SLOVENSKI STANDARD
SIST EN 10088-5:2009

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Nerjavna jekla - 5. del: Tehniļni dobavni pogoji za drogove, palice, ģico, profile in svetle izdelke iz nerjavnih konstrukcijskih jekel

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

Nichtrostende Stähle - Teil 5: Technische Lieferbedingungen für Stäbe, Walzdraht, gezogenen Draht, Profile und Blankstahlerzeugnisse aus korrosionsbeständigen Stählen für das Bauwesen

Aciers inoxydables - Partie 5: Conditions techniques de livraison pour les barres, fils machines, fil, profils et produits blanc en acier de résistance a la corrosion pour usage de construction.

Ta slovenski standard je istoveten z: **EN 10088-5:2009**

ICS:

77.140.20	Visokokakovostna jekla	Stainless steels
77.140.60	Jeklene palice in drogovi	Steel bars and rods
77.140.65	Jeklene žice, jeklene vrvi in verige	Steel wire, wire ropes and link chains

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10088-5

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ICS 77.140.20; 77.140.50; 77.140.65

English Version

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

Aciers inoxydables - Partie 5 : Conditions techniques des livraisons pour les barres, fils tréfilés, profils et produits transformés à froid en acier résistant à la corrosion pour usage de construction

Nichtrostende Stähle - Teil 5: Technische Lieferbedingungen für Stäbe, Walzdraht, gezogenen Draht, Profile und Blankstahlerzeugnisse aus korrosionsbeständigen Stählen für das Bauwesen

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Foreword

This document (EN 10088-5:2009) has been prepared by Technical Committee ECISS/TC 23 “Steels for heat treatment, alloy steels and free-cutting steels - Qualities and dimensions”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by September 2009, and conflicting national standards shall be withdrawn at the latest by December 2010.

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 [and/or] CENELEC shall not be held responsible for identifying any or all such patent rights.

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 D);

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

Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting 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.

The European Organisation for Standardisation (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning two steel grades.

CEN takes no position concerning the evidence, validity and scope of these patent rights.

The holder of these patent rights has assured 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:

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This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

For relationship with EC Directive(s), see informative Annex ZA, which is an integral part of this document.

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

1 Scope

1.1 The scope of this part of EN 10088 is to specify the technical delivery conditions for hot or cold formed bars, rods, wire, sections and bright products of standard and special grades of corrosion resisting stainless steels for construction purposes in addition to the general technical delivery conditions specified in EN 10021.

1.2 This European Standard does not apply to components manufactured by further processing of the product forms listed in 1.1 with quality characteristics altered as a result of such further processing.

2 Normative references

The following referenced documents are indispensable for the application 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 10002-1, *Metallic materials - Tensile testing - Part 1: Method of test at ambient temperature*

EN 10002-5, *Metallic materials - Tensile testing - Part 5: Method of test at elevated temperature*

EN 10021, *General technical delivery requirements 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 10045-1, *Metallic materials - Charpy impact test - Part 1: Test method*

EN 10052:1993, *Vocabulary of heat treatment terms for ferrous products*

EN 10079:2007, *Definition of steel products*

EN 10088-1:2005, *Stainless steels - Part 1: List of stainless steels*

EN 10088-3, *Stainless steels – Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*

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

EN 10168:2004, *Steel products - Inspection documents - List of information and description*

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

EN 10221, *Surface quality classes for hot-rolled bars and rods - Technical delivery conditions*

CEN/TR 10261, *Iron and steel - Review of available methods of chemical analysis*

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 377, *Steel and steel products - Location and preparation of samples and test pieces for mechanical testing (ISO 377:1997)*

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 sulphuric acid (ISO 3651-2:1998)*

EN ISO 6506-1, *Metallic materials - Brinell hardness test - Part 1: Test method (ISO 6506-1:2005)*

EN ISO 9001, *Quality management systems - Requirements (ISO 9001:2008)*

EN ISO 14284, *Steel and iron - Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996)*

ISO 286-1, *ISO system of limits and fits – Part 1: Bases of tolerances, deviations and fits*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
stainless steels
the definition in EN 10088-1:2005 applies

3.2
corrosion resisting steels
steels with at least 10,5 % Cr and max. 1,20 % C if their resistance to corrosion is of primary importance

3.3
product forms
the definitions in EN 10079:2007 apply

3.4
types of heat treatment
the definitions in EN 10052:1993 apply

3.5
standard grades
grades with a relatively good availability and a wider range of application

3.6
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) are allocated in accordance with EN 10027-1 and EN 10027-2 respectively.

