SLOVENSKI STANDARD
SIST EN 3043:2008

01-september-2008

Aeronavtika - Vezni elementi z zunanjim navojem iz toplotnoodpornega jekla FE PA92HT (A286) - Klasifikacija: 900 MPa/650 ÁC, metoda izdelave po izbiri - Tehniļ na 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 - Eléments de fixation, filetés, en acier résistant à chaud FE-PA92HT (A286) - Classification: 900 MPa/650 °C - Mode de fabrication non imposé - Spécification technique

Ta slovenski standard je istoveten z: **EN 3043:2008**

ICS:

49.030.01 Vezni elementi na splošno Fasteners in general

SIST EN 3043:2008 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 3043

May 2008

ICS 49.030.01

English Version

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This European Standard was approved by CEN on 12 December 2007.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 3043:2008: E

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Foreword

This document (EN 3043:2008) 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 Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, 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of an identical text or by endorsement, at the latest by November 2008, and conflicting national standards shall be withdrawn at the latest by November 2008.

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According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard 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 referenced documents are indispensable for the application 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, *Heat resisting steel FE-PA92-HT — $R_m \geq$ 900 MPa — Bars for machined bolts $D \leq$ 25 mm — Aerospace Series*[1)]

EN 2399, *Heat resisting steel FE-PA92-HT — $R_m \geq$ 900 MPa — Bars for forged bolts $D \leq$ 25 mm — Aerospace Series*[1)]

EN 3039, *Aerospace series — Quality systems — Supplementary requirements to ISO 9002 applicable for the manufacture/processing of material for propulsion standard parts*

EN 3639, *Heat resisting alloy FE-PA2601 — Softened and cold worked — Wire for forged fasteners — $D \leq$ 15 mm, 900 MPa $\leq R_m \leq$ 1 100 MPa*[1)]

ISO 468, *Surface roughness; Parameters, their values and general rules for specifying requirements*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 3452, *Non destructive testing — Penetrant inspection — General principles*

ISO 3534-1, *Statistics — Vocabulary and symbols — Part 1: General statistical terms and terms used in probability*

ISO 3534-2, *Statistics — Vocabulary and symbols — Part 2: Applied statistics*

ISO 7961, *Aerospace — Bolts — Test methods*

ISO 9001, *Quality management systems — Requirements*

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1) Published as AECMA prestandard at the date of publication of this standard.

3 Terms and definitions

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 continues run

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 transcrystallyne 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. They 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[2)]
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

3.6
critical defect[2)]
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

3.7
major defect[2)]
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

2) Definitions taken in ISO 3534-1:2006 and ISO 3534-2:2006.

3.8
minor defect[2)]
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

3.9
sampling plan[2)]
a plan according to which one or more samples are taken in order to obtain information and possibly to reach a decision

3.10
limiting quality LQ_{10}[2)]
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

When expressed as a per cent defective, it may be referred to as a lot tolerance per cent defective

3.11
acceptable quality level[2)]
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

3.12
finished part
a 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

The allocation of tests corresponding to the requirements of this standard is as follows.

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 inherant 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 his quality system and his ability for continuing production of parts according to this standard, to the required level of quality.

4.2.2 Requirements and procedure

The requirements and procedures for quality system certification shall be according to the requirements of ISO 9001 and EN 3039.

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 method

A = Production acceptance requirements (4.1).

Clause	Characteristic	Technical requirement	Inspection and test method	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	Tables 4 and 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 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.		

Table 1 *(continued)*

A = Production acceptance requirements (4.1).

Clause	Characteristic	Technical requirement	Inspection and test method	A	Sample size
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 XXXX.			
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 machining, 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 contamination 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.		

Table 1 *(continued)*

A = Production acceptance requirements (4.1).

Clause	Characteristic	Technical requirement	Inspection and test method	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, precipitation 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	Tables 5 and 6