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ANSI B18.2.4.4M-1982
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AMERICAN NATIONAL STANDARD

Metric Hex Flange Nuts

ANSI B18.2.4.4M - 1982

REAFFIRMED 1999

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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. Subcommittee 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 November 25, 1980, and was subsequently approved by the secretariat and submitted to the American National Standards Institute for designation as an American National Standard. This was granted on June 21, 1982.

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AMERICAN NATIONAL STANDARD

METRIC HEX FLANGE NUTS

GENERAL DATA

1. Scope

1.1 This Standard covers the complete general and dimensional data for metric hex flange nuts recognized as 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 flange nuts.

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

2. Comparision with ISO Standards

2.1 Hex flange nuts as covered in this Standard are essentially identical with ISO 4161. The dimensional differences between this ANSI standard and the ISO standard are very few and relatively minor. None affect the functional interchangeability of nuts manufactured to the requirements of either.

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

5. Top of Nut. The top of the nut shall be flat with chamfered corners. The diameter of the chamfer circle shall be equal to the maximum width across flats within a tolerance of minus 15%.

6. 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 plane of the bearing circle diameter, and shall exclude raised identification markings, if present.

7. Hex Height. The hex height shall be the distance, measured at a corner of the hex, from the junction of hex portion with the flange to the top of the nut.

8. Wrenching Height. The wrenching height, Ta, is the distance, measured at a corner of the hex, from the junction of the hex portion with the flange to the last plane of full formed hex, i.e., the plane perpendicular to the nut axis which is closest to the top of the nut at which the width across corners is within its specified limits.

9. Corner Fill. The rounding due to lack of fill at the six corners of the hex shall be reasonably uniform.

10. Gaging of Hex Portion. The nut shall be gaged using two plain ring gages, A and B, to demonstrate the coincidental acceptability of hex height, wrenching height, corner fill, and width across corners. Gage

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A shall be placed over the hex and shall seat on the flange. Gage B shall be placed on the top of the nut normal to the nut axis. The two gages shall not be in contact.

NOTE: The minimum inside diameter of Gage A equals the maximum width across corners; the maximum inside diameter of Gage B equals the minimum width across corners minus 0.01 mm; the maximum thickness of Gage A equals or is greater than the computed wrenching height necessary to provide sufficient driveability to develop two times the torsional strength of the properly mated externally threaded component.

11. Flange. The top surface of the flange shall be conical or slightly rounded (convex). The flange periphery shall be round in form and within the specified maximum flange diameter and a diameter 5% smaller. The contour of the edge at the flange periphery shall be optional provided the minimum flange thickness is maintained at the minimum bearing circle diameter.

12. Gaging of Flange. The flange shall be gaged using two plain ring gages, A and C, to demonstrate the coincidental acceptability of flange diameter and thickness. Gage C shall be seated on a flat surface and the nut placed in it. Gage A shall be placed over the hex portion. The nut shall seat within Gage C and Gages A and C shall not be in contact.

13. Bearing Surface. The bearing surface shall be flat to concave to a maximum of 1.5 deg. from the plane formed by the bearing circle diameter. The plane formed by the bearing circle diameter shall be perpendicular to the thread within the runout limit specified in Table 1 when measured at diameter Dw.

14. 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% of the maximum width across flats, regardless of feature size.

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

16. Threads

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

16.2 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.

16.3 Unless otherwise specified, screw thread acceptability shall be determined based on System 21 of ANSI B1.3M Screw Thread Gaging Systems for Dimensional Acceptability – M and MJ Threads.

17. Material and Mechanical Properties

17.1 Non-heat treated carbon steel nuts shall conform to the material and mechanical property requirements specified for property class 9 nuts in ASTM A563M. Heat treated carbon steel nuts shall conform to the material and mechanical property requirements specified for property classes 10 and 12 nuts in ASTM A563M.

17.2 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.

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

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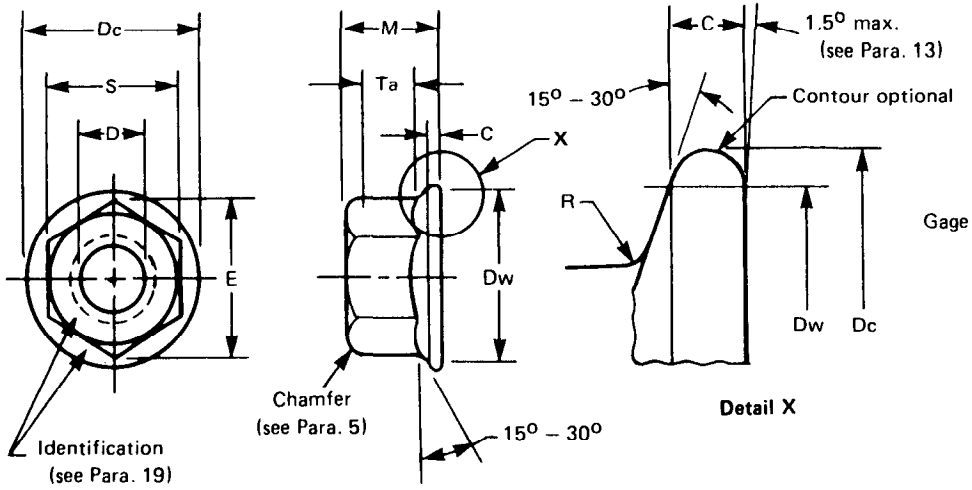

