

Acceptance Criteria for Nuts -
Magnetic Particle, Fluorescent Penetrant, and Visible Penetrant Examination

RATIONALE

AS5447 has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

1.1 Type:

This standard establishes the acceptance criteria for surface discontinuities as revealed by magnetic particle or liquid penetrant examination of nuts.

1.2 Application:

Primarily for use on aerospace propulsion system free running and self-locking nuts, including the plate and channel for plate and channel nuts. Discontinuities revealed by nondestructive test methods other than those in this standard shall have the acceptance criteria specified on the part drawing or other definition document.

2. REFERENCES:

2.1 Applicable Documents:

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2012 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: <http://www.sae.org>

**SAE values your input. To provide feedback
on this Technical Report, please visit
<http://www.sae.org/technical/standards/AS5447>**

- 2.1.1 ASTM Publications: Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM E 1417 Liquid Penetrant Examination

ASTM E 1418 Visible Penetrant Examination Using the Water-Washable Process

ASTM E 1444 Magnetic Particle Examination

2.2 Definitions:

BURR: A rough edge or ridge left on the metal due to cutting, grinding, piercing, or blanking.

CIRCULAR INDICATION: Any rateable discontinuity in the general direction around the thread axis (transverse), see Figure 1.

CRACK: A crystalline fracture passing through or across grain boundaries without inclusion of foreign elements. Cracks are normally caused by overstressing the metal during forming, or during heat treatment.

DISCONTINUITY: An interruption in the normal physical structure or configuration of the part; such as a crack, inclusion, machining tear, lap, seam, or stringer.

FORMING TEARS: Pattern of short, jagged individual slits, generally at right angles to the direction of metal working, see Figure 2.

GRINDING CHECK: Fine thermal cracks that develop from overheating of the area being ground. Such cracks are generally at right angles to the direction of grinding but may appear as a complete network.

INCLUSION: Nonmetallic particles inherent in the material when it was made. These particles may be isolated or distributed in the form of longitudinal stringers.

INDICATION: An indication is visual evidence of a discontinuity, as revealed by magnetic particle or liquid penetrant examination.

LAMINATIONS: Found only in plate steel, and are thin flat discontinuities seen only at the edge of the plate.

LAP: A surface imperfection appearing as a seam or crack, caused by folding of the material during operations as forming, forging, rolling, or drawing.

LINEAR INDICATION: Any rateable discontinuity in the general direction of the thread axis (longitudinal), see Figure 3.

MACHINING TEAR: A pattern of short, jagged individual cracks, generally at right angles to the direction of machining. Frequently the result of improperly set cutting tools, or dull cutting tools.

