

ASME B18.16.4-2008

Serrated Hex Flange Locknuts 90,000 psi (Inch Series)

AN AMERICAN NATIONAL STANDARD



The American Society of
Mechanical Engineers



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FOREWORD

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

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Secretary, B18 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

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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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Interpretations. Upon request, the B18 Standards 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 B18 Standards Committee.

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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 an 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 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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SERRATED HEX FLANGE LOCKNUTS 90,000 psi (INCH SERIES)

1 SCOPE

This Standard covers the general, dimensional, and mechanical performance requirements for low strength carbon steel, case hardened, regular and large serrated flange locknuts (inch series), recognized as American National Standard.

2 COMPARISON TO ISO STANDARDS

There is no inch series ISO standard for these products at this time.

3 TERMINOLOGY

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

4 REFERENCE STANDARDS

The following is a list of publications referenced in this Standard.

- ASME B1.1, Unified Inch Screw Threads
- ASME B1.3, Screw and Thread Gaging Systems for Dimensional Acceptability — Inch and Metric Screw Threads (UN, UNR, UNJ, M, and MJ)
- ASME B18.12, Glossary of Terms for Mechanical Fasteners
- ASME B18.18.2M, Inspection and Quality Assurance for High-Volume Machine Assembly Fasteners
- 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, P.O. Box 2300, Fairfield, NJ 07007-2300
- ASTM F 606, Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets
- ASTM F 812, Specification for Surface Discontinuities of Nuts, Inch Series
- ASTM F 1941, Electrodeposited Coatings on Threaded Fasteners [Unified Inch Screw Threads (UN/UNR)]
- ASTM F 2282, Standard Specification for Quality Assurance Requirements for Carbon and Alloy Steel Wire, Rods, and Bars for Mechanical Fasteners

ASTM F 2328, Standard Test Method for Determining Decarburization and Carburization in Hardened and Tempered Threaded Steel Bolts, Screws, and Studs

Publisher: ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959

5 DIMENSIONS

(a) Unless otherwise specified, all dimensions in this Standard shall be as specified in Tables 1 and 2, and sections 6 through 9. All dimensions in this Standard are in inches and apply before plating or coating is specified. 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.

6 SERRATIONS

The configuration of the serrations shall be at the discretion of the manufacturer, provided the performance requirements as specified in para. 12.2 are met.

7 TOPS OF NUTS

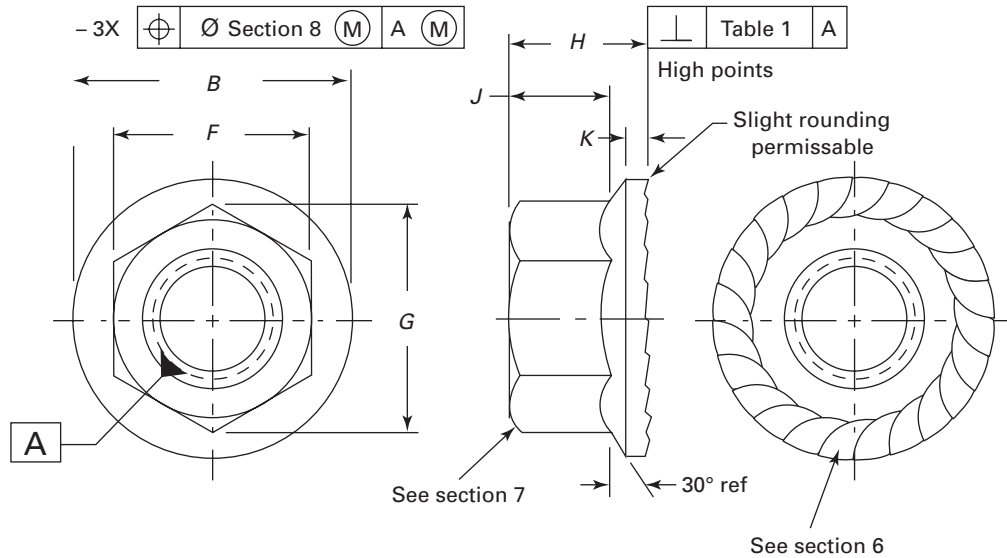
Tops of nuts shall be flat and chamfered. The length of chamfer at hex corners shall be from 5% to 15% of the basic thread size. The surface may be slightly convex or rounded.

