Designation: F 812/F812M – 97

Standard Specification for Surface Discontinuities of Nuts, Inch and Metric Series[1]

This standard is issued under the fixed designation F 812/F812M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification establishes allowable limits for the various types of surface discontinuities that may occur during the manufacture and processing of metric-series nuts with nominal diameters 5 mm and larger and inch-series nuts with nominal diameters ¼ in. and larger.

1.2 The values stated in either SI (metric) or inch-pound units are to be regarded separately as standard. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

1.3 When the engineering requirements of the application necessitate control of surface discontinuities on nuts, the purchaser shall specify conformance to this ASTM specification in the original inquiry and purchase order.

1.3.1 When the engineering requirements of the application necessitate that surface discontinuities on nuts be controlled within limits closer than those specified in this specification, the purchaser shall specify the applicable limits in the original inquiry and purchase order.

1.4 The allowable limits established in this specification for metric nuts, with nominal diameters 5 to 24 mm inclusive, are essentially identical with requirements given in ISO/DIS 6157/II. There are no ISO standards for surface discontinuities on metric-series nuts with nominal diameters larger than 24 mm or on any inch-series nuts.

1.5 The following precautionary caveat pertains only to the test method portion, Section 6, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

F 606 Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, and Rivets[2]

2.2 *ISO Standard:*

ISO/DIS 6157/II Fasteners, Surface Discontinuities on Nuts[3]

3. Ordering Information

3.1 Orders for nuts requiring surface discontinuity control shall include:

3.1.1 ASTM designation and date of issue of this specification.

3.1.2 Special requirements, for example, closer discontinuity limits (1.3.1) and inspection sampling plan (6.2).

4. Types of Surface Discontinuities

4.1 *Crack*—A clean (crystalline) fracture passing through or across the grain boundaries and may possibly follow inclusions of foreign elements. Cracks are normally caused by overstressing the metal during forging or other forming operations, or during heat treatment. Where parts are subjected to significant reheating, cracks usually are discolored by scale.

4.1.1 *Quench Cracks*— May occur due to excessively high thermal and transformation stresses during heat treatment. Quench cracks usually traverse an irregular and erratic course on the surface of the nut. Typical quench cracks are shown in Fig. 1; limits are specified in 5.2.

4.1.2 *Forging Cracks*— May occur during the cut-off or forging operations and are located on the top and bottom face of the nut and at the intersection of the face and flat. Typical forging cracks are shown in Fig. 2; limits are specified in 5.3.

4.1.3 *Inclusion Cracks*— Normally caused by nonmetallic inclusions or stringers inherent in the raw material. Typical inclusion cracks are shown in Fig. 2; limits are specified in 5.3.

4.1.4 *Locking-Element Cracks*—Occur due to application of pressure when forming the locking element of prevailing torque-type nuts. Such cracks are usually located in the vicinity of the locking element and may be either on the internal or external surface. Typical locking element cracks are shown in Fig. 3; limits are specified in 5.4.

4.1.5 *Washer-Retainer Cracks*—Openings in the lip or hub of metal used to retain a washer on a nut. Washer-retainer

[1] This specification is under the jurisdiction of ASTM Committee F-16 on Fasteners and is the direct responsibility of Subcommittee F16.02 on Steel Bolts, Nuts, Rivets, and Washers.

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[2] *Annual Book of ASTM Standards*, Vol 01.08.