4.2 Order designation

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

a) the desired quantity;

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

c) the nominal dimensions and, where an appropriate dimensional standard is available, (see Table 7 and Annex B) the number of the standard plus any choice of requirements;

d) if there is no dimensional standard, the nominal dimensions and tolerances required;

e) the type of material (steel);

f) the number of this European Standard;

g) the steel name or steel number;

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

i) the desired condition (see symbols in Table 7);

j) verification of internal soundness, if required;

k) the type of inspection certificate (3.1 or 3.2) according to EN 10204;

l) regulatory marking requirements (see Annex ZA).

EXAMPLE 10 t round bars of a steel grade with the name X5CrNi18-10 and the number 1.4301 as specified in EN 10088-5 of 50 mm diameter, dimensional tolerances as specified in EN 10060, in condition 1D (see Table 7), inspection certificate 3.1 as specified in EN 10204 and declaration of conformity:

10 t round bars EN 10060-50
Steel EN 10088-5-X5CrNi18-10+1D
Inspection certificate 3.1, CE

or

10 t round bars EN 10060-50
Steel EN 10088-5-1.4301+1D
Inspection certificate 3.1, CE

5 Classification of grades

Steels covered in this European Standard are classified according to their structure into

a) ferritic steels;

b) martensitic steels;

c) precipitation hardening steels;

d) austenitic steels;

e) austenitic-ferritic steels.

See also Annex B to EN 10088-1:2005.

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 European Standard shall be at the discretion of the manufacturer.

6.2 Delivery condition

The products shall be supplied by reference to the process route given in Table 7 and, where different alternatives exist, to the treatment conditions given in Tables 8 to 18 and 20 (see also Annex A).

6.3 Chemical composition

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

If grades other than those included in this European Standard are required for construction purposes, they shall comply with EN 10088-3 and be in conjunction with the requirements of this European Standard.

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 properties

Referring to resistance to intergranular corrosion as defined in EN ISO 3651-2, for ferritic, austenitic and austenitic-ferritic stainless steels the specifications in Tables 8, 11 and 12 apply.

EN ISO 3651-2 shall not be not applicable for testing martensitic and precipitation hardening steels.

NOTE 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 shall apply for hot worked products of every condition, condition 1U 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 shall apply. For these products, the condition is the prime property with the mechanical properties secondary.

If the products are to 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 Table 18 shall 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 20 shall 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 Table 19 shall apply for the 0,2%- and 1%- proof strength of austenitic steels at elevated temperatures.

6.6 Surface quality

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

Table 1 — Maximum acceptable depth of 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	See EN 10163-3.	
1U, 1C, 1E, 1D	Rounds and rod	See EN 10221.	
1X[b], 2H[b], 2D[b]	Rounds	- max. 0,2 mm for d ≤ 20 mm - max. 0,01 d for 20 < d ≤ 75 mm - max. 0,75 mm for d > 75 mm	1 %
	Hexagons	- max. 0,3 mm for d ≤ 15 mm - max. 0,02 d for 15 < d ≤ 63 mm	2 %
	Other bars	- max. 0,3 mm for d ≤ 15 mm - max. 0,02 d for 15 < d ≤ 63 mm	4 %
1G, 2B, 2G, 2P	Rounds	Technically defect free by manufacture.	0,2 %

[a] The depth of discontinuities shall be the distance, measured normally to the surface, between the bottom of the discontinuities and that surface.

