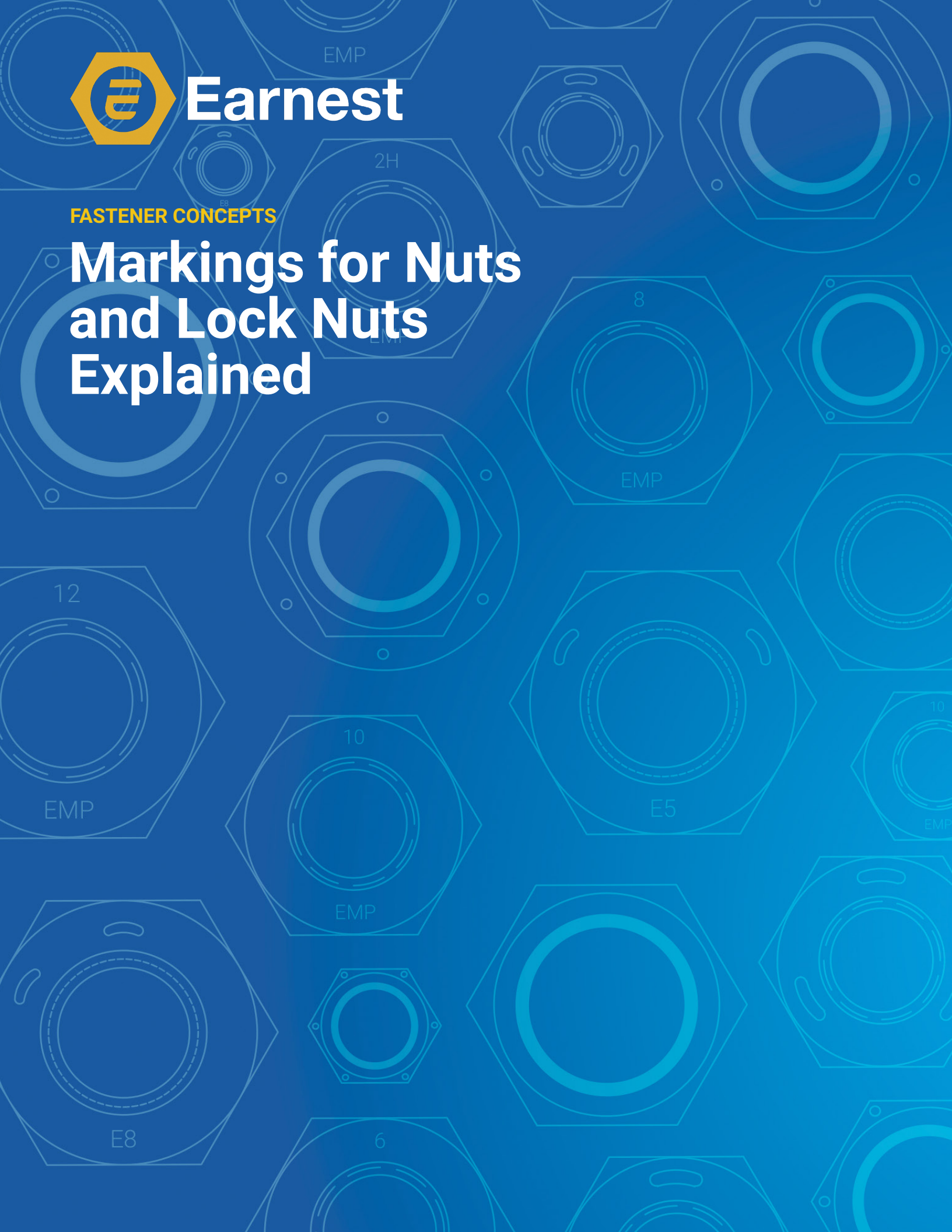
Earnest

FASTENER CONCEPTS

Markings for Nuts and Lock Nuts Explained



Markings for Nuts and Lock Nuts Explained

In our previous article titled Head Markings for Bolts and Screws Explained, we discussed the head markings found on inch (imperial) and metric bolts and screws. In this article, we will discuss the markings found on nuts and lock nuts.

When dealing with the inch (imperial) sizes of nuts and lock nuts, there are three main standards organizations that specify the material, hardness, strength level, and markings required. Those standards organizations are:

- SAE (Society of Automotive Engineers)
- ASTM (American Society of Testing and Materials)
- IFI (Industrial Fastener Institute) - for lock nuts

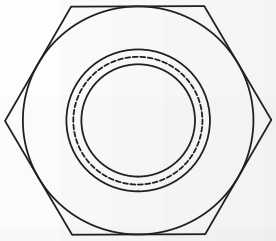
All three standard organizations include a marking that is designed to identify the strength of the fastener and require a manufacturer's identification marking to be included on the fastener. In the U.S., we have a Fastener Quality Act (FQA) that requires heat-treated and grade-marked fasteners to be marked with a manufacturer’s marking that has been registered with the National Institute of Standards and Technology (NIST) if it is to be sold in the U.S. The markings E5, E8, and EMP have been registered by Earnest Machine Products for use on our inch sizes of fasteners.

