

International Standard



3506

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Corrosion-resistant stainless steel fasteners — Specifications

Éléments de fixation en acier inoxydable résistant à la corrosion — Spécifications

First edition — 1979-05-15

UDC 621.882 : 669.14.018.8

Ref. No. ISO 3506-1979 (E)

Descriptors : fasteners, bolts, screws, studs, nuts (fasteners), specifications, designation, steel products, corrosion resistant steels, stainless steels, austenitic steels, ferritic steels, martensitic steels, chemical composition, marking, mechanical properties, tests, mechanical tests, tension tests, torsion tests, test equipment, elongation at rupture.

 **Document Sharing Hub**

Price based on 14 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3506 was developed by Technical Committee ISO/TC 2, *Fasteners*, and was circulated to the member bodies in June 1978.

It has been approved by the member bodies of the following countries :

Australia	Germany, F.R.	Poland
Austria	Hungary	Romania
Belgium	India	South Africa, Rep. of
Bulgaria	Ireland	Sweden
Canada	Italy	Switzerland
Chile	Japan	Turkey
Denmark	Korea, Rep. of	United Kingdom
Egypt, Arab Rep. of	Mexico	USA
Finland	Netherlands	USSR
France	Norway	

The member body of the following country expressed disapproval of the document on technical grounds :

New Zealand

CONTENTS

	Page
0 Introduction.	1
1 Scope and field of application	1
2 References.	1
3 Designation, marking, finish and magnetic properties	2
4 Chemical composition	5
5 Mechanical properties.	5
6 Methods of test.	6

Annexes

A Stainless steel composition specifications (Extract from ISO 683/XIII)	11
B Stainless steel composition specifications (Extract from ISO 4954)	12
C Screw thread — Tensile stress areas	13
D Total extension at fracture (A_L).	14

Corrosion-resistant stainless steel fasteners — Specifications

0 INTRODUCTION

In the preparation of this International Standard, special attention has been given to the fundamentally different property characteristics of the stainless steel fastener grades compared with carbon and low-alloy steel fasteners of similar dimensions. The ferritic and austenitic stainless steels are strengthened only by cold working, and consequently the components do not have as homogeneous a condition as a hardened and tempered part. These special features have been recognized in the preparation of the clauses applicable to property classes and the mechanical test procedures, which differ from the carbon and low alloy steel fastener test procedures with regard to the measurement of yield point (stress at 0,2 % permanent strain) and ductility (total extension at fracture) on the finished component.

1 SCOPE AND FIELD OF APPLICATION

This International Standard gives specifications for bolts, screws, studs and nuts made from austenitic, ferritic and martensitic grades of corrosion-resistant stainless steels.

It is applicable only to fastener components after completion of manufacture,

- with nominal thread diameters from 1,6 up to and including 39 mm,
- of any triangular ISO metric threads according to ISO 68 and with diameters and pitches according to ISO 262,
- of any shape;

and additionally for nuts of any shape provided that

- width across flats or outside diameters is not less than 1,45 times nominal diameter, and

- effective thread engagement is at least 0,6 times nominal diameter.

This International Standard does not define corrosion or oxidation resistance in particular environments. It does specify grades for fasteners made from corrosion-resistant stainless steels. Some have mechanical properties allowing use at temperatures down to -200°C in air. Some have oxidation resistance allowing use at temperatures up to $+800^{\circ}\text{C}$ in air.

Acceptable corrosion and oxidation performances and mechanical property values allowing use at elevated or sub-zero temperatures must be the subject of agreement between user and manufacturer wherever appropriate to the proposed service environment.

