BRITISH STANDARD

BS EN
10088-5:2009

Stainless steels

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

ICS 77.140.20; 77.140.60; 77.140.65; 77.140.70

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 10088-5:2009.

The UK participation in its preparation was entrusted to Technical Committee ISE/30, Stainless steels.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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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

This European Standard was approved by CEN on 21 February 2009.

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of an identical text or by endorsement, at the latest by September 2009, and conflicting national standards shall be withdrawn at the latest by December 2010.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

Sandvik AB
SE-811 81 SANDVIKEN
Sweden
for grade 1.4477

Outokumpu Stainless AB
SE-77480 AVESTA
Sweden
for grade 1.4162

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

lntensive 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:

a) identification of the steel product tested;

b) the date of sampling and testing;

c) the test methods performed;

d) the test results.

8.3.3 Manufacturer-specific FPC system requirements

8.3.3.1 Personnel

The responsibility, authority and the relationship between personnel that manage, perform or verify work affecting product conformity, shall be defined. This applies in particular to personnel that need to initiate actions preventing product non-conformities from occurring, actions in case of non-conformities and to identify and register product conformity problems. Personnel performing work affecting product conformity shall be competent on the basis of appropriate education, training, skills and experience for which records shall be maintained.

8.3.3.2 Equipment

All weighing, measuring and testing equipment necessary to achieve or produce evidence of conformity shall be calibrated or verified and regularly inspected according to documented procedures, frequencies and criteria. Control of monitoring and measuring devices shall comply with the appropriate clause of EN ISO 9001:2008.

All equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process.

Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer’s written procedures and the records retained for the period defined in the manufacturer's FPC procedures.

8.3.3.3 Raw materials

The specifications of all incoming raw materials shall be documented, as shall the inspection scheme for ensuring their conformity. The verification of conformity of the raw material with the specification shall be in accordance with EN ISO 9001:2008, 7.4.3.

8.3.3.4 In-process control

The manufacturer shall plan and carry out production under controlled conditions. Compliance with EN ISO 9001:2008, 7.5.1 and 7.5.2 shall be deemed to satisfy the requirements of this sub-clause.

8.3.3.5 Traceability and marking

Individual steel products shall be identifiable and traceable with regard to their production origin. The manufacturer shall have written procedures ensuring that processes related to affixing traceability codes and/or markings (see Clause 9) are inspected regularly. Compliance with EN ISO 9001:2008, 7.5.3 shall be deemed to satisfy the requirements of this sub-clause.

8.3.3.6 Non-conforming products

The manufacturer shall have written procedures which specify how non-conforming products shall be dealt with. Any such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer’s written procedures. Compliance with EN ISO 9001:2008, 8.3 shall be deemed to satisfy the requirements of this sub-clause.

8.3.3.7 Corrective action

The manufacturer shall have documented procedures that instigate action to eliminate the cause of non-conformities in order to prevent recurrence. Compliance with EN ISO 9001:2008, 8.5.2 shall be deemed to satisfy the requirements of this sub-clause.

8.3.3.8 Handling, storage and packaging

The manufacturer shall have written procedures providing methods of product handling and shall provide suitable storage areas preventing damage or deterioration.

9 Marking

9.1 Marking shall be durable.

9.2 The requirements listed in Table 23 apply. (See Annex ZA for regulatory marking.)

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

a) bars and sections in thicknesses over 35 mm by inking, adhesive labels, electrolytic etching or stamping;

b) 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;

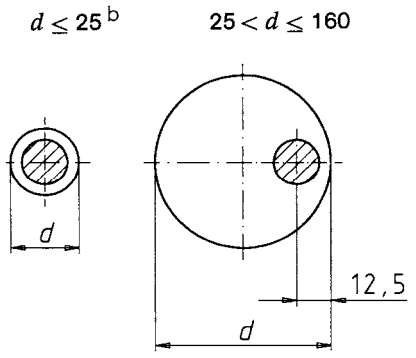
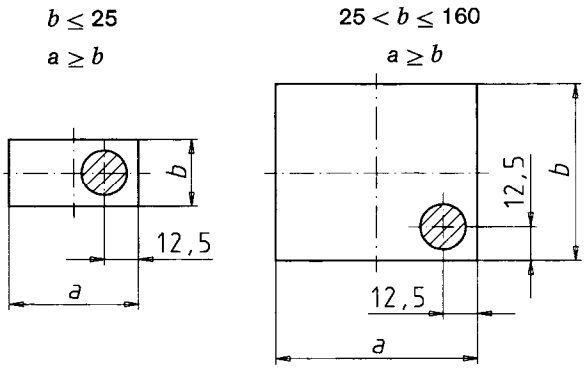
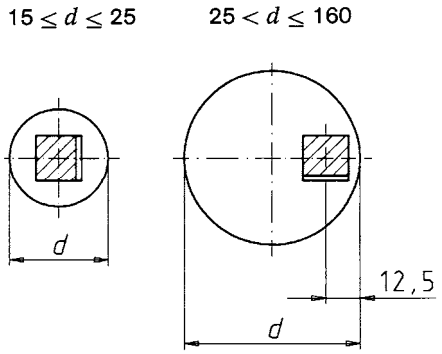
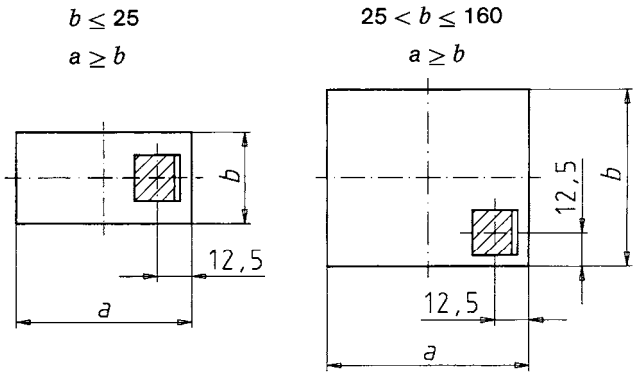
c) rods by means of a label attached to the coil.

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.

NOTE For regulatory marking see Annex ZA.

10 Dangerous substances

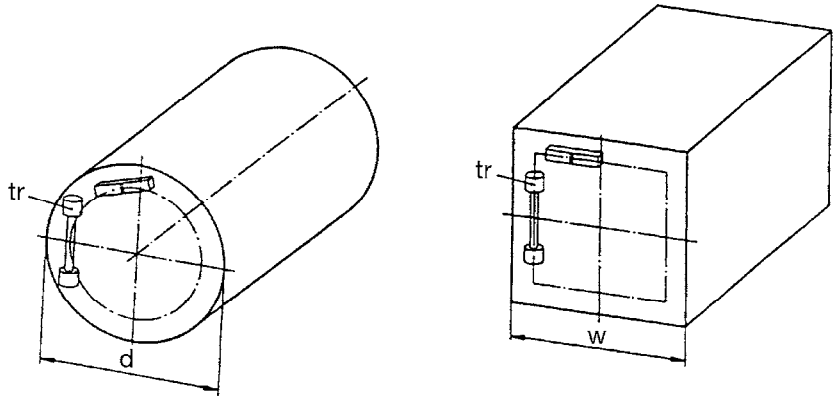
Materials used in products shall not release any dangerous substances in excess of the maximum permitted levels specified in a relevant European Standard for the material or permitted in the national regulations of the member state of destination.

Type of test	Round cross-section products	Rectangular cross-section products
Tensile		
Impact [a]		

[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)

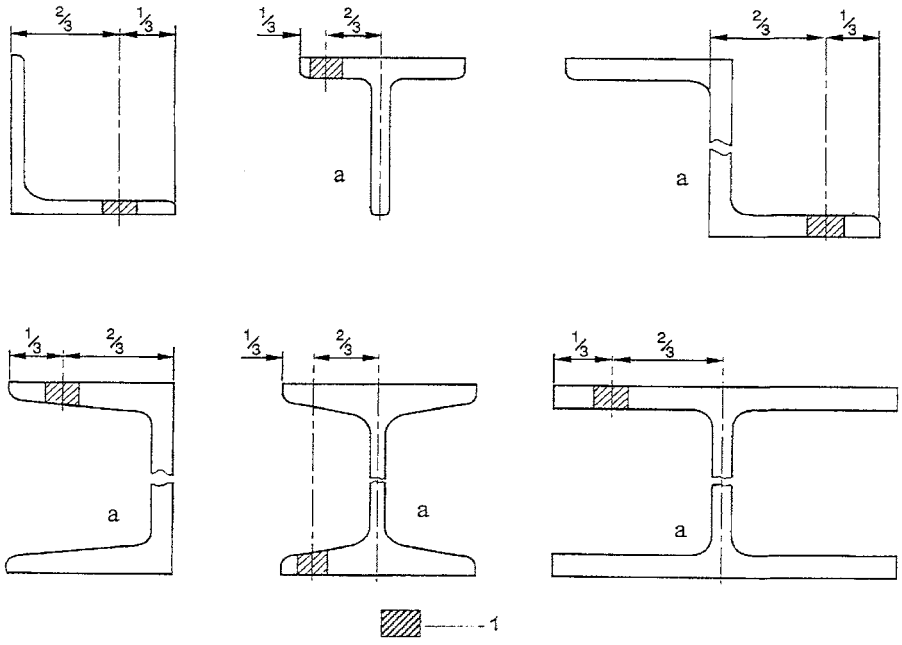


Key

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)



KEY

1 Location of sample

NOTE The axis of the notch on the impact test pieces should be perpendicular to the outside surface of the section.

[a] By agreement, the sample can be taken from the web, at a quarter of the total height.

Figure 3 — Position of test pieces for beams, channels, angles, T sections and Z sections

Table 2 — Chemical composition (cast analysis) of ferritic corrosion resisting steels

Steel designation		% by mass										
Name	Number	C max.	Si max.	Mn max.	P max.	S	N max.	Cr	Mo	Ni	Ti	Others
Standard grades												
X2CrNi12	1.4003	0,030	1,00	1,50	0,040	≤ 0,030[a]	0,030	10,5 to 12,5	-	0,30 to 1,00	-	-
X6Cr17	1.4016	0,08	1,00	1,00	0,040	≤ 0,030[a]	-	16,0 to 18,0	-	-	-	-
Special grade												
X2CrMoTiS18-2	1.4523	0,030	1,00	0,50	0,040	0,15 to 0,35	-	17,5 to 19,0	2,00 to 2,50	-	0,30 to 0,80	(C + N) ≤ 0,040

All precautions shall be taken to avoid the addition of such elements not quoted in the table from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.