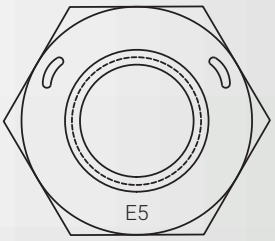
The term Grade is the word we use to identify the material, hardness, and strength level for inch size fasteners. The purpose of the grade marking is to identify the strength level that the fastener has been manufactured to and the manufacturer's marking is to identify who is responsible for the quality and testing of the fastener.

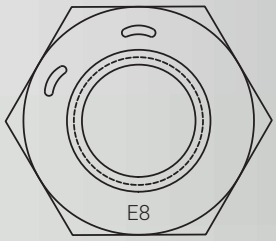
SAE Grades

The SAE grade designations are the most common grades of fasteners sold in the U.S. Fasteners made to the SAE grades are used in the manufacture of equipment that moves such as cars, trucks, buses, trains, agricultural, construction, and mining equipment. The SAE specification that defines the material, hardness, and strength level of steel nuts (SAE J995) specifies multiple strength levels and typically deals with diameters between 1/4" and 1 1/2". The three main strength levels that are used in industry are Grade 2 (low strength), Grade 5 (medium strength), and Grade 8 (high strength).

SAE Grade Markings:







	Grade 2	Grade 5	Grade 8
Grade Marking	No Marking Required	2 Lines 120º Apart	2 Lines 60º Apart
Proof Load Strength (min)	90,000 psi*	120,000 psi*	150,000 psi*
Hardness	HRC 32 max	HRC 32 max	HRC 24/36*
Material	Low Carbon Steel	Low/Medium Carbon Steel	Medium Carbon Steel

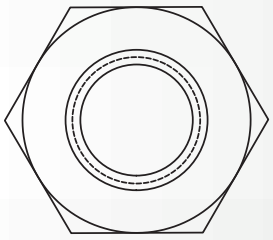
The SAE spec only requires grade markings to be applied to regular hex nuts and flange nuts. Other styles of nuts, such as jam nuts, slotted nuts, thick nuts, heavy hex nuts, etc., are not required to be marked, per the SAE spec.

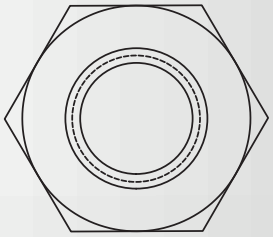
*Proof load strengths and hardness can vary by size and thread pitch

ASTM Grades

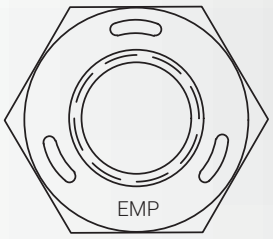
The ASTM grades are more commonly used in structural applications (buildings, warehouses, bridges, cell towers, etc.) but are also used in construction and transportation applications when a heavy hex or diameters above 1 1/2" are specified. ASTM grades are commonly referred to as structural grades because of their use in the construction of buildings.

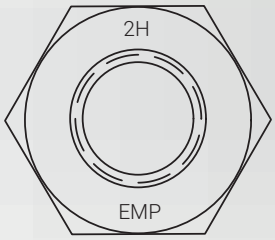
Structural Grade Markings:





	A563 Grade A	A563 Grade B
Grade Marking	No Marking Required	No Marking Required
Proof Load Strength (min)	90,000 psi	133,000 psi*
Hardness	HRB 69/100	HRB 69/HRC 32
Material	Low Carbon Steel	Low/Medium Carbon Steel





	A563 Grade C	A194 Grade 2H
Grade Marking (cont.)	3 Circumferential Lines	2H
Proof Load Strength (min)	125,000 psi	175,000 psi
Hardness	HRC 35 max	HRC 24/35
Material	Alloy Steel	Medium Carbon Steel

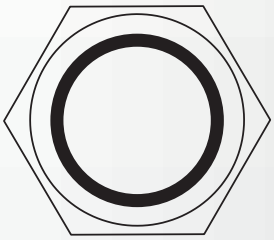
*Proof load strengths and hardness can vary by size and thread pitch

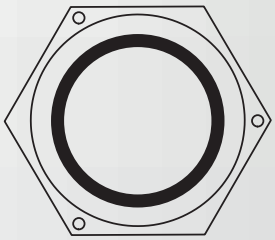
Lock Nut Grades

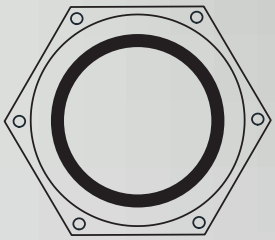
The grade designations for nuts that provide a locking action (commonly called prevailing torque nuts) are specified by the IFI. ASME specs have been updated to include prevailing torque lock nuts in their standards (ASME B18.16.6) but historically, lock nut grades (and the marking requirements) have been specified in IFI 100/107.

