



SLOVENSKI STANDARD

SIST EN 10088-3:2005

01-september-2005

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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

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

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

Ta slovenski standard je istoveten z: EN 10088-3:2005

ICS:

77.140.20	Visokokakovostna jekla	Stainless steels
77.140.50	Ú[z aãá\ ^} áá á^ \ áá][ã á^ \ á	Flat steel products and semi-products
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 10088-3

June 2005

ICS 77.140.50; 77.140.65; 77.140.20

Supersedes EN 10088-3:1995

English version

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

Aciers inoxydables - Partie 3 : Conditions techniques de livraison pour les demi-produits, barres, fils machines, 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 4 May 2005.

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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 Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 10088-3:2005) 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 December 2005, and conflicting national standards shall be withdrawn at the latest by December 2005.

This document supersedes EN 10088-3:1995.

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.

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 four steel grades.

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Grades 1.4362, 1.4410 and 1.4477

Sandvik AB
SE-811 81 SANDVIKEN
Sweden

Grade 1.4652

Outokumpu Stainless AB
SE-77480 AVESTA
Sweden

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

EN 10088-3:2005 (E)**1 Scope**

1.1 This part of EN 10088 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 resisting stainless steels for general purposes.

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

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

1.3 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 and iron products.*

EN 10027-1, *Designation systems for steels - Part 1: Steel names, principal symbols.*

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, *Vocabulary of heat treatment terms for ferrous products.*

EN 10079, *Definition of steel products.*

EN 10088-1, *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 10168:2004, *Steel products - Inspection documents - List of information and description.*

EN 10204:2004, *Metallic products - Types of inspection documents.*

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

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 6506-1:1999).*

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 European Standard, the following terms and definitions apply.

3.1

stainless steels

definition in EN 10088-1 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

definitions in EN 10079 apply

3.4

types of heat treatment

definitions in EN 10052 apply

3.5

general purposes

purposes other than the special purposes mentioned in the Bibliography

3.6

standard grades

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

3.7

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.

4.2 Designation to be used on ordering

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

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- desired quantity;
- product form (e. g. round bars, square bars or rod);
- where an appropriate dimensional standard is available (see Table 7 and 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 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;
- if an inspection document is required, its designation in accordance with EN 10204.

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

10 t round bars EN 10060-50
Steel EN 10088-3-X5CrNi18-10+1D
Inspection document 3.1

or

10 t round bars EN 10060-50
Steel EN 10088-3-1.4301+1D
Inspection document 3.1

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5 Classification of grades

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

- ferritic steels,
- martensitic steels,
- precipitation hardening steels,
- austenitic steels,
- austenitic-ferritic steels.

See also Annex B to EN 10088-1.

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 A).

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.

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.

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 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 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.

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

6.6 Surface quality

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

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

Conditions	Product forms	Permissible defect depth ^a	Max. % of delivered weight in excess of permissible defect depth
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	To be agreed upon at the time of enquiry and order on the basis of EN 10221.	
1X ^b , 2H ^b , 2D ^b	Rounds	- max. 0,2 mm for $d \leq 20$ mm - max. 0,01 d for $20 < d \leq 75$ mm - max. 0,75 mm for $d > 75$ mm	1 %
	Hexagons	- max. 0,3 mm for $d \leq 15$ mm - max. 0,02 d for $15 < d \leq 63$ mm	2 %
	Other bars	- max. 0,3 mm for $d \leq 15$ mm - max. 0,02 d for $15 < d \leq 63$ mm	4 %
1G, 2B, 2G, 2P	Rounds	Technically defect free by manufacture.	0,2 %
^a Defect depth is understood as being the distance, measured normally to the surface, between the bottom of the defect 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 defect depth 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 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 are to 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 C.

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 in Annex C, they may be agreed at the time of enquiry and order.

7 Inspection and testing

7.1 General

The appropriate process control, inspection and testing 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 At the time of ordering the type of inspection document in accordance with EN 10204 may be agreed for each delivery.

7.2.2 If it is agreed to issue a test report, 2.2, in accordance with EN 10204:2004 it shall indicate the following information:

- a) information groups A, B and Z of EN 10168:2004;
- b) results of the cast analysis in accordance with the code numbers C71 to C92 in EN 10168:2004.

