SLOVENSKI STANDARD
oSIST prEN 3043:2023

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Aeronavtika - Vezni elementi z zunanjim navojem iz toplotnoodpornega jekla FE PA92HT (A286) - Klasifikacija: 900 MPa/650 °C, metoda izdelave po izbiri - Tehnična specifikacija

Aerospace series - Fasteners, externally threaded, in heat resisting steel FE PA92HT (A286) - Classification: 900 MPa/650 °C, manufacturing method optional - Technical specification

Luft- und Raumfahrt - Verbindungselemente mit Außengewinde aus hochwarmfestem Stahl FE-PA92HT (A286) - Klasse: 900 MPa/650 °C, Herstellverfahren nach Wahl - Technische Lieferbedingungen

Série aérospatiale - Élements de fixation, filetés, en acier résistant à chaud FE PA92HT (A286) - Classification: 900 MPa/650 °C, mode de fabrication non imposé - Spécification technique

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ICS:

49.030.01 Vezni elementi na splošno Fasteners in general

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EUROPEAN STANDARD

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English Version

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee ASD-STAN.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Page

European foreword

This document (prEN 3043:2022) has been prepared by the Aerospace and Defence Industries Association of Europe — Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this document has received the approval of the National Associations and the Official Services of the member countries of ASD-STAN, prior to its presentation to CEN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 3043:2008.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

1 Scope

This document specifies the technical and quality assurance requirements for externally threaded fasteners in material FE-PA92HT (A286) of tensile strength class 900 MPa at room temperature, maximum test temperature of material 650 °C.

The externally threaded fasteners specified here may be manufactured by machining from bar or by forging at the manufacturer's option, if forged there is no requirement for control of grain flow.

Primarily for aerospace applications it is applicable to such externally threaded fasteners when referenced on the product standard or drawing.

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.

EN 2398, *Aerospace series — Heat resisting steel FE-PA2601 (X6NiCrTiMoV26-15) — $R_m \geq 900$ MPa — Bars for machined bolts — D ≤ 25 mm*[1]

EN 2399, *Aerospace series — Heat resisting steel FE-PA2601 (X4NiCrTiMoV26-15) — $R_m \geq 900$ MPa — Bars for forged bolts — D ≤ 25 mm*[1]

EN 3639, *Aerospace series — Heat resisting alloy X6NiCrTiMoV26-15 (1.4980) — Softened and cold worked — Wires for forged fasteners — D ≤ 15 mm — 900 MPa ≤ R_m ≤ 1 100 MPa*[1]

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

ISO 7961, *Aerospace — Bolts — Test methods*

EN 9100, *Quality Management Systems — Requirements for Aviation, Space and Defence Organizations*

3 Terms and definitions

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

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

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
production batch
quantity of finished parts fabricated by the same process from a single material cast (single heat of alloy), having the same basic part number and diameter, heat treated together to the same specified condition and produced as one continuous run

[1] Published as ASD-STAN Standard at the date of publication of this standard by AeroSpace and Defence Industries Association of Europe – Standardization (ASD-STAN) (www.asd-stan.org)

3.2
inspection lot
consists of parts from a single production batch of the same part number which completely defines the part

3.3
discontinuities
3.3.1
crack
rupture in the material which may extend in any direction and which may be intercrystalline or transcrystalline in character

3.3.2
seam
longitudinal surface defect in the form of an unwelded open fold in the material

3.3.3
lap
surface defect caused by folding over metal fins or sharp corners and then rolling or forging them into the surface

3.3.4
inclusion
non-metallic particles originating from the material making process, which may exist as discrete particles or strings of particles extending longitudinally

3.4
test temperature
ambient temperature, unless otherwise specified

3.5
simple random sampling
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

[SOURCE: ISO 3534-2:2006, 1.3.4 – modified]

3.6
critical defect
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

[SOURCE: ISO 9152:1998, 3.12 – modified]

3.7
major defect
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

[SOURCE: ISO 9152:1998, 3.13 – modified]

3.8
minor defect
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

[SOURCE: ISO 9152:1998, 3.14 – modified]

3.9
sampling plan
plan according to which one or more samples are taken in order to obtain information and possibly to reach a decision

[SOURCE: ISO 9152:1998, 3.10 – modified]

3.10
limiting quality LQ_{10}
in a sampling plan, a quality level which corresponds to a specified and relatively low probability of acceptance — in this case 10 % probability of acceptance. It is the limiting lot quality characteristic that a lot of this quality would occur

Note 1 to entry: When expressed as a per cent defective, it may be referred to as a lot tolerance per cent defective.

[SOURCE: ISO 9152:1998, 3.15 – modified]

3.11
acceptable quality level
quality level which in a sampling plan corresponds to a specified but relatively high probability of acceptance

Note 1 to entry: 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.

[SOURCE: ISO 9152:1998, 3.16 – modified]

3.12
finished part
part ready for use, inclusive of any possible treatments and/or surface coatings, as specified in the dimensional standard or drawing

4 Certification and quality assurance

4.1 Acceptance

4.1.1 Purpose

The purpose of acceptance 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 bolts constituting the batch satisfy the requirements of this standard.

