19.00	27.7	0.8	0.4	0.56
M24 x 3	36.00	35.00	41.57	39.55	23.90	22.60	33.2	0.8	0.4	0.64
M30 x 3.5	46.00	45.00	53.12	50.85	28.60	27.30	42.7	0.8	0.4	0.76
M36 x 4	55.00	53.80	63.51	60.79	34.70	33.10	51.1	0.8	0.4	0.89
Refer to Para.	4		7		5		6	6		6
*M10 x 1.5	15.00	14.73	17.32	16.64	10.0	9.6	13.6	0.6	0.3	0.39

*See Para. 2.2 in General Data.

APPENDIX I

Government Standard Items and Part Numbering System

Note

The Government encourages the general use of this appendix to achieve maximum parts standardization.

This appendix establishes the standard items for Government application selected from the possible variations of items within the scope of the standard and provides a part numbering system for identification and application in engineering documents.

The following variations are standard:

a. Diameter/Thread Pitch – as specified in Table 2.

b. Material – Steel, Property Class 12 or 9 as coded in Part Numbering System.

c. Finish – Cadmium plating or zinc plating as coded in Part Numbering System.

The part number shall consist of the following element codes in the order shown:

a. Document Identifier – ANSI Standard Number less decimal points.

b. Material and Finish

c. Nominal Diameter

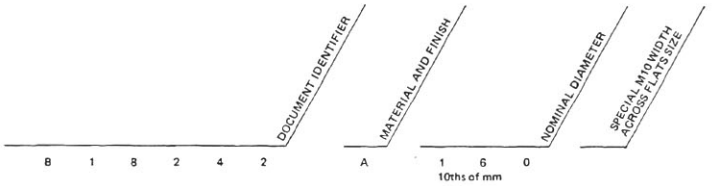
d. Special M10 Width Across Flats Size

Quality Assurance Provisions: Quality assurance provisions shall be in accordance with FF-N-836, Nut: Square, Hexagon, Cap, Slotted, Castle.

Packaging: Packaging shall be in accordance with PPP-H-1581, Hardware (Fasteners and Related Items), Packaging and Packing for Shipment and Storage of.

PART NUMBERING SYSTEM COVERING STANDARD ITEMS FOR GOVERNMENT USE

NOTE: THE GOVERNMENT ENCOURAGES THE GENERAL USE OF THIS SYSTEM TO ACHIEVE MAXIMUM PARTS STANDARDIZATION.



MATERIAL AND FINISH CODE
A — Steel w/Cadmium Plating per QQ-P-416, Type II, Class 3 (0.005mm Plating Thickness), Property Class 12.
B — Steel w/Zinc Plating per QQ-Z-325, Type II, Class 3 (0.005mm Plating Thickness), Property Class 12.
C — Same as Code A, except Property Class 9.
D — Same as Code B, except Property Class 9.

SPECIAL M10 WIDTH ACROSS FLATS SIZE CODE
F — 15mm Nominal
NOTE: The 16mm Hex Width Across Flats will be supplied unless Code F is designated.

EXAMPLE: B18242A160 indicates a Nut, Plain, Hex, Style 2-Metric, made of cadmium plated steel, property class 12 with M16x2 threads.

METRIC PLAIN HEX NUTS, STYLE 2

Table 2 Government Standard Items and Part Numbering System

NOMINAL NUT SIZE AND THREAD PITCH	STANDARD DIAMETER (PART NUMBER)
M3 x 0.5	030
M3.5 x 0.6	035
M4 x 0.7	040
M5 x 0.8	050
M6 x 1	060
M8 x 1.25	080
M10 x 1.5	100
M12 x 1.75	120
M14 x 2	140
M16 x 2	160
M20 x 2.5	200
M24 x 3	240
M30 x 3.5	300
M36 x 4	360