# SLOVENSKI STANDARD
# SIST EN 10088-3:2024

**01-februar-2024**

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**Nerjavna jekla - 3. del: Tehnični dobavni pogoji za polizdelke, drogove, palice, žico, profile in svetle izdelke iz korozijsko odpornih jekel za splošno uporabo**

Stainless steels - Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resistant steels for general purposes

Nichtrostende Stähle - Teil 3: Technische Lieferbedingungen für Halbzeug, Stäbe, Walzdraht, gezogenen Draht, Profile und Blankstahlerzeugnisse aus korrosionsbeständigen Stählen für allgemeine Verwendung

Aciers inoxydables - Partie 3 : Conditions techniques de livraison pour les demi-produits, barres, fils, fils tréfilés, profils et produits transformés à froid en acier résistant à la corrosion pour usage général



**Ta slovenski standard je istoveten z:** **EN 10088-3:2023**

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**ICS:**

| | | |
|---|---|---|
| 77.140.20 | Visokokakovostna jekla | Stainless steels |
| 77.140.50 | Ploščati jekleni izdelki in polizdelki | Flat steel products and semi-products |
| 77.140.65 | Jeklene žice, jeklene vrvi in verige | Steel wire, wire ropes and link chains |

**SIST EN 10088-3:2024** **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 10088-3

December 2023

ICS 77.140.20; 77.140.50; 77.140.65

Supersedes EN 10088-3:2014

English Version

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Aciers inoxydables - Partie 3 : Conditions techniques de livraison pour les demi-produits, barres, fils, fils tréfilés, profils et produits transformés à froid en acier résistant à la corrosion pour usage général

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This European Standard was approved by CEN on 6 November 2023.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**



Ref. No. EN 10088-3:2023 E

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## European foreword

This document (EN 10088-3:2023) has been prepared by Technical Committee CEN/TC 459 “ECISS - European Committee for Iron and Steel Standardization[1]”, the secretariat of which is held by AFNOR.

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 June 2024, and conflicting national standards shall be withdrawn at the latest by June 2024.

This document supersedes EN 10088-3:2014.

In comparison with the previous edition, the following technical modifications have been made:

a) addition of austenitic grades 1.4681, 1.4391, addition of austenitic-ferritic (duplex) grade 1.4670, addition of ferritic grades 1.4106, 1.4114, 1.4045, addition of martensitic grade 1.4037;

b) chemical composition was changed for following grades: austenitic grades 1.4310, 1.4404, 1.4529, ferritic grade 1.4003 and for martensitic grade 1.4028, 1.4116;

c) removal of austenitic grades, 1.4319, 1.4537;

d) mechanical values for bright bars have been changed for austenitic grades 1.4301, 1.4307 for ferritic grades 1.4509, for martensitic grades 1.4028, 1.44418 and for austeno-ferritic grades 1.4362. Mechanical values for bright bars have been added for martensitic grade 1.4021 in QT800 condition and for 1.4057 in QT900 condition;

e) introduction of the possibility to use modelling for the determination of tensile properties;

f) columns have swapped places in Table 7 for better reading;

g) new Annex A lists all grades that appear in this document by ascending steel number.



EN 10088, under the general title *Stainless steels*, consists of the following parts:



— *Part 1: List of stainless steels* (including a table of European Standards, in which these stainless steels are further specified, see Annex C);

— *Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resistant steels for general purposes*;

— *Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resistant steels for general purposes*;

— *Part 4: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for construction purposes*;

— *Part 5: Technical delivery conditions for bars, rods, wire, sections and bright products of corrosion resisting steels for construction purposes*.

[1] Through its sub-committee SC 5 “Steels for heat treatment, alloy steels, free-cutting steels and stainless steels”, (secretariat: DIN).

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

# Introduction

The European Committee for Standardization (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents applied to seven steel grades, given in 8.3, A and B and which is claimed to be relevant for the following clause(s) of this document:

Clauses 8, A and B.

