WITHDRAWN
See ASME B18.16.6 (included in 9th Edition INCH FASTENER STANDARDS book)

INDUSTRIAL FASTENERS INSTITUTE
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IFI Notes:

1. ***IFI-100/107 is a standard developed through the procedures of the Industrial Fasteners Institute. IFI-100/107 is under the jurisdiction of the IFI Standards and Technical Practices Committee.***

2. ***IFI-100/107 is a combination of two former IFI standards. Previously, IFI-100 covered three strength grades of prevailing-torque type steel hex nuts and IFI-107 covered two strength grades of prevailing-torque type steel hex flange nuts. Locknut is a generic term used commercially for prevailing-torque type nuts. The term "locknut" is not intended to imply an indefinite permanency of fixity.***

3. ***IFI-100 was first published in 1967, and IFI-107 in 1969. Since first publication, both standards were periodically reviewed and updated. The combination of the two standards into IFI-100/107 was accomplished in 1987.***

4. ***There are no American National Standards for inch series prevailing-torque type steel hex nuts or hex flange nuts, nor are any contemplated.***

1.0 Introduction

1.1 Scope. This standard establishes the dimensional, mechanical and performance requirements for three grades of prevailing-torque type steel hex nuts, in sizes No. 4 thru 1-1/2 in., and two grades of prevailing-torque type steel hex flange nuts, in sizes 1/4 thru 3/4 in.

1.2 Definition. A prevailing-torque type nut is one that is frictionally resistant to rotation due to a self-contained prevailing-torque feature, and not because of a compressive load developed against the bearing surface of the nut.

1.3 Torque-Tension Capability. In some engineering applications it may be desirable to use nuts which have the capability to develop a known tensile load in the mating externally threaded component when the nut is tightened with a specific torque. Under certain controlled conditions, prevailing-torque type steel hex nuts, in sizes 1/4 thru 1 in., and all sizes of hex flange nuts have this capability. Torque tension requirements for these plated nuts are covered in IFI-101.

1.4 Stock Items. The inclusion of data in this standard is not intended to imply that all nut styles, sizes and grades in conjunction with the various options described herein are stock items. Purchasers are requested to consult with manufacturers concerning lists of stock production prevailing-torque hex and hex flange nuts.

1.5 Prevailing-Torque. The prevailing-torque developed by a nut is the torque necessary to rotate the nut on its mating externally threaded component with the torque being measured while the nut is in motion, and with no axial load in the mating component.

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2.0 Referenced Standards

All standards are latest issue unless otherwise agreed between manufacturer and purchaser.

2.1 ASME standards are available from The American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

ASME B1.1 *Unified Inch Screw Threads (UN, and UNR Thread Form)*

ASME B18.2.1 *Square and Hex Bolts and Screws*

2.2 ASTM standards are available from The American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B487 *Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section*

ASTM E18 *Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials*

ASTM F436 *Hardened Steel Washers*

ASTM F788 *Surface Discontinuities of Bolts, Screws and Studs for Inch Series*

ASTM F812 *Surface Discontinuities of Nuts, Inch Series*

ASTM F1137 *Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners*

2.3 IFI standards are available from the Industrial Fasteners Institute, 6363 Oak Tree Boulevard, Independence, OH 44131-2500.

IFI-101 *Torque-Tension Requirements for Prevailing-Torque Type Steel Hex and Hex Flange Nuts*

IFI-140 *Carbon and Alloy Steel Wire, Rods and Bars for Mechanical Fasteners*

IFI-142 *Hydrogen Embrittlement Risk Management*

IFI-155 *Test Procedure for the Performance of Nonmetallic Resistant Element Prevailing-Torque Nuts*

2.4 SAE standards are available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J121 *Decarburization in Hardened and Tempered Unified Threaded Fasteners*

3.0 Nut Designs

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3.1 There are three basic designs for prevailing-torque nuts:

(a.) all-metal, one piece construction nuts which derive their prevailing-torque characteristics from controlled distortion of the nut thread and/or body;

(b.) metal nuts which derive their prevailing-torque characteristics from the addition or fusion of a nonmetallic insert, plug, or patch in their threads, see IFI-155.

(c.) top insert, two-piece construction nuts which derive their prevailing-torque characteristics from an insert, usually a full ring of nonmetallic material, located and retained in the nut at its top surface.

Note: "All-metal" is a generic term encompassing nuts that are totally all metal and also those which have nonmetallic patches, pellets or plugs located in their threads.