[a] Particular ranges of sulphur content can provide improvement of particular properties. For machinability a controlled sulphur content of 0,015 % to 0,030 % is recommended. For weldability, a controlled sulphur content of 0,008 % to 0,015 % is recommended. For polishability, a controlled sulphur content of 0,015 % max. is recommended.

Table 3 — Chemical composition (cast analysis) of martensitic and precipitation hardening corrosion resisting steels

Steel designation		% by mass									
Name	Number	C	Si max.	Mn max.	P max.	S max.	Cr	Cu	Mo	Ni	Others
Standard grades (Martensitic steels)											
X12Cr13	1.4006	0,08 to 0,15	1,00	1,50	0,040	0,030[a]	11,5 to 13,5	-	-	≤ 0,75	-
X20Cr13	1.4021	0,16 to 0,25	1,00	1,50	0,040	0,030[a]	12,0 to 14,0	-	-	-	-
X17CrNi16-2	1.4057	0,12 to 0,22	1,00	1,50	0,040	0,030[a]	15,0 to 17,0	-	-	1,50 to 2,50	-
X4CrNiMo16-5-1	1.4418	≤ 0,06	0,70	1,50	0,040	0,030[a]	15,0 to 17,0	-	0,80 to 1,50	4,0 to 6,0	N: ≥ 0,020
Standard grades (Precipitation hardening steels)											
X5CrNiCuNb16-4	1.4542	≤ 0,07	0,70	1,50	0,040	0,030[a]	15,0 to 17,0	3,0 to 5,0	≤ 0,60	3,0 to 5,0	Nb: 5xC to 0,45
X7CrNiAI17-7	1.4568	≤ 0,09	0,70	1,00	0,040	0,015	16,0 to 18,0	-	-	6,5 to 7,8[b]	AI: 0,70 to 1,50

All precautions shall be taken to avoid the addition of such elements not quoted in the table from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.

[a] Particular ranges of sulphur content can provide improvement of particular properties. For machinability a controlled sulphur content of 0,015 % to 0,030 % is recommended. For weldability, a controlled sulphur content of 0,008 % to 0,015 % is recommended. For polishability, a controlled sulphur content of 0,015 % max. is recommended.

[b] For better cold deformability, the upper limit may be increased to 8,3 %.

Table 4 — Chemical composition (cast analysis) of austenitic corrosion resisting steels

Steel designation		% by mass											
Name	Number	C	Si	Mn	P max.	S	N	Cr	Cu	Mo	Nb	Ni	Others
Standard grades													
X2CrNi18-9	1.4307	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	≤ 0,10	17,5 to 19,5	-	-	-	8,0 to 10,5	-
X2CrNi19-11	1.4306	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	≤ 0,10	18,0 to 20,0	-	-	-	10,0 to 12,0[b]	-
X2CrNiN18-10	1.4311	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	0,12 to 0,22	17,5 to 19,5	-	-	-	8,5 to 11,5	-
X5CrNi18-10	1.4301	≤ 0,07	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	≤ 0,10	17,5 to 19,5	-	-	-	8,0 to 10,5	-
X8CrNiS18-9	1.4305	≤ 0,10	≤ 1,00	≤ 2,00	0,045	0,15 to 0,35	≤ 0,10	17,0 to 19,0	≤ 1,00	-	-	8,0 to 10,0	-
X6CrNiTi18-10	1.4541	≤ 0,08	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	-	17,0 to 19,0	-	-	-	9,0 to 12,0[b]	Ti: 5 x C to 0,70
X2CrNiMo17-12-2	1.4404	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	≤ 0,10	16,5 to 18,5	-	2,00 to 2,50	-	10,0 to 13,0[b]	-
X2CrNiMoN17-11-2	1.4406	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	0,12 to 0,22	16,5 to 18,5	-	2,00 to 2,50	-	10,0 to 12,5[b]	-
X5CrNiMo17-12-2	1.4401	≤ 0,07	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	≤ 0,10	16,5 to 18,5	-	2,00 to 2,50	-	10,0 to 13,0	-
X6CrNiMoTi17-12-2	1.4571	≤ 0,08	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	-	16,5 to 18,5	-	2,00 to 2,50	-	10,5 to 13,5[b]	Ti: 5 x C to 0,70
X2CrNiMo17-12-3	1.4432	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	≤ 0,10	16,5 to 18,5	-	2,50 to 3,00	-	10,5 to 13,0	-
X2CrNiMoN17-13-3	1.4429	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015	0,12 to 0,22	16,5 to 18,5	-	2,50 to 3,00	-	11,0 to 14,0[b]	-
X3CrNiMo17-13-3	1.4436	≤ 0,05	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	≤ 0,10	16,5 to 18,5	-	2,50 to 3,00	-	10,5 to 13,0	-
X2CrNiMo18-14-3	1.4435	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	≤ 0,10	17,0 to 19,0	-	2,50 to 3,00	-	12,5 to 15,0	-
X2CrNiMoN17-13-5	1.4439	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015	0,12 to 0,22	16,5 to18,5	-	4,0 to 5,0	-	12,5 to 14,5	-
X3CrNiCu18-9-4	1.4567	≤ 0,04	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	≤ 0,10	17,0 to 19,0	3,0 to 4,0	-	-	8,5 to 10,5	-
X1NiCrMoCu25-20-5	1.4539	≤ 0,020	≤ 0,70	≤ 2,00	0,030	≤ 0,010	≤ 0,15	19,0 to 21,0	1,20 to 2,00	4,0 to 5,0	-	24,0 to 26,0	-
Special grades													
X6CrNiNb18-10	1.4550	≤ 0,08	≤ 1,00	≤ 2,00	0,045	≤ 0,015	-	17,0 to 19,0	-	-	10 x C to 1,00	9,0 to 12,0[b]	-
X1CrNiMoN25-22-2	1.4466	≤ 0,020	≤ 0,70	≤ 2,00	0,025	≤ 0,010	0,10 to 0,16	24,0 to 26,0	-	2,00 to 2,50	-	21,0 to 23,0	-
X2CrNiMo18-15-4	1.4438	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030[a]	≤ 0,10	17,5 to 19,5	-	3,0 to 4,0	-	13,0 to 16,0[b]	-
X12CrMnNiN17-7-5	1.4372	≤ 0,15	≤ 1,00	5,5 to 7,5	0,045	≤ 0,015	0,05 to 0,25	16,0 to 18,0	-	-	-	3,5 to 5,5	-
X3CrNiCuMo17-11-3-2	1.4578	≤ 0,04	≤ 1,00	≤ 1,00	0,045	≤ 0,015	≤ 0,10	16,5 to 17,5	3,0 to 3,5	2,00 to 2,50	-	10,0 to 11,0	-
X1NiCrMoCu31-27-4	1.4563	≤ 0,020	≤ 0,70	≤ 2,00	0,030	≤ 0,010	≤ 0,10	26,0 to 28,0	0,70 to 1,50	3,0 to 4,0	-	30,0 to 32,0	-
X1CrNiMoCuN20-18-7	1.4547	≤ 0,020	≤ 0,70	≤ 1,00	0,030	≤ 0,010	0,18 to 0,25	19,5 to 20,5	0,50 to 1,00	6,0 to 7,0	-	17,5 to 18,5	-
X1NiCrMoCuN25-20-7	1.4529	≤ 0,020	≤ 0,50	≤ 1,00	0,030	≤ 0,010	0,15 to 0,25	19,0 to 21,0	0,50 to 1,50	6,0 to 7,0	-	24,0 to 26,0	-
X2CrNiMnMoN25-18-6-5	1.4565	≤ 0,030	≤ 1,00	5,0 to 7,0	0,030	≤ 0,015	0,30 to 0,60	24,0 to 26,0	-	4,0 to 5,0	≤ 0,15	16,0 to 19,0	-

All precautions shall be taken to avoid the addition of such elements not quoted in the table from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.

[a] Particular ranges of sulphur content can provide improvement of particular properties. For machinability a controlled sulphur content of 0,015 % to 0,030 % is recommended. For weldability, a controlled sulphur content of 0,008 % to 0,015 % is recommended. For polishability, a controlled sulphur content of 0,015 % max. is recommended.

[b] Where for special reasons, e.g. hot workability for the fabrication of seamless tubes where it is necessary to minimize the delta ferrite content, or with the aim of low magnetic permeability, the maximum Ni content may be increased by the following amounts:
0,50 % (by mass): 1.4571
1,00 % (by mass): 1.4306, 1.4406, 1.4429, 1.4438, 1.4541, 1.4550
1,50 % (by mass): 1.4404.

Table 5 — Chemical composition (cast analysis) of austenitic-ferritic corrosion resisting steels

Steel designation		% by mass									
Name	Number	C max.	Si max.	Mn	P max.	S max.	N	Cr	Cu	Mo	Ni
Standard grades											
X3CrNiMoN27-5-2	1.4460	0,05	1,00	≤ 2,00	0,035	0,030[a]	0,05 to 0,20	25,0 to 28,0	-	1,30 to 2,00	4,5 to 6,5
X2CrNiMoN22-5-3 [b]	1.4462 [b]	0,030	1,00	≤ 2,00	0,035	0,015	0,10 to 0,22	21,0 to 23,0	-	2,50 to 3,5	4,5 to 6,5
Special grades											
X2CrNiN23-4	1.4362	0,030	1,00	≤ 2,00	0,035	0,015	0,05 to 0,20	22,0 to 24,0	0,10 to 0,60	0,10 to 0,60	3,5 to 5,5
X2CrNiMoN29-7-2*)	1.4477*)	0,030	0,50	0,80 to 1,50	0,030	0,015	0,30 to 0,40	28,0 to 30,0	≤ 0,80	1,50 to 2,60	5,8 to 7,5
X2CrNiMoN25-7-4	1.4410	0,030	1,00	≤ 2,00	0,035	0,015	0,24 to 0,35	24,0 to 26,0	-	3,0 to 4,5	6,0 to 8,0
X2CrNiMoSi18-5-3	1.4424	0,030	1,40 to 2,00	1,20 to 2,00	0,035	0,015	0,05 to 0,10	18,0 to 19,0	-	2,50 to 3,0	4,5 to 5,2
X2CrMnNiN21-5-1*)	1.4162*)	0,040	1,00	4,0 to 6,0	0,040	0,015	0,20 to 0,25	21,0 to 22,0	0,10 to 0,80	0,10 to 0,80	1,35 to 1,70

All precautions shall be taken to avoid the addition of such elements not quoted in the table from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.

[a] Particular ranges of sulphur content can provide improvement of particular properties. For machinability a controlled sulphur content of 0,015 % to 0,030 % is recommended. For weldability, a controlled sulphur content of 0,008 % to 0,015 % is recommended. For polishability, a controlled sulphur content of 0,015 % max. is recommended.

[b] By agreement, this grade can be delivered with a Pitting Resistance Equivalent Number (PRE = Cr +3,3Mo + 16N, compare Table C.1 of EN 10088-1:2005) greater than 34.

*) Patented steel grade.

Table 6 — Permissible product analysis tolerances on the limiting values given in Tables 2 to 5 for the cast analysis

Element	Specified limits, cast analysis % by mass		Permissible tolerance[a] % by mass
Carbon		≤ 0,030	+ 0,005
	> 0,030	≤ 0,20	± 0,01
	> 0,20	≤ 0,25	± 0,02
Silicon		≤ 1,00	+ 0,05
	> 1,00	≤ 2,00	± 0,10
Manganese		≤ 1,00	+ 0,03
	> 1,00	≤ 2,00	± 0,04
	> 2,00	≤ 7,5	± 0,10
Phosphorus		≤ 0,045	+ 0,005
Sulphur		≤ 0,015	+ 0,003
	> 0,015	≤ 0,030	± 0,005
	≥ 0,15	≤ 0,35	± 0,02
Nitrogen		≤ 0,10	± 0,01
	> 0,10	≤ 0,60	± 0,02
Chromium	10,5	≤ 15,0	± 0,15
	> 15,0	≤ 20,0	± 0,20
	> 20,0	≤ 30,0	± 0,25
Copper		≤ 1,00	± 0,07
	> 1,00	≤ 5,0	± 0,10
Molybdenum		≤ 0,60	± 0,03
	> 0,60	≤ 1,75	± 0,05
	> 1,75	≤ 7,0	± 0,10
Niobium		≤ 1,00	± 0,05
Nickel		≤ 1,00	± 0,03
	> 1,00	≤ 5,0	± 0,07
	> 5,0	≤ 10,0	± 0,10
	> 10,0	≤ 20,0	± 0,15
	> 20,0	≤ 32,0	± 0,20
Aluminium	> 0,70	≤ 1,50	± 0,10
Titanium		≤ 0,80	± 0,05

[a] If several product analyses are carried out on one cast, and the contents of an individual element determined lies outside the permissible range of the chemical composition specified for the cast analysis, then it shall be only allowed to exceed the permissible maximum value or to fall short of the permissible minimum value, but not both at the same time.

Table 7 — Type of surface finish and process route of rods and wires, bars and sections

	Product forms			Tolerances on nominal dimensions [a]	Condition			Recommended use and observations
	Rods	Wires	Bars, sections		Symbol[b]	Surface finish	Type of process route	
Hot formed	x	-	x	EN 10017, EN 10058, EN 10059, EN 10060, EN 10061	1U	Covered with scale (spot ground if necessary). Not free of surface defects.	Hot formed, not heat treated, not descaled.	Suitable for products to be further hot formed.
	x	-	x		1C		Hot formed, heat treated[c], not descaled.	Suitable for products to be further processed (hot or cold).
	-	-	x	≥ IT 14[g]/ISO 286-1	1E	Largely free of scale (but some black spots may remain). Not free of surface defects.	Hot formed, heat treated[c], mechanically descaled[d].	
	x	-	x	EN 10017, EN 10058, EN 10059, EN 10060, EN 10061	1D	Free of scale (spot ground if necessary). Not free of surface defects.	Hot formed, heat treated[c], pickled, coated (optional).	Products used in their present condition or to be further processed (hot or cold).
	-	-	x	≥ IT 12[g]/ISO 286-1	1X	Free of scale (but some marks left from machining may remain). Not free of surface defects.	Hot formed, heat treated[c], rough machined[e].	
	x	-	x		1G	Appearance bright, but not uniform, Free of surface defects.	Hot formed, heat treated[c], descaled, rough machined[e] or shaved in the case of rod. Finishing by removal of material[f].	Suitable for severe applications (extrusion and/or cold or hot heading). Surface roughness can be specified.
Cold processed	-	x	x	Bars: IT 8 to 11[g] /EN 10278 Wire: T3 or T4 /EN 10218-2	2H	Smooth and matt or bright. Not necessarily polished. Not free of surface defects[h].	Finishes 1C, 1D or 1X, cold processed[i], coated (optional).	In products formed by cold drawing without subsequent heat treatment, the tensile strength is substantially increased, particularly in austenitic materials, depending on the degree of cold processing. The surface hardness may be higher than the centre hardness.
	-	x	x	Bars: IT 8 to 11[g] /EN 10278 Wire: T3 or T4 /EN 10218-2	2D	Smooth and matt or bright. Not free of surface defects[h].	Finish 2H, heat treated[c], pickled and skin-passed (optional), coated (optional).	This finish allows the restoration of the mechanical properties after cold processing. Products with good ductility (extrusion) and specific magnetic properties.
	-	-	x	Bars: IT 8 to 11[g] /EN 10278	2B	Smooth, uniform and bright. Free of surface defects.	Finishes 1C, 1D or 1X, cold processed[i], mechanically smoothed[j].	Products used in their present condition or intended for better finishing. In products formed by cold drawing without subsequent heat treatment, the tensile strength is substantially increased, particularly in austenitic materials, depending on the degree of cold processing. The surface hardness may be higher than the centre hardness.

Table 7 (*continued*)

	Product forms			Tolerances on nominal dimensions [a]	Condition			Recommended use and observations
	Rods	Wires	Bars, sections		Symbol[b]	Surface finish	Type of process route	
	-	-	x	IT ≤ 9[g]/EN 10278	2G	Smooth, uniform and bright. Free of surface defects.	Finishes 2H, 2D or 2B, centreless ground, mechanically smoothed (optional)[k].	Finish for close tolerances. Unless otherwise agreed the surface roughness shall be Ra ≤ 1,2.
	-	-	x	IT < 11[g]/EN 10278	2P	Smoother and brighter than finish 2B or 2G. Free of surface defects.	Finishes 2H, 2D, 2B or 2G, specular polishing[k].	Products showing a well groomed surface appearance. Surface roughness shall be specified at the time of enquiry and order.

NOTE Not all surface finishes and process routes are available for all steels.

[a] For sections, the following standards are used, in practice, for tolerances on dimensions and shape: EN 10024, EN 10034, EN 10055, EN 10056-2 and EN 10279. See footnote to Annex B.

[b] First digit 1 = Hot formed; 2 = Cold processed.

[c] On ferritic, austenitic and austenitic-ferritic grades, the heat treatment may be omitted if the conditions for hot forming and subsequent cooling are such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion are obtained.

[d] The type of mechanical descaling (shot blasting, grinding, peeling) is left to the manufacturer's discretion unless otherwise agreed.

[e] The type of rough machining (grinding, peeling) is left to the manufacturer's discretion unless otherwise agreed.

[f] The type of finish is left to the manufacturer's discretion unless otherwise agreed.

[g] Specific tolerance within this range shall be agreed upon at the time of enquiry and order.

[h] Unless otherwise agreed at the time of order.

[i] The type of cold processing (cold drawing, turning, grinding, abrading ...) is left to the manufacturer's discretion unless otherwise agreed.

[j] The type of mechanical polishing (burnishing, abrading) is left to the manufacturer's discretion unless otherwise agreed.

[k] The type of specular polishing (electro-polishing, felting, buffing ...) is left to the manufacturer's discretion unless otherwise agreed.

Table 8 — Mechanical properties at room temperature of ferritic steels in the annealed condition (see Table A.1) and resistance to intergranular corrosion in conditions 1C, 1E, 1D, 1X, 1G and 2D

Steel designation		Thickness *t* or diameter[a] *d*	Hardness	0,2%-proof strength	Tensile Strength	Elongation after fracture[c]	Resistance to intergranular corrosion[d]	
Name	Number	mm max.	*HB*[b] max.	$R_{p0,2}$[c] MPa[*)] min.	R_m[c] MPa[*)]	*A* % min. (long.)	in the delivery condition	in the welded condition
Standard grades								
X2CrNi12	1.4003	100	200	260	450 to 600	20	no	no
X6Cr17	1.4016	100	200	240	400 to 630	20	yes	no
Special grade								
X2CrMoTiS18-2	1.4523	100	200	280	430 to 600	15	yes	no

The annealing treatment may be omitted, if the conditions for hot working and subsequent cooling are such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.

[a] Width across flats for hexagons.

[b] Only for guidance.

[c] For rods, only the tensile strength values apply.

[d] When tested according to EN ISO 3651-2.

[*)] 1MPa = 1 N/mm².

Table 9 — Mechanical properties at room temperature of martensitic steels in the heat-treated condition (see Table A.2) in conditions 1C, 1E, 1D, 1X, 1G and 2D

Steel designation		Thickness *t* or diameter[a] *d*	Heat-treatment condition[b]	Hardness	0,2 %-proof strength	Tensile strength	Elongation after fracture		Impact energy (ISO-V)	
Name	Number	mm		*HB*[c] max.	$R_{p0,2}$[d] MPa[*)] min.	R_m[d] MPa[*)]	*A*[d] % min. (long.)	(tr.)	*KV* J min. (long.)	(tr.)
Standard grades										
X12Cr13	1.4006	-	+A	220	-	max. 730	-	-	-	-
		≤ 160	+QT650	-	450	650 to 850	15	-	25	-
X20Cr13	1.4021	-	+A	230	-	max. 760	-	-	-	-
		≤ 160	+QT700	-	500	700 to 850	13	-	25	-
			+QT800	-	600	800 to 950	12	-	20	-
X17CrNi16-2	1.4057	-	+A	295	-	max. 950	-	-	-	-
		≤ 60	+QT800	-	600	800 to 950	14		25	
		60 < *t* ≤ 160					12	-	20	-
		≤ 60	+QT900	-	700	900 to 1050	12		20	
		60 < *t* ≤ 160					10	-	15	-
X4CrNiMo16-5-1	1.4418	-	+A	320	-	max. 1100	-	-	-	-
		≤ 160	+QT760	-	550	760 to 960	16	-	90	-
		160 < *t* ≤ 250					-	14	-	70
		≤ 160	+QT900	-	700	900 to 1100	16	-	80	-
		160 < *t* ≤ 250					-	14	-	60

[a] Width across flats for hexagons.

[b] +A = annealed, +QT = quenched and tempered.

[c] Only for guidance.

[d] For rods, only the tensile strength values apply.

[*)] 1 MPa = 1 N/mm².

Table 10 — Mechanical properties at room temperature of precipitation hardening steels in the heat-treated condition (see Table A.3) in conditions 1C, 1E, 1D, 1X, 1G and 2D

Steel designation		Thickness *t* or diameter[a] *d*	Heat treatment condition[b]	Hard-ness[c]	0,2 %-proof strength	Tensile strength	Elongation after fracture	Impact energy (ISO-V)
Name	Number	mm max.		*HB* max.	$R_{p0,2}$ MPa*) min.	R_m MPa*)	*A* % min. (long.)	*KV* J min. (long.)
Standard grades								
X5CrNiCuNb16-4	1.4542	100	+AT	360	-	max. 1200	-	-
			+P800	-	520	800 to 950	18	75
			+P930	-	720	930 to 1100	16	40
			+P960	-	790	960 to 1160	12	-
			+P1070	-	1000	1070 to 1270	10	-
X7CrNiAl17-7	1.4568	30	+AT	255	-	max. 850	-	-

[a] Width across flats for hexagons.

[b] +AT = solution annealed, +P = precipitation hardened.

[c] Only for guidance.

*) 1 MPa = 1 N/mm^2.

Table 11 — Mechanical properties at room temperature of austenitic steels in the solution annealed condition (see Table A.4) and resistance to intergranular corrosion in conditions 1C, 1E, 1D, 1X, 1G and 2D

Steel designation		Thickness *t* or diameter[a] *d*	Hard-ness[b,c]	0,2%-proof strength	1%-proof strength	Tensile strength[c,d]	Elongation after fracture[c,d]		Impact energy (ISO-V)		Resistance to intergranular corrosion[e]	
Name	Number	mm	*HB* max.	$R_{p0,2}$[d] MPa*) min.	$R_{p1,0}$[b,d] MPa*) min.	*R*m MPa*)	*A* % min.		*KV* J min		in the delivery condition	In the sensi-tized con-dition[f]
							(long.)	(tr.)	(long.)	(tr.)		
Standard grades												
X2CrNi18-9	1.4307	≤ 160	215	175	210	500 to 700	45	-	100	-	yes	yes
		160 < *t* ≤ 250					-	35	-	60		
X2CrNi19-11	1.4306	≤ 160	215	180	215	460 to 680	45	-	100	-	yes	yes
		160 < *t* ≤ 250					-	35	-	60		
X2CrNiN18-10	1.4311	≤ 160	230	270	305	550 to 760	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X5CrNi18-10	1.4301	≤ 160	215	190	225	500 to 700	45	-	100	-	yes	no[g]
		160 < *t* ≤ 250					-	35	-	60		
X8CrNiS18-9	1.4305	≤ 160	230	190	225	500 to 750	35	-	-	-	no	No
X6CrNiTi18-10	1.4541	≤ 160	215	190	225	500 to 700	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X2CrNiMo17-12-2	1.4404	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X2CrNiMoN17-11-2	1.4406	≤ 160	250	280	315	580 to 800	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X5CrNiMo17-12-2	1.4401	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	no[g]
		160 < *t* ≤ 250					-	30	-	60		
X6CrNiMoTi17-12-2	1.4571	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X2CrNiMo17-12-3	1.4432	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X2CrNiMoN17-13-3	1.4429	≤ 160	250	280	315	580 to 800	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X3CrNiMo17-13-3	1.4436	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	no[g]
		160 < *t* ≤ 250					-	30	-	60		
X2CrNiMo18-14-3	1.4435	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X2CrNiMoN17-13-5	1.4439	≤ 160	250	280	315	580 to 800	35	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X3CrNiCu18-9-4	1.4567	≤ 160	215	175	210	450 to 650	45	-	-	-	yes	yes
X1NiCrMoCu25-20-5	1.4539	≤ 160	230	230	260	530 to 730	35	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		

Table 11 (*continued*)

Steel designation		Thickness *t* or diameter[a] *d*	Hard-ness[b,c]	0,2%-proof strength	1%-proof strength	Tensile strength[c,d]	Elongation after fracture[c,d]		Impact energy (ISO-V)		Resistance to intergranular corrosion[e]	
Name	Number	mm	*HB*	$R_{p0,2}$[d] MPa*)	$R_{p1,0}$[b, d] MPa*)	*R*m MPa*)	*A* % min.		*KV* J min		in the delivery condition	in the sensitized condition[f]
			max.	min.	min.		(long.)	(tr.)	(long.)	(tr.)		
Special grades												
X6CrNiNb18-10	1.4550	≤ 160	230	205	240	510 to 740	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X1CrNiMoN25-22-2	1.4466	≤ 160	240	250	290	540 to 740	35	-	100	-	yes	yes
		160 < *t* ≤ 250	240	250	290	540 to 740	-	30	-	60		
X2CrNiMo18-15-4	1.4438	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X12CrMnNiN17-7-5	1.4372	≤ 160	260	230	370	750 to 950	40	-	100	-	yes	no
		160 < *t* ≤ 250	260	230	370	750 to 950	-	35	-	60		
X3CrNiCuMo17-11-3-2	1.4578	≤ 160	215	175	-	450 to 650	45	-	-	-	yes	yes
X1NiCrMoCu31-27-4	1.4563	≤ 160	230	220	250	500 to 750	35	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X1CrNiMoCuN20-18-7	1.4547	≤ 160	260	300	340	650 to 850	35	-	100	-	yes	yes
		160 < *t* ≤ 250					-	30	-	60		
X1NiCrMoCuN25-20-7	1.4529	≤ 160	250	300	340	650 to 850	40	-	100	-	yes	yes
		160 < *t* ≤ 250					-	35	-	60		
X2CrNiMnMoN25-18-6-5	1.4565	≤ 160	-	420	460	800 to 950	35	-	100	-	yes	yes

The solution treatment may be omitted if the conditions for hot working and subsequent cooling are such that the requirements for the mechanical properties of the product and the resistance to Intergranular corrosion as defined in EN ISO 3651-2 are obtained.

[a] Width across flats for hexagons.

[b] Only for guidance.

[c] The maximum HB-values may be raised by 100 HB or the tensile strength value may be raised by 200 MPa and the minimum elongation value may be lowered to 20 % for sections and bars of ≤ 35 mm thickness having a final cold deformation and for hot formed sections and bars of ≤ 8 mm thickness.

[d] For rods, only the tensile strength values apply.

[e] When tested according to EN ISO 3651-2.

[f] See NOTE to 6.4.

[g] Sensitization treatment of 15 min at 700°C followed by cooling in air.

*) 1 MPa = 1 N/mm^2.

Table 12 — Mechanical properties at room temperature of austenitic-ferritic steels in the solution annealed condition (see Table A.5) and resistance to intergranular corrosion in conditions 1C, 1E, 1D, 1X, 1G and 2D

Steel designation		Thickness *t* or diameter[a] *d*	Hardness[b]	0,2 %-proof strength	Tensile strength	Elongation after fracture	Impact energy (ISO-V)	Resistance to intergranular corrosion[d]	
Name	Number	mm	*HB* max.	$R_{p0,2}$[c] MPa*) min.	R_m[c] MPa*)	*A*[c] % min. (long.)	*KV* J min. (long.)	in the delivery condition	in the sensitized condition[e]
Standard grades									
X3CrNiMoN27-5-2	1.4460	≤ 160	260	450	620 to 880	20	85	yes	yes
X2CrNiMoN22-5-3	1.4462	≤ 160	270	450	650 to 880	25	100	yes	yes
Special grades									
X2CrNiN23-4	1.4362	≤ 160	260	400	600 to 830	25	100	yes	yes
X2CrNiMoN29-7-2	1.4477	≤ 10	310	650	800 to 1050	25	100	yes	yes
		10 < *t* ≤ 160	310	550	750 to 1000	25	100	yes	yes
X2CrNiMoN25-7-4	1.4410	≤ 160	290	530	730 to 930	25	100	yes	yes
X2CrNiMoSi18-5-3	1.4424	≤ 50	260	450	700 to 900	25	100	yes	yes
		50 < *t* ≤ 160	260	400	680 to 900	25	100	yes	yes
X2CrMnNiN21-5-1	1.4162	≤ 160	-	450	650 to 850	30	60	yes	yes

The solution treatment may be omitted if the conditions for hot working and subsequent cooling are such that the requirement for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.

[a] Width across flats for hexagons.

[b] Only for guidance.

[c] For rods, only the tensile strength values apply.

[d] When tested according to EN ISO 3651-2.

[e] See NOTE to 6.4.

*) 1 MPa = 1N/mm^2.

Table 13 — Mechanical properties for bright bars [a] at room temperature of annealed (see Table A.1) ferritic steels in conditions 2H, 2B, 2G or 2P

Steel designation		Thickness *t* or diameter [b] *d*	0,2 %-proof strength	Tensile strength	Elongation after fracture
Name	Number	mm	$R_{p0,2}$ MPa*) min.	R_m MPa*)	A_5 [c] % min.
Standard grade					
X6Cr17	1.4016	≤ 10[d]	320	500 to 750	8
		10 < *t* ≤ 16	300	480 to 750	8
		16 < *t* ≤ 40	240	400 to 700	15
		40 < *t* ≤ 63	240	400 to 700	15
		63 < *t* ≤100	240	400 to 630	20
The initial annealing treatment may be omitted if the conditions for previous hot working and subsequent cooling have been such that the requirements for the final mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.					

[a] Including cut lengths from wire.

[b] Width across flats for hexagons.

[c] Elongation A_5 is valid only for dimensions of 5 mm and above. For smaller diameters, the minimum elongation has to be agreed upon at the time of enquiry and order.

[d] In the range 1 mm ≤ *d* < 5 mm valid only for rounds. The mechanical properties of non round bars with thicknesses < 5 mm have to be agreed at the time of enquiry and order.

*) 1MPa = 1N/mm^2.

Table 14 — Mechanical properties for bright bars [a] at room temperature of heat-treated (see Table A.2) martensitic steels in conditions 2H, 2B, 2G or 2P

Steel designation		Thickness *t* or diameter[b] *d* mm	Annealed		Quenched + tempered						
Name	Number		R_m MPa*) max.	*HB* [c] max.	Heat treatment condition	$R_{p0,2}$ MPa*) min.	R_m MPa*)	A_5[d] % min.		*KV* J min.	
								(long.)	(tr.)	(long.)	(tr.)
Standard grades											
X12Cr13	1.4006	≤ 10[e]	880	280	+QT650	550	700 to 1000	9	-	-	-
		10 < *t* ≤ 16	880	280		500	700 to 1000	9	-	-	-
		16 < *t* ≤ 40	800	250		450	650 to 930	10	-	25	-
		40 < *t* ≤ 63	760	230		450	650 to 880	10	-	25	-
		63 < *t* ≤ 160	730	220		450	650 to 850	15	-	25	-
X20Cr13	1.4021	≤ 10[e]	910	290	+QT700	600	750 to 1000	8	-	-	-
		10 < *t* ≤ 16	910	290		550	750 to 1000	8	-	-	-
		16 < *t* ≤ 40	850	260		500	700 to 950	10	-	25	-
		40 < *t* ≤ 63	800	250		500	700 to 900	12	-	25	-
		63 < *t* ≤ 160	760	230		500	700 to 850	13	-	25	-
X17CrNi16-2	1.4057	≤ 10[e]	1050	330	+QT800	750	850 to 1100	7	-	-	-
		10 < *t* ≤ 16	1050	330		700	850 to 1100	7	-	-	-
		16 < *t* ≤ 40	1000	310		650	800 to 1050	9	-	25	-
		40 < *t* ≤ 63	950	295		650	800 to 1000	12	-	25	-
		63 < *t* ≤ 160	950	295		650	800 to 950	12	-	20	-
X4CrNiMo16-5-1	1.4418	≤ 10[e]	1150	380	+QT900	750	900 to 1150	10	-	-	-
		10 < *t* ≤ 16	1150	380		750	900 to 1150	10	-	-	-
		16 < *t* ≤ 40	1100	320		700	900 to 1100	12	-	80	-
		40 < *t* ≤ 63	1100	320		700	900 to 1100	16	-	80	-
		63 < *t* ≤ 160	1100	320		700	900 to 1100	16	-	80	-
		160 < *t* ≤ 250	1100	320		700	900 to 1100	-	14	-	60

[a] Including cut lengths from wire.