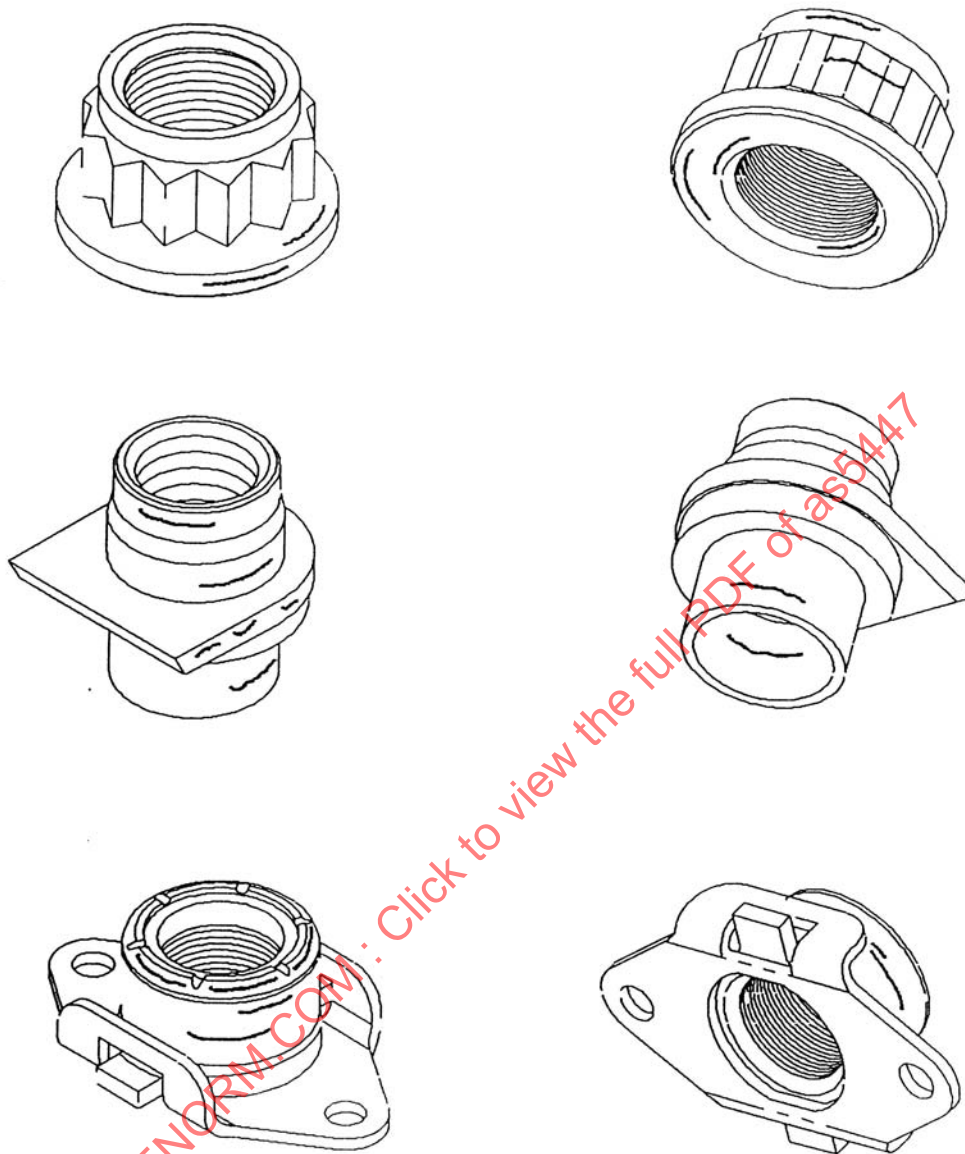


FIGURE 1 - Typical Circular Indications

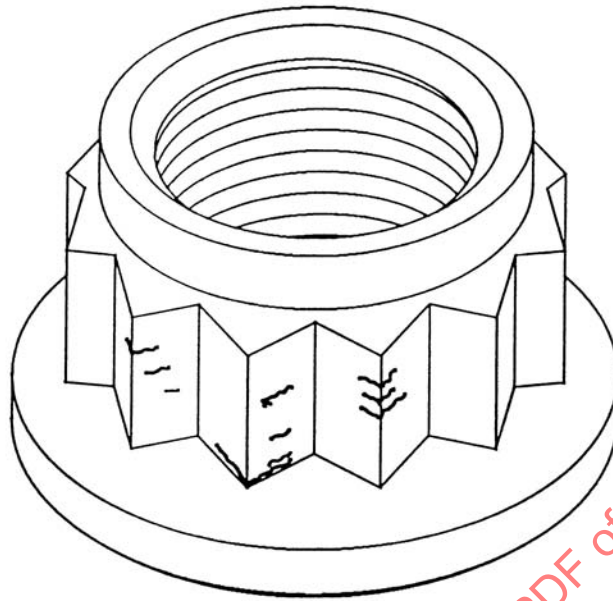


FIGURE 2 - Typical Forming Tears

SAENORM.COM : Click to view the full PDF of as5447

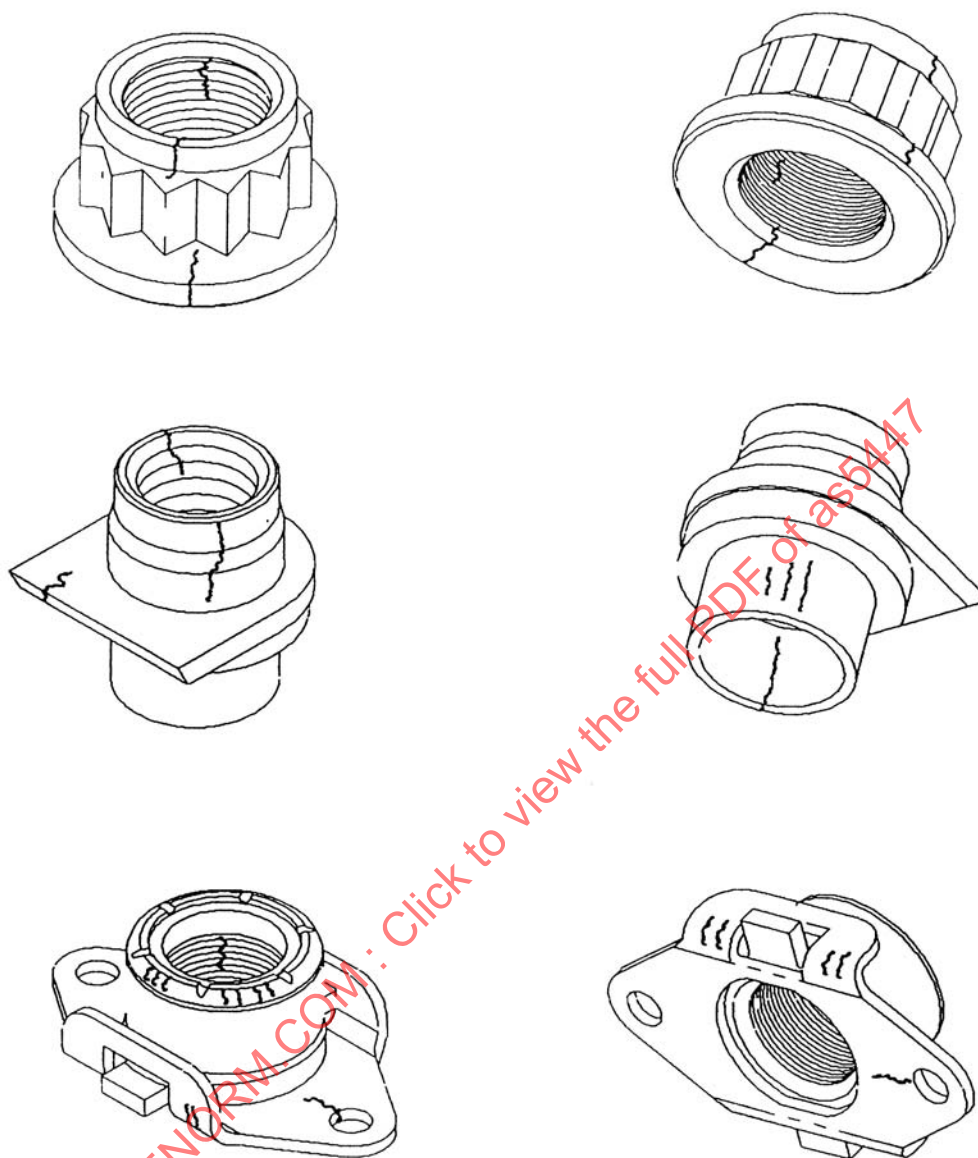


FIGURE 3 - Typical Linear Indications

2.2 (Continued):

NICKS or PITS: Depressions or indentations in the surface of the metal.

NON-RATEABLE INDICATION: Any discontinuity, regardless of location, with a depth less than or equal to 0.0005 in.

PIPE: A discontinuity in the center of a rolled bar. It is caused by internal cavities in the ingot formed during solidification and which have become elongated or stretched in the rolling operations.

RATEABLE INDICATION: Any discontinuity, regardless of location, with a depth greater than 0.0005 in.

SEAM: Open surface imperfection that is narrow and continuous, usually straight, running generally parallel to the bar axis. Seams are generally inherent in the bar from which the part is formed.

STRINGER: A solid nonmetallic impurity in the parent metal, often the result of inclusions that have been extended during the rolling process.

3. TECHNICAL REQUIREMENTS:

3.1 General Indications:

Where this standard is specified as the acceptance criteria for nondestructive examination of discontinuities, it shall apply in support of ASTM E 1444 for magnetic particle examination, ASTM E 1417 for fluorescent penetrant examination, and ASTM E 1418 for visible penetrant examination. The part marking requirement for identification of magnetic particle or penetrant inspection is waived.

- 3.1.1 Multi-piece nuts such as gang channel or floating plate nuts shall be inspected prior to assembly. When the multi-piece nut is heat treated after assembly, the nuts shall be inspected as an assembly.
- 3.1.2 Indications in themselves shall not be cause for rejection. Representative samples shall be taken from those nuts having indications and examined metallurgically at 10X magnification to determine if the discontinuities are outside the applicable limits permitted for rateable indications.

3.2 Acceptance Criteria:

- 3.2.1 Unless otherwise specified, parts with rateable or non-rateable indications shall show no indications of cracks, laminations, machining tears, pipes, or grinding checks. However, forming tears, which appear as cracks on the wrench pads, are acceptable provided the depth does not exceed the limits specified in Table 2.
- 3.2.2 Except as noted in 3.2.1, parts with non-rateable indications are acceptable.