2 REFERENCES

ISO 68, *ISO general purpose screw threads — Basic profile.*

ISO/R 79, *Brinell hardness test for steel.*

ISO/R 80, *Rockwell hardness test (B and C scales) for steel.*

ISO/R 81, *Vickers hardness test for steel.*

ISO 82, *Steel — Tensile testing.*

ISO 262, *ISO general purpose metric screw threads — Selected sizes for screws, bolts and nuts.*

ISO 683/XIII, *Heat-treated steels, alloy steels and free-cutting steels — Part XIII : Wrought stainless steels.*

ISO 898/I, *Mechanical properties of fasteners — Part I : Bolts, screws and studs.*

ISO 898/II, *Mechanical properties of fasteners — Part II : Nuts with specified proof load values.¹⁾*

ISO 3651, *Austenitic stainless steels — Determination of resistance to intergranular corrosion.*

ISO 4954, *Steels for cold heading and extruding.²⁾*

1) At present at the stage of draft. (Revision of ISO/R 898/II-1969 and ISO 898/IV-1972.)

2) At present at the stage of draft.

3 DESIGNATION, MARKING, FINISH AND MAGNETIC PROPERTIES

3.1 Designation

The designation of fasteners is given in table 1. The steel grades and property classes are designated by a four-character identifier consisting of a letter followed by three digits. The letter indicates the general composition groups of steels as follows :

- A for austenitic steels;
- C for martensitic steels;
- F for ferritic steels.

The first digit following the letter indicates the type of alloying elements present for the particular group A, C or F. The last two digits indicate the property class (metallurgical condition); for example :

- 1) A2-70 indicates :
austenitic steel, cold-worked, minimum 700 N/mm²* tensile strength.
- 2) C4-70 indicates :
martensitic 12 % Cr steel, hardened and tempered, minimum 700 N/mm² tensile strength.

3.2 Marking

3.2.1 Bolts and screws

All hexagon head screws and bolts and socket cap screws of M5 thread diameter and greater shall be clearly marked in accordance with the designation system given in 3.1. This marking can be applied to other types of bolts and screws where it is technically possible to do so on the head portion only.

The marking shall include the steel grade and property class and also the manufacturer's identification mark (see figure 1). Additional marking can be applied at the option

of the manufacturer or at the specific request of the purchaser. This additional marking should not be liable to cause confusion with any other standardized marking or identification.

3.2.2 Studs and other fasteners

Marking of studs and other fasteners shall be agreed between user and manufacturer.

3.2.3 Nuts

Nuts shall be marked with the steel grade and property class, if necessary, and with the manufacturer's identification mark in the case of nuts of M5 nominal thread diameter and greater (see figure 2), where this is technically possible for the manufacturer. Marking of one nut face is acceptable and shall be by indentation only when applied to the bearing surface of the nuts. Alternatively, marking on the side of the nuts is permissible. Property class marking and designation of nuts is necessary where the nuts do not meet the minimum proof load stress of the highest property class for the steel grade.

3.2.4 Packages and containers

Marking of the designation is mandatory on all packages or containers of all sizes.

3.3 Finish

Unless otherwise specified, stainless steel fasteners shall be supplied clean and bright.

3.4 Magnetic properties

All austenitic stainless steel fasteners are normally non-magnetic; after cold working, some magnetic properties may be evident.

* 1 N/mm² = 1 MPa

Corrosion-resistant stainless steel fasteners — Specifications

0 INTRODUCTION

In the preparation of this International Standard, special attention has been given to the fundamentally different property characteristics of the stainless steel fastener grades compared with carbon and low-alloy steel fasteners of similar dimensions. The ferritic and austenitic stainless steels are strengthened only by cold working, and consequently the components do not have as homogeneous a condition as a hardened and tempered part. These special features have been recognized in the preparation of the clauses applicable to property classes and the mechanical test procedures, which differ from the carbon and low alloy steel fastener test procedures with regard to the measurement of yield point (stress at 0,2 % permanent strain) and ductility (total extension at fracture) on the finished component.

1 SCOPE AND FIELD OF APPLICATION

This International Standard gives specifications for bolts, screws, studs and nuts made from austenitic, ferritic and martensitic grades of corrosion-resistant stainless steels.

It is applicable only to fastener components after completion of manufacture,

- with nominal thread diameters from 1,6 up to and including 39 mm,
- of any triangular ISO metric threads according to ISO 68 and with diameters and pitches according to ISO 262,
- of any shape;

and additionally for nuts of any shape provided that

- width across flats or outside diameters is not less than 1,45 times nominal diameter, and

- effective thread engagement is at least 0,6 times nominal diameter.