[b] The order can require 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.

6.7 Internal soundness

The products shall be free of internal defects which would exclude them from being used for their intended purpose. If verification of internal soundness is required, ultrasonic testing of H-beams with parallel flanges and IPE-beams shall be in accordance with EN 10306 and ultrasonic testing of steel bars shall be 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

Dimensions and tolerances on dimensions and shape shall be declared by reference to the appropriate European Standard (see Annex B). Dimensions and tolerances on dimensions and shape not covered by European

Standards shall be in accordance with a national standard valid in the intended place of use of the product or as agreed at the time of enquiry and order.

6.10 Calculation of mass and tolerances on mass

6.10.1 When calculating the nominal mass from the nominal dimensions the values given in EN 10088-1 shall be used as a basis for the density of the steel concerned.

6.10.2 If the tolerances on mass are not specified in the dimensional standard listed in Table 7 or the normative references, they may be agreed at the time of enquiry and order.

7 Inspection and testing

7.1 General

The process control, inspection and testing shall be carried out according to 8.3 to ensure that the product complies with the requirements of both this European Standard and the order.

This includes the following:

a) A suitable frequency of verification of the dimensions of the products;

b) An adequate intensity of visual examination of the surface quality of the products;

c) An 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 shall be in accordance with the manufacturer's written procedures in compliance with 8.3.

7.2 Agreement on tests and inspection documents

Products declaring compliance with this European Standard shall be delivered with an inspection certificate 3.1 or 3.2 as specified in EN 10204. The type of certificate shall be agreed upon at the time of enquiry and order. If the order does not contain any specification of this type, inspection certificate 3.1 shall be issued.

The specific inspection described in 7.3 shall be carried out and confirmed together with the following information in the inspection certificate with the code numbers and details required by EN 10168:2004.

a) the information groups A, B and Z of EN 10168:2004;

b) the results of the cast analysis in accordance with the code numbers C71 to C92 in EN 10168:2004;

c) the results of the tests marked in Table 21, second column, by 'm';

d) the results of any optional test or inspections agreed at the time of enquiry and order;

e) the regulatory information (see Annex ZA).

7.3 Specific inspection and testing

7.3.1 Extent of testing

The tests to be carried out and the composition and size of the test units and the number of sample products, samples and test pieces to be taken shall be as in Table 21.

7.3.2 Selection and preparation of samples

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, the stipulations in 7.3.2.2 apply for the mechanical tests.

7.3.2.2 The samples for the tensile test shall be taken in accordance with Figures 1 to 3. Impact samples shall be taken from the same location.

The samples shall be taken from products in the delivery condition. If agreed, samples from bars may be taken before straightening. For samples to be given a simulated heat treatment the conditions for annealing, hardening and tempering shall be agreed.

7.3.2.3 Samples for the hardness test and for the resistance to intergranular corrosion test, shall be taken from the same locations as those for the mechanical tests.

7.4 Test methods

7.4.1 The chemical analysis shall be carried out using the appropriate European Standard for the element being analysed. In the absence of an appropriate European Standard, the choice of a suitable physical or chemical analytical method for the analysis shall be at the discretion of the manufacturer. The manufacturer shall declare the test method used, if required.

The list of available European Standards on chemical analysis is given in CEN/TR 10261.

7.4.2 The tensile test at room temperature shall be carried out in accordance with EN 10002-1, this generally being with proportional test pieces having a gauge length $L_0 = 5{,}65\sqrt{S_0}$. (S_0 = cross-section of the parallel length). In cases of doubt and in referee testing these test pieces shall be used.

For wire of nominal diameter < 4 mm, the tensile test shall be made directly on the product using a gauge length of 100 mm.

The tensile strength, elongation after fracture and the 0,2 %-proof strength shall be determined. In addition, for austenitic steels only, the 1%- proof strength shall be determined.

7.4.3 The tensile test for austenitic steels at elevated temperature shall be carried out in accordance with EN 10002-5. If the proof strength is to be verified for austenitic steels the 0,2%- and the 1%- proof strength shall be determined.

