

**ASME B18.16.4-2008**

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

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**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**



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# FOREWORD

This 2008 edition was approved by the American National Standards Institute on August 25, 2008, and designated as ASME B18.16.4-2008.

# ASME B18 COMMITTEE

## 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.

**Proposing a Case.** Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the standard, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the standard to which the proposed Case applies.

**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.

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, 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.

ASME procedures provide for reconsideration of any interpretation when or if additional information that 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 B18 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B18 Standards Committee.

# 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.

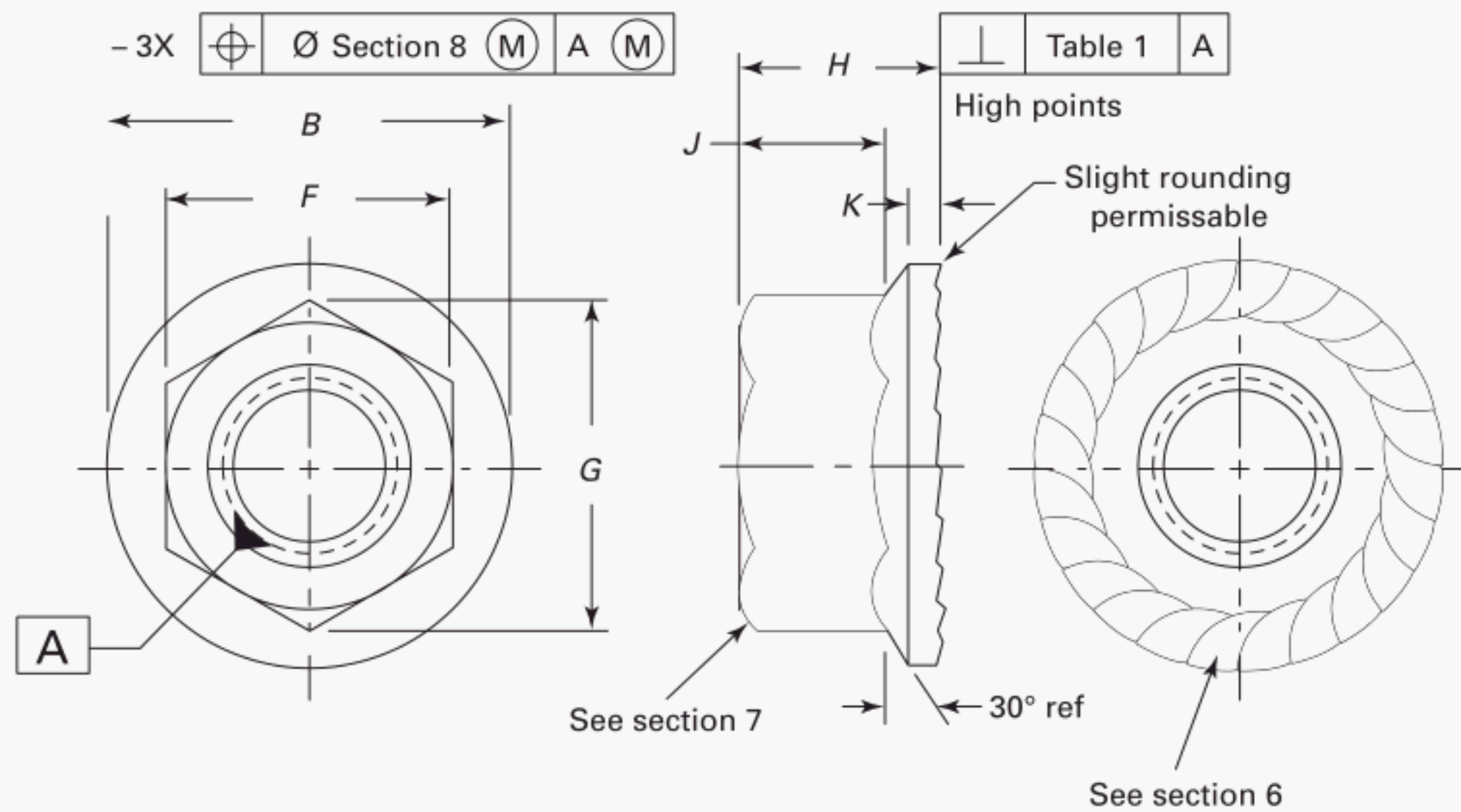
## 8 TRUE POSITION OF HEXAGON TO TAPPED HOLE