[3] Available from American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

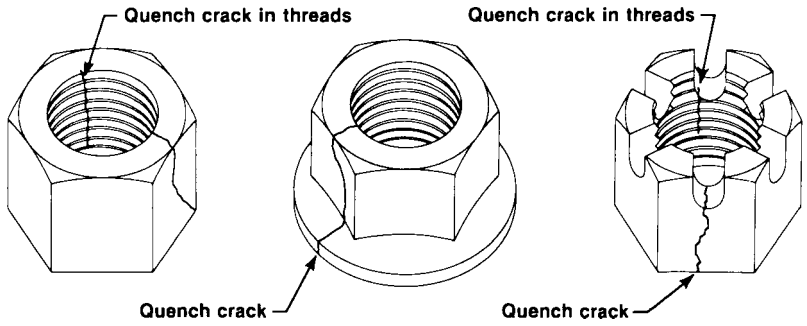

FIG. 1 Typical Quench Cracks in Nuts

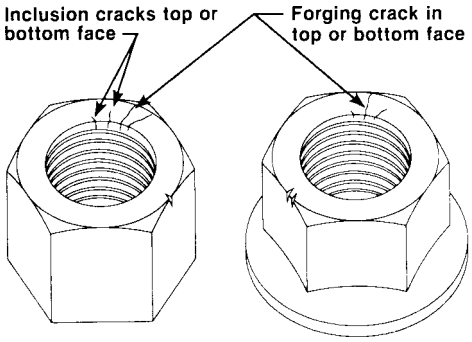

FIG. 2 Typical Forging and Inclusion Cracks in Nuts

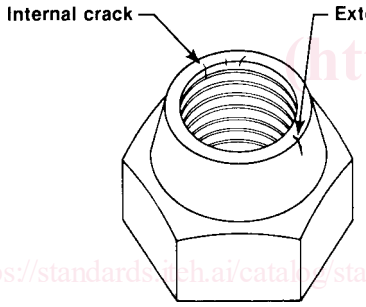

FIG. 3 Typical Locking Element Cracks in Prevailing-Torque Nuts

cracks may occur when pressure is applied to the lip or hub during assembly of the washer. Typical washer-retainer cracks are shown in Fig. 4; limits are specified in 5.5.

4.2 *Burst*—An open break in the metal. Bursts occur during the forging operation and are located on the flats or corners of nuts or at the periphery of the flange on flanged nuts. A typical burst is shown in Fig. 5; limits are specified in 5.6.

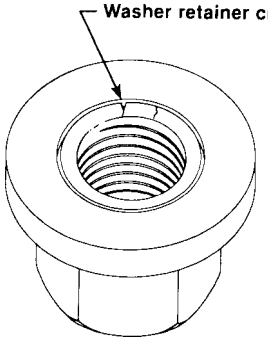

FIG. 4 Typical Washer Retainer Cracks in Nuts

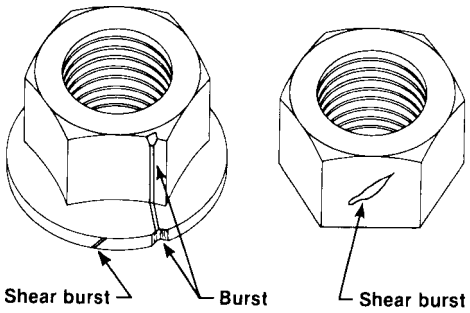

FIG. 5 Typical Bursts and Shear Bursts in Nuts

4.2.1 *Shear Burst*— An open break in the metal located at approximately a 45° angle to the nut axis. Shear bursts occur most frequently at the periphery of flanged nuts. A typical shear burst is shown in Fig. 5; limits are specified in 5.6.

4.3 *Seam*—Seams are generally inherent in the raw material from which the nut is made. Seams in nuts are usually straight or smooth-curved line discontinuities running generally parallel to the nut axis. Seams in raw material used for forged or formed nuts may lead to the formation of bursts. Typical seams are shown in Fig. 6; limits are specified in 5.7.

4.4 *Fold*—A doubling over of metal that occurs during the forging operation. Folds in nuts may occur at or near the intersection of diameter changes or on the top or bottom face of the nut. Typical folds are shown in Fig. 7; limits are specified in 5.8.

4.5 *Void*—A shallow pocket or hollow on the surface of a nut due to nonfilling of metal during forging. Voids are produced by marks or impressions of chips (shear burrs) or by rust formation on the raw material. They are not planished during forging. Typical voids are shown in Fig. 8; limits are specified in 5.9.

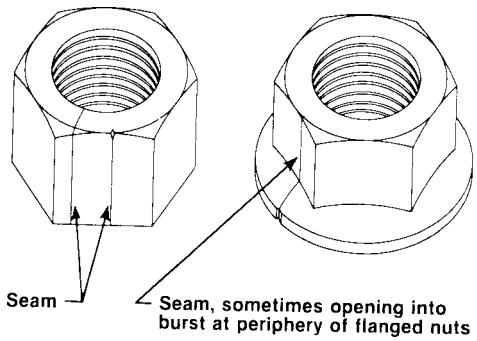

FIG. 6 Typical Seams in Nuts