4.1.2 Conditions

Acceptance tests are summarised in Table 2. They shall be performed on each batch. Table 1 specifies the test method and sampling plan to be used for each test. Bolts from the batch to be tested shall be selected by simple random sampling.

Each bolt may be submitted to several tests.

The bolts to be subjected to destructive tests may be those on which non-destructive tests have been performed.

4.2 Quality system certification

4.2.1 Purpose

The purpose of quality system certification is to ensure that the manufacturer has demonstrated the acceptability of their quality system and their ability for continuing production of parts according to this standard, to the required level of quality.

4.2.2 Requirements and procedure, quality management system

The requirements and procedures for quality system certification shall be according to the requirements of EN 9100.

The manufacturer's operations shall be an approved production organisation for aerospace products and shall demonstrate that it has implemented and is able to maintain a quality management system (e.g. according to EN 9100 or an equivalent aerospace accepted and established quality management system).

The qualification procedure for aerospace standard products (e.g. according to EN 9133 or an equivalent aerospace accepted and established qualification procedure) shall be used and documented according to the specified tests if not otherwise agreed between customer and supplier.

4.3 Responsibility for inspection and tests

The manufacturer is responsible for the performance of all inspection and test requirements as specified herein. Each manufacturer will use their own or exceptionally, any other facilities approved in accordance with 4.2 for the implementation of these inspection and test requirements.

4.4 Inspection and test report

A test report showing actual numerical values shall be provided at the purchaser's option as part of the terms of the purchase order.

5 Technical requirements and test method

Table 1 — Technical requirements and test methods

Clause	Characteristic	Technical requirement	Inspection and test method	A [a]	Sample size
5.1	Material	Material FE-PA92-HT according to specification EN 2398, EN 2399 or EN 3639 supplied by an approved source: shall be used for the manufacture of parts to this standard.	As stated in the material specification.		
5.2	Dimensions; tolerances of form and position; threads and quality			A	Table 4 and Table 5
5.2.1	Dimensions	The dimensions of the finished parts shall conform to the product standard or definition document.	All dimensions shall be controlled by an		

Clause	Characteristic	Technical requirement	Inspection and test method	A [a]	Sample size
			approved system of gauging.		
5.2.2	Tolerances of form and position	Tolerances of form and position shall conform to the product standard or definition document.	Tolerances of form and position shall be controlled by an approved system of gauging.		
5.2.3	Threads	Threads shall conform to the product standard or definition document.	Threads shall be gauged by an approved system of gauging.		
5.3	Manufacturing	Parts may be manufactured by machining from material EN 2398 or by forging from material EN 2399 or EN 3639.			
5.3.1	Machined from bar parts	Parts manufactured from material in the softened, cold worked and solution treated condition shall be semi-finish machined and then precipitation heat treated per 5.3.3.2 prior to final machi-ning, thread rolling (and fillet rolling if specified on the product standard). Parts manufactured from material in the softened, cold worked, solution treated and precipitation treated condition shall be finished, machined, thread rolled etc. without further heat treatment.			
5.3.2	Forged parts	Forged parts may be formed by hot or cold forging. If hot forged the forging temperature shall not exceed 1 150 °C and shall be air cooled. The heating equipment for forging shall be of a type which ensures a consistent temperature throughout the batch. The forged blanks to be solution treated and precipitation treated.			
5.3.3	Heat treatment	The heat treatment medium or atmosphere shall not cause any surface contami-nation except as permitted by 5.5.2. Any scale which will not be removed by subsequent machining shall be removed by abrasive blasting.	The heat treatment equipment shall be approved. The equipment for abrasive blasting shall be approved.		

Clause	Characteristic	Technical requirement	Inspection and test method	A [a]	Sample size
5.3.3.1	Solution heat treatment	Forged parts to be solution treated at a temperature of 980 °C ± 15 °C for 1 h, quenching in oil or water.			
5.3.3.2	Precipitation heat treatment	Before thread rolling (and fillet rolling if specified on the product standard) the parts shall be precipitation treated at 710 °C to 730 °C holding the selected temperature within ±8 °C for not less than 16 h and cooled in air.			
5.3.4	Removal of surface contamination	After solution and precipitation treatment the parts shall have all the shank and bearing surface of the head ground: a) for the removal of all surface contamination and oxide penetration; b) to obtain a clean smooth surface.			
5.3.5	Cold rolling	If specified on the product standard parts shall, after completion of solution, pre-cipitation treatment and machining, have the fillet radius cold rolled sufficiently to remove all evidence of machining. Cold rolling the head to shank fillet radius may cause distortion of the fillet area. Any such distortions shall be in accordance with the requirements of Figure 1 unless otherwise specified on the product standard or definition document. For parts with compound radii between head and shank, cold work only the radius that blends with the head, however it is acceptable for cold work to extend over the compound radius. The fillet shall not show evidence of seams or inclusions.	Dimensional check (see 5.5.2) and visual examination. See 5.5.3.1	A	Table 5 and Table 6
5.3.6	Threads	Threads shall be formed on the solution treated, precipitation treated and machined parts by a single thread rolling operation.			
5.3.7	Surface roughness	The surface roughness shall be as specified on the product standard or definition document prior to protective treatment.	The surface roughness of the thread shall be determined by	A	Table 4 and Table 5