International Standard

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Aerospace — Nuts, plain or slotted (castellated) — Procurement specification

Aéronautique et espace — Écrous lisses ou à créneaux — Spécification d'approvisionnement

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 4, *Aerospace fastener systems*.

This second edition cancels and replaces the first edition (ISO 9139:1998), which has been technically revised.

The main changes are as follows:

— a new sampling method for visual inspections and dimensional characteristics has been introduced, replacing the acceptance quality limit (AQL) sampling;

— the definition of inspection reliability requirement (IRR) has been added in Clause 3;

— the definition of AQL has been removed from Clause 3;

— an AS/EN 9138 paragraph has been added to 4.3;

— the structure of Table 1 has been changed;

— acceptance sample sizes for visual inspections and dimensional characteristics have been changed in Table 1, with Table 6 modified, previous Table 7 removed and replaced by new Tables 7 to 9.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Aerospace — Nuts, plain or slotted (castellated) — Procurement specification

1 Scope

This document specifies the required characteristics for metric plain or slotted (castellated) nuts, with MJ threads according to ISO 5855-2, for use in aerospace construction.

It is applicable to nuts as defined above, provided that reference is made to this document in the relevant definition document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1463, *Metallic and oxide coatings — Measurement of coating thickness — Microscopical method*

ISO 3452 (all parts), *Non-destructive testing — Penetrant inspection*

ISO 3887, *Steels — Determination of the depth of decarburization*

ISO 8788, *Aerospace — Nuts, metric — Tolerances of form and position*

ISO 9140, *Aerospace — Nuts, plain or slotted (castellated) — Test methods*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 21920-3, *Geometrical product specifications (GPS) — Surface texture: Profile — Part 3: Specification operators*

AS/EN 9138, *Aerospace Series - Quality Management Systems Statistical Product Acceptance Requirements*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
definition document
document specifying all the requirements for nuts, i.e.:

— metallurgical requirements;

— geometrical and dimensional requirements;

— functional requirements (strength and temperature classes)

Note 1 to entry: The definition document may be an International Standard, a national standard, an in-house standard or drawing.

3.2
finished nut
nut ready for use, inclusive of any possible treatments or surface coatings, as specified in the *definition document* (3.1)

3.3
batch
quantity of *finished nuts* (3.2), of the same type and same diameter, produced from a material obtained from the same melt, manufactured in the course of the same production cycle, following the same manufacturing route and having undergone all the relevant heat treatments and surface treatments

3.4
crack
rupture in the material which may extend in any direction and may be intercrystalline or transcrystalline in character

3.5
seam
open surface defect resulting from extension of the metal

3.6
lap
folding over of unwelded metal that can arise when the material is formed (drawing) or in the finished product (pressing or forging)

3.7
inclusion
non-metallic particle originating from the material manufacturing process

Note 1 to entry: These particles may be isolated or arranged in strings.

3.8
sampling plan
plan according to which one or more samples are taken in order to obtain information and possibly reach a decision

Note 1 to entry: In this document, each sampling plan specifies the number of nuts to be inspected as a function of the size of the *batch* (3.3) and the acceptance number [number of defective items acceptable (Ac)].

3.9
simple random sampling
sampling of n items from a population of N items in such a way that all possible combinations of n items have the same probability of being chosen

3.10
IRR
inspection reliability requirement
minimum acceptable outgoing yield or probability of conformance

4 Quality assurance

4.1 General

The manufacturer shall be capable of continuous production of bolts meeting the quality requirements specified in this document.

The purpose of qualification inspections[1)] of nuts is to check that the design and manufacturing conditions of a nut allow it to satisfy the requirements of this document.

Quality documentation for parts produced in accordance to this document shall be maintained for a minimum period of 10 years.

The purpose of production acceptance inspection of a nut is to check, as simply as possible, using a method which is inexpensive but most representative of the actual conditions of use, with the uncertainty inherent in statistical sampling, that the nuts satisfy the requirements of this document.

Production acceptance inspections shall be carried out by, or under the responsibility of, the manufacturer.

4.2 Qualification of nuts

The purpose of qualification inspections and tests of nuts is to check that the design and manufacturing conditions of a nut allow it to satisfy the requirements of this document.

The qualification is applicable to nuts either of strength classes greater than or equal to 1 550 MPa or of temperature classes greater than or equal to 650 °C, or both.

4.3 Production acceptance of nuts

The purpose of production acceptance inspection and tests of a nut is to check, as simply as possible, using a method which is inexpensive but most representative of the actual conditions of use, with the uncertainty inherent in statistical sampling, that the nuts satisfy the requirements of this document.

Production acceptance inspections and tests shall be carried out by, or under the responsibility of, the manufacturer.

The manufacturer is responsible for the quality of the nuts manufactured.

4.4 Qualification inspection and test conditions

Qualification inspections and tests (requirements, methods, numbers of nuts) are specified in Table 1. They shall be carried out on:

— each type and diameter of nut either of strength classes greater than or equal to 1 550 MPa or of temperature classes greater than or equal to 650 °C, or both;

— 75 nuts selected from a single inspection lot by simple random sampling.

If the mandated qualifying body agrees, the test programme can be reduced, or qualification of a nut granted without inspection or testing; any such decision shall be based on the results obtained on similar types and diameters of nuts provided that the design and manufacturing conditions are identical.

The inspections and tests shall be repeated on any nut if the supplier or the manufacturing conditions have changed.

Qualification inspections and tests are summarized in Table 2.

4.5 Production acceptance inspection and test conditions

Production acceptance inspections and tests (requirements, methods, numbers of nuts) are specified in Table 1. They shall be carried out on each batch. Nuts from the batch to be tested shall be selected by simple random sampling.

Each nut may be submitted to several inspections or tests.

1) In order to simplify the text, the term "inspections" used in this document also refers to "inspections and tests".