8 TRUE POSITION OF HEXAGON TO 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.

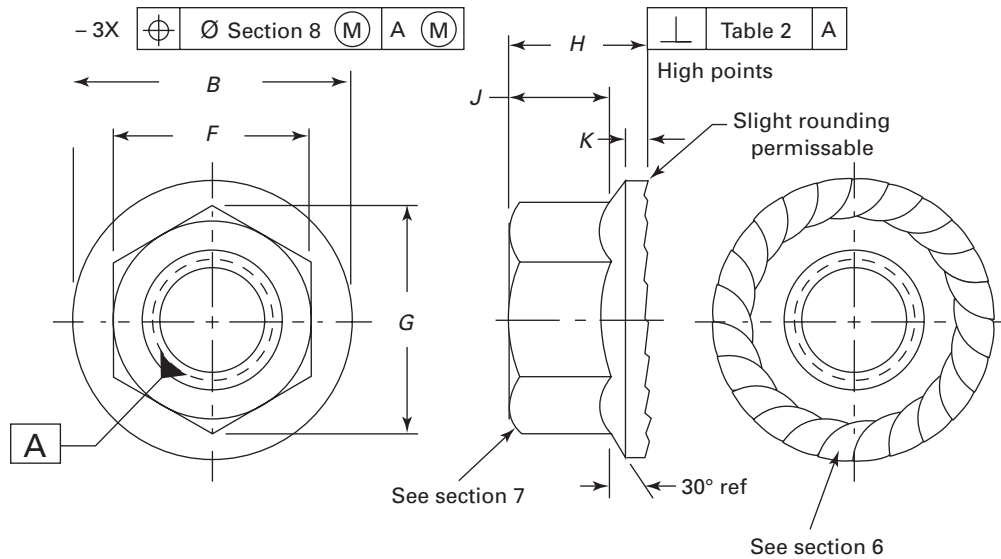
9 COUNTERSINK

Tapped hole shall be countersunk on the bearing face and may be countersunk on the top. The maximum countersink diameter shall be the thread basic (nominal) major diameter plus 0.030 in. for $\frac{3}{8}$ in. nominal size nuts and smaller, and 1.08 times the basic major diameter for

Table 1 Regular Serrated Flange Locknuts

Nominal Size or Basic Major Diameter of Thread		Width Across Flats, <i>F</i>		Width Across Corners, <i>G</i>		Flange Diameter, <i>B</i>		Nut Thickness, <i>H</i>		Minimum Hex Height, <i>J</i>	Minimum Flange Thick- ness, <i>K</i>	Maximum Perpendicularity of Bearing Surface
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
No. 6	0.1380	0.312	0.302	0.361	0.342	0.422	0.408	0.171	0.156	0.10	0.02	0.014
8	0.1640	0.344	0.334	0.397	0.381	0.469	0.452	0.203	0.187	0.13	0.02	0.016
10	0.1900	0.375	0.365	0.433	0.416	0.500	0.480	0.219	0.203	0.13	0.03	0.017
12	0.2160	0.438	0.428	0.505	0.488	0.594	0.574	0.236	0.222	0.14	0.04	0.020
1/4	0.2500	0.438	0.428	0.505	0.488	0.594	0.574	0.236	0.222	0.14	0.04	0.020
5/16	0.3125	0.500	0.489	0.577	0.557	0.680	0.660	0.283	0.268	0.17	0.04	0.023
3/8	0.3750	0.562	0.551	0.650	0.628	0.750	0.728	0.347	0.330	0.23	0.04	0.025
7/16	0.4375	0.688	0.675	0.794	0.768	0.937	0.910	0.395	0.375	0.26	0.04	0.032
1/2	0.5000	0.750	0.736	0.866	0.840	1.031	1.000	0.458	0.437	0.31	0.05	0.035
9/16	0.5625	0.875	0.861	1.010	0.982	1.188	1.155	0.506	0.483	0.35	0.05	0.040
5/8	0.6250	0.938	0.922	1.083	1.051	1.281	1.248	0.569	0.545	0.40	0.05	0.044
3/4	0.7500	1.125	1.088	1.299	1.240	1.500	1.460	0.675	0.627	0.46	0.06	0.051

GENERAL NOTE: Dimensions are in inches.