7.4.4 The impact test shall be carried out in accordance with EN 10045-1 on test pieces with a V-notch. The average obtained from three test pieces shall be considered to be the test result (see also EN 10021).

7.4.5 The Brinell hardness test shall be carried out in accordance with EN ISO 6506-1.

7.4.6 The resistance to intergranular corrosion shall be tested in accordance with EN ISO 3651-2 for ferritic, austenitic and austenitic-ferritic steels.

7.4.7 Dimensions and dimensional tolerances of the products shall be tested in accordance with the requirements of the dimensional standard relevant to the product form.

7.5 Retests

Shall be according to EN 10021.

8 Evaluation of conformity

8.1 General

The conformity of a steel product to the requirements of this standard and with the stated values (including classes) shall be demonstrated by:

initial type testing;

factory production control by the manufacturer, including product assessment.

For the purposes of testing, steel products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for all steel products within that same family (a product may be in different families for different characteristics).

The testing of samples taken at the works in accordance with the manufacturer's prescribed plan shall be the means of evaluation of conformity of the steel product delivered in accordance with this European Standard (see Table ZA.3). The report of such testing shall be in an inspection document in accordance with EN 10204.

NOTE The assignment of tasks is given in Table ZA.3.

8.2 Initial type testing

8.2.1 General

An initial type test is the complete set of tests or other procedures, in respect of the characteristics to be assessed, determining the performance of samples of products representative of the product type.

Initial type testing (see Table ZA.3) shall be performed to show conformity with this European Standard for a steel product being put onto the market and:

— at the beginning of the production of a new or modified steel product design;

— at the beginning of a new or modified method of production.

In case of type testing of a steel product for which initial type testing in accordance with this European Standard was already performed, type testing may be reduced:

— if it has been established that the performance characteristics compared with the already tested steel products have not been affected or

— in accordance with the rules for families and/or direct or extended application of test results.

8.2.2 Characteristics

All characteristics of Clause 6 shall be subject to initial type testing, with following exceptions:

a) Weldability is covered by chemical composition;

b) Durability is covered by chemical composition;

c) Fracture toughness is covered by impact strength, no additional test available;

d) Cold formability is covered by elongation, no additional test available;

e) Release of dangerous substances is covered by chemical composition.

8.2.3 Use of historical data

Tests previously performed on the same steel product in accordance with the provisions of this European Standard (same characteristic(s), test method, sampling procedure, system of attestation of conformity, etc.) may be taken into account.

8.2.4 Sampling, testing and conformity criteria

8.2.4.1 Sampling

Initial type testing shall be performed on samples of steel products representative for the manufactured steel product type.

8.2.4.2 Testing and conformity criteria

Intensive testing shall be specific inspection and testing in accordance with 7.3 carried out on the first five casts produced.

However, for tensile and impact testing, at least 6 products from each of the five casts shall be tested and where this is not possible, test pieces shall be taken from opposite ends of the products being tested.

The results of all type tests shall be recorded and held by the manufacturer for at least 10 years after the date when the last product to which they apply was delivered.

8.3 Factory production control (FPC)

8.3.1 General

The manufacturer shall establish, document and maintain an FPC system to ensure that the products placed on the market conform to the declared performance characteristics. The FPC system shall consist of written procedures (works' manual), regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product. Records shall remain legible, readily identifiable and retrievable.

An FPC system conforming with the requirements of EN ISO 9001:2008 and made specific to the requirements of this European Standard, shall be considered to satisfy the above requirements.

The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded and retained for the period specified in the manufacturer's FPC procedures.

8.3.2 FPC requirements for all manufacturers

The manufacturer shall establish procedures to ensure that the production tolerances allow for the steel product performances to be in conformity with the declared values, derived from initial type testing.

The characteristics, and the means of verification, are given in Table 22.

The manufacturer shall record the results of the tests specified above. These records shall include at least the following information: