SLOVENSKI STANDARD
SIST EN 3685:2019

01-december-2019

Nadomešča:
SIST EN 3685:2008

Aeronavtika - Sorniki iz toplotnoodpornega jekla FE-PA2601 (A286) - Klasifikacija: 1100 MPa/650 °C - Tehnična specifikacija

Aerospace series - Bolts in heat resisting steel FE-PA2601 (A286) - Classification: 1 100 MPa/650 °C - Technical specification

Luft- und Raumfahrt - Schrauben aus hochwarmfestem Stahl FE-PA2601 (A286) - Klasse: 1 100 MPa/650 °C - Technische Lieferbedingungen; Deutsche und Englische Fassung EN 3685:2008

Série aérospatiale - Vis en acier résistant à chaud FE-PA2601 (A286) - Classification : 1 100 MPa/650 °C - Spécification technique

Ta slovenski standard je istoveten z: **EN 3685:2019**

ICS:

21.060.10	Sorniki, vijaki, stebelni vijaki	Bolts, screws, studs
49.025.10	Jekla	Steels
49.030.20	Sorniki, vijaki, stebelni vijaki	Bolts, screws, studs

SIST EN 3685:2019 **en,fr,de**

EUROPEAN STANDARD

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English Version

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European foreword

This document (EN 3685:2019) 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of an identical text or by endorsement, at the latest by February 2020, and conflicting national standards shall be withdrawn at the latest by February 2020.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 3685:2008.

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1 Scope

This European standard specifies the technical specification, qualification and quality assurance requirements for bolts in material FE–PA2601 (A286) of tensile strength class 1 100 MPa at room temperature, maximum test temperature of material 650 °C.

Primarily for aerospace applications it is applicable to such bolts when referenced on the product standard or 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.

EN 3041, *Aerospace series — Propulsion standard parts — Manufacturing process change procedure for qualified parts*[1]

EN 3761, *Aerospace series — Heat resisting alloy FE-PA2601 — Softened and cold worked — Bar for forged fasteners — D ≤ 50 mm — 1 100 MPa ≤ R_m ≤ 1 300 MPa*[2]

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

EN ISO 4288, *Geometrical product specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

EN ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

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 7961, *Aerospace series — Bolts — Test methods*

ASD-STAN/TR 3040-1, *Aerospace series — Quality assurance — EN aerospace products — Part 1: List of approved manufacturers*[3]

ASD-STAN/TR 3775, *Bolts and pins — Materials*[3]

ASTM E112, *Standard Test Methods for Determining Average Grain Size*[4]

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1 In preparation at the date of publication of this European standard (www.asd-stan.org).

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

3 Published as ASD-STAN Technical Report at the date of publication of this European standard by AeroSpace and Defence Industries Association of Europe – Standardization (ASD-STAN) (www.asd-stan.org).

4 Published by: ASTM International, 100 Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, USA.

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:

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

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

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

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

3.3 Surface 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 discontinuity in the form of an unwelded open fold in the material

3.3.3
lap
surface discontinuity 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 manufacturing process

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

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

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

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

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

3.10
Limiting Quality
LQ_{10}

quality level in a sampling plan, which corresponds to a specified and relatively low probability of acceptance, in this case 10 % probability of acceptance

Note 1 to entry: It is the limiting lot quality characteristic that a lot of this quality would occur.

3.11
Acceptance Quality Limit
AQL
quality limit 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.

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

4 Certification and quality assurance

4.1 Qualification

4.1.1 Purpose

The purpose of qualification tests is to ensure that the bolt design and bolt manufacturing conditions allow the bolt to comply with the requirements of this document.

4.1.2 Conditions

The qualification tests summarized in Table 3 shall be performed on each type and diameter of bolt. Proposed changes in manufacturing source or procedure shall be subject to the requirements of EN 3041.

25 bolts selected from a single inspection lot by simple random sampling shall be subjected to the qualification tests.

The number of bolts to be subjected to each test as well as the method(s) to be used are specified in Table 1.

The tests to be applied to each bolt are shown in Table 4.

The test programme may possibly be reduced, this decision will be based on the comparison of results obtained from parts of similar design, size and manufacturing conditions.

All or part of these tests may also be performed for production acceptance, when a reinforced inspection seems to be necessary, or to survey bolts that have not proved satisfactory in use.

In that case, the sample to be subjected to these tests is the same as that used for production acceptance tests.

4.1.3 Qualification test requirements and procedures

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

4.1.4 Qualified manufacturers

A list of qualified manufacturers for specific standard parts is listed in ASD-STAN/TR 3040-1.

4.2 Acceptance

4.2.1 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 European standard.

4.2.2 Conditions

Acceptance tests are summarized in Table 3. 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.

4.3 Quality system certification

4.3.1 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 to this document, to the required limit of quality.

4.3.2 Requirements and procedure

The manufacturer's operations shall be an approved production organization for aerospace products and shall demonstrate that it has implemented and is able to maintain a quality 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.

4.4 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 clause 4.1 and clause 4.2 for the implementation of these inspection and test requirements.

4.5 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 methods

See Table 1.

Table 1

Clause	Characteristic	Requirement	Inspection and test method	Q/A[a]	Sample size
5.1	**Material**	Material FE-2601 to specification EN 3761 or to specification ASD-STAN/TR 3775, Table 3, strength class 1 100 MPa supplied by an approved source shall be used for the manufacture of bolts to this European standard.[b]	As stated in the material specification.		
5.2	**Dimensions, tolerances of form and position, threads and quality**			Q	25
				A	Table 6 and Table 7
5.2.1	**Dimensions**	The dimensions of the finished bolts shall conform to the product standard or drawing.	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 drawing.	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 drawing.	Threads shall be gauged by an approved system of gauging.		
5.3	**Manufacturing**				
5.3.1	**Forging**	The heads of the bolts shall be formed by hot or cold forging. If hot forged the forging temperature shall not exceed 1 150 °C and shall be air cooled or faster. The heating equipment for forging shall be of a type which ensures a consistent temperature throughout the batch.	The method of forging shall be approved.		

Clause	Characteristic	Requirement	Inspection and test method	Q/A[a]	Sample size
5.3.2	**Heat treatment**	The heat treatment medium or atmosphere shall not cause any surface contamination except as permitted by 5.5.6. 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.		
5.3.2.1	**Solution and precipitation heat treatment**	The headed blanks shall be precipitation treated at a temperature 710 °C to 730 °C holding the selected temperature within ±8 °C for not less than 16 hours and cooling in air.			
5.3.3	**Removal of surface contamination**	After precipitation treatment the headed blanks shall have the shank and bearing surface of the head machined: a) for the removal of all surface contamination and oxide penetration; b) to obtain a clean smooth surface. The amount of material removed (see Figure 1) shall be as little as practicable and shall respect the requirements of 5.5.1.	See 5.5.1.		