The IFI standard uses letter grades to differentiate the different strength levels for lock nuts. The three main strength levels that are used for all metal and nylon insert lock nuts are the Grade A (low strength), Grade B (medium strength), and Grade C (high strength). The IFI spec uses different grade letters with flange lock nuts, Grade F (medium strength), and Grade G (high strength).

IFI Grade Markings (for Hex Nuts):





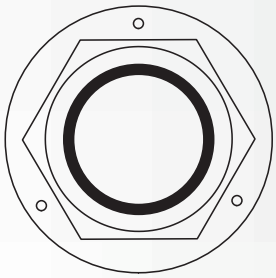


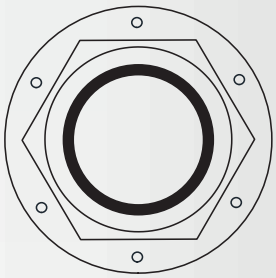
	Grade A	Grade B	Grade C
Grade Marking	No Marking Required	3 Dots* 120º Apart	6 Dots* 60º Apart
Proof Load Strength (min)	90,000 psi*	120,000 psi*	150,000 psi*
Hardness	HRC 32 max	HRC 32 max	HRC 24/36*
Material	Low Carbon Steel	Low/Medium Carbon Steel	Medium Carbon Steel

*Proof load strengths and hardness can vary by size and thread pitch and one dot can be replaced by manufactures marking

Lock Nut Grades (cont.)

IFI Grade Markings (for Flange Nuts):





	Grade F	Grade G
Grade Marking	3 Dots* 120º Apart	6 Dots* 60º Apart
Proof Load Strength (min)	120,000 psi*	150,000 psi*
Hardness	HRC 32 max	HRC 24/36*
Material	Low/Medium Carbon Steel	Low/Medium Carbon Steel

The IFI grades are designed to be used with the following SAE bolt grades:

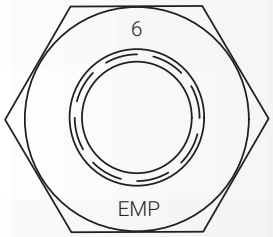
IFI Grade	SAE Bolt
A	2
B and F	5
C and G	8

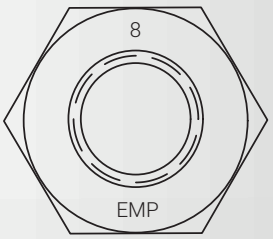
Metric Nut Strength Levels

The grade designations for nuts that provide a locking action (commonly called prevailing torque nuts) are specified by the IFI. ASME specs have been updated to include prevailing torque lock nuts in their standards (ASME B18.16.6) but historically, lock nut grades (and the marking requirements) have been specified in IFI 100/107.

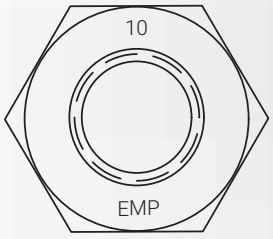
Metric Nut Strength Levels (cont.)

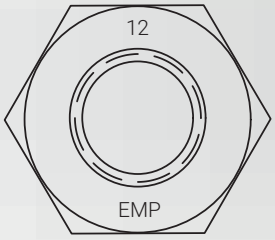
When dealing with metric nuts, we use the term Property Class to define the material, hardness, and strength (instead of the word grade that is used to describe inch fasteners). The metric strength level, or property class, uses numbers to identify their strength levels. The four main strength levels that are used in industry for metric nuts are Property Class 6 (low strength), Property Class 8 (medium strength), Property Class 10 (high strength), and Property Class 12 (extra high strength).





	Property Class 6	Property Class 8
Class Marking	6	8
Proof Load Strength (min)	600 MPa*	800 MPa*
Hardness	HRB 78/HRC 30	HRB 87/HRC 36*
Material	Low Carbon Steel	Low/Medium Carbon Steel





	Property Class 10	Property Class 12
Class Marking (cont.)	10	12
Proof Load Strength (min)	1040 MPa*	1140 MPa*
Hardness	HRC 26/36*	HRC 29/36*
Material	Medium Carbon Steel	Medium Carbon Steel

*proof load strengths can vary depending on diameter and thread pitch

Summary

The term Grade (used when referring to inch products) and the term Property Class (used when referring to metric products) are the words used within our industry to identify the material, hardness, and strength level for fasteners.

The standards organizations that specify the material, hardness, strength level, and the marking requirements for steel nuts and lock nuts are:

- SAE (Society of Automotive Engineers)
- ASTM (American Society of Testing and Materials)
- IFI (Industrial Fastener Institute) - for lock nuts

Generally speaking, if a nut has:

- Lines or dots, it's an inch fastener made to an SAE Grade
- Letters and numbers, it's a structural fastener made to an ASTM Spec
- Numbers, it's a metric fastener made to ISO Property Classes

For questions on the material used, hardness level, strength level, or markings for nuts and lock nuts, please contact us at: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