CEN takes no position concerning the evidence, validity and scope of these patent rights. The holders of these patent rights have ensured CEN that they are willing to negotiate licenses, under reasonable and non-discriminatory terms and conditions, with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with CEN. Information may be obtained from:

Grade: 1.4662

Outokumpu Stainless AB

SE-77480 Avesta, Sweden

Grade 1.4062, 1.4669, 1.4670

Ugitech

F-73403 Ugine Cedex, France,

Grade 1.4062, 1.4669

Industeel

F-71200 Creusot, 56 Rue Clemenceau, France

Grade 1.4646, 1.4611, 1.4613

Acciai Speciali Terni

I-05100 Terni, Italy

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

# 1 Scope

This document specifies the technical delivery conditions for semi-finished products, hot or cold formed bars, rods, wire, sections and bright products of standard grades and special grades of corrosion resistant stainless steels for general purposes.

NOTE General purposes include the use of stainless steels in contact with foodstuffs.

The general technical delivery conditions specified in EN 10021 apply in addition to the specifications of this document, unless otherwise specified in this document.

This document does not apply to components manufactured by further processing of the product forms listed above with quality characteristics altered as a result of such further processing.

# 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 10021, *General technical delivery conditions for steel products*

EN 10079, *Definition of steel products*

EN 10088-1:2023, *Stainless steels — Part 1: List of stainless steels*

EN 10163-3, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections — Part 3: Sections*

EN 10168, *Steel products — Inspection documents — List of information and description*

EN 10204, *Metallic products — Types of inspection documents*

EN 10306, *Iron and steel — Ultrasonic testing of H beams with parallel flanges and IPE beams*

EN 10308, *Non-destructive testing — Ultrasonic testing of steel bars*

EN ISO 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method (ISO 148-1)*

EN ISO 286-1, *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 1: Basis of tolerances, deviations and fits (ISO 286-1)*

EN ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing (ISO 377)*

EN ISO 3651-2, *Determination of resistance to intergranular corrosion of stainless steels — Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels — Corrosion test in media containing sulfuric acid (ISO 3651-2)*

EN ISO 4885, *Ferrous materials — Heat treatments — Vocabulary (ISO 4885)*

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

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

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

EN ISO 9443, *Surface quality classes for hot-rolled bars and wire rod (ISO 9443)*

EN ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition (ISO 14284)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions regarding types of heat-treatment in EN ISO 4885 and regarding product forms in EN 10079 and the following 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 steels**
steels with at least 10,5 % of chromium and maximum 1,20 % of carbon

[SOURCE: EN 10020:2000, 3.2.2]

Note 1 to entry: Stainless steels are further subdivided in accordance with their main property into corrosion resistant steels, heat resistant steels and creep resistant steels.



**3.2**
**corrosion resistant stainless steels**
standard stainless (see 3.1) where its resistance to corrosion is of primary importance

**3.3**
**general purposes**
purposes other than the special purposes mentioned in the Bibliography



**3.4**
**standard grades**
grades with a relatively good availability and a wider range of application

**3.5**
**special grades**
grades for special use and/or with limited availability

# 4 Designation and ordering

## 4.1 Designation of steel grades

The steel names and steel numbers (see Tables 2 to 5) were formed in accordance with EN 10027-1 and EN 10027-2, respectively.

A complete overview of all grades that are in this document is given in Annex A.

## 4.2 Designation to be used on ordering

The complete designation for ordering a product according to this document shall contain the following information:

— desired quantity;

— product form (e.g. round bars, square bars or rod);

— where an appropriate dimensional standard is available (see Table 7 and Annex D) the number of the standard plus any choice of requirements; if there is no dimensional standard, the nominal dimensions and tolerances required;

— type of material (steel);

— number of this document;

— steel name or steel number;

— if for the relevant steel in the table for the mechanical properties more than one treatment condition is covered, the symbol for the desired heat treatment or cold worked condition;

— desired condition (see symbols in Table 7);

— if a verification of internal soundness is required, products shall be tested in accordance with EN 10306 or EN 10308;

— any additional optional tests or inspections (see 7.2.3 d);

— standard designation for a test report 2.2 or, if required, any other type of inspection document in accordance with EN 10204 (see 7.2.1).



EXAMPLE 10 t round bars according to EN 10060 of 50 mm diameter made of steel grade EN 10088-3 with the name X5CrNi18-10 and the number 1.4301 in condition 1D (see Table 7), inspection certificate 3.1 as specified in EN 10204:

10 t round bars EN 10060 — 50

Steel EN 10088-3 — X5CrNi18-10+1D

EN 10204 — 3.1

or

10 t round bars EN 10060 — 50

Steel EN 10088-3-1.4301+1D

EN 10204 — 3.1.

