International Standard

ISO 5858

Aerospace — Nuts, self-locking, with maximum operating temperature less than or equal to 425 °C — Procurement specification

Aéronautique et espace — Écrous à freinage interne dont la température maximale d'utilisation est inférieure ou égale à 425 °C — 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 document 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 third edition cancels and replaces the second edition (ISO 5858:1999), which has been technically revised.

The main changes are as follows:

— normative references have been updated;

— the structure of Table 1 has been changed;

— new tables for sampling have been added.

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, self-locking, with maximum operating temperature less than or equal to 425 °C — Procurement specification

1 Scope

This document specifies the required characteristics for metric self-locking nuts, with MJ threads, for use in aerospace construction at a maximum temperature less than or equal to 425 °C.

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 691, *Assembly tools for screws and nuts — Wrench and socket openings — Tolerances for general use*

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

ISO 3452-1, *Non-destructive testing — Penetrant testing — Part 1: General principles*

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

ISO 5855-2, *Aerospace — MJ threads — Part 2: Limit dimensions for bolts and nuts*

ISO 7403, *Aerospace — Spline drives — Wrenching configuration — Metric series*

ISO 7481, *Aerospace — Nuts, self-locking, with maximum operating temperature less than or equal to 425 °C — Test methods*

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

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

ISO 9934 , *Non-destructive testing — Magnetic particle testing*

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

ASTM E1417, *Standard Practice for Liquid Penetrant Testing*

ASTM E1444, *Standard Practice for Magnetic Particle Testing*

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, or 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
production batch
quantity of *finished nuts* (3.2), manufactured using the same process, from a single material cast (single heat of alloy), having the same number of *definitiondocument* (3.1), same thread and diameter code, heat treated together to the same specified condition and produced as one continuous run 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 can extend in any direction and which can 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 can be isolated or arranged in strings.

3.11
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)]. See ISO 2859-1.

3.12
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

3.15
self-locking torque
torque to be applied to the nut or bolt to maintain its movement of rotation in relation to the associated part, the assembly being under no axial load and the nut-locking system being completely engaged with the bolt (two pitches minimum protrusion, including the end chamfer)

3.16
seating torque
tightening torque to be applied to the nut or bolt to introduce or to increase the axial load in the assembly

3.18
breakaway torque
torque required to start unscrewing the nut or bolt with respect to the associated part, with the nut-locking device still fully engaged on the bolt, but after the axial load in the assembly has been removed by unscrewing half a turn followed by a halt in rotational movement

3.19
wrench torque
tightening and untightening torques which the driving feature of the nut has to withstand repeatedly without any permanent deformation which would prevent the appropriate wrench from being used or preclude re-use of the nut

3.20
IRR
initial reliability requirement
inspection reliability requirement
minimum acceptable outgoing yield or probability of conformance

4 Quality assurance

4.1 General

4.1.1 Manufacturer's approval

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

4.1.2 Qualification of nuts

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

4.1.3 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.

4.2 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;

— 100 nuts selected from a single batch by simple random sampling.

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.

4.3 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 subjected to several inspections or tests.

The nuts to be subjected to destructive inspections or tests may be those on which non-destructive inspections or tests have been carried out.

If a more stringent inspection is deemed necessary, all or part of the qualification inspections and tests may be performed during the production acceptance inspections and testing. In this case, the number of nuts submitted is the same as that submitted for qualification inspections and tests.

Batches declared unacceptable after the production acceptance inspections and tests shall be submitted for re-inspection or testing only after either all the defective units have been removed or defects have been corrected, or both. In this case, the attribute(s) which caused the rejection shall be verified using a sample of twice the normal size but the maximum number of allowed defective items shall be the same as in the original inspection.

Production acceptance inspections and tests are summarized in Table 2.

4.4 Use of statistical process control (SPC)

Where a characteristic is obtained by a controlled statistical process, in order to declare conformity of the characteristic, the manufacturer may refrain from the final systematic sampling provided for in this document, if he/she is can formally justify this choice by using the standards quoted in it as a basis.

This justification will include the following phases:

— analysis of the product's key characteristics;

— analysis of the risks for each implemented process;

— determination of either the parameters or characteristics, or both, to be respected under SPC;

— determination of the capabilities of each process;

— drawing up an inspection plan and integration in the manufacturing process;

— drawing up of routes and control charts (e.g. ISO 7870-1, ISO 7870-2, ISO 7870-3);

— use of control charts for data consolidation;

— determination of the audits to be run and the control to be carried out to ensure reliability of the device.

To be usable in production, this process shall be validated beforehand by the qualifying body, either during the qualification phase or a posteriori, according to the case, by analysing the justificatory file and the results of the qualification inspections such as provided for in Clause 5.

5 Technical requirements

The technical requirements are given in Table 1.

They complement the requirements of all other standards or specifications referenced in the definition document for the nut.

If there is no International Standard specifying the method to be used, a prior agreement shall be reached between the user and the manufacturer with respect to the following inspections and tests:

— spectrographic analysis or spectroscopic analysis of the material (Table 1, item-no 111);

— micrographic inspection of the structure of the material (Table 1, item-no 1-2);

— inspection for carburization or decarburization (Table 1, item-no 1-3);

— magnetoscopic or fluorescent inspection for surface discontinuities (Table 1, item-no 1-4);

— magnetic permeability inspection (Table 1, item-no 1-6);

— inspection by chemical reagent to determine type of surface coating (Table 1, item-no 2-2);

— tactile inspection or inspection using a profilometer to determine surface roughness (Table 1, item-no 3-2).

Table 1 — Technical requirements

Item-no	Characteristic	Technical requirement	Inspection and test method	Test category	Sample size
1	**Material**				
1-1	**Type**	The material shall be as specified in the definition document.	Spectrographic analysis or spectroscopic analysis (method to be agreed upon between the user and manufacturer).	Qualification [a]	3

[a] See Clause 4 for applicability conditions.

[b] Inspections applicable only to nuts made of steel or steel alloy.

[c] Inspection to be carried out before coating of the surface or after removal of the surface coating.

[d] Inspection applicable only to nuts made of stainless steel.

[e] Inspection applicable only to electrolytic coatings (cadmium, silver, etc.).

[f] This inspection may be performed on nuts that have been subjected to the inspection of microstructure (see item no 1-2).

[g] Test applicable only to all-metal self-locking wrench nuts.

[h] For the qualification testing of all-metal self-locking nuts, the nuts shall be exposed for 6 h to the maximum operating temperature specified in the definition document before the load is applied.

[i] Test applicable only to wrench nuts.

[j] Test applicable only to nuts heat-treated to a hardness equal to or greater than 44 HRC.

[k] Test applicable only to floating-anchor nuts, gang channel nuts and fixed-anchor nuts, produced in several parts and assembled by brazing or clinching.

[l] Test applicable only to gang channel and anchor nuts, with the exception of corner nuts (see ISO 7481) and of reduced-series single-lug nuts.

[m] For all-metal self-locking nuts made of stainless steel with MoS_2-type dry-film lubrication, this test shall be carried out over five cycles in order to avoid any risk of seizing.

[n] Test applicable only to nuts of diameter 5 mm, 6 mm, 7 mm, 8 mm, 10 mm and 12 mm (see ISO 7481).

[o] Test applicable only to sealing nuts.

[p] Test applicable only to clinch nuts.