

**SLOVENSKI STANDARD**  
**SIST EN 3833:2019****01-junij-2019****Nadomešča:****SIST EN 3833:2005**

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**Aeronavtika - Sorniki, navoj MJ, iz toplotnoodporne zlitine na nikljevi osnovi NI-PH2601 (Inconel 718), pasivirane - Klasifikacija 1550 MPa (pri okoljski temperaturi)/650 °C - Tehnična specifikacija**

Aerospace series - Bolts, MJ threads, in heat resisting nickel base alloy NI-PH2601 (Inconel 718), passivated - Classification: 1 550 MPa (at ambient temperature) / 650 °C - Technical specification

Luft- und Raumfahrt - Schrauben, MJ-Gewinde, aus hochwarmfester Nickelbasislegierung NI-PH2601 (Inconel 718), passiviert - Klasse: 1 550 MPa (bei Raumtemperatur)/650 °C - Technische Lieferbedingungen

Série aérospatiale - Vis à filetage MJ, en alliage résistant à chaud à base de nickel NI-PH2601 (Inconel 718), passivées - Classification : 1 550 MPa (à température ambiante) / 650 °C - Spécification technique

**Ta slovenski standard je istoveten z: EN 3833:2019**

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**ICS:**

49.030.20 Sorniki, vijaki, stebelni vijaki Bolts, screws, studs

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EUROPEAN STANDARD

**EN 3833**

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 49.030.20

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English Version

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Raumtemperatur)/650 °C - Technische  
Lieferbedingungen

This European Standard was approved by CEN on 5 November 2018.

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

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## European foreword

This document (EN 3833:2019) 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of an identical text or by endorsement, at the latest by October 2019, and conflicting national standards shall be withdrawn at the latest by October 2019.

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

This document supersedes EN 3833:2004.

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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**EN 3833:2019 (E)****1 Scope**

This European standard specifies the characteristics, qualification and acceptance requirements for bolts with MJ threads in NI-PH2601, passivated, for aerospace applications.

Classification: 1 550 MPa<sup>1</sup>/650 °C<sup>2</sup>.

It is applicable whenever referenced.

**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 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*

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

EN ISO 6892-2, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature*

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

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

ISO 7961, *Aerospace — Bolts — Test methods*

ASTM E112-13, *Standard Test Methods for Determining Average Grain Size*<sup>3</sup>

**3 Terms and definitions**

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

**3.1 batch**  
quantity of finished parts, of the same type and same diameter, produced from the same 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

<sup>1</sup> Minimum tensile strength of the material at ambient temperature.

<sup>2</sup> Maximum test temperature of the parts.

<sup>3</sup> Published by: ASTM National (US) American Society for Testing and Materials <http://www.astm.org>.

### 3.2

#### **inspection lot**

quantity of parts from a single production batch with the same part number which completely defines the part

### 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**

open surface defect

##### 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

#### **inclusions**

non-metallic particles originating from the material manufacturing process

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

### 3.4

**test temperature** <https://standards.iteh.ai/catalog/standards/sist/03fd324f-2250-434f-8bbd-5562c17a817a/sist-en-3833-2019>  
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

**EN 3833:2019 (E)****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 limit which, in a sampling plan, corresponds to a specified 10 % probability of acceptance

**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 product standard or definition document

**3.13****definition document**

document specifying all the requirements for finished bolts

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**4 Quality assurance**

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**4.1 Qualification**

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.

The product qualification shall be performed to the process as defined in e. g. EN 9133 to achieve a qualification approval from the controlling Certification Authority (CA).

Qualification inspections and tests (requirements, methods, numbers of bolts) are specified in Table 1. They shall be carried out on:

- each type and diameter of bolt;
- 25 bolts selected from a single inspection lot by simple random sampling.



The test programme may possibly be reduced, or the qualification of a bolt be granted without inspection or testing. Any such decision shall be based on the results obtained on similar types and diameters of bolts provided that the design and manufacturing conditions are identical.

Table 2 indicates the allocation of bolt samples 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 bolts constituting the batch satisfy the requirements of this standard.

### 4.2.2 Conditions

Acceptance inspections and tests (requirements, methods, numbers of bolts) are specified in Table 1; they shall be carried out on each batch. Bolts from the batch to be tested shall be selected by simple random sampling.