# 5 Classification of grades

Steels covered in this document are classified according to their structure into:

— austenitic steels,

— austenitic-ferritic steels,

— ferritic steels,

— martensitic steels,

— precipitation hardening steels.

See also EN 10088-1:2023, Annex C.

# 6 Requirements

## 6.1 Steelmaking process

Unless otherwise agreed at the time of enquiry and order, the steelmaking and manufacturing process for steels conforming to this document shall be at the discretion of the manufacturer.

## 6.2 Delivery condition

The products shall be supplied in the delivery condition agreed at the time of enquiry and order by reference to the conditions given in Table 7 and, where different alternatives exist, to the treatment conditions given in Tables 8 to 19 and 25 (see also Annex B).

## 6.3 Chemical composition

**6.3.1** The chemical composition requirements given in Tables 2 to 5 apply in respect of the chemical composition according to the cast analysis.

Elements not quoted ("-") or not listed in these tables shall not be intentionally added to the steel without the agreement of the purchaser except for finishing the cast. All precautions shall be taken to avoid the addition of such elements from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.

**6.3.2** The product analysis may deviate from the limiting values for the cast analysis given in Tables 2 to 5 by the values listed in Table 6.

## 6.4 Chemical corrosion resistance properties

For austenitic, austenitic-ferritic and ferritic stainless steels, the specifications in Tables 8, 9 and 10, referring to resistance to intergranular corrosion as defined in EN ISO 3651-2 applies (see also 7.4.6).

NOTE 1 EN ISO 3651-2 is not applicable for testing martensitic and precipitation hardening steels.

NOTE 2 The corrosion resistance of stainless steels is very dependent on the type of environment and can therefore not always be clearly ascertained through laboratory tests. It is therefore advisable to draw on the available experience of the use of the steels.

## 6.5 Mechanical properties

**6.5.1** The mechanical properties at room temperature as specified in Tables 8 to 12 apply for hot worked products of every condition, condition 1U and semi-finished products excluded, for cold processed products in condition 2D (excluding wire), and for each specified heat treatment condition.

For cold processed products of every specified condition, condition 2D and wire excluded, and each specified heat treatment condition, the mechanical properties at room temperature as specified in Tables 13 to 17 apply. For these products, the condition is the prime property with the mechanical properties secondary.

If by agreement at the time of ordering the products shall be supplied in a non-heat-treated condition, the mechanical properties specified in Tables 8 to 17 shall be obtained from reference test pieces which have received the appropriate heat treatment (simulated heat treatment).

For wire, the properties as specified in Tables 18 and 19 apply.

For bars which are intentionally cold work hardened in order to increase their tensile strength to a specified level, the mechanical properties at room temperature as specified in Table 25 apply. For these products, the mechanical properties are prime, with the condition a secondary property.

NOTE Austenitic steels are insensitive to brittle fracture in the solution annealed condition. Because they do not have a pronounced transition temperature, which is characteristic of other steels, they are also useful for application at cryogenic temperatures.

**6.5.2** The values in Tables 20 to 24 apply for the 0,2 %- and 1,0 %-proof strength at elevated temperatures.

**6.5.3** A number of grades in Tables 2 to 5 are not listed or have limited information included in Tables 13 to 25. In this case, grade dimensions and corresponding mechanical properties shall be agreed upon at the time of enquiry and order.

In case of demand for larger diameters than stated in Tables 13 to 19, appropriate mechanical property values shall be agreed at the time of enquiry and order.

## 6.6 Surface quality



The available surface finishes are given in Table 7. Slight surface imperfections, inherent to the production process, are permitted. Exact requirements concerning maximum depth of acceptable discontinuities for bars, rods and sections in the relevant conditions are given in Table 1.

