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**Vezni elementi - Mehanske lastnosti veznih elementov iz korozijsko odpornega nerjavnega jekla - 5. del: Posebni vezni elementi (vključno z veznimi elementi iz nikljevih zlitin) za uporabo pri visokih temperaturah (ISO 3506-5:2022)**

Fasteners - Mechanical properties of corrosion-resistant stainless steel fasteners - Part 5: Special fasteners (also including fasteners from nickel alloys) for high temperature applications (ISO 3506-5:2022)

Verbindungselemente - Mechanische Eigenschaften von Verbindungselementen aus nichtrostenden Stählen - Teil 5: Spezielle Verbindungselemente (einschließlich Verbindungselemente aus Nickellegierungen) für Hochtemperaturanwendungen (ISO 3506-5:2022)

Fixations - Caractéristiques mécaniques des fixations en acier inoxydable résistant à la corrosion - Partie 5: Fixations spéciales (incluant également les fixations en alliages de nickel) pour utilisation à hautes températures (ISO 3506-5:2022)

**Ta slovenski standard je istoveten z: EN ISO 3506-5:2023**

**ICS:**

21.060.99      Drugi vezni elementi      Other fasteners

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## Fasteners - Mechanical properties of corrosion-resistant stainless steel fasteners - Part 5: Special fasteners (also including fasteners from nickel alloys) for high temperature applications (ISO 3506-5:2022)

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This European Standard was approved by CEN on 29 October 2023.

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## European foreword

The text of ISO 3506-5:2022 has been prepared by Technical Committee ISO/TC 2 "Fasteners" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 3506-5:2023 by Technical Committee CEN/TC 185 "Fasteners" the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by May 2024, and conflicting national standards shall be withdrawn at the latest by May 2024.

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# INTERNATIONAL STANDARD

# ISO 3506-5

First edition  
2022-04

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## Fasteners — Mechanical properties of corrosion-resistant stainless steel fasteners —

### Part 5: Special fasteners (also including fasteners from nickel alloys) for high temperature applications

*Fixations — Caractéristiques mécaniques des fixations en acier  
inoxydable résistant à la corrosion —*

*Partie 5: Fixations spéciales (incluant également les fixations en  
alliages de nickel) pour utilisation à hautes températures*

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CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
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## Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 2, *Fasteners*.

A list of all parts in the ISO 3506 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

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## ISO 3506-5:2022(E)

### Introduction

The ISO 3506 series consists of the following parts, under the general title *Fasteners — Mechanical properties of corrosion-resistant stainless steel fasteners*:

- *Part 1: Bolts, screws and studs with specified grades and property classes*
- *Part 2: Nuts with specified grades and property classes*
- *Part 3*<sup>1)</sup>: *Set screws and similar fasteners not under tensile stress*
- *Part 4*<sup>1)</sup>: *Tapping screws*
- *Part 5: Special fasteners (also including fasteners from nickel alloys) for high temperature applications*
- *Part 6: General rules for the selection of stainless steels and nickel alloys for fasteners*

Complementary detailed explanations about definitions of stainless steel grades and properties are specified in ISO 3506-6.

The properties of stainless steel and nickel alloy fasteners for high temperature applications result from the chemical composition of the material, from the heat treatment process and from the manufacturing process of the fasteners. Static or dynamic properties at room temperature like tensile strength, hardness or fatigue resistance are not sufficient enough to design fasteners for high temperature applications properly.

In fact, at high temperatures e.g. above 300 °C, additional phenomena occur, for instance:

- decrease in tensile properties and hardness,
- hot oxidation and scaling,
- stress relaxation,
- creep.

All these phenomena significantly affect the durability and service life of fasteners. Therefore:

- a proper choice of material grade is essential to avoid heavy hot oxidation,
- qualification of fasteners through dedicated tests should be performed.

