SLOVENSKI STANDARD
SIST EN 10088-2:2024

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Nerjavna jekla - 2. del: Tehnični dobavni pogoji za korozijsko odporne pločevine in trakove za splošno uporabo

Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes

Nichtrostende Stähle - Teil 2: Technische Lieferbedingungen für Blech und Band aus korrosionsbeständigen Stählen für allgemeine Verwendung

Aciers inoxydables - Partie 2: Conditions techniques de livraison des tôles et bandes en acier de résistance à la corrosion pour usage général

Ta slovenski standard je istoveten z: **EN 10088-2:2024**

ICS:

77.140.20	Visokokakovostna jekla	Stainless steels
77.140.50	Ploščati jekleni izdelki in polizdelki	Flat steel products and semi-products

SIST EN 10088-2:2024 **en,fr,de**

EUROPEAN STANDARD

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EN 10088-2

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ICS 77.140.20; 77.140.50

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Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resistant steels for general purposes

Aciers inoxydables - Partie 2 : Conditions techniques de livraison des tôles et bandes en acier résistant à la corrosion pour usage général

Nichtrostende Stähle - Teil 2: Technische Lieferbedingungen für Blech und Band aus korrosionsbeständigen Stählen für allgemeine Verwendung

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

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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

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European foreword

This document (EN 10088-2:2024) 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of an identical text or by endorsement, at the latest by March 2025, and conflicting national standards shall be withdrawn at the latest by March 2025.

This document supersedes EN 10088-2:2014.

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

a) addition of austenitic grades 1.4382, 1.4420, 1.4678, 1.4682, addition of austenitic-ferritic (duplex) grade 1.4637, addition of ferritic grade 1.4622, and addition of martensitic grade 1.4060;

b) chemical composition was changed for following grades: austenitic grades 1.4310, 1.4404, 1.4529, ferritic grades 1.4003, 1.4521, and martensitic grades 1.4028, 1.4116;

c) removal of austenitic grades 1.4319, 1.4537, and removal of austenitic-ferritic (duplex) grade 1.4655;

d) permissible product analysis tolerances have been adjusted;

e) austenitic grade 1.4529 cold and hot rolled strip products have been added;

f) austenitic-ferritic (duplex) grades:

   — 1.4162 cold and hot rolled strip max. product thicknesses, and mechanical property requirements at room and elevated temperatures have been changed;

   — 1.4362 hot rolled strip and plate, a mechanical property requirement has been changed;

   — 1.4501 cold and hot rolled strip products have been added;

   — 1.4662 cold and hot rolled strip max. product thicknesses have been changed;

g) ferritic grades 1.4509, 1.4513, 1.4520, 1.4526 hot rolled strip products have been added;

h) introduction of the possibility to use modelling for determination of the mechanical properties measured by tensile testing;

i) addition of austenitic grades 1.4307, 1.4404, 1.4420, 1.4678 to cold worked process route, and expansion of cold worked strength levels for austenitic grades 1.4401, 1.4571;

j) listing of types of process route has been revised;

k) Clause 8 “Marking” has been revised;

l) listing of grades in all tables has been revised;

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

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

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*.

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 eight steel grades, given in Clause 8, Annex A and Annex B and which is claimed to be relevant for the following clause(s) of this document:

Clauses: Clause 8, Annex A and Annex 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 1.4637, 1.4662

Outokumpu Stainless AB

SE-77480 Avesta, Sweden

Grade 1.4420, 1.4622

Outokumpu Oyj

FI-00180, Helsinki, Salmisaarenranta 11, Finland

Grade 1.4062

Ugitech

F-73403 Ugine Cedex, France

Grade 1.4062

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 hot or cold rolled sheet/plate and strip 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 the 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 10027-1, *Designation systems for steels — Part 1: Steel names*