[b] Width across flats for hexagons.

[c] For information only.

[d] Elongation A_5 is valid only for dimensions of 5 mm and above. For smaller diameters, the minimum elongation has to be agreed upon at the time of enquiry and order.

[e] In the range 1 mm ≤ *d* < 5 mm valid only for rounds. The mechanical properties of non round bars with thicknesses < 5 mm have to be agreed at the time of enquiry and order.

*) 1MPa = 1N/mm^2.

Table 15 — Mechanical properties for bright bars [a] at room temperature of heat-treated (see Table A.3) precipitation hardening steels in conditions 2H, 2B, 2G or 2P

Steel designation		Thickness t or diameter [b] d	Annealed		Precipitation hardened				
Name	Number	mm	R_m MPa*) max.	HB [c] max.	Heat treatment condition	$R_{p0,2}$ MPa*) min.	R_m MPa*)	A_5 [d] % min. (long.)	KV J min. (long.)
Standard grade									
X5CrNiCuNb16-4	1.4542	≤ 10[e]	1200	360	+P800	600	900 to 1100	10	-
		10 < t ≤ 16	1200	360		600	900 to 1100	10	-
		16 < t ≤ 40	1200	360		520	800 to 1050	12	75
		40 < t ≤ 63	1200	360		520	800 to 1000	18	75
		63 < t ≤ 160	1200	360		520	800 to 950	18	75
		≤ 100	-	-	+P930	720	930 to 1100	12	40
		≤ 100	-	-	+P960	790	960 to 1160	10	-
		≤ 100	-	-	+P1070	1000	1070 to 1270	10	-

[a] Including cut lengths from wire.

[b] Width across flats for hexagons.

[c] For information only.

[d] Elongation A_5 is valid only for dimensions of 5 mm and above. For smaller diameters, the minimum elongation has to be agreed upon at the time of enquiry and order.

[e] In the range 1 mm ≤ d < 5 mm valid only for rounds. The mechanical properties of non round bars with thicknesses < 5 mm have to be agreed at the time of enquiry and order.

*) 1MPa = 1N/mm^2.

Table 16 — Mechanical properties for bright bars [a] at room temperature of solution annealed (see Table A.4) austenitic steels in conditions 2H, 2B, 2G or 2P

Steel designation		Thickness *t* or diameter[b] *d* mm	Solution annealed					
Name	Number		$R_{p0,2}$ MPa*) min.	R_m MPa*)	A_5[c] % min.		*KV* J min.	
					(long.)	(tr.)	(long.)	(tr.)
Standard grades								
X2CrNi18-9	1.4307	≤ 10[d]	400	600 to 930	25	-	-	-
		10 < *t* ≤ 16	380	600 to 930	25	-	-	-
		16 < *t* ≤ 40	175	500 to 830	30	-	100	-
		40 < *t* ≤ 63	175	500 to 830	30	-	100	-
		63 < *t* ≤ 160	175	500 to 700	45	-	100	-
		160 < *t* ≤ 250	175	500 to 700	-	35	-	60
X2CrNi19-11	1.4306	≤ 10[e]	400	600 to 930	25	-	-	-
		10 < *t* ≤ 16	380	600 to 930	25	-	-	-
		16 < *t* ≤ 40	180	460 to 830	30	-	100	-
		40 < *t* ≤ 63	180	460 to 830	30	-	100	-
		63 < *t* ≤ 160	180	460 to 680	45	-	100	-
		160 < *t* ≤ 250	180	460 to 680	-	35	-	60
X5CrNi18-10	1.4301	≤ 10[d]	400	600 to 950	25	-	-	-
		10 < *t* ≤ 16	400	600 to 950	25	-	-	-
		16 < *t* ≤ 40	190	600 to 850	30	-	100	-
		40 < *t* ≤ 63	190	580 to 850	30	-	100	-
		63 < *t* ≤ 160	190	500 to 700	45	-	100	-
		160 < *t* ≤ 250	190	500 to 700	-	35	-	60
X8CrNiS18-9	1.4305	≤ 10[e]	400	600 to 950	15	-	-	-
		10 < *t* ≤ 16	400	600 to 950	15	-	-	-
		16 < *t* ≤ 40	190	500 to 850	20		100	-
		40 < *t* ≤ 63	190	500 to 850	20	-	100	-
		63 < *t* ≤ 160	190	500 to 750	35	-	100	-
X2CrNiMo17-12-2	1.4404	≤ 10[d]	400	600 to 930	25	-	-	-
		10 < *t* ≤ 16	380	580 to 930	25	-	-	-
		16 < *t* ≤ 40	200	500 to 830	30	-	100	-
		40 < *t* ≤ 63	200	500 to 830	30	-	100	-
		63 < *t* ≤ 160	200	500 to 700	40	-	100	-
		160 < *t* ≤ 250	200	500 to 700	-	30	-	60
X5CrNiMo17-12-2	1.4401	≤ 10[d]	400	600 to 950	25	-	-	-
		10 < *t* ≤ 16	380	580 to 950	25	-	-	-
		16 < *t* ≤ 40	200	500 to 850	30	-	100	-
		40 < *t* ≤ 63	200	500 to 850	30	-	100	-
		63 < *t* ≤ 160	200	500 to 700	40	-	100	-
		160 < *t* ≤ 250	200	500 to 700	-	30	-	60
X6CrNiMoTi17-12-2	1.4571	≤ 10[d]	400	600 to 950	25	-	-	-
		10 < *t* ≤ 16	380	580 to 950	25	-	-	-
		16 < *t* ≤ 40	200	500 to 850	30		100	-
		40 < *t* ≤ 63	200	500 to 850	30	-	100	-
		63 < *t* ≤ 160	200	500 to 700	40	-	100	-
		160 < *t* ≤ 250	200	500 to 700	-	30	-	60
X2CrNiMo17-12-3	1.4432	≤ 10[d]	400	600 to 930	25	-	-	-
		10 < *t* ≤ 16	380	600 to 880	25	-	-	-
		16 < *t* ≤ 40	200	500 to 850	30		100	-
		40 < *t* ≤ 63	200	500 to 850	30	-	100	-
		63 < *t* ≤ 160	200	500 to 700	40	-	100	-
		160 < *t* ≤ 250	200	500 to 700	-	30	-	60

Table 16 *(continued)*

Steel designation		Thickness t or diameter[b] d	Solution annealed					
Name	Number	mm	$R_{p0,2}$ MPa*) min.	R_m MPa*)	A_5[c] % min.		KV J min.	
					(long.)	(tr.)	(long.)	(tr.)
Standard grades (continued)								
X3CrNiMo17-13-3	1.4436	≤ 10[d]	400	600 to 950	25	-	-	-
		10 < t ≤ 16	400	600 to 950	25	-	-	-
		16 < t ≤ 40	200	500 to 850	30	-	100	-
		40 < t ≤ 63	190	500 to 850	30	-	100	-
		63 < t ≤ 160	200	500 to 700	40	-	100	-
		160 < t ≤ 250	200	500 to 700	-	30	-	60
X2CrNiMo18-14-3	1.4435	≤ 10[d]	400	600 to 950	25	-	-	-
		10 < t ≤ 16	400	600 to 950	25	-	-	-
		16 < t ≤ 40	235	500 to 850	30	-	100	-
		40 < t ≤ 63	235	500 to 850	30	-	100	-
		63 < t ≤ 160	235	500 to 700	40	-	100	-
		160 < t ≤ 250	235	500 to 700	-	30	-	60
X3CrNiCu18-9-4	1.4567	≤ 10[d]	400	600 to 850	25	-	-	-
		10 < t ≤ 16	340	600 to 850	25	-	-	-
		16 < t ≤ 40	175	450 to 800	30		100	-
		40 < t ≤ 63	175	450 to 800	30	-	100	-
		63 < t ≤ 160	175	450 to 650	40	-	100	-
X1NiCrMoCu25-20-5	1.4539	≤ 10[d]	400	600 to 930	20	-	-	-
		10 < t ≤ 16	400	600 to 930	20	-	-	-
		16 < t ≤ 40	230	530 to 880	25		100	-
		40 < t ≤ 63	230	530 to 880	25	-	100	-
		63 < t ≤ 160	230	530 to 730	35	-	100	-
		160 < t ≤ 250	230	530 to 730	-	30	-	60
Special grade								
X3CrNiCuMo17-11-3-2	1.4578	≤ 10[d]	400	600 to 850	20	-	-	-
		10 < t ≤ 16	340	600 to 850	20	-	-	-
		16 < t ≤ 40	175	450 to 800	30	-	-	-
		40 < t ≤ 63	175	450 to 800	30	-	-	-
		63 < t ≤ 160	175	450 to 650	45	-	-	-

The inital solution treatment may be omitted if the conditions for previous hot-working and subsequent cooling have been such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.

[a] Including cut lengths from wire.

[b] Width across flats for hexagons.

[c] Elongation is valid only for dimensions of 5 mm and above. For smaller diameters, the minimum elongation has to be agreed upon at the time of enquiry and order.

[d] In the range 1 mm ≤ d < 5 mm valid only for rounds. The mechanical properties of non round bars with thicknesses < 5 mm have to be agreed at the time of enquiry and order.

*) 1MPa = 1N/mm^2.

