SLOVENSKI STANDARD

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Nerjavne jeklene palice za tlaļ ne posode

Stainless steel bars for pressure purposes

Stäbe aus nichtrostendem Stahl für Druckbehälter

Barres en acier inoxydable pour appareils a pression

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77.140.60	Jeklene palice in drogovi	Steel bars and rods

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Stainless steel bars for pressure purposes

Barres en acier inoxydable pour appareils à pression

Stäbe aus nichtrostendem Stahl für Druckbehälter

This European Standard was approved by CEN on 23 August 2007.

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

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Foreword

This document (EN 10272:2007) has been prepared by Technical Committee ECISS/TC 22 “Steels for pressure purposes - Qualities”, 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of an identical text or by endorsement, at the latest by April 2008, and conflicting national standards shall be withdrawn at the latest by April 2008.

This document supersedes EN 10272:2000.

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 EU Directive 97/23/EC.

For relationship with EU Directive 97/23/EC, see informative Annex ZA, which is an integral part of this document.

NOTE The clauses marked with a point (•) contain information relating to agreements which are to be made at the time of enquiry and order. The clauses marked by two points (••) contain information relating to agreements that may be made at the time of enquiry and order.

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

This document specifies the technical delivery conditions for hot and cold formed stainless steel bars for the construction of pressure equipment supplied in accordance with one of the process routes and surface finishes listed in Table 5.

The general technical delivery conditions in EN 10021 also apply.

NOTE Once this European Standard is published in the EU Official Journal (OJEU) under Directive 97/23/EC, presumption of conformity to the Essential Safety Requirements (ESRs) of Directive 97/23/EC is limited to technical data of materials in this European Standard and does not presume adequacy of the material to a specific item of equipment. Consequently, the assessment of the technical data stated in this material standard against the design requirements of this specific item of equipment to verify that the ESRs of Directive 97/23/EC are satisfied, needs to be done.

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 10002-1:2001, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

EN 10002-5:1991, *Metallic materials — Tensile testing — Part 5: Method of testing at elevated temperature*

EN 10020:2000, *Definition and classification of grades of steel*

EN 10021:2006, *General technical delivery conditions for steel products*

EN 10045-1:1990, *Metallic materials — Charpy impact test — Part 1: Test method*

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

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 10079:2007, *Definition of steel products*

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

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

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

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

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

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 the resistance to intergranular corrosion of stainless steels — Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels — Corrosion test in media containing sulfuric acid (ISO 3651-2:1998)*

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

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 purpose of this document the terms and definitions given in EN 10020:2000, EN 10052:1993, EN 10079:2007, EN 10088-1:2005 and the following apply.

3.1
purchaser
person or organization that orders products in accordance with this document. The purchaser is not necessarily, but may be, a manufacturer of pressure equipment in accordance with the EU Directive listed in Annex ZA

NOTE Where a purchaser has responsibilities under this EU Directive, this document will provide a presumption of conformity with the essential requirements of the Directive so identified in Annex ZA.

3.2
cryogenic temperature
temperature lower than –75 °C used in the liquefaction of gases

4 • Dimensions and tolerances on dimensions

The nominal dimensions and tolerances on dimensions shall be agreed at the time of enquiry and order with reference to the relevant dimensional standard EN 10058, EN 10059, EN 10060, EN 10061, EN 10278 or ISO 286-1. If the relevant standard offers the purchaser certain options, e.g. regarding tolerance classes, specific information on these aspects shall additionally be given.

5 Calculation of mass

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 Classification and designation

6.1 Classification

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

— ferritic steels;

— martensitic steels;

— austenitic steels;

— austenitic-ferritic (duplex) steels.

NOTE For more details see EN 10088-1.

6.2 Designation

The steel grades are designated with steel names in accordance with EN 10027-1. The corresponding steel numbers have been allocated in accordance with EN 10027-2.

7 Information to be supplied by the purchaser

7.1 Mandatory information

The following information shall be supplied by the purchaser at the time of enquiry and order:

a) quantity to be delivered (mass, length, number of pieces);

b) shape of bar;

c) number of the standard specifying the tolerances on dimensions, shape and mass (see Clause 4);

d) nominal dimensions of the product;

e) number of this European Standard, i.e. EN 10272;

f) steel name or the steel number;

g) delivery condition (see 8.2);

h) process route and surface finish (see Table 5);

i) type of inspection certificate in accordance with EN 10204 (see 9.1.1).

7.2 Options

A number of options are specified in this document and listed below. If the purchaser does not indicate a wish to implement any of these options at the time of enquiry and order, the product shall be supplied in accordance with the basic specifications (see 7.1).

1) specification of the steelmaking process (see 8.1);

2) tighter carbon ranges for martensitic steels (see Table 1, footnote b);

3) specification of a controlled sulphur content (see Table 1, footnote c or Table 2, footnote b);

4) verification of resistance to intergranular corrosion (see 8.4, 9.6.4.1 and Table 13);

5) verification of tensile properties at elevated temperature (see 8.5.2, 9.6.3 and Table 13);

6) verification of product analysis (see 9.6.1 and Table 13);

7) test temperature for the tensile test at elevated temperature (see 9.6.2.2);

8) verification of impact properties of austenitic steels at room temperature (see 8.5.1, 9.6.3 and Table 13);

9) verification of impact properties at low temperature (see 8.5.1, 9.6.3 and Table 13);

10) special requirements on surface quality (see 8.6);

11) verification of internal soundness (see 8.7 and Table 13);

12) verification of the hardness (see 9.6.4.2 and Table 13);

13) special marking requirements (see 10.2).