3.2 For hex nuts, the two nut designs defined in *(a)* and *(b)* of 3.1 have the same dimensional requirements and are designated "all-metal type" in Table 2; nut design *(c)* of 3.1 is designated "top insert type" in Table 2. For hex flange nuts, all three nut designs have the same dimensional requirements as detailed in Table 3.

3.3 The method of producing prevailing-torque characteristics, and the design of the prevailing-torque feature shall be in accordance with the practice of the manufacturer.

4.0 Nut Strength Grades

4.1 There are three grades of prevailing-torque type steel hex nuts designated as Grades A, B and C, respectively. There are two grades of prevailing-torque type steel hex flange nuts designated respectively as Grades F and G.

Each grade of nut is suggested for use with externally threaded components having specified minimum tensile strengths within the following values:

Table 1 Nut/Bolt Compatibility

Grade of Nut	Specified Min Ultimate Tensile Strength of Bolt, ksi
Grade A	not greater than 90
Grades B and F	not greater than 120
Grade C	not less than 105, nor greater than 150
Grade G	not less than 120, nor greater than 150

5.0 Requirements

5.1 Materials and Processes

5.1.1 *Material.* Nuts shall be made of steel in accordance with IFI-140. Alternate material may be used if agreed upon with the purchaser. The material shall be processed to meet the mechanical and performance requirements of this standard.

The prevailing-torque element of top insert design nuts may be of a material other than steel.

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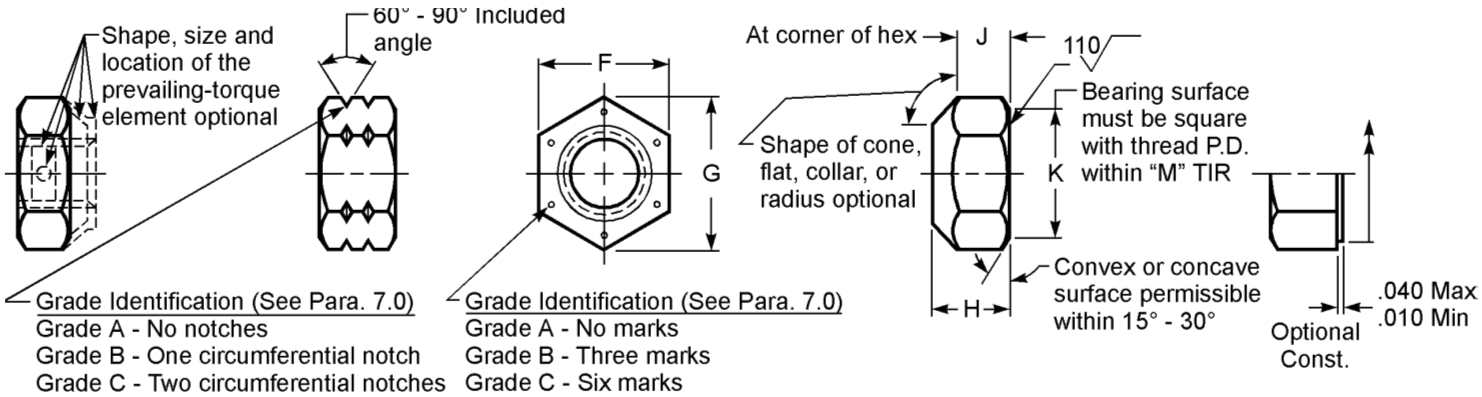

Grade Identification (See Para. 7.0)
Grade A - No notches
Grade B - One circumferential notch
Grade C - Two circumferential notches

Grade Identification (See Para. 7.0)
Grade A - No marks
Grade B - Three marks
Grade C - Six marks

Marks need not be located at corners

Table 2 Dimensions of Prevailing-Torque Type Regular Hex and Light Hex Series Nuts

