



**International
Standard**

ISO 3506-4

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

Part 4:
**Tapping screws with specified
grades and hardness classes**

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

Partie 4: Vis à tôle de grades et classes de dureté spécifiés

**Third edition
2025-01**

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Published in Switzerland

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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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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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.

This document was prepared by Technical Committee ISO/TC 2, Fasteners, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 185 Fasteners, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 3506-4:2009), which has been technically revised.

The main changes are as follows:

- annexes common to several parts of the ISO 3506 series have been withdrawn from this document and are now included in the new ISO 3506-6 which is to be used with this document;
- austenitic stainless steel of grade A8 and duplex (austenitic-ferritic) stainless steels of grades D2 to D8 for hardness classes 20H, 25H and 30H have been added (see [Figure 1](#));
- operational temperature ranges have been clarified (see [Clause 1](#));
- terms and definitions have been added (see [Clause 3](#));
- wording for surface conditions and corrosion resistance have been improved (see [5.3](#) and [5.4](#));
- manufacturer's, supplier's and purchaser's inspections have been added (see [Clause 7](#));
- applicability of test methods has been added, and hardness test, torsional test and drive test methods have been improved (see [Clause 8](#));
- marking and labelling have been improved (see [Clause 9](#));
- structure and content of this document have been brought in line with other parts of ISO 3506 published recently.

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

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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 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 process. Austenitic, ferritic 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 and have been increasingly used since the 1980s. This document was revised to reflect their standardization for fasteners.

All duplex stainless steels show improved resistance to stress corrosion cracking compared to the commonly used A2 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.

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

Part 4: Tapping screws with specified grades and hardness classes

1 Scope

This document specifies the mechanical and physical properties of tapping screws made of corrosion resistant austenitic, martensitic, ferritic and duplex stainless steels, with specified grades and hardness classes.

ISO 3506-6 provides general rules and additional technical information on suitable stainless steels and their properties (detailed properties of stainless steel grades, corrosion behaviour with regards to pitting, crevice and intergranular corrosion, magnetic properties, etc.).

WARNING — Tapping screws conforming to the requirements of this document are tested at the ambient temperature range of 10 °C to 35 °C and are used in applications ranging from -20 °C to +150 °C. It is possible that they do not retain the specified mechanical and physical properties at lower and/or elevated temperatures. Therefore, it is the responsibility of the user to determine the appropriate choices based on service environment conditions of the assembly (see also [Clauses 5](#) and [6](#)).

This document applies to tapping screws with threads ST2,2 to ST8, in accordance with ISO 1478.

This document does not apply to tapping screws with special properties, such as 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 1478, *Tapping screws 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 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

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 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

tapping screw

sheet metal screw

screw with thread in accordance with ISO 1478 which, when driven into a hole, creates its own mating threads in the materials of the parts being assembled (usually thin metal sheets) without deforming its own thread

3.2

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]

3.3

austenitic stainless steel

stainless steel (3.2) with high amounts of chromium and nickel which usually cannot be hardened by heat treatment, providing excellent resistance to corrosion, good ductility, and usually low or non-magnetic properties

[SOURCE: ISO 3506-1:2020, 3.6]

3.4

martensitic stainless steel

stainless steel (3.2) with high amounts of chromium but very little nickel or other alloying elements, which can be hardened by heat treatment for increasing strength but with reduced ductility, and with highly magnetic properties

[SOURCE: ISO 3506-1:2020, 3.7]

3.5

ferritic stainless steel

stainless steel (3.2) containing less than 0,1 % carbon and typically 11 % to 18 % chromium, which usually cannot be hardened by heat treatment, and with highly magnetic properties

[SOURCE: ISO 3506-1:2020, 3.8]

3.6

duplex stainless steel

stainless steel (3.2) with a micro-structure that includes both austenitic and ferritic phases providing excellent resistance to corrosion, containing a higher amount of chromium and a reduced quantity of nickel compared to austenitic steel, with high strength, and with magnetic properties