**Table 1 — Maximum depth of acceptable discontinuities for bars, rods and sections**

| Conditions | Product forms | Permissible depth of discontinuities [a] | Max. % of delivered weight in excess of permissible depth of discontinuities |
|---|---|---|---|
| 1U, 1C, 1E, 1D | Sections | To be agreed upon at the time of enquiry and order on the basis of EN 10163-3. | |
| 1U, 1C, 1E, 1D | Rounds and rod | Unless not specified otherwise at the time of enquiry and order:<br>EN ISO 9443 - class A. | |
| 1X [b], 2H [b], 2D [b] | Rounds | - max. 0,2 mm for d ≤ 20 mm<br>- max. 0,01 d for 20 < d ≤ 75 mm<br>- max. 0,75 mm for d > 75 mm | 1 % |
| | Hexagons | - max. 0,3 mm for d ≤ 15 mm<br>- max. 0,02 d for 15 < d ≤ 63 mm | 2 % |
| | Other bars | - max. 0,3 mm for d ≤ 15 mm<br>- max. 0,02 d for 15 < d ≤ 63 mm | 4 % |
| 1G, 2B, 2G, 2P | Rounds | Technically defect free by manufacture. | 0,2 % |

[a] Depth of discontinuities is understood as being the distance, measured normally to the surface, between the bottom of the discontinuities and that surface.

[b] At the time of enquiry and order it may be agreed that the product shall be delivered with a surface being technically defect free by manufacture. In this case, also the maximum % of delivered weight in excess of permissible depth of discontinuities shall be agreed.

For further information, e.g. roughness in conditions 2G and 2P, see Table 7.

For wires supplied in 2H condition according to Table 18 or 2B according to Table 19 the surface quality shall be agreed upon at the time of enquiry and order.



## 6.7 Internal soundness

The products shall be free of internal defects which would exclude them from being used for their usual purpose. At the time of enquiry and order ultrasonic testing of H-beams with parallel flanges and IPE-beams may be agreed in accordance with EN 10306 and ultrasonic testing of steel bars may be agreed in accordance with EN 10308.



## 6.8 Formability at room temperature

Cold formability may be verified by elongation in the tensile test.

## 6.9 Dimensions and tolerances on dimensions and shape

The dimensions and the tolerances on dimensions shall be agreed at the time of enquiry and order, as far as possible with reference to the dimensional standards listed in Table 7 and in Annex D.

## 6.10 Calculation of mass and tolerances on mass

**6.10.1** The nominal mass shall be calculated by using the steel density given in Annex E of EN 10088-1:2023 and the nominal dimensions of the steel product.

**6.10.2** The dimensional standards listed in Table 7 or in Annex D do not specify tolerances on mass, which therefore may be agreed at the time of enquiry and order.

# 7 Inspection and testing

## 7.1 General

The appropriate process control, inspection, testing and modelling shall be carried out to ensure that the product complies with the requirements of the order.

This includes the following:

— suitable frequency of verification of the dimensions of the products;

— adequate intensity of visual examination of the surface quality of the products;

— appropriate frequency and type of test to ensure that the correct grade of steel is used.

The nature and frequency of these verifications, examinations and tests is determined in the light of the degree of consistency that has been determined by the evidence of the quality system. In view of this, verifications by specific tests for these requirements are not necessary unless otherwise agreed.

## 7.2 Agreement on tests and inspection documents

**7.2.1** Products complying with this document shall be ordered and delivered with one of the inspection documents as specified in EN 10204. The type of document shall be agreed upon at the time of enquiry and order. If the order does not contain any specification of this type, at least a test report 2.2 shall be issued.

**7.2.2** If it is agreed to issue a test report 2.2 in accordance with EN 10204 it shall indicate the following information:

a) information groups A, B and Z of EN 10168;

b) results of the cast analysis in accordance with Tables 2 to 5 with the code numbers C71 to C92 in EN 10168.

**7.2.3** If the issuing of an inspection certificate 3.1 or 3.2 according to EN 10204 has been agreed, specific inspections according to 7.3 shall be carried out and the following information shall be given in the inspection document with the code numbers and details required by EN 10168:

a) information groups A, B and Z of EN 10168;

b) results of the cast analysis in accordance with Tables 2 to 5 with the code numbers C71 to C92 in EN 10168;

c) results of all mandatory (m) tests according to Table 26*;*

d) results of any optional (o) test according to Table 26 or any further product verification agreed at the time of enquiry and order.

## 7.3 Specific inspection and testing

### 7.3.1 Extent of testing

The tests to be carried out, either mandatorily (m) or optionally by agreement (o) and the composition and size of the test units, and the number of sample products, samples and test pieces to be taken are given in Table 26.