TABLE 1 DIMENSIONS OF HEX FLANGE NUTS

Nominal Nut Dia and Thread Pitch	S		E		Dc	Dw	C	Circular Runout of Bearing Circle FIM	M		R	Wa		Ta		Wb		Tb	Wc		Tc	
	Width Across Flats		Width Across Corners		Flange Dia	Bearing Circle Dia	Flange Edge Thickness		Thickness		Flange Top Fillet Radius	Gage A				Gage B			Gage C			
												Inside Dia		Thickness		Inside Dia		Thickness	Inside Dia		Thickness	
	Max.	Min.	Max.	Min.	Max.	Min.	Min.	Max.	Max.	Min.	Max.	Max.	Min.	Max.	Min.	Max.	Min.	Min.	Max.	Min.	Max.	Min.
M5 x 0.8	8.00	7.78	9.24	8.79	11.8	9.8	1.0	0.31	5.00	4.70	0.3	9.25	9.24	2.20	2.19	8.78	8.77	3.0	12.00	11.90	1.08	1.07
M6 x1	10.00	9.78	11.55	11.05	14.2	12.2	1.1	0.34	6.00	5.70	0.4	11.56	11.55	3.10	3.09	11.04	11.03	4.0	14.40	14.30	1.19	1.18
M8 x 1.25	13.00	12.73	15.01	14.38	17.9	15.8	1.2	0.38	8.00	7.60	0.5	15.02	15.01	4.50	4.49	14.37	14.36	4.0	18.10	18.00	1.31	1.30
M10 x 1.5	15.00	14.73	17.32	16.64	21.8	19.6	1.5	0.43	10.00	9.60	0.6	17.33	17.32	5.50	5.49	16.63	16.62	5.0	22.00	21.90	1.81	1.80
M12 x 1.75	18.00	17.73	20.78	20.03	26.0	23.8	1.8	0.50	12.00	11.60	0.7	20.79	20.78	6.70	6.69	20.02	20.01	5.0	26.20	26.10	2.20	2.19
M14 x 2	21.00	20.67	24.25	23.35	29.9	27.6	2.1	0.55	14.00	13.30	0.9	24.26	24.25	7.80	7.79	23.34	23.33	6.0	30.10	30.00	2.55	2.54
M16 x2	24.00	23.67	27.71	26.75	34.5	31.9	2.4	0.61	16.00	15.30	1.0	27.72	27.71	9.00	8.99	26.74	26.73	6.0	34.70	34.60	2.96	2.95
M20 x 2.5	30.00	29.16	34.64	32.95	42.8	39.9	3.0	0.76	20.00	18.90	1.2	34.65	34.64	11.10	11.09	32.94	32.93	6.0	43.00	42.90	3.70	3.69
Refer To Para.	4		10		11, 12	13	11, 12	13	6			10, 12				10			12			

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19. Identification Symbols

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

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

20. Designation

20.1 Hex flange nuts 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 flange nut, M10 x 1.5, ASTM A563M class 10, zinc plated.

Hex flange nuts, M20 x 2.5, silicon bronze, ASTM F467M grade 651.

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

21. 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.

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

23. 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.

24. Referenced Standards

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

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

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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 I-1.

(b) Material – Steel, Property Class 10 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

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 of.

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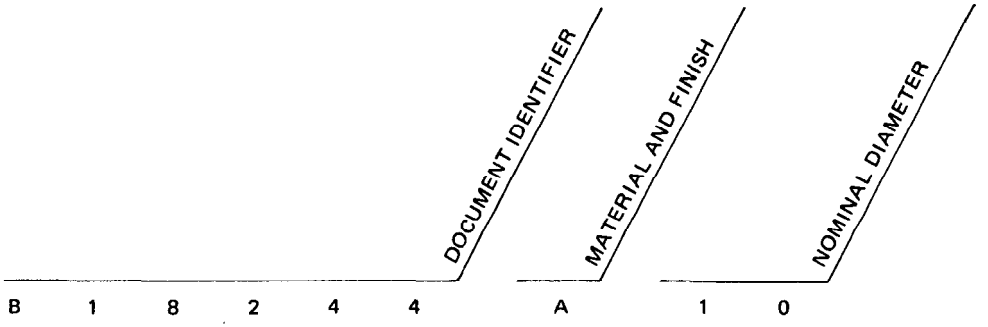
PART NUMBERING SYSTEM COVERING STANDARD ITEMS FOR GOVERNMENT USE

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 (5.1 μm Plating Thickness), Property Class 10.

B – Steel w/Zinc Plating per QQ-Z-325, Type II, Class 3 (5.1 μm Plating Thickness), Property Class 10.

EXAMPLE: B18244A10 indicates a nut flange, hex-metric, made of cadmium plated steel, property class 10 with M10 x 1.5 thread.

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TABLE I-1
GOVERNMENT STANDARD ITEMS AND PART NUMBERING SYSTEM

Nominal Nut Size and Thread Pitch	Standard Diameter (Part Number)
M5 x 0.8	05
M6 x 1	06
M8 x 1.25	08
M10 x 1.5	10
M12 x 1.75	12
M14 x 2	14
M16 x 2	16
M20 x 2.5	20

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