Nominal Size or Basic Major Dia of Thread	Width Across Flats						Width Across Corners				Thickness			Height of Hex	Dia of Bearing Surface				Angularity of Bearing Surface FIM
	Regular Series			Light Series			Regular Series		Light Series		Top Insert Type	All Metal Type	Both Types		Regular Series		Light Series		
	F			F			G		G		H	H	H	J	K		K		M
	Basic	Max	Min	Basic	Max	Min	Max	Min	Max	Min	Max	Max	Min	Min	Max	Min	Max	Min	Max
No. 4 0.1120	1/4	0.251	0.241	1/4	0.251	0.241	0.289	0.275	0.289	0.275	0.163	0.163	0.087	0.066	0.251	0.238	0.251	0.238	0.008
6 0.1380	5/16	0.313	0.302	5/16	0.313	0.302	0.361	0.344	0.361	0.344	0.188	0.171	0.102	0.075	0.313	0.297	0.313	0.297	0.008
8 0.1640	11/32	0.345	0.332	11/32	0.345	0.332	0.397	0.378	0.397	0.378	0.239	0.191	0.117	0.083	0.345	0.328	0.345	0.328	0.009
10 0.1900	3/8	0.376	0.362	3/8	0.376	0.362	0.433	0.413	0.433	0.413	0.249	0.241	0.117	0.083	0.376	0.357	0.376	0.357	0.009
12 0.2160	7/16	0.438	0.423	7/16	0.438	0.423	0.505	0.482	0.505	0.482	0.328	0.241	0.148	0.103	0.438	0.416	0.438	0.416	0.010
1/4 0.2500	7/16	0.4385	0.428	7/16	0.4385	0.428	0.505	0.488	0.505	0.488	0.328	0.288	0.212	0.145	0.438	0.416	0.438	0.416	0.010
5/16 0.3125	1/2	0.5020	0.489	1/2	0.5020	0.489	0.577	0.557	0.577	0.557	0.359	0.336	0.258	0.166	0.502	0.475	0.502	0.475	0.011
3/8 0.3750	9/16	0.5645	0.551	9/16	0.5645	0.551	0.650	0.628	0.650	0.628	0.469	0.415	0.320	0.198	0.564	0.534	0.564	0.534	0.012
7/16 0.4375	11/16	0.6895	0.675	11/16	0.6895	0.675	0.794	0.768	0.794	0.768	0.524	0.463	0.365	0.223	0.689	0.653	0.689	0.653	0.013
1/2 0.5000	3/4	0.7520	0.736	3/4	0.7520	0.736	0.866	0.840	0.866	0.840	0.609	0.573	0.427	0.262	0.752	0.712	0.752	0.712	0.014
9/16 0.5625	7/8	0.8770	0.861	7/8	0.8770	0.861	1.010	0.982	1.010	0.982	0.656	0.621	0.473	0.286	0.877	0.830	0.877	0.830	0.015
5/8 0.6250	15/16	0.9395	0.922	15/16	0.9395	0.922	1.083	1.051	1.083	1.051	0.765	0.731	0.535	0.329	0.939	0.890	0.939	0.890	0.016
3/4 0.7500	1-1/8	1.1270	1.088	1-1/16	1.064	1.052	1.299	1.240	1.227	1.191	0.890	0.827	0.617	0.382	1.127	1.069	1.064	1.033	0.018
7/8 0.8750	1-5/16	1.3145	1.269	1-1/4	1.252	1.239	1.516	1.447	1.443	1.403	0.999	0.922	0.724	0.450	1.314	1.246	1.252	1.230	0.020
1 1.0000	1-1/2	1.5020	1.450	1-7/16	1.440	1.427	1.732	1.653	1.660	1.619	1.124	1.018	0.831	0.513	1.502	1.425	1.440	1.418	0.022
1-1/8 1.1250	1-11/16	1.6895	1.631	1-5/8	1.627	1.614	1.949	1.859	1.876	1.833	1.281	1.176	0.939	0.576	1.689	1.603	1.627	1.605	0.025
1-1/4 1.2500	1-7/8	1.8770	1.812	1-13/16	1.815	1.801	2.165	2.066	2.093	2.046	1.422	1.272	1.030	0.628	1.877	1.781	1.815	1.793	0.028
1-3/8 1.3750	2-1/16	2.0645	1.994	2	2.008	1.973	2.382	2.273	2.309	2.259	1.609	1.399	1.138	0.681	2.064	1.959	2.008	1.962	0.031
1-1/2 1.5000	2-1/4	2.2520	2.175	2-3/16	2.197	2.159	2.598	2.480	2.526	2.473	1.671	1.526	1.245	0.757	2.252	2.138	2.197	2.148	0.034

NOTES:
1. All dimensions are in inches.
2. Except as noted, dimensions apply to all grades of locknuts.
3. Tapped holes shall be countersunk on the bearing face. The maximum countersink diameter shall be the thread basic (nominal) major diameter plus .030 in. for 3/8 in. nuts or smaller, and 1.08 times the basic major diameter for nuts larger than 3/8 in. No part of the threaded portion shall project beyond the bearing surface.
4. Axis of tapped hole shall be concentric with axis of locknut body within a tolerance of 1.5 percent (3 percent FIM) of the maximum width across flats.
5. FIM signifies "Full Indicator Movement."