Table 17 — Mechanical properties for bright bars [a] at room temperature of solution annealed (see Table A.5) austenitic-ferritic steels in conditions 2H, 2B, 2G or 2P

Steel designation		Thickness *t*	Solution annealed			
Name	Number	or diameter[b] *d* mm	$R_{p0,2}$ MPa*) min.	R_m MPa*)	A_5[c] % min. (long.)	*K*V J min. (long.)
Standard grades						
X3CrNiMoN27-5-2	1.4460	≤ 10[d]	610	770 to 1030	12	-
		10 < *t* ≤ 16	560	770 to 1030	12	-
		16 < *t* ≤ 40	460	620 to 950	15	85
		40 < *t* ≤ 63	460	620 to 950	15	85
		63 < *t* ≤ 160	460	620 to 880	20	85
X2CrNiMoN22-5-3	1.4462	≤ 10[d]	650	850 to 1150	12	-
		10 < *t* ≤ 16	650	850 to 1100	12	-
		16 < *t* ≤ 40	450	650 to 1000	15	100
		40 < *t* ≤ 63	450	650 to 1000	15	100
		63 < *t* ≤ 160	450	650 to 880	25	100
The inital solution treatment may be omitted if the conditions for previous hot-working and subsequent cooling have been such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.						

[a] Including cut lengths from wire.

[b] Width across flats for hexagons.

[c] Elongation is valid only for dimensions of 5 mm and above. For smaller diameters, the minimum elongation has to be agreed upon at the time of enquiry and order.

[d] In the range 1 mm ≤ *d* < 5 mm valid only for rounds. The mechanical properties of non round bars with thicknesses < 5 mm have to be agreed at the time of enquiry and order.

*) 1MPa = 1N/mm^2.

Table 18 — Mechanical properties at room temperature of annealed wire in 2D condition

Steel designation Name	Number	Nominal dimension *d* mm	Tensile strength MPa*) max.	Elongation % min.
Ferritc steels (+A) [a]				
X6Cr17	1.4016	1,00 < *d* ≤ 3,00	800	15
		3,00 < *d* ≤ 5,00	750	15
		5,00 < *d* ≤ 16,00	700	20
Martensitic (+A) and precipitation hardening (+AT) steels [a]				
X12Cr13	1.4006	1,00 < *d* ≤ 3,00	1050	10
X20Cr13	1.4021	3,00 < *d* ≤ 5,00	1000	10
X17CrNi16-2	1.4057	5,00 < *d* ≤ 16,00	950	15
X7CrNiAl17-7	1.4568			
Austenitic steels (+AT) [a]				
X2CrNi18-9,	1.4307,	1,00 < *d* ≤ 3,00	900	30
X2CrNi19-11	1.4306,	3,00 < *d* ≤ 5,00	850	35
X5CrNi18-10,	1.4301,	5,00 < *d* ≤ 16,00	800	35
X8CrNiS18-9	1.4305			
X6CrNiTi18-10	1.4541,			
X2CrNiMo17-12-2,	1.4404,			
X5CrNiMo17-12-2,	1.4401,			
X6CrNiMoTi17-12-2,	1.4571,			
X2CrNiMo17-12-3,	1.4432,			
X3CrNiMo17-13-3,	1.4436			
X2CrNiMo18-14-3,	1.4435,			
X1CrNiMoN25-22-2	1.4466,			
X1NiCrMoCu31-27-4,	1.4563,			
X1CrNiMoCuN20-18-7,	1.4547,			
X1NiCrMoCuN25-20-7	1.4529			
Austenitic-ferritic steels (+AT) [a]				
X2CrNiMoN22-5-3	1.4462	1,00 < *d* ≤ 3,00	1000	20
X2CrNiN23-4	1.4362	3,00 < *d* ≤ 5,00	950	25
X2CrNiMoN25-7-4	1.4410	5,00 < *d* ≤ 16,00	900	25

NOTE 1 If skin passed (i. e. less than 5 % reduction in cross section), the maximum tensile strength might be increased by up to 50 MPa.

NOTE 2 For cold heading, see EN 10263-5.

[a] +A = annealed, +AT = solution annealed.

*) 1 MPa = 1 N/mm²

Table 19 — Minimum values for the 0,2 %- and 1 %-proof strength of austenitic steels at elevated temperatures

Steel designation		Heat treatment condition [a]	Minimum 0,2 % proof strength (MPa*) at a temperature (in °C) of										Minimum 1 % proof strength (MPa*) at a temperature (in °C) of									
Name	Number		100	150	200	250	300	350	400	450	500	550	100	150	200	250	300	350	400	450	500	550
Standard grades																						
X2CrNi18-9	1.4307	+AT	145	130	118	108	100	94	89	85	81	80	180	160	145	135	127	121	116	112	109	108
X2CrNi19-11	1.4306	+AT	145	130	118	108	100	94	89	85	81	80	180	160	145	135	127	121	116	112	109	108
X2CrNiN18-10	1.4311	+AT	205	175	157	145	136	130	125	121	119	118	240	210	187	175	167	160	156	152	149	147
X5CrNi18-10	1.4301	+AT	155	140	127	118	110	104	98	95	92	90	190	170	155	145	135	129	125	122	120	120
X6CrNiTi18-10	1.4541	+AT	175	165	155	145	136	130	125	121	119	118	205	195	185	175	167	161	156	152	149	147
X2CrNiMoN17-11-2	1.4406	+AT	215	195	175	165	155	150	145	140	138	136	245	225	205	195	185	180	175	170	168	166
X5CrNiMo17-12-2	1.4401	+AT	175	158	145	135	127	120	115	112	110	108	210	190	175	165	155	150	145	141	139	137
X6CrNiMoTi17-12-2	1.4571	+AT	185	175	165	155	145	140	135	131	129	127	215	205	192	183	175	169	164	160	158	157
X2CrNiMo17-12-3	1.4432	+AT	165	150	137	127	119	113	108	103	100	98	200	180	165	153	145	139	135	130	128	127
X2CrNiMoN17-13-3	1.4429	+AT	215	195	175	165	155	150	145	140	138	136	245	225	205	195	185	180	175	170	168	166
X3CrNiMo17-13-3	1.4436	+AT	175	158	145	135	127	120	115	112	110	108	210	190	175	165	155	150	145	141	139	137
X2CrNiMo18-14-3	1.4435	+AT	165	150	137	127	119	113	108	103	100	98	200	180	165	153	145	139	135	130	128	127
X2CrNiMoN17-13-5	1.4439	+AT	225	200	185	175	165	155	150	-	-	-	255	230	210	200	190	180	175	-	-	-
X1NiCrMoCu25-20-5	1.4539	+AT	205	190	175	160	145	135	125	115	110	105	235	220	205	190	175	165	155	145	140	135
Special grades																						
X6CrNiNb18-10	1.4550	+AT	175	165	155	145	136	130	125	121	119	118	210	195	185	175	167	161	156	152	149	147
X1CrNiMoN25-22-2	1.4466	+AT	195	170	160	150	140	135	-	-	-	-	225	205	190	180	170	165	-	-	-	-
X2CrNiMo18-15-4	1.4438	+AT	172	157	147	137	127	120	115	112	110	108	206	186	177	167	157	150	144	140	138	136
X12CrMnNiN17-7-5	1.4372	+AT	295	260	230	220	205	185	-	-	-	-	325	295	265	250	230	205	-	-	-	-
X1NiCrMoCu31-27-4	1.4563	+AT	190	175	160	155	150	145	135	125	120	115	220	205	190	185	180	175	165	155	150	145
X1CrNiMoCuN20-18-7	1.4547	+AT	230	205	190	180	170	165	160	153	148	-	270	245	225	212	200	195	190	184	180	-
X1NiCrMoCuN25-20-7	1.4529	+AT	230	210	190	180	170	165	160	-	-	-	270	245	225	215	205	195	190	-	-	-
X2CrNiMnMoN25-18-6-5	1.4565	+AT	350	310	270	255	240	225	210	210	210	200	400	355	310	290	270	255	240	240	240	230

[a] +AT = solution annealed.

*) 1 MPa = 1 N/mm².

Table 20 — Mechanical properties for bars at room temperature of steels in the cold work hardened (2H) condition

Steel designation		Tensile strength level	0,2 % proof strength	Tensile strength	Elongation after fracture
Name	Number		$R_{p0,2}$ MPa*) min.	R_m MPa*)	A % min.
Standard grades (Austenitic steels)					
X2CrNi18-9	1.4307	+C700[b]	350	700 to 850	20
		+C800[a]	500	800 to 1000	12
X2CrNi19-11	1.4306	+C700[b]	350	700 to 850	20
		+C800[a]	500	800 to 1000	12
X5CrNi18-10	1.4301	+C700[b]	350	700 to 850	20
		+C800[a]	500	800 to 1000	12
X8CrNiS18-9	1.4305	+C700[b]	350	700 to 850	20
		+C800[a]	500	800 to 1000	12
X6CrNiTi18-10	1.4541	+C700[b]	350	700 to 850	20
		+C800[a]	500	800 to 1000	12
X2CrNiMo17-12-2	1.4404	+C700[b]	350	700 to 850	20
		+C800[a]	500	800 to 1000	12
X5CrNiMo17-12-2	1.4401	+C700[b]	350	700 to 850	20
		+C800[a]	500	800 to 1000	12
X6CrNiMoTi17-12-2	1.4571	+C700[b]	350	700 to 850	20
		+C800[a]	500	800 to 1000	12

[a] The maximum diameter for this tensile strength level shall be agreed at the time of enquiry and order; it shall not be greater than 25 mm.

[b] The maximum diameter for this tensile strength level shall be agreed at the time of enquiry and order; it shall not be greater than 35 mm.

*) 1 MPa = 1 N/mm².

Table 21 — Tests to be carried out, test units and extent of testing in specific testing

Test	[a]	**Test unit**	**Product form** **Rods, bars and sections**	**Number of test pieces per sample**
Chemical analysis	m	Cast	The cast analysis is given by the manufacturer[b]	–
Tensile test at ambient temperature	m	Batch[c]	1 sample per 25 t; maximum of 2 per test unit	1
Tensile test at elevated temperature	o	–	To be agreed at the time of ordering (see Table 19)	1
Impact test at ambient temperature	o	–	To be agreed at the time of ordering (see Tables 9 to 12)	3
Resistance to intergranular corrosion	o	–	To be agreed at the time of ordering if intergranular corrosion is a hazard (see Tables 8, 11 and 12)	1

[a] Tests marked with an “m” shall be carried out as specific tests in all cases. Those marked with an “o” (optional) shall be carried out as specific tests only if agreed at the time of ordering.

[b] A product analysis may be agreed at the time of ordering; the extent of testing shall be specified at the same time.