Table 2 Large Serrated Flange Locknuts

Nominal Size or Basic Major Diameter of Thread		Width Across Flats, F		Width Across Corners, G		Flange Diameter, B		Nut Thickness, H		Minimum Hex Height, J	Minimum Flange Thickness, K	Maximum Perpendicularity of Bearing Surface
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
$\frac{1}{4}$	0.2500	0.438	0.428	0.505	0.488	0.728	0.700	0.312	0.281	0.15	0.04	0.024
$\frac{5}{16}$	0.3125	0.500	0.489	0.577	0.557	0.820	0.790	0.375	0.343	0.20	0.04	0.028
$\frac{3}{8}$	0.3750	0.562	0.551	0.650	0.628	0.915	0.885	0.406	0.390	0.24	0.04	0.031
$\frac{7}{16}$	0.4375	0.688	0.675	0.794	0.768	1.131	1.100	0.468	0.437	0.26	0.04	0.038
$\frac{1}{2}$	0.5000	0.750	0.736	0.866	0.840	1.205	1.175	0.515	0.485	0.29	0.06	0.041
$\frac{9}{16}$	0.5825	0.875	0.861	1.010	0.982	1.300	1.260	0.578	0.546	0.37	0.06	0.044
$\frac{5}{8}$	0.6250	0.938	0.922	1.083	1.051	1.360	1.280	0.640	0.600	0.42	0.06	0.045

GENERAL NOTE: All dimensions are in inches.

nuts larger than $\frac{3}{8}$ in. No part of the threaded portion shall project beyond the bearing surface.

10 THREADS

Threads shall be Unified coarse or fine thread series (UNC or UNF series) Class 2B, in accordance with ASME B1.1.

Inspection shall be based on System 21 of ASME B1.3.

11 MATERIAL AND HARDNESS

Unless otherwise specified, nuts shall be manufactured from carbon steel in accordance with ASTM F 2282. The nuts shall have a case hardness of HR 15N 78-90 on the surface of the nut in accordance with ASTM F 2328. For referee purposes, case hardness shall be measured in the serrations.

12 MECHANICAL REQUIREMENTS

12.1 Proof Load Test

Nuts shall meet the proof load test using the values in Table 3. The proof load test procedure from ASTM F 606 shall be followed.

12.2 Break Loose Torque Test

Nuts shall have a break loose torque value equal to or greater than 100% of the seating torque value. The seating torque value shall be $\pm 10\%$ of the values listed in Table 3.

(a) *Procedure.* Place a test bolt through a cold-rolled steel strip and spacers as required. Assemble a test nut so that at least three thread pitches of the bolt extend beyond the top of the nut. While preventing the steel strip from rotating, apply the torque value listed in Table 3. Record the seating torque values, break the nut loose from its seated position, and record the highest

Table 3 Proof Load and Torque Values

Nut Size and Threads per inch	Proof Load, lb	Seating Torque	Nut Size and Threads per inch	Proof Load, lb	Seating Torque
6-32	820	50 in.-lb	6-40	900	55 in.-lb
8-32	1,250	60 in.-lb	8-36	1,350	65 in.-lb
10-24	1,650	70 in.-lb	10-32	1,800	75 in.-lb
12-24	2,200	90 in.-lb	12-28	2,300	95 in.-lb
$\frac{1}{4}$ -20	2,900	9 ft-lb	$\frac{1}{4}$ -28	3,300	10 ft-lb
$\frac{5}{16}$ -18	4,700	14 ft-lb	$\frac{5}{16}$ -24	5,200	15 ft-lb
$\frac{3}{8}$ -16	7,000	27 ft-lb	$\frac{3}{8}$ -24	7,900	29 ft-lb
$\frac{7}{16}$ -14	9,550	40 ft-lb	$\frac{7}{16}$ -20	10,700	43 ft-lb
$\frac{1}{2}$ -13	12,800	62 ft-lb	$\frac{1}{2}$ -20	14,400	68 ft-lb
$\frac{9}{16}$ -12	16,400	82 ft-lb	$\frac{9}{16}$ -18	18,300	90 ft-lb
$\frac{5}{8}$ -11	20,300	125 ft-lb	$\frac{5}{8}$ -18	22,900	140 ft-lb
$\frac{3}{4}$ -10	30,000	240 ft-lb	$\frac{3}{4}$ -16	33,600	269 ft-lb

GENERAL NOTE: Proof load values are based on 90,000 psi.

torque value. That value is the “break loose torque.” A different unused test bolt, test nut, and hole in the test strip must be used for every test. The test bolt shall be prevented from turning during testing. Additional lubricant shall not be added.