Each bolt 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 bolts submitted to these inspections and tests is the same as that submitted for qualification inspection and tests.

### 4.2.3 Responsibility

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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 <sup>a</sup>	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	25
				A	Table 3 and Table 4

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Clause	Characteristic	Requirement	Inspection and test method	Q/A <sup>a</sup>	Sample size
5.3	Manufacturing				
5.3.1	Forging	The head of the bolts shall be formed by hot or cold forging. If hot forged, the forging temperature shall be between 1 040 °C and 1 080 °C and they shall be air cooled.  The equipment shall ensure a uniform temperature throughout the batch.	The method of forging shall be indicated.  The equipment shall be approved.	Q	
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 not removed by subsequent machining shall be removed by abrasive blasting with an appropriate equipment.  The headed blanks shall be precipitation heat treated at (720 ± 5) °C, held at temperature for 8 h ± 15 min, furnace cooled at (55 ± 5) °C per hour to (620 ± 5) °C, held at 620 °C for 8 h ± 15 min, followed by air cooling or faster.  Instead of the 55 °C per hour cooling rate to 620 °C, parts may be furnace cooled at any rate provided the time at 620 °C is adjusted to give a total precipitation time of 18 h min.	Calibration of the heat treatment equipment shall be confirmed.  Visual examination  Examination of the heat treatment specification	Q	
5.3.3	Removal of surface contamination	After precipitation treatment the headed blanks shall have all 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 shall be as little as practicable and shall respect the requirements of 5.5.1.	See 5.5.6.  See 5.5.1.		
5.3.4	Head to shank fillet	After completion of heat treatment and machining, the underhead fillet radius shall be cold rolled to remove all visual signs of machining and to create cold working.  This may cause distortion which shall not exceed the values in Figure 1, unless otherwise specified on the product standard or definition document.  For parts with compound radii between head and shank (e.g. <i>T</i> head bolts), only the radius that blends with the head shall be cold worked, however it is acceptable for cold work to extend over the compound radius.  The fillet shall not show seams or inclusions (see Table 5).	Dimensional check (see 5.2) and visual examination	Q A	25 Table 3 and Table 4
5.3.5	Threads	Shall be formed by a single rolling process after full heat treatment (see Figure 2).		Q	
5.3.6	Surface roughness	In accordance with the product standard or definition document	EN ISO 4288  Visual examination	Q A	3 Table 3 and Table 4
5.3.7	Passivation treatment	Uncoated finished bolts shall be passivated in accordance with Annex A (normative).	EN ISO 9227, neutral salt spray (NSS) test	Q	5

Clause	Characteristic	Requirement	Inspection and test method	Q/A <sup>a</sup>	Sample size
		After 2 h of salt spray, bolts shall show no evidence of corrosion or staining.	Visual examination	A	100 %
5.3.8	Surface coating	In accordance with the product standard or definition document	See applicable coating standard.	Q A	3 Table 3 and Table 4
5.4	Mechanical properties	A test sample shall be selected from each diameter of bar/wire taken from each cast, and shall be heat treated together with a production batch of bolts. The sample selected shall be sufficient to provide tensile and stress rupture test specimens. The test specimens shall meet the mechanical properties required by the material standard.			
5.4.1	Tensile strength	The finished bolts shall withstand the minimum tensile loads specified in Table 6. Externally wrenched bolts shall not fail in the head to shank area when subjected to the tensile test. Tensile tests are not applicable to the following: a) protruding head bolts of grip length < twice the nominal shank diameter; b) countersunk head bolts of grip length < $\times 2,5$ the nominal shank diameter; c) threaded to head bolts of overall length < $\times 3$ the nominal shank diameter or bolts having an overall length < 18 mm; d) bolts of diameters of < 4 mm. In such cases acceptability shall be based on the results from test bars of the same material heat treated within the same process cycle.			
5.4.1.1	— at ambient temperature		ISO 7961 for bolts EN ISO 6892-1 for test specimens	Q A	4 Table 7 or Table 8
5.4.1.2	— at elevated temperature	(650 $\pm$ 5) °C	ISO 7961 for bolts EN ISO 6892-2 for test specimens	Q	4
5.4.2	Creep test	The finished bolts shall be maintained at (650 $\pm$ 2) °C while the load specified in Table 6 is applied continuously. There shall be no rupture in less than 23 h.	ISO 7961	Q	3