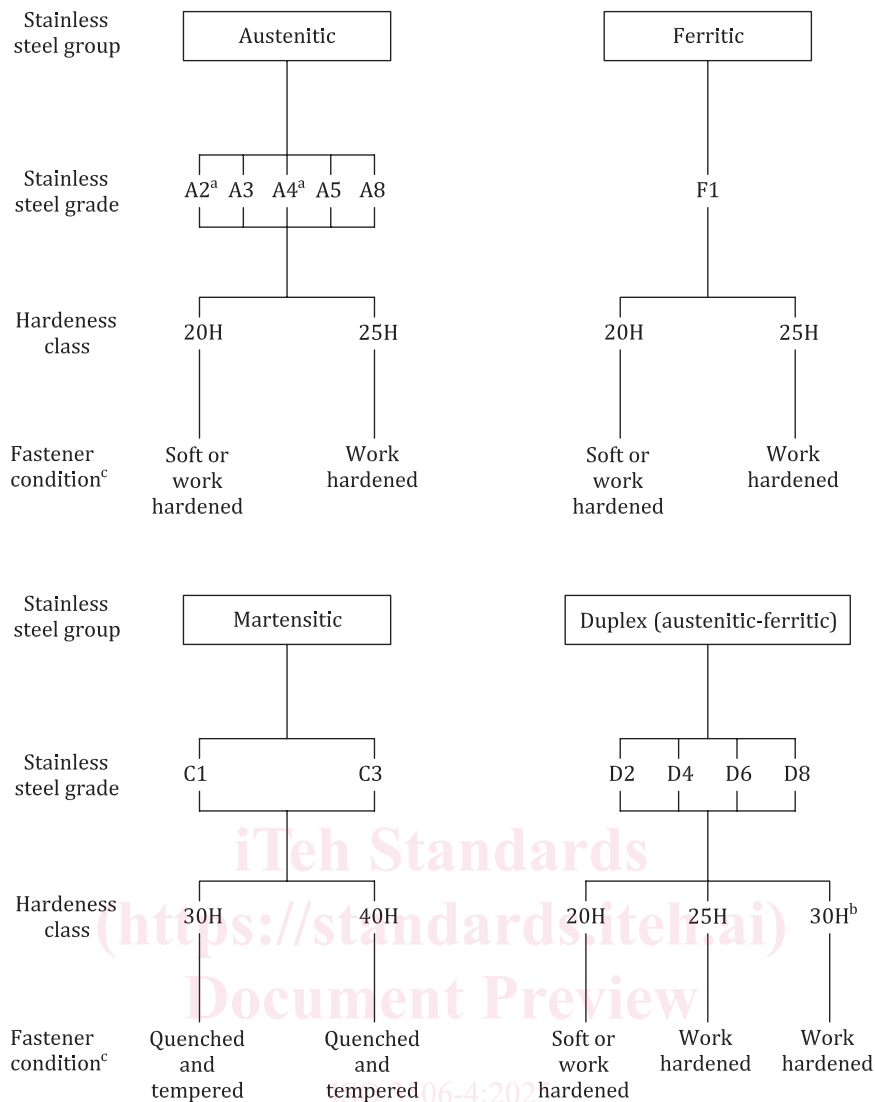
[SOURCE: ISO 3506-1:2020, 3.9]

4 Designation system for stainless steel grades and hardness classes

4.1 General

The designation system for stainless steel tapping screws consists of two blocks, separated by a hyphen: the stainless steel grade and the hardness class, as specified in [Figure 1](#).

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- a For low carbon austenitic stainless steels with carbon content not exceeding 0,030 %, tapping screws can additionally be designated with the letter “L” just after the grade. EXAMPLE: A4L-25H.
- b This hardness class requires a prior agreement between the purchaser and the manufacturer.
- c For information only.

Figure 1 — Designation system for stainless steel tapping screws

Although a great number of stainless steel grades combined with hardness classes are specified in this document for tapping screws, this does not mean that all combinations are appropriate due to the properties of the material in conjunction with the fastener geometry. Nevertheless, some combinations of grades and property classes may not be available on the market. For non-standard fasteners, it is recommended that a fastener expert be consulted.

The marking, labelling, and designation of tapping screws with stainless steel grade and hardness class shall be as specified in [Clause 9](#).

This designation system may be used for sizes outside the diameter limits specified in this document (i.e. for threads <ST2,2 or >ST8), provided that all applicable chemical, mechanical, and physical requirements are met.

4.2 Designation of stainless steel grades (first block)

The designation of the stainless steel grade (first block) consists of one letter which specifies the stainless steel group:

- **A** for austenitic,
- **C** for martensitic,
- **F** for ferritic,
- **D** for duplex (austenitic-ferritic),

and

- a digit which specifies the range of chemical compositions within this stainless steel group.

The chemical compositions of stainless steel groups and grades classified in [Figure 1](#) are specified in [Table 2](#).

4.3 Designation of hardness classes (second block)

The designation of the hardness class (second block) consists of two parts, as specified in [Table 1](#):

- the number to the left corresponds to 1/10 of the minimum Vickers hardness, and
- the letter H to the right represents Vickers hardness.

Table 1 — Designation of hardness classes in relation to Vickers hardness

| Hardness class | 20H | 25H | 30H | 40H |
|---------------------------|-----|-----|-----|-----|
| Vickers hardness, HV min. | 200 | 250 | 300 | 400 |

EXAMPLE 1 A4-25H specifies a tapping screw in austenitic stainless steel of grade A4, work hardened, with a minimum hardness of 250 HV.

EXAMPLE 2 C3-40H specifies a tapping screw in martensitic stainless steel of grade C3, quenched and tempered, with a minimum hardness of 400 HV.

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5 Materials

5.1 Chemical composition

[Table 2](#) specifies the limits for chemical composition of the stainless steel grades for fasteners. The chemical composition shall be assessed in accordance with the relevant International Standards.

The final choice of the chemical composition within the specified stainless steel grade is at the discretion of the manufacturer, unless otherwise agreed between the purchaser and the manufacturer.

The stainless steel grade suitable for an application shall be selected in accordance with ISO 3506-6. ISO 3506-6 also gives examples of stainless steels related to each grade specified in [Table 2](#) (see also Bibliography for additional material information).

For corrosion resistance, see also [5.3](#) and [5.4](#).