EN 10027-2, *Designation systems for steels — Part 2: Numerical system*

EN 10079, *Definition of steel products*

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

EN 10151, *Stainless steel strip for springs — Technical delivery conditions*

EN 10163-2, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections — Part 2: Plate and wide flats*

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

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

EN 10307, *Non-destructive testing — Ultrasonic testing of austenitic and austenitic-ferritic stainless steels flat products of thickness equal to or greater than 6 mm (reflection method)*

EN 10373, *Determination of the physical and mechanical properties of steels using models*

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

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

EN ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test (ISO 6508-1)*

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 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 steels (see 3.1) where its resistance to corrosion is of primary importance

3.3
general purposes
purposes other than the special purposes referred to 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 1 to 4) 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 (mass or pieces);

— product form (strip, sheet or plate);

— where an appropriate dimensional standard is available (see Annex C) 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 process route (see symbols in Table 6);

— if a verification of internal soundness is required, flat products with thickness ≥ 6 mm shall be tested in accordance with EN 10307;

— 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 plates according to EN ISO 18286 with thickness = 8 mm, width = 2 000 mm, length = 5 000 mm; tolerances on width and length class B, flatness tolerance class N made of steel EN 10088-2 with the name X5CrNi18-10 and the number 1.4301 in process route 1D (see Table 6), inspection certificate 3.1 as specified in EN 10204:

10 plates EN ISO 18286 — 8 × 2000 × 5000 B N
Steel EN 10088-2 — X5CrNi18-10+1D
EN 10204 — 3.1

or

10 plates EN ISO 18286 — 8 × 2000 × 5000 B N
Steel EN 10088-2 — 1.4301+1D
EN 10204 — 3.1

5 Classification of grades

Steels covered in this document are classified according to their structures 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 a special steelmaking process is agreed at the time of enquiry and order, the steelmaking 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 process route given in Table 6 and, where different alternatives exist, to the treatment conditions given in Tables 7 to 11, 17 and 18 (see also Annex B).

6.3 Chemical composition

6.3.1 The chemical composition requirements given in Tables 1 to 4 apply with respect to 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 appropriate 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 1 to 4 by the values listed in Table 5.

6.4 Chemical corrosion resistance properties

For austenitic, austenitic-ferritic and ferritic steels the specification in Tables 7 to 9, referring to resistance to intergranular corrosion as determined according to 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 7 to 11 apply for the relevant specified heat treatment condition. This does not apply to the process route 1U (hot rolled, not heat treated, not descaled).

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 7 to 11 shall be obtained from reference test pieces which have received the appropriate heat treatment (simulated heat treatment). For the process routes 1M and 2M for patterned finish, the mechanical properties specified in Tables 7 to 11 also do not apply. In this case, agreements shall be made at the time of enquiry and order, e.g. performing a bend test according to EN ISO 7438.

For cold worked products, the tensile strength levels at ambient temperature as specified in Table 17 apply. The available tensile strength levels in the cold worked condition are indicated in Table 19.

Alternatively, cold worked products can be ordered according to their 0,2 % proof strength as given in Tables 18 and 20.

NOTE Austenitic steels are insensitive to brittle fracture in the solution annealed condition. As 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 12 to 16 apply for the 0,2 % and 1,0 % proof strength at elevated temperatures.

6.5.3 In case of demand for larger thicknesses than stated in Tables 7 to 11, appropriate mechanical property values shall be agreed at the time of enquiry and order.

6.6 Surface quality

Slight surface imperfections, inherent in the rolling process, are permitted.

When products are delivered in coil form, the degree and extent of such imperfections may be expected to be greater, due to the impracticability of removing short lengths of coil. For hot rolled quarto plates (symbol P in Tables 7 to 11), the requirements in EN 10163-2, class A2, apply unless otherwise agreed. For other products, where necessary, more precise requirements on surface quality may be agreed at the time of enquiry and order.