7.2.3 If the issuing of an inspection certificate 3.1 or 3.2 according to EN 10204:2004 has been agreed, specific inspections according to 7.3 are to be carried out and the following information shall be given in the inspection document with the code numbers and details required by EN 10168:2004:

- a) under 7.2.2 a);
- b) under 7.2.2 b);
- c) results of the mandatory tests marked in Table 26, second column, by 'm';
- d) results of any optional test or inspections 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 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.

EN 10088-3:2005 (E)**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. If it has been agreed that impact tests shall be carried out, the 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, where requested, 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 appropriate European Standards. 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.

NOTE The list of available European Standards on chemical analysis is given in CR 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 is 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 If a tensile test at elevated temperature has been ordered, this shall be carried out in accordance with EN 10002-5. If the proof strength is to be verified, the 0,2 %- proof strength shall be determined, for ferritic, martensitic, precipitation hardening and austenitic-ferritic steels. In the case of austenitic steels the 0,2 %- and the 1 %- proof strength shall be determined.

7.4.4 If an impact test has been ordered, it shall be carried out in accordance with EN 10045-1 on test pieces with a V-notch. The average obtained from three test pieces is 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.

7.4.7 Dimensions and dimensional tolerances of the products shall be tested in accordance with the requirements of the relevant dimensional standards, where available.

7.5 Retests

See EN 10021.

8 Marking

8.1 Marking shall be durable.

8.2 Unless otherwise agreed, the requirements listed in Table 27 apply.

8.3 Unless otherwise agreed, the products shall be marked as follows:

- semi-finished products, bars and sections in thicknesses over 35 mm by inking, adhesive labels, electrolytic etching or stamping;
- bars and sections in thicknesses up to 35 mm by labels attached to the bundle or by means of the possibilities listed in the first hyphen;
- rods by means of a label attached to the coil.

NOTE If the marking is to be applied by inking or adhesive label, the inks or adhesives should be carefully selected to ensure that resistance to corrosion is not impaired.

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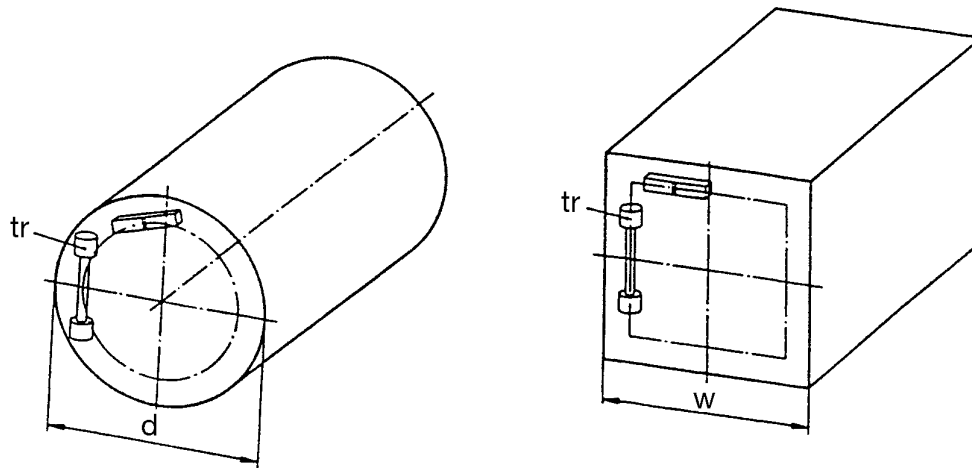
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Type of test	Round cross-section products	Rectangular cross-section products
Tensile	<p>$d \leq 25^b$ $25 < d \leq 160$</p>	<p>$b \leq 25$ $25 < b \leq 160$ $a \geq b$ $a \geq b$</p>
Impact ^a	<p>$15 \leq d \leq 25$ $25 < d \leq 160$</p>	<p>$b \leq 25$ $25 < b \leq 160$ $a \geq b$ $a \geq b$</p>

^a For products of a round cross-section, the axis of the notch is parallel to a diameter; for products with a rectangular cross-section, the axis of the notch is perpendicular to the greatest rolled surface.

^b Samples of product may alternatively be tested unmachined, in accordance with EN ISO 377.

Figure 1 — Position of test pieces for steel bars and rods ≤ 160 mm diameter or thickness (longitudinal test pieces)

**Key**

tr transverse

NOTE The axis of the notch on the impact test pieces should be radial in the case of round steel bars, and perpendicular to the nearest rolled surface for rectangular bars.

Figure 2 — Position of test pieces for steel bars > 160 mm diameter or thickness (transverse test pieces)

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