Different tests are currently available to assess the behaviour of machined and standardized samples (see for example ASTM E292 or ASTM E328). In addition to these tests, this document specifies test methods on finished fasteners: these are useful when requiring results as representative as possible of the actual service conditions.

All fastener categories included in this document are heat-treated (see [Clause 6](#)). Heat treatment processing is crucial to reach mechanical properties and suitable microstructure that are essential to stand phenomena described above and to get adequate durability for the fasteners and the assembled bolted joints.

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1) It is intended to revise ISO 3506-3 and ISO 3506-4 in the future in order to include the reference to ISO 3506-6.

# Fasteners — Mechanical properties of corrosion-resistant stainless steel fasteners —

## Part 5: Special fasteners (also including fasteners from nickel alloys) for high temperature applications

### 1 Scope

This document specifies the mechanical and physical properties of bolts, screws, studs and nuts, with coarse pitch thread and fine pitch thread, made of corrosion-resistant stainless steels (i.e. martensitic stainless steels and precipitation hardening austenitic stainless steels) and nickel alloys, intended for use at high temperatures up to 800 °C.

Tests in accordance with [Clause 9](#) are performed at the ambient temperature range of 10 °C to 35 °C, and other tests can be performed at higher temperatures, see [Clause 10](#).

NOTE Fasteners specified in this document are also suitable when used at low temperatures, typically down to -50 °C. For more information, see ISO 3506-6.

The term “fasteners” is used in this document when bolts, screws, studs and nuts are considered all together.

ISO 3506-6 provides general rules and additional technical information on suitable stainless steels and nickel alloys as well as their properties.

This document applies to fasteners:

- with ISO metric thread in accordance with ISO 68-1,
- with diameter/pitch combinations in accordance with ISO 261 and ISO 262,
- with coarse pitch thread M3 to M39, and fine pitch thread M8×1 to M39×3,
- with thread tolerances in accordance with ISO 965-1 and ISO 965-2, and
- of any shape but with full loadability.

Stainless steel and nickel alloy fastener symbols can be used for sizes outside the diameter limits of this document (i.e. for bolts, screws and studs with  $d < 3$  mm or  $d > 39$  mm and for nuts with  $D < 5$  mm or  $D > 39$  mm), provided that all applicable chemical, mechanical and physical requirements are met.

Fasteners with reduced loadability (i.e. thin nuts and bolts, screws and studs with head or unthreaded shank weaker than the threaded shank) are not dealt with in this document.

This document does not specify requirements for functional properties such as:

- torque/clamp force properties,
- shear strength,
- fatigue resistance,
- weldability,

## ISO 3506-5:2022(E)

or

- properties of bolted joints and fasteners in high temperature environment (see test methods at high temperature for fasteners in [Clause 10](#)).

## 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.

ISO 1891-4, *Fasteners — Vocabulary — Part 4: Control, inspection, delivery, acceptance and quality*

ISO 3506-1, *Fasteners — Mechanical properties of corrosion-resistant stainless steel fasteners — Part 1: Bolts, screws and studs with specified grades and property classes*

ISO 3506-2, *Fasteners — Mechanical properties of corrosion-resistant stainless steel fasteners — Part 2: Nuts with specified grades and property classes*

ISO 3506-6, *Fasteners — Mechanical properties of corrosion-resistant stainless steel fasteners — Part 6: General rules for the selection of stainless steels and nickel alloys for fasteners*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

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

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

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 9513, *Metallic materials — Calibration of extensometer systems used in uniaxial testing*

ISO 16228, *Fasteners — Types of inspection documents*

EN 10319-2, *Metallic materials — Tensile stress relaxation testing — Part 2: Procedure for bolted joint models*

## 3 Terms and definitions

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

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

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

**3.1**  
**stainless steel**  
 steel with at least 10,5 % (mass fraction) of chromium (Cr) and maximum 1,2 % (mass fraction) of carbon (C)

[SOURCE: ISO 3506-1:2020, 3.5]