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Standard Terminology for F16 Mechanical Fasteners[1]

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1. Scope

1.1 This terminology standard provides a compilation of definitions for terminology used for mechanical fasteners.

1.2 Terms in this terminology are organized alphabetically. In Appendix X1 they are listed under fastener characteristic.

1.3 Additional definitions are shown in ANSI/ASME B18.12; IFI Glossary of Terms, IFI-139 and IFI-140; and SAE J412.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A563/A563M Specification for Carbon and Alloy Steel Nuts (Inch and Metric)

E456 Terminology Relating to Quality and Statistics

F432 Specification for Roof and Rock Bolts and Accessories

F2482 Specification for Load-Indicating Externally Threaded Fasteners

2.2 *ANSI/ASME Standard:*[3]

B18.12 Glossary of Terms for Mechanical Fasteners

2.3 *IFI Standards:*[4]

Glossary of Terms Relating to Aerospace Fasteners

IFI-139 Quality Assurance Requirements for Fastener Testing Laboratories

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

2.4 *SAE Standard:*[5]

SAE J412 General Characteristics and Heat Treatments of Steels

2.5 *ISO/IEC Standards:*[6]

ISO/IEC 17011 Conformity assessment -- General requirements for accreditation bodies accrediting conformity assessment bodies

ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

3. Terminology

Mechanical Fastener Definitions

acceptance number—numerical value representing the maximum number of permissible non-conformances within a sample submitted for testing and acceptance of the population.

accredited laboratory—an organization found to be operating in conformance with the requirements of ISO/IEC 17025 by an accrediting body that has been found to be compliant to ISO/IEC 17011, and is recognized as a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA).

age hardened—precipitation of constituents within certain alloy metals to increase mechanical properties.

alloy group—materials grouped by their chemical designation and considered to be functionally or chemically similar for general purpose use.

alloy steel—steel is considered to be alloy when the maximum range given for manganese exceeds 1.65 % or a definite minimum quantity for any of the following elements is specified or required within the limits of the recognized field of constructional alloy steels: chromium, molybdenum, nickel, or any other alloying element added to obtain a desired alloying effect.

[1] This terminology is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.91 on Editorial.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[4] Available from Industrial Fasteners Institute, 1717 E. 9th Street, Suite 1105, Cleveland, OH 44114. http://www.indfast.org

[5] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, http://www.sae.org.

[6] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.

alter—to change fastener properties such as hardness, tensile strength, surface finish, length, or other characteristics of the fastener through such processes as heat treatment, plating, and machining.

alteration

*insignificant alteration—*any change to the fastener from its purchased condition that results in no diminished or modified mechanical, metallurgical, or functional properties.

*significant alteration—*any change to the fastener from its as purchased condition that results in modified mechanical, metallurgical, or functional properties.

alteration distributor—distributor of fasteners who alters a fastener prior to sale and assumes the full responsibilities of the alteration and its affected mechanical and performance characteristics.

anchor bolt—steel rod or bar, one end of which is intended to be cast in concrete while the opposite end is threaded and projects from the concrete for anchoring other material to the concrete. The end cast in concrete may be either straight or provided with an anchor, such as a bent hook, forged head, or a tapped or welded attachment to resist forces imposed on the anchor bolt as required.

annealing—general term applied to a variety of thermal treatments applied to fasteners for the purpose of softening or homogenizing material properties. The specific types of annealing are:

*full annealing—*heating steel above the upper critical transformation temperature, holding it there long enough to fully transform the steel to austenite, and then cooling it at a controlled rate, in a furnace, to below a specified temperature. A full anneal refines grain structure and provides a relatively soft, ductile material that is free of internal stresses.

*intercritical annealing/isothermal annealing—*heating a steel above the lower critical transformation temperature, but below the upper-critical transformation temperature, to dissolve all the iron carbides, but not transform all the ferrite to austenite. Cooling slowly from this temperature, through the lower critical temperature, produces a structure of ferrite and pearlite that is free of internal stresses. In *intercritical annealing*, the steel continues to cool slowly in the furnace, similarly to full annealing. In *isothermal annealing*, cooling is stopped just below the lower critical, assuring complete transformation to ferrite and coarse pearlite, and eliminating the potential for bainite formation. The coarse pearlite structure greatly improves machinability of medium carbon steels.

*normalizing—*variation of full annealing in which steel is heated above the upper critical temperature and is then air cooled in air, rather than in a furnace. Normalizing relieves the internal stresses caused by previous working, and while it produces sufficient softness and ductility for many purposes, it leaves the steel harder and with a higher tensile strength than full annealing. To remove cooling stresses, normalizing if often followed by tempering.

*process annealing—*sometimes called subcritical annealing or stress relieving, performed at temperatures just below the lower critical temperature. Process annealing neither refines grains nor redissolves cementite, but does improve the ductility and decreases residual stress in work-hardened steel.

*solution annealing—*heating an austenitic stainless steel to a temperature that puts the carbides into solution. The steel is held at this temperature long enough to achieve grain growth. It is then quenched in a medium for fast cooling, which prevents most of the carbides from reprecipitating. The process achieves optimum creep strength.

*spheroidize annealing—*type of subcritical annealing used to soften steel and improve machinability. Heat treating fine pearlite for a long time just below the lower critical temperature of the steel, followed by a very slow cooling, produces a spheroidal or globular form of the pearlite.

*stabilization annealing—*heating an austenitic stainless steel used in severe aqueous corrosion environments by first solution annealing and then reheating to about 1600 °F, and holding at that temperature. The treatment causes grain boundary precipitation of carbides, but also the hold time permits the chromium remaining in the austenite solution to redistribute within the grains, restoring corrosion resistance, even adjacent to the grain boundaries.

applicable standards—those having the capability of being applied in some fashion to the host standard.

arbitration hardness location—prescribed location on the fastener, such as at mid-radius, using 90° intervals taken through the cross section, one diameter from the threaded end for bolts and screws.

assembly lot—assembly lot may consist of a combination of different products. As long as the products that make up the assembly are in accordance with *lot*, the quantity of assemblies determine the sample size. Example: ten assemblies consisting of a bolt, nut, and a washer would have a lot size of ten if the bolts, nuts, and washers meet the criteria of *lot*. However, if any of the components in the assembly are not in accordance with *lot* then the ten assemblies will have to be separated into lots that meet all the requirements of *lot*.

austenitic stainless alloys—steel alloys that contain a minimum of 15 % chromium and from a residual to 20 % nickel. Some alloys may contain as much as 18 % manganese. The metal is predominantly face centered cubic in structure and hardenable only by cold working. Essentially nonmagnetic in its wire form, it may become slightly magnetic from cold working. Austenitic stainless steels can be grouped into three categories: 300 series alloy, Cr-Ni-Mn alloys, and Cr-Ni-Mo-Ti.

average coating thickness—determined as either the value obtained by analytical methods or the mean value of a specified number of local thickness measurements that are evenly distributed over the significant surface.