(b) *Test Bolt.* The test bolt shall be plain finished with threads conforming to Class 2A tolerances as specified in ASME B1.1. The bolt shall have an ultimate tensile strength not less than the specified proof load of the nut to be tested. Bolt length shall be such that a minimum length equivalent to six thread pitches as measured from the end of the bolt will protrude through the nut when the nut is seated.

(c) *Test Strip.* The steel strip must be a minimum of 0.060 in. thick, having a hardness between HRB 60 and HRB 90. The strip must have holes for placing the bolt through that are 0.010 in. to 0.025 in. over the bolt's nominal thread diameter.

(d) *Torque Measuring Device.* Test results may be measured by an analog or digital device that is capable of indicating and holding a peak torque value. The analog or electronic measuring system shall have a certified accuracy of $\pm 2\%$ or less.

13 FINISH

Unless otherwise specified, nuts shall be furnished with an electrodeposited zinc-plated finish in accordance with ASTM F 1941, Fe/Zn 3A.

14 GRADE AND IDENTIFICATION MARKING

Unless otherwise specified by the purchaser, these nuts shall have no grade marking requirements. Nuts

$\frac{1}{4}$ in. and above in diameter shall be marked with the source identification marking.

15 INSPECTION AND QUALITY ASSURANCE

Unless otherwise specified by the purchaser, inspection of serrated flange locknuts shall be in accordance with ASME B18.18.2M.

16 DESIGNATION

Serrated hex flange locknuts shall be designated by the following data, preferably in the sequence as follows:

(a) product name and designation of standard (ASME B18.16.4)

(b) nominal diameter and thread pitch

(c) steel property class or material identification, and protective coating, if required.

EXAMPLE: Regular serrated flange locknut, ASME B18.16.4, $\frac{1}{2}$ -13, zinc plated per ASTM F 1941 Fe/Zn 3A.

