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

Part 2: Nuts with specified grades and property classes

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

Partie 2: Écrous de grades et classes de qualité spécifiés

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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.

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

This third edition cancels and replaces the second edition (ISO 3506-2:2009) which has been technically revised.

The main changes compared to the previous edition are as follows:

— annexes common to several parts of the ISO 3506 series have been withdrawn from this document and are now included in a new document (ISO 3506-6);

— duplex (austenitic-ferritic) stainless steels for property classes 70, 80 and 100 have been added (see Figure 1);

— property class 100 for austenitic stainless steel grades as well as grade A8 have been added (see Figure 1);

— information for nut styles (see 5.1) has been added;

— design of stainless steel bolt and nut assemblies (see Clause 6), and design principles of stainless steel nuts (see Annex A) have been added;

— finish (see 7.3) has been improved;

— calculated proof load values (see Tables 5 to 8) and rounding rules have been added;

— requirements and guidance for inspection procedures (see Clause 9) have been added;

— thread dimensions of the test mandrel for proof load (see Annex B) have been added;

— operational temperature ranges (see Clause 1) have been clarified;

— test methods for proof load and hardness have been improved (see Clause 10);

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— nut marking and labelling especially for thin nuts with reduced loadability (see Clause 11) have been added;

— structure and content of this document have been brought in line with ISO 898-2.

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.

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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*[1)]*: Set screws and similar fasteners not under tensile stress*

— *Part 4*[1)]*: Tapping screws*

— *Part 5*[2)]*: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.*

The properties of stainless steel fasteners result from the chemical composition of the material (especially corrosion resistance) and from the mechanical properties due to the manufacturing processes. Ferritic, austenitic and duplex (austenitic-ferritic) stainless steel fasteners are generally manufactured by cold working; they consequently do not have homogeneous local material properties when compared to quenched and tempered fasteners.

Austenitic-ferritic stainless steels referred to as duplex stainless steels were originally invented in the 1930s. Standard duplex grades used today have been developed since the 1980s. Fasteners made of duplex stainless steels have been long established in a range of applications. This document was revised to reflect their standardization.

All duplex stainless steel grades show improved resistance to stress corrosion cracking compared to the commonly used A1 to A5 austenitic grades. Most duplex grades also show higher levels of pitting corrosion resistance, where D2 matches at least A2 and where D4 matches at least A4.

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

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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.

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

Part 2:
Nuts with specified grades and property classes

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1 Scope

This document specifies the mechanical and physical properties of nuts, with coarse pitch thread and fine pitch thread, made of corrosion-resistant stainless steels, when tested at the ambient temperature range of 10 °C to 35 °C. It specifies property classes in relation to austenitic, martensitic, ferritic and duplex (austenitic-ferritic) steel grades for nuts.

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

Nuts conforming to the requirements of this document are evaluated at the ambient temperature specified in paragraph 1. It is possible that they do not retain the specified mechanical and physical properties at elevated and/or lower temperatures.

NOTE 1 Fasteners conforming to the requirements of this document are used without restriction in applications ranging from –20 °C to +150 °C; however, fasteners conforming to this document are also used for applications outside this range down to –196 °C and up to +300 °C. For more details, see ISO 3506-6.

Outside the temperature range of –20 °C to +150 °C, it is the responsibility of the user to determine the appropriate choice for a given application, in consultation with an experienced fastener metallurgist and by taking into account e.g. stainless steel composition, duration of exposure at elevated or low temperature, the effect of the temperature on the fastener mechanical properties and clamped parts, and the corrosive service environment of the bolted joint.

NOTE 2 ISO 3506-5[3)] is developed in order to assist in the selection of appropriate stainless steel grades and property classes intended for use at temperatures up to +800 °C.

This document applies to nuts:

— 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 M5 to M39, and fine pitch thread M8×1 to M39×3,

— with thread tolerances in accordance with ISO 965-1 and ISO 965-2,

— with specified property classes, including proof load,

— with different nut styles: thin nuts, regular nuts and high nuts,

— with a minimum nut height $m \geq 0{,}45D$,

— with a minimum outside diameter or width across flats $s \geq 1{,}45D$ (see Annex A),

— of any shape, and

— able to mate with bolts, screws and studs with property classes in accordance with ISO 3506-1.

3) Under preparation.

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Stainless steel grades and property classes can be used for sizes outside the diameter limits of this document (i.e. for D < 5 mm or D > 39 mm), provided that all applicable chemical, mechanical and physical requirements are met.

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

— torque/clamp force properties,

— prevailing torque properties, or

— weldability.

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 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread*

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

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 16228, *Fasteners — Types of inspection documents*

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 https://www.iso.org/obp

— IEC Electropedia: available at http://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]

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