[c] Each batch consists of products coming from the same cast. The products shall have been subject to the same heat treatment cycle in the same furnace. In the case of a continuous furnace or in process annealing a batch is the lot heat treated without intermission with the same process parameters.
The shape and size of the cross sectional area of products in a single batch may be different providing that the ratio of the largest to the smallest cross sectional areas shall be equal or less than three.

Table 22 – Minimum frequency of testing for product testing and evaluation as part of FPC

Property	**Clause, indicating the relevant test method (if any)**	**Threshold value (if any) and tolerances**	**Minimum number of samples**	**Minimum frequency of tests**
Tolerances on dimension and shape	Annex B	yes	1 per product form and nominal dimension	1 per sample
Elongation	7.4.2	yes	1 per cast, product form, dimensional range (tables for mechanical properties), heat treatment batch	1 per sample
Tensile strength	7.4.2			
Yield strength	7.4.2			
Impact strength	7.4.2	yes	1 per cast, product form, dimensional range (tables for mechanical properties), heat treatment batch	3 per sample
Weldability [covered by chemical composition]	7.4.1	yes	1 per cast	1 per cast
Durability [covered by chemical composition]	7.4.1	yes	1 per cast	1 per cast

Table 23 — Marking of the products

Marking of	Products with specific testing[a]
Manufacturer's name, trade mark or logo	+
Steel number or name	+
Cast number	+
Identification number[b]	+
Inspector's mark	(+)

[a] The symbols in the table mean:
+ = the marking shall be applied;
(+) = the marking shall be applied if so agreed, or at the manufacturer's discretion.

[b] The numbers or letters used for identification shall allow the product(s) to be related to the relevant inspection certificate.

Annex A
(informative)

Guidelines for further treatment (including heat treatment) in fabrication

A.1 The guidelines given in Tables A.1 to A.5 are intended for hot forming and heat treatment.

A.2 Flame cutting can adversely affect edge areas; where necessary, they should be machined.

A.3 As the corrosion resistance of stainless steels is only ensured with a metallically clean surface, layers of scale and annealing colours produced during hot forming, heat treatment or welding should be removed as far as possible before use. Finished parts made of steels with approximately 13 % Cr also require the best surface condition (e. g. polished) in order to achieve maximum resistance to corrosion.

Table A.1 — Guidelines on the temperatures for hot forming and heat treatment of ferritic corrosion resisting steels

Steel designation		**Hot forming**		**Heat treatment symbol**	**Annealing**	
Name	**Number**	**Temperature °C**	**Type of cooling**		**Temperature[a] °C**	**Type of cooling**
Standard grades						
X2CrNi12	1.4003	1100 to 800	air	+A	680 to 740	air
X6Cr17	1.4016				750 to 850	
Special grade						
X2CrMoTiS18-2	1.4523	1100 to 800	air	+A	1000 to 1050	air
NOTE The temperature of annealing should be agreed for simulated heat-treated test pieces.						
[a] If heat treatment is carried out in a continuous furnace, the upper part of the range specified should usually be preferred, or even exceeded.						

Table A.2 — Guidelines on the temperatures for hot forming and heat treatment of martensitic corrosion resisting steels

Steel designaton		Hot forming		Heat treatment symbol	Annealing		Quenching		Tempering
Name	Number	Temperature °C	Type of cooling		Temperature[a] °C	Type of cooling	Temperature[a] °C	Type of cooling	Temperature °C
Standard grades									
X12Cr13	1.4006	1100 to 800	air	+A	745 to 825	air	-	-	-
				+QT650	-	-	950 to 1000	oil, air	680 to 780
X20Cr13	1.4021		slow cooling	+A	745 to 825	air	-	-	-
				+QT700	-	-	950 to 1050	oil, air	650 to 750
				+QT800	-	-	950 to 1050	oil, air	600 to 700
X17CrNi16-2	1.4057			+A[b]	680 to 800	furn.,air	-	-	-
				+QT800[c]	-	-	950 to 1050	oil, air	750 to 800 + 650 to 700[c]
				+QT900	-	-	950 to 1050	oil, air	600 to 650
X4CrNiMo16-5-1	1.4418	1150 to 900	air	+A[d]	600 to 650	furn., air	-	-	-
				+QT760	-	-	950 to 1050	oil, air	590 to 620[e]
				+QT900	-	-	950 to 1050	oil, air	550 to 620

NOTE The temperatures of annealing, quenching and tempering should be agreed for simulated heat-treated test pieces

[a] If heat treatment is carried out in a continuous furnace, the upper part of the range specified should usually be preferred, or even exceeded.

[b] Double annealing might be advisable.

[c] In the case that the nickel is at the lower side of the range specified in Table 3, a single tempering at 620 to 720°C may be sufficient.

[d] Tempering after martensitic transformation.

[e] Either 2 x 4 h or 1 x 8 h as a minimum time.

Table A.3 — Guidelines on the temperatures for hot forming and heat treatment of precipitation hardening corrosion resisting steels

Steel designation		Hot forming		Heat treatment symbol	Solution annealing		Precipitation hardening
Name	Number	Temperature °C	Type of cooling		Temperature[a] °C	Type of cooling	Temperature °C
Standard grades							
X5CrNiCuNb16-4	1.4542	1150 to 900	furnace, air	+AT[b]	1030 to 1050	oil, air	-
				+P800	1030 to 1050		2 h 760 °C/air + 4 h 620 °C/air
				+P930	1030 to 1050		4 h 620 °C/air
				+P960	1030 to 1050		4 h 590 °C/air
				+P1070	1030 to 1050		4 h 550 °C/air
X7CrNiAl17-7	1.4568		air	+AT	1060 to 1080	water, air	-

NOTE The temperatures of solution annealing should be agreed for simulated heat-treated test pieces.

[a] If heat treatment is carried out in a continuous furnace, the upper part of the range specified should usually be preferred, or even exceeded.

[b] Not suitable for direct application, prompt precipitation hardening after solution annealing is recommended to avoid cracking.

Table A.4 — Guidelines on the temperatures for hot forming and heat treatment of austenitic corrosion resisting steels

Steel designation		Hot forming		Heat treatment symbol	Solution annealing[a]	
Name	Number	Temperature °C	Type of cooling		Temperature [b, c] °C	Type of cooling
Standard grades						
X2CrNi18-9	1.4307	1200 to 900	air	+AT	1000 to 1100	water,air[d]
X2CrNi19-11	1.4306				1000 to 1100	
X2CrNiN18-10	1.4311				1000 to 1100	
X5CrNi18-10	1.4301				1000 to 1100	
X8CrNiS18-9	1.4305				1000 to 1100	
X6CrNiTi18-10	1.4541				1020 to 1120	
X2CrNiMo17-12-2	1.4404				1020 to 1120	
X2CrNiMoN17-11-2	1.4406				1020 to 1120	
X5CrNiMo17-12-2	1.4401				1020 to 1120	
X6CrNiMoTi17-12-2	1.4571				1020 to 1120	
X2CrNiMo17-12-3	1.4432				1020 to 1120	
X2CrNiMoN17-13-3	1.4429				1020 to 1120	
X3CrNiMo17-13-3	1.4436				1020 to 1120	
X2CrNiMo18-14-3	1.4435				1020 to 1120	
X2CrNiMoN17-13-5	1.4439				1020 to 1120	
X3CrNiCu18-9-4	1.4567				1000 to 1100	
X1NiCrMoCu25-20-5	1.4539				1050 to 1150	
Special grades						
X6CrNiNb18-10	1.4550	1150 to 850	air	+AT	1020 to 1120	water,air[d]
X1CrNiMoN25-22-2	1.4466	1150 to 850			1070 to 1150	
X2CrNiMo18-15-4	1.4438	1150 to 850			1020 to 1120	
X12CrMnNiN17-7-5	1.4372	1150 to 850			1000 to 1100	
X3CrNiCuMo17-11-3-2	1.4578	1150 to 900			1000 to 1100	
X1NiCrMoCu31-27-4	1.4563	1150 to 850			1050 to 1150	
X1CrNiMoCuN20-18-7	1.4547	1200 to 1000			1140 to 1200	
X1NiCrMoCuN25-20-7	1.4529	1200 to 950			1120 to 1180	
X2CrNiMnMoN25-18-6-5	1.4565	1200 to 950			1120 to 1170	

NOTE The temperatures of solution annealing should be agreed for simulated heat-treated test pieces.

[a] If heat treatment is carried out in a continuous furnace, the upper part of the range specified should usually be preferred, or even exceeded.

[b] The solution annealing may be omitted, if the conditions for hot working and subsequent cooling are such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.

[c] The lower end of the range specified for solution annealing should be aimed at the heat treatment as part of further processing, because otherwise the mechanical properties might be affected. If the temperature of hot forming does not drop below the lower temperature for solution annealing, a temperature of 980°C is adequate as lower limit for Mo-free steels, a temperature of 1000 °C for steels with Mo contents up to 3 % and a temperature of 1020°C for steels with Mo contents exceeding 3 %.

[d] Cooling sufficiently rapidly in order to avoid the occurrence of intergranular corrosion as defined in EN ISO 3651-2.

Table A.5 — Guidelines on the temperatures for hot forming and heat treatment of austenitic-ferritic corrosion resisting steels

Steel designation		Hot forming		Heat treatment symbol	Solution annealing[a]	
Name	Number	Temperature °C	Type of cooling		Temperature[b] °C	Type of cooling
Standard grades						
X3CrNiMoN27-5-2	1.4460	1200 to 950	air	+AT	1020 to 1100	water, air[c]
X2CrNiMoN22-5-3	1.4462				1020 to 1100	water, air[c]
Special grades						
X2CrNiN23-4	1.4362	1200			950 to 1050	water, air
X2CrNiMoN29-7-2	1.4477	to	air	+AT	1040 to 1120	water
X2CrNiMoN25-7-4	1.4410	1000			1040 to 1120	water
X2CrNiMoSi18-5-3	1.4424				1000 to 1100	water, air[c]
X2CrMnNiN21-5-1	1.4162	1100 to 900			1020 to 1080	water, air

NOTE The temperature of solution annealing should be agreed for simulated heat-treated test pieces.

[a] If heat treatment is carried out in a continuous furnace, the upper part of the range specified should usually be preferred, or even exceeded.

[b] The solution annealing may be omitted, if the conditions for hot working and subsequent cooling are such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.

[c] Cooling sufficiently rapidly in order to avoid precipitation.