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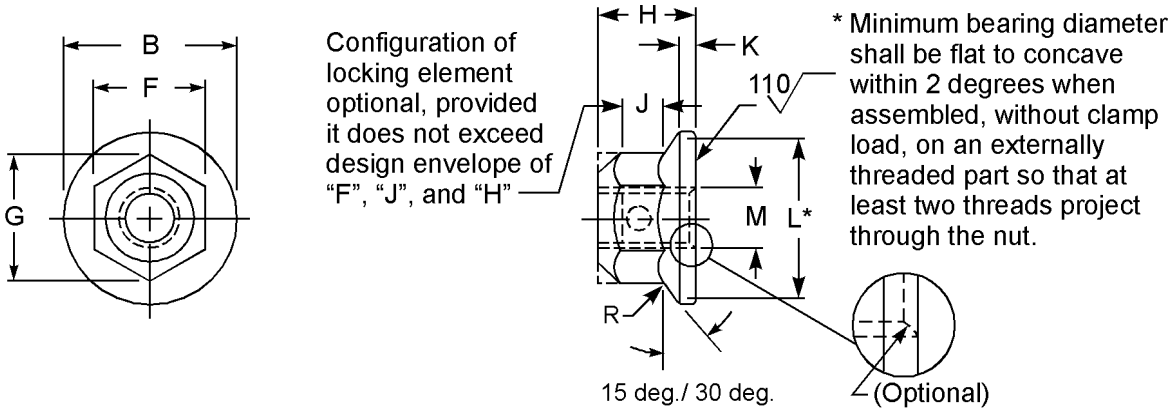

Table 3 Dimensions of Prevailing-Torque Type Hex Flange Nuts

Nominal Size or Basic Major Dia of Thread		Width Across Flats			Width Across Corners		Height	Flange Dia	Bear-ing* Dia	Flange Thick-ness	Wrench-ing Height	Counter-sink Dia	Angularity of Brg. Surf. with Thd P.D. FIM	Flange Top Radius
		F			G		H	B	L	K	J	M		R
		Basic	Max	Min	Max	Min	Max	Max	Min	Min	Min	Max	Max	Max
1/4	0.2500	7/16	0.4385	0.428	0.505	0.488	0.300	0.560	0.484	0.04	0.14	0.295	0.011	0.01
5/16	0.3125	1/2	0.5020	0.489	0.577	0.557	0.365	0.680	0.602	0.05	0.17	0.357	0.013	0.01
3/8	0.3750	9/16	0.5645	0.551	0.650	0.628	0.425	0.810	0.730	0.06	0.20	0.420	0.015	0.02
7/16	0.4375	11/16	0.6895	0.675	0.794	0.768	0.495	0.930	0.846	0.07	0.23	0.482	0.016	0.02
1/2	0.5000	3/4	0.7520	0.736	0.866	0.840	0.555	1.070	0.982	0.08	0.26	0.560	0.018	0.02
9/16	0.5625	7/8	0.8770	0.861	1.010	0.982	0.625	1.190	1.101	0.09	0.29	0.622	0.019	0.03
5/8	0.6250	15/16	0.9395	0.922	1.083	1.051	0.690	1.330	1.230	0.10	0.32	0.685	0.021	0.03
3/4	0.7500	1-1/8	1.1270	1.088	1.299	1.240	0.825	1.585	1.472	0.11	0.38	0.810	0.023	0.03

NOTES:

1. All dimensions are in inches.
2. * The bearing diameter is determined from the bearing area necessary to support 75 percent of the specified proof load of an SAE Grade 5 UNF bolt with a bearing stress of 20,000 psi. This same bearing area will support 100 percent of the specified proof load of an SAE Grade 8 UNF bolt with a bearing stress of 37,800 psi.
3. Axis of tapped hole shall be concentric with axis of locknut body within a tolerance of 1.5 percent (3 percent FIM) of the maximum width across flats.
4. FIM signifies "Full Indicator Movement".

5.1.2 *Heat Treatment.* Grade A nuts shall not be heat treated. Other nut grades may be heat treated as necessary to meet the mechanical and performance requirements of this standard, except that they shall not be case hardened. Heat treatment is defined as heating the nut to the austenitizing temperature of the material of which the nut is made, quenching in a proper medium to obtain a predominately martensitic microstructure, and tempering to the specified hardness. (See Table 4.)

5.1.3 *Finish.* Nuts may be furnished plain (bare metal) or with a protective coating as specified by the user. All nuts may be provided with an additional supplementary lubricant which shall be clean and dry to the touch. The performance of nuts which are furnished with a protective coating shall not deteriorate when nuts are stored indoors for a period of six months.

In cases where nuts are given a protective coating or are cleaned following delivery to the purchaser, the nut producer shall not be held responsible for failures of the nut to meet dimensional, mechanical, or performance requirements traceable to plating, coating, or cleaning practice.

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