

SLOVENSKI STANDARD

SIST EN 3004:2001

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Aerospace series - Nuts, self-locking, MJ threads, in heat resisting steel FE-PA2601 (A286) - Classification: 1 100 MPa (at ambient temperature)/650°C - Technical specification

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Luft- und Raumfahrt - Muttern, selbstsichernd, MJ-Gewinde, aus hochwarmfestem Stahl FE-PA2601 (A286) - Klasse: 1 100 MPa (bei Raumtemperatur)/650°C - Technische Lieferbedingungen

Série aérospatiale - Ecrous, à freinage interne, à filetage MJ, en acier résistant à chaud FE-PA2601 (A286) - Classification: 1 100 MPa (à température ambiante)/650°C - Spécification technique

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49.030.30 Matice Nuts

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EUROPEAN STANDARD

EN 3004

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EUROPÄISCHE NORM

January 1997

ICS 49.040.20

Descriptors: aircraft industry, nut, fastener, self-locking nut, steel, heat resistant steel, classification, quality assurance, specification, characteristic, inspection, test

English version

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After inquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of AECMA, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 1997, and conflicting national standards shall be withdrawn at the latest by July 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This standard specifies the characteristics, qualification and acceptance requirements for self-locking nuts with MJ threads in FE-PA2601.

Classification : 1 100 MPa ¹⁾ / 650 °C ²⁾.

It is applicable whenever referenced.

2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 2859-1	Sampling procedures for inspection by attributes - Part 1 : Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection
ISO 3452	Non-destructive testing - Penetrant inspection - General principles
ISO 3534-1977	Statistics - Vocabulary and symbols
ISO 4288	Rules and procedures for the measurement of surface roughness using stylus instruments
ISO 8642	Aerospace - Self-locking nuts with maximum operating temperature greater than 425 °C - Test methods
EN 2786	Aerospace series - Electrolytic silver plating of fasteners ³⁾
EN 3042	Aerospace Series - Quality assurance - EN aerospace products - Qualification procedure
ASTM E 112-88	Standard Test Methods for Determining Average Grain Size ⁴⁾

1) Corresponds to the minimum tensile stress which the nut is able to withstand at ambient temperature without breaking or cracking when tested with a bolt of a higher strength class.

2) Maximum test temperature of the parts

3) Published as AECMA Prestandard at the date of publication of this standard

4) Published by : American Society for Testing and Materials (ASTM), 1916, Race Street, Philadelphia, PA 19103, USA

3 Definitions

For the purposes of this standard, the following definitions apply :

3.1 Batch

Quantity of finished nuts, 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

3.2 Surface discontinuities

3.2.1 Crack : rupture in the material which may extend in any direction and which may be intercrystalline or transcrystalline in character

3.2.2 Seam : open surface defect

3.2.3 Lap : surface defect caused by folding over metal fins or sharp corners and then compressing them into the surface

3.2.4 Inclusions : non-metallic particles originating from the material manufacturing process. These particles may be isolated or arranged in strings.

3.3 Test temperature

Ambient temperature, unless otherwise specified

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3.4 Simple random sampling

The taking 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 ⁵⁾

3.5 Critical defect

A defect that, according to judgement and experience, is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the considered product, or that is likely to prevent performance of the function of a major end item ⁵⁾

3.6 Major defect

A defect other than critical, that is likely to result in a failure or to reduce materially the usability of the considered product for its intended purpose ⁵⁾

3.7 Minor defect

A defect that is not likely to reduce materially the usability of the considered product for its intended purpose, or that is a departure from established specification having little bearing on the effective use or operation of this product ⁵⁾

3.8 Sampling plan

A plan according to which one or more samples are taken in order to obtain information and possibly to reach a decision ⁵⁾

3.9 Limiting quality

In a sampling plan, the quality level which corresponds to the specified 10 % probability of acceptance

3.10 Acceptable quality level (AQL)

A quality level which in a sampling plan corresponds to a specified but relatively high probability of acceptance

It is the maximum per cent defective (or the maximum number of defects per hundred units) that, for purposes of sampling inspection can be considered satisfactory as a process average ⁵⁾.

3.11 Finished nut

A nut ready for use, inclusive of any possible treatments and/or surface coatings, as specified in the product standard or definition document

3.12 Definition document

Document specifying all the requirements for finished nuts

3.13 Self-locking torque

The 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 zone being completely engaged with the bolt (minimum protrusion of two pitches, including the end chamfer)

3.14 Seating torque

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

3.15 Unseating torque

The untightening torque to be applied to the nut or bolt to reduce or remove the axial load in the assembly

3.16 Breakaway torque

The torque required to start unscrewing the nut or bolt with respect to the associated part, with the nut locking zone 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

3.17 Torque for testing the wrench feature

The torque to be applied to the wrenching feature of the nut

5) Definition taken from ISO 3534

4 Quality assurance

4.1 Qualification

EN 3042

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 ;
- 46 nuts selected from a single batch by simple random sampling.

The test programme may possibly be reduced, or the qualification be 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.

Table 2 indicates the allocation of nut sample for the inspections and tests.

4.2 Acceptance

4.2.1 Purpose

The purpose of acceptance inspections and tests is to check, as simply as possible, by a method representative of actual use conditions, with the uncertainty inherent to statistical sampling, that the nuts constituting the batch satisfy the requirements of this standard.