Products delivered with hot rolled or cold rolled finishes (see Table 6) shall, unless otherwise agreed, be supplied with only one surface inspected to the required finish (the prime surface). In such instances, the manufacturer should indicate the prime surface, by marking the material or the packaging, or by some other agreed method. The default method is to mark the prime surface, and to make this surface the top surface of plates, sheets and cut lengths, or the outside surface of coiled products.

6.7 Internal soundness

The products shall be free of internal defects which would exclude them from being used for their usual purpose. For austenitic and austenitic-ferritic stainless steel flat products with a thickness ≥ 6 mm, ultrasonic testing may be agreed at the time of enquiry and order in accordance with EN 10307.

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 and shape shall be agreed at the time of enquiry and order, as far as possible with reference to the dimensional standards listed in Annex C. EN ISO 18286 shall normally only be applied for product form P (individually hot rolled plates, i.e. “quarto plates”) and not for product form H (continuously hot rolled strip, or sheet or plate cut off from it), for which EN ISO 9444-2 shall be applied. When applying EN ISO 18286, tolerances on width and length class A shall apply, unless specifically agreed otherwise at the time of enquiry and order.

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 Annex C 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 Table 1 to 4 with 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 Table 1 to 4 with code numbers C71 to C92 in EN 10168;

c) results of all mandatory (m) tests according to Table 21;

d) results of any optional (o) test according to Table 21 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 21.

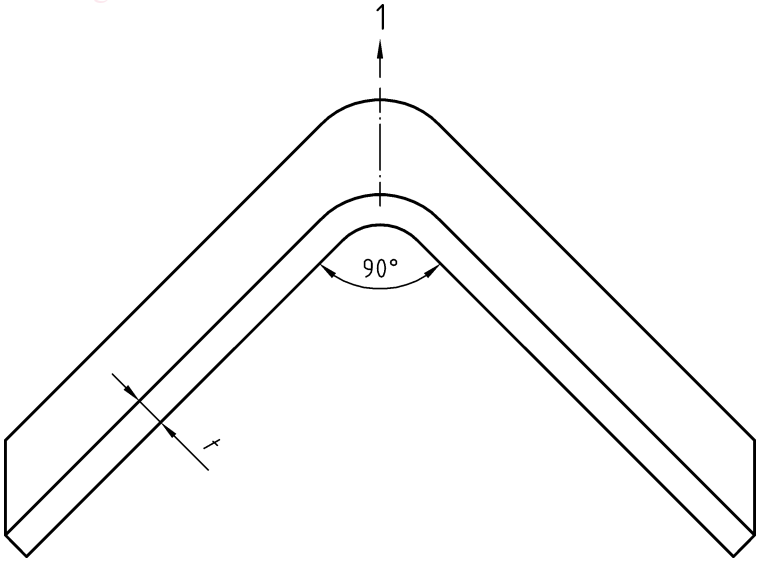
7.3.2 Selection and preparation of samples and test pieces

7.3.2.1 Sampling and sample preparation shall be in accordance with the requirements of EN ISO 14284 and EN ISO 377. In addition, for the mechanical tests, the stipulations in 7.3.2.2 apply.

7.3.2.2 In accordance with Table 22, samples for tensile testing shall be taken from halfway between the centre and a longitudinal edge. If it has been agreed that optional impact tests shall be carried out, the test samples shall be taken from the same location.

The samples shall be taken from products in the delivery condition. If agreed, the samples may be taken before flattening. For samples to be given a simulated heat treatment (see also 6.5.1) the conditions for annealing, hardening and tempering shall be agreed.

7.3.2.3 Samples for hardness testing on martensitic steels and for optional testing of resistance to intergranular corrosion shall be taken from the same location as those for the mechanical tests (see 7.3.2.2). The test pieces for testing of resistance to intergranular corrosion shall be pre-bend as shown in Figure 1.



Key

1 rolling direction

Figure 1 — Test piece for determination of resistance to intergranular corrosion: direction of bending in relation to the rolling direction