This International Standard does not define corrosion or oxidation resistance in particular environments. It does specify grades for fasteners made from corrosion-resistant stainless steels. Some have mechanical properties allowing use at temperatures down to -200°C in air. Some have oxidation resistance allowing use at temperatures up to $+800^{\circ}\text{C}$ in air.

Acceptable corrosion and oxidation performances and mechanical property values allowing use at elevated or sub-zero temperatures must be the subject of agreement between user and manufacturer wherever appropriate to the proposed service environment.

2 REFERENCES

ISO 68, *ISO general purpose screw threads — Basic profile.*

ISO/R 79, *Brinell hardness test for steel.*

ISO/R 80, *Rockwell hardness test (B and C scales) for steel.*

ISO/R 81, *Vickers hardness test for steel.*

ISO 82, *Steel — Tensile testing.*

ISO 262, *ISO general purpose metric screw threads — Selected sizes for screws, bolts and nuts.*

ISO 683/XIII, *Heat-treated steels, alloy steels and free-cutting steels — Part XIII : Wrought stainless steels.*

ISO 898/I, *Mechanical properties of fasteners — Part I : Bolts, screws and studs.*

ISO 898/II, *Mechanical properties of fasteners — Part II : Nuts with specified proof load values.¹⁾*

ISO 3651, *Austenitic stainless steels — Determination of resistance to intergranular corrosion.*

ISO 4954, *Steels for cold heading and extruding.²⁾*

1) At present at the stage of draft. (Revision of ISO/R 898/II-1969 and ISO 898/IV-1972.)

2) At present at the stage of draft.

3 DESIGNATION, MARKING, FINISH AND MAGNETIC PROPERTIES

3.1 Designation

The designation of fasteners is given in table 1. The steel grades and property classes are designated by a four-character identifier consisting of a letter followed by three digits. The letter indicates the general composition groups of steels as follows :

- A for austenitic steels;
- C for martensitic steels;
- F for ferritic steels.

The first digit following the letter indicates the type of alloying elements present for the particular group A, C or F. The last two digits indicate the property class (metallurgical condition); for example :

- 1) A2-70 indicates :
austenitic steel, cold-worked, minimum 700 N/mm²* tensile strength.
- 2) C4-70 indicates :
martensitic 12 % Cr steel, hardened and tempered, minimum 700 N/mm² tensile strength.

3.2 Marking

3.2.1 Bolts and screws

All hexagon head screws and bolts and socket cap screws of M5 thread diameter and greater shall be clearly marked in accordance with the designation system given in 3.1. This marking can be applied to other types of bolts and screws where it is technically possible to do so on the head portion only.

The marking shall include the steel grade and property class and also the manufacturer's identification mark (see figure 1). Additional marking can be applied at the option

of the manufacturer or at the specific request of the purchaser. This additional marking should not be liable to cause confusion with any other standardized marking or identification.

3.2.2 Studs and other fasteners

Marking of studs and other fasteners shall be agreed between user and manufacturer.

3.2.3 Nuts

Nuts shall be marked with the steel grade and property class, if necessary, and with the manufacturer's identification mark in the case of nuts of M5 nominal thread diameter and greater (see figure 2), where this is technically possible for the manufacturer. Marking of one nut face is acceptable and shall be by indentation only when applied to the bearing surface of the nuts. Alternatively, marking on the side of the nuts is permissible. Property class marking and designation of nuts is necessary where the nuts do not meet the minimum proof load stress of the highest property class for the steel grade.

3.2.4 Packages and containers

Marking of the designation is mandatory on all packages or containers of all sizes.

3.3 Finish

Unless otherwise specified, stainless steel fasteners shall be supplied clean and bright.

3.4 Magnetic properties

All austenitic stainless steel fasteners are normally non-magnetic; after cold working, some magnetic properties may be evident.

* 1 N/mm² = 1 MPa