Annex B
(normative)

Applicable dimensional standards

EN 10017, *Steel rod for drawing and/or cold rolling – Dimensions and tolerances*

EN 10024[1], *Hot-rolled taper flange I sections – Tolerances on shape and dimensions*

EN 10034[1], *Structural steel I and H sections – Tolerances on shape and dimensions*

EN 10055[1], *Hot rolled steel equal flange tees with radiused root and toes – Dimensions and tolerances on shape and dimensions*

EN 10056-2[1], *Structural steel equal and unequal leg angles – Part 2: Tolerances on shape and dimensions*

EN 10058, *Hot rolled flat steel bars for general purposes – Dimensions and tolerances on shape and dimensions*

EN 10059, *Hot rolled square steel bars for general purposes – Dimensions and tolerances on shape and dimensions*

EN 10060, *Hot rolled round steel bars for general purposes – Dimensions and tolerances on shape and dimensions*

EN 10061, *Hot rolled hexagon steel bars for general purposes – Dimensions and tolerances on shape and dimensions*

EN 10218-2, *Steel wire and wire products - General - Part 2: Wire dimensions and tolerances*

EN 10278, *Dimensions and tolerances of bright steel products*

EN 10279[1)], *Hot rolled steel channels - Tolerances on shape, dimensions and mass*

1) In the scopes of these dimensional standards, stainless steels are expressly excluded. On the other hand, these standards are used in practice for stainless steels, too. Therefore, they are listed here.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 89/106/EEC, EU Construction Products Directive

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under mandate M/120 'Structural metal products' given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this Annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the construction products covered by this Annex for the intended uses indicated herein; reference shall be made to the information accompanying the CE marking.

WARNING: Other requirements and other EU Directives, not affecting the fitness for intended uses, can be applicable to the product(s) falling within the scope of this European Standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this European Standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with when and where they apply.

NOTE 2 an informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through http://ec.europa.eu/enterprise/construction/internal/dangsub/dangmain_en.htm).

This Annex has the same scope as Clause 1 of this European standard. It establishes the conditions for the CE marking of corrosion resistant steel products intended for the use indicated below and shows the relevant clauses applicable (see Table ZA.1). Construction products are structural metallic sections/profiles: hot rolled sections/profiles with various shapes (T, L, H, U, Z, I, channels, angle), flat products (plate, sheet, strip), bars.

Intended uses: metal structures or in composite metal and concrete structures.

NOTE 3 In this European Standard the term "steel grades" is used. It is identical with the term "technical classes".

The requirement on a certain characteristic is not applicable in those Member States (MSs) where there are no regulatory requirements on that characteristic for the intended use of the product. In this case, manufacturers placing their products on the market of these MSs are not obliged to determine nor declare the performance of their products with regard to this characteristic and the option 'No performance determined' (NPD) in the information accompanying the CE marking (see ZA.3) may be used. The NPD option may not be used, however, where the characteristic is subject to a threshold level.

Table ZA.1 — Relevant clauses for stainless steel long products for construction purposes

Product: Stainless steel long products for construction purposes **Intended use:** Metal structures or composite metal and concrete structures			
Essential characteristics	**Requirement clause(s)**	**Levels/and/or classes**	**Notes**
Tolerances on dimensions and shape	6.9 and Annex B	–	Pass/fail
Elongation	6.5.1 and EN 10002-1	–	Threshold values
Tensile strength	6.5.1 and EN 10002-1	–	Threshold values
0,2%-proof strength (yield strength)	6.5.1 and EN 10002-1	–	Threshold values
Impact strength	6.5.1 and EN 10045-1	–	Threshold values
Weldability [covered by chemical composition]	6.3	–	Threshold values
Durability [covered by chemical composition]	6.3 + 6.4	–	Threshold values
Fracture toughness/brittle strength [covered by impact strength]	6.5.1 and EN 10045-1	–	Threshold values
Cold formability [covered by elongation]	6.8 and EN 10002-1	–	Threshold values

ZA.2 Procedures for the attestation of conformity of products

ZA.2.1 Systems of attestation of conformity

The system of attestation of conformity for corrosion resistant steel products indicated in Table ZA.1 in accordance with the Decision of the Commission 98/214/EC of 1998-03-18, amended by the Decision 01/596EC of 8 January (published as document L 209 of 02.08.01) and as given in Annex III of the mandate for Structural metallic products and ancillaries, is shown in Table ZA.2 for the indicated intended use.

Table ZA.2 — Products, intended uses and attestation of conformity system

Product(s)	**Intended use(s)**	**Level(s) or class(es)**	**Attestation of conformity system**
STRUCTURAL METALLIC SECTIONS/PROFILES: hot rolled sections/profiles with various shapes (T, L, H, U, Z, I, channels, angle), flat products (plate, sheet, strip), bars.	to be used in metal structures or in composite metal and concrete structures	–	2+
System 2+: See Directive 89/106/EEC (CPD) Annex III.2.(ii), First possibility, including certification of the factory production control by an approved body on the basis of its initial inspection of the works and of factory control as well as continuous surveillance, assessment and approval of factory production control.			

The attestation of conformity of corrosion resistant steel products in Table ZA.2 shall be according to the evaluation of conformity procedures indicated in Table ZA.3 resulting from the application of Clause 8 of this European Standard.

Table ZA.3 — Assignment of evaluation of conformity tasks for corrosion resistant steel products under system 2+

Tasks			**Content of the task**	**Evaluation of conformity clauses to apply**
Tasks under the responsibility of the manufacturer	Factory production control (FPC)		Parameters related to all relevant characteristics of Table ZA.1	See 8.3
	Initial type testing by the manufacturer		Tolerances on dimension and shape; elongation; tensile strength; yield strength; impact strength; weldability (possibly);	See 8.2
	Testing of samples taken at the factory		All characteristics of Table ZA.1	See 8.2
	Certification of FPC by the FPC certification body on the basis of	Initial inspection of factory and of FPC	Parameters related to all relevant characteristics of Table ZA.1, in particular: Tolerances on dimension and shape; elongation; tensile strength; yield strength; impact strength; weldability; durability.	See 8.3
		Continuous surveillance, assessment and approval of FPC	Parameters related to all relevant characteristics of Table ZA.1, in particular: Tolerances on dimension and shape; elongation; tensile strength; yield strength; impact strength; weldability; durability.	See 8.3

ZA.2.2 EC certificate and declaration of conformity

When compliance with the conditions of this Annex is achieved, and once the notified body has drawn up the certificate mentioned below, the manufacturer or his agent established in the European Economic Area (EEA) shall prepare and retain a declaration of conformity, which entitles the manufacturer to affix the CE marking. This declaration shall include:

a) name and address of the manufacturer, or his authorised representative established in the EEA, and the place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto EEA market, if he takes responsibility for CE marking.

b) description of the product (type, identification, use …), and a copy of the information accompanying the CE marking;

NOTE 2 Where some of the information required for the Declaration is already given in the CE marking information, it does not need to be repeated.

c) provisions to which the product conforms (e.g. Annex ZA of this European Standard);

d) particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);

e) the number of the accompanying factory production control certificate;

f) name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorized representative.

The declaration shall be accompanied by a factory production control certificate, drawn up by the notified body, which shall contain in addition to the information above, the following:

g) name and address of the notified body;

h) the number of the factory production control certificate;

i) conditions and period of validity of the certificate, where applicable;

j) name of and position held by, the person empowered to sign the certificate.

The above mentioned declaration and certificate shall be presented in the official language(s) acceptable to the Member State in which the product is to be used.

ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking shall be in accordance with Directive 93/68/EEC[2)] EC and shall be shown on the construction product or when not possible it may be on the accompanying label, the packaging or on the accompanying commercial documents (inspection document). The CE marking consists of the letters "CE" in the specified form and shall be accompanied by the following information:

a) identification number of the certification body;

b) name or identifying mark and registered address of the producer;

c) the last two digits of the year in which the marking is affixed;

d) the number of the factory production control certificate;

e) reference to this European Standard;

f) description of the product (see 4.2) in accordance with the relevant dimensional tolerance standard (see 2): generic name, intended use, dimensions and material;

g) information on those relevant essential characteristics listed in Table ZA.1 which are to be declared presented as:

   1) declared values and, where relevant, level or class (including 'pass' for pass/fail requirements, where necessary) to declare for each essential characteristic as indicated in 'Notes' in Table ZA.1;

   2) 'No performance determined' for characteristics where this is relevant;

   3) as an alternative, a standard designation which shows some or all of the relevant characteristics (where the designation covers only some characteristics, it will need to be supplemented with declared values for other characteristics as above).

Figures ZA.1 and ZA.2 give examples of the information to be given on the product, label, packaging and/or commercial documents.

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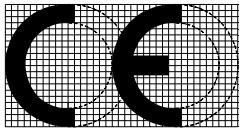
2) Council Directive 93/68/EEC of 22 July 1993 amending 12 Directives, including Directive 89/106/EEC harmonising the provisions for CE marking



01234

CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.

Identification number of the certification body (where relevant)

Any Co Ltd, PO Box 21, B-1050

Name or identifying mark and registered address of the producer

08

Last two digits of the year in which the marking was affixed

01234-CPD-00234

Certificate number (where relevant)

EN 10088-5

No. of European standard

Corrosion resistant steel round bar

Intended uses: Building construction or civil engineering

Description of product

and

information on regulated characteristics

Tolerances on dimensions and shape: Round bars EN 10060

Elongation	**Steel 1.4301 EN 10088-5**
Tensile strength	
Yield strength	
Impact strength	
Weldability	
Durability	

Regulated substance: No performance determined

Figure ZA.1 — First example CE marking information

CE 01234	*CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.* *Identification number of the certification body (where relevant)*
Any Co Ltd, PO Box 21, B-1050 **08** 01234-CPD-00234	*Name or identifying mark and registered address of the producer* *Last two digits of the year in which the marking was affixed* *Certificate number (where relevant)*
EN 10088-5:2009 Corrosion resistant steel round bar for building construction or civil engineering. **Tolerances on dimensions and shape: Round bars EN 10060** **Steel 1.4301 – EN 10088-5** **Regulated substance: No performance determined**	*No. of European standard* *Description of product* *and* *information on regulated characteristics*

Figure ZA.2 — Second example CE marking information

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE 1 European legislation without national derogations need not be mentioned.

NOTE 2 Affixing the CE marking symbol means, if a product is subject to more than one directive, that it complies with all applicable directives.

Bibliography

[1] EN 10095, *Heat resisting steels and nickel alloys*

[2] EN 10263-5, *Steel rod, bars and steel wire for cold heading and cold extrusion – Part 5: Technical delivery conditions for stainless steels*

[3] EN 10264-4, *Steel wire and wire products - Steel wire for ropes - Part 4: Stainless steel wire*

[4] EN 10270-3, *Steel wire for mechanical springs – Part 3: Stainless spring steel wire*

[5] EN 10272, *Stainless steel bars for pressure purposes*

[6] EN 10302, *Creep resisting steels, nickel and cobalt alloys*

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Headquarters 389
Chiswick High Road,
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Tel +44 (0)20 8996 9001
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