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

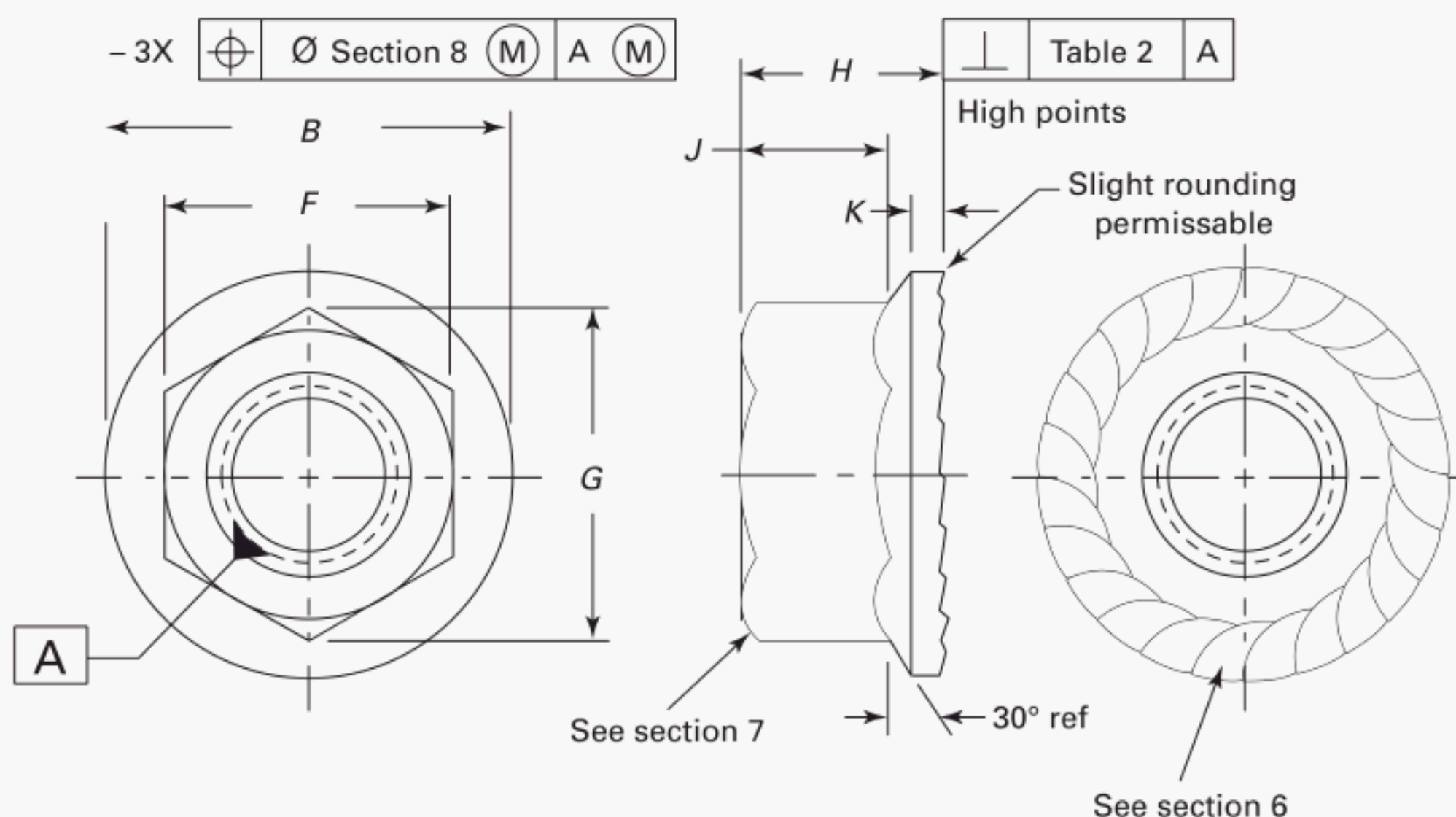
Tapped hole shall be countersunk on the bearing face and may be countersunk on the top. The maximum countersink diameter shall be the thread basic (nominal) major diameter plus 0.030 in. for  $\frac{3}{8}$  in. nominal size nuts and smaller, and 1.08 times the basic major diameter for



**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, <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.			
$\frac{1}{4}$	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)
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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
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Metric Slotted Hex Nuts .....	B18.2.4.3M-1979 (R2001)
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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
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Round Head Square Neck Bolts With Large Head (Metric Series) .....	B18.5.2.3M-1990 (R2003)
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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
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