4.2.2 Conditions

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.

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

4.2.3 Responsibility

Acceptance inspections and tests shall be carried out by the manufacturer, or under his responsibility.

4.2.4 Inspection and test report

A test report showing actual numerical values shall be provided if specified in the purchase order.

5 Requirements

See table 1.

Table 1 : Technical requirements and test methods

Clause	Characteristic	Requirement	Inspection and test method	Q/A 1)	Sample size
5.1	Material	In accordance with the product standard or definition document	Chemical analysis or certificate of compliance issued by the manufacturer of the semi-finished product	Q A	
5.2	Dimensions, tolerances and tolerances of form and position	In accordance with the product standard or definition document	Standard gauging	Q A	4.6 Tables 3 and 4
5.3	Manufacturing				
5.3.1	Forming	Nuts shall be formed by a hot or cold forming process. If hot formed, the forming temperature shall not exceed 1 150 °C and they shall be air cooled or faster. The equipment shall ensure a uniform temperature throughout the batch.	The method of forming shall be indicated.	Q	
5.3.2	Heat treatment	The heat treatment medium or atmosphere shall not cause any surface contamination except as permitted by 5.5.4. Any scale which will not be removed by subsequent machining shall be removed by abrasive blasting with an appropriate equipment. Solution treat (if applicable) at a temperature of 900 °C to 980 °C, held at the selected temperature within ± 15 °C for between 1 h min. and 2 h max., quench in oil, or alternative medium or faster. Precipitation treat at (720 ± 10) °C held at temperature for 16 h ± 15 min cooled in air or faster.	Calibration of the heat treatment equipment shall be confirmed. Visual examination Examination of the heat treatment specification	Q	

continued

Table 1 (continued)

Clause	Characteristic	Requirement	Inspection and test method	Q/A ¹⁾	Sample size
5.3.3	Bearing surface perpendicularity	In accordance with the product standard or definition document. For non-floating plate nuts having a bearing surface exceeding 1,5 times the thread nominal diameter, the perpendicularity requirement shall, unless otherwise specified by the product standard or definition document, apply only to that portion of the bearing surface of the part contained within a diameter equal to 1,5 times the thread nominal diameter.	ISO 8642	Q	46
				A	Tables 3 and 4
5.3.4	Thread and thread deformation (form out-of-round)	Threads in the locking region may be deformed in any manner provided that the nut meets the requirements of this standard. Any tool marks shall blend smoothly without any abrupt changes. The finished nuts shall allow the "GO" thread plug gauge to enter a minimum of three turns before engagement of the locking element for nuts having overall length of thread portion not less than 1,2 times the nominal thread diameter. Finished nuts having shorter threaded portion shall allow the "GO" thread plug gauge to enter a minimum of three quarters of a turn.	Standard gauging	Q	46
				A	Tables 3 and 4
5.3.5	Surface roughness	In accordance with the product standard or definition document	ISO 4288 Visual examination	Q	3
				A	Tables 3 and 4
5.3.6	Surface coating				
5.3.6.1	Appearance	See EN 2786.	EN 2786	Q	43
				A	Tables 3 and 4
5.3.6.2	Thickness	In accordance with the product standard or definition document	See 5.3.6.1. Inspection can be carried out at the same time as inspection per 5.5.1.	Q	2
				A	Table 6, column B
5.3.6.3	Adhesion	See EN 2786.	See 5.3.6.1. Inspection can be carried out at the same time as inspection per 5.4.3.2.	Q	5
				A	Table 6, column B

continued

Table 1 (continued)

Clause	Characteristic	Requirement	Inspection and test method	Q/A ¹⁾	Sample size
5.4	Mechanical properties				
5.4.1	Axial load				
5.4.1.1	at ambient temperature	Finished nuts shall withstand the minimum loads specified in table 5. After the load has been applied the nut shall not display : - any cracks ; - any permanent set ; - any significant reduction in self-locking torque.	ISO 8642 100 % test	Q A	4 Table 6, column B
5.4.1.2	after 650 °C baking	Finished nuts shall withstand the minimum loads specified in table 5. After testing, the nuts shall not display : - any cracks ; - any fracture. Permanent set and resultant effects (reduction of the self-locking torque) are permissible.	ISO 8642, 100 % test Prior to testing, the nut shall be assembled on a bolt of the same material, at least two thread pitches protruding. The assembly shall be heated to (650 ± 8) °C and held at this temperature for 6 h ± 15 min and cooled to ambient temperature. Remove the nut from the bolt and proceed in accordance with ISO 8642. A new test bolt shall be used for each nut to be tested.	Q	4
5.4.2	Wrench feature test	All wrenchable nuts shall withstand 15 successive applications of the torque specified in table 5 without any permanent damage to the wrench feature.	ISO 8642	Q	3
5.4.3	Vibration test	After the test, rotation of the nut relative to the bolt less than or equal to 360° is permissible. The nut shall not be cracked and shall not be capable of turning by hand.	ISO 8642 cycles : 30 000 total displacement : 11,25 mm Seating torque to be applied, see table 5.		
5.4.3.1	at ambient temperature	See 5.4.3.	See 5.4.3.	Q	5

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