17 OPTIONS

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

18 WORKMANSHIP

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

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

Small Solid Rivets	B18.1.1-1972 (R2001)
Large Rivets	B18.1.2-1972 (R2001)
Metric Small Solid Rivets	B18.1.3M-1983 (R2001)
Square and Hex Bolts and Screws (Inch Series)	B18.2.1-1996
Square and Hex Nuts (Inch Series)	B18.2.2-1987 (R1999)
Metric Hex Cap Screws	B18.2.3.1M-1999
Metric Formed Hex Screws	B18.2.3.2M-2005
Metric Heavy Hex Screws	B18.2.3.3M-1979 (R2001)
Metric Hex Flange Screws	B18.2.3.4M-2001
Metric Hex Bolts	B18.2.3.5M-1979 (R2001)
Metric Heavy Hex Bolts	B18.2.3.6M-1979 (R2001)
Metric Heavy Hex Structural Bolts	B18.2.3.7M-1979 (R2001)
Metric Hex Lag Screws	B18.2.3.8M-1981 (R1999)
Metric Heavy Hex Flange Screws	B18.2.3.9M-2001
Square Head Bolts (Metric Series)	B18.2.3.10M-1996 (R2003)
Metric Hex Nuts, Style 1	B18.2.4.1M-2002
Metric Hex Nuts, Style 2	B18.2.4.2M-2005
Metric Slotted Hex Nuts	B18.2.4.3M-1979 (R2001)
Metric Hex Flange Nuts	B18.2.4.4M-1982 (R1999)
Metric Hex Jam Nuts	B18.2.4.5M-1979 (R2003)
Metric Heavy Hex Nuts	B18.2.4.6M-1979 (R2003)
Fasteners for Use in Structural Applications	B18.2.6-2006
Metric 12-Spline Flange Screws	B18.2.7.1M-2002
Clearance Holes for Bolt, Screws, and Studs	B18.2.8-1999
Socket Cap, Shoulder, and Set Screws, Hex and Spline Keys (Inch Series)	B18.3-2003
Socket Head Cap Screws (Metric Series)	B18.3.1M-1986 (R2002)
Metric Series Hexagon Keys and Bits	B18.3.2M-1979 (R2003)
Hexagon Socket Head Shoulder Screws (Metric Series)	B18.3.3M-1986 (R2002)
Hexagon Socket Button Head Cap Screws (Metric Series)	B18.3.4M-1986 (R2002)
Hexagon Socket Flat Countersunk Head Cap Screws (Metric Series)	B18.3.5M-1986 (R2002)
Metric Series Socket Set Screws	B18.3.6M-1986 (R2002)
Round Head Bolts (Inch Series)	B18.5-1990 (R2003)
Metric Round Head Short Square Neck Bolts	B18.5.2.1M-2006
Metric Round Head Square Neck Bolts	B18.5.2.2M-1982 (R2000)
Round Head Square Neck Bolts With Large Head (Metric Series)	B18.5.2.3M-1990 (R2003)
Wood Screws (Inch Series)	B18.6.1-1981 (R2003)
Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws (Inch Series)	B18.6.2-1998
Machine Screws and Machine Screw Nuts	B18.6.3-2003
Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws (Inch Series)	B18.6.4-1998
Metric Thread-Forming and Thread-Cutting Tapping Screws	B18.6.5M-2000
Metric Machine Screws	B18.6.7M-1999
General Purpose Semi-Tubular Rivets, Full Tubular Rivets, Split Rivets and Rivet Caps	B18.7-2007
Metric General Purpose Semi-Tubular Rivets	B18.7.1M-2007
Clevis Pins and Cotter Pins (Inch Series)	B18.8.1-1994 (R2000)
Taper Pins, Dowel Pins, Straight Pins, Grooved Pins, and Spring Pins (Inch Series)	B18.8.2-2000
Spring Pins: Coiled Type, Spring Pins: Slotted, Machine Dowel Pins: Hardened Ground, and Grooved Pins (Metric Series)	B18.8.100M-2000
Cotter Pins, Headless Clevis Pins, and Headed Clevis Pins (Metric Series)	B18.8.200M-2000
Plow Bolts	B18.9-2007
Track Bolts and Nuts	B18.10-1982 (R2000)
Miniature Screws	B18.11-1961 (R2000)
Glossary of Terms for Mechanical Fasteners	B18.12-2001
Screw and Washer Assemblies — Sems (Inch Series)	B18.13-1996 (R2003)
Screw and Washer Assemblies: Sems (Metric Series)	B18.13.1M-1998 (R2003)
Forged Eyebolts	B18.15-1985 (R2003)
Metric Lifting Eyes	B18.15M-1998 (R2004)

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Prevailing-Torque Type Steel Metric Hex Nuts and Hex Flange Nuts	B18.16M-2004
Serrated Hex Flange Locknuts 90,000 psi (Inch Series)	B18.16.4-2008
Inspection and Quality Assurance for General Purpose Fasteners	B18.18.1-2006
Inspection and Quality Assurance for High-Volume Machine Assembly Fasteners	B18.18.2M-1987 (R1999)
Inspection and Quality Assurance for Special Purpose Fasteners	B18.18.3M-1987 (R1999)
Inspection and Quality Assurance for Fasteners for Highly Specialized Engineered Applications	B18.18.4M-1987 (R1999)
Inspection and Quality Assurance Plan Requiring In-Process Inspection and Controls	B18.18.5M-1998 (R2003)
Quality Assurance Plan for Fasteners Produced in a Third Party Accreditation System	B18.18.6M-1998 (R2003)
Quality Assurance Plan for Fasteners Produced in a Customer Approved Control Plan	B18.18.7M-1998 (R2003)
Lock Washers (Inch Series)	B18.21.1-1999
Lock Washers (Metric Series)	B18.21.2M-1999
Metric Plain Washers	B18.22M-1981 (R2000)
Plain Washers	B18.22.1-1965 (R2003)
Part Identifying Number (PIN) Code System for B18 Fastener Products	B18.24-2004
Square and Rectangular Keys and Keyways	B18.25.1M-1996 (R2003)
Woodruff Keys and Keyways	B18.25.2M-1996 (R2003)
Square and Rectangular Keys and Keyways: Width Tolerances and Deviations Greater Than Basic Size	B18.25.3M-1998 (R2003)
Tapered and Reduced Cross Section Retaining Rings (Inch Series)	B18.27-1998
Helical Coil Screw Thread Inserts — Free Running and Screw Locking (Inch Series)	B18.29.1-1993 (R2002)
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