7.3 Example of ordering

10 t rounds of 50 mm diameter, dimensional tolerances as specified in EN 10060 made of the steel grade X5CrNi18-10 (1.4301) as specified in EN 10272 to process route 1D (see Table 5), inspection certificate 3.1 as specified in EN 10204:

10 t rounds EN 10060–50– steel EN 10272–X5CrNi18-10+1D–inspection certificate 3.1

or

10 t rounds EN 10060–50– steel EN 10272–1.4301+1D–inspection certificate 3.1

8 Requirements

8.1 Steelmaking process

•• Unless a special steelmaking process is agreed at the time of enquiry and order, the steelmaking process shall be at the discretion of the manufacturer.

8.2 • Delivery condition

The products shall be supplied in the delivery condition specified in the order by reference to the process route given in Table 5 and, where different alternatives exist; to the treatment conditions given in Tables 6 to 8 (see also Annex A).

8.3 Chemical composition

8.3.1 The cast analysis reported by the steel producer shall apply and comply with the requirements of Tables 1 to 3.

8.3.2 The product analysis shall not deviate from the limiting values for the cast analysis as specified in Tables 1 to 3 by more than the values given in Table 4.

8.4 Corrosion resistance

Referring to resistance to intergranular corrosion as defined in EN ISO 3651-2, for austenitic and austenitic-ferritic steels the specifications in Tables 7 and 8 apply.

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

NOTE 2 The corrosion resistance of stainless steels is strongly 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.

8.5 Mechanical properties

8.5.1 The tensile properties at room temperature and the impact energy at room and at low temperatures as specified in Tables 6 to 8 apply for the relevant specified heat treatment condition.

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 for other steels, they are also useful for application at cryogenic temperatures (see also the NOTE to Tables 7 and 8).

8.5.2 The values in Tables 9 to 11 apply for the 0,2 % and, Table 10 only, additionally for the 1,0 %-proof strength at elevated temperatures. For austenitic steels, the values given in Table 12 apply for the tensile strength at elevated temperatures.

Tensile strength values at elevated temperatures for austenitic-ferritic steels are given for guidance in Table B.1.

8.5.3 For creep rupture strength values of the grade X6CrNi25-20, see Table C.1.

8.6 Surface quality

See Table 5.

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

•• If more exact requirements for the surface quality are necessary, these shall be agreed at the time of enquiry and order, where appropriate, on the basis of EN 10221.

8.7 Internal soundness

The products shall be sound and free from defects that preclude their intended use.

•• Where appropriate, requirements together with the conditions for their verification (see 9.6.4.5 and Table 13) may be agreed at the time of enquiry and order.

9 Inspection

9.1 Types of inspection and inspection documents

9.1.1 The compliance with the requirements of the order shall be checked for products in accordance with this document by specific inspection.

• The purchaser shall specify the required type of inspection certificate (3.1 or 3.2) in accordance with EN 10204.

If an inspection certificate 3.2 is specified, the purchaser shall notify the manufacturer of the name and address of the organization or person who is to carry out the inspection and produce the inspection certificate. It shall also be agreed which party shall issue the certificate.

9.1.2 The inspection certificate shall include, in accordance with EN 10168, the following codes and information:

A commercial transactions and parties involved;

B description of products to which the inspection certificate applies (including tempering temperature, where applicable);

C03 test temperature;

C10 to C29 tensile test at room temperature and, if applicable, at elevated temperature;

C30 to C32 if applicable, hardness test;

C40 to C43 if applicable, the impact test at room temperature and at low temperature;

C70 steelmaking process, if applicable;

C71 to C92 cast analysis and, if applicable, product analysis;

D01 marking, dimensional and visual checking and, if applicable, verification of resistance to intergranular corrosion;

D02 to D99 NDT, if applicable;

Z validation.

9.2 Tests to be carried out

See Table 13.

9.3 Frequency of testing

The composition and size of test units and the number of samples and test pieces are specified in Table 13.

9.4 Re-tests, sorting and reprocessing

For retests, sorting and reprocessing the requirements of EN 10021 shall apply.

9.5 Sampling and preparation of samples and test pieces

9.5.1 Sampling and sample preparation shall be in accordance with the requirements of EN ISO 14284 and EN ISO 377. In addition, the requirements in 9.5.2 shall apply to the mechanical tests.

9.5.2 The samples shall be taken in accordance with Figures 1 and 2 for the tensile test at room temperature, the impact test and the tensile test at elevated temperatures.

9.5.3 • If, following agreement (see 9.2), the products are not to be delivered in a heat treated condition, the samples shall be heat treated prior to the test.

9.6 Test methods

9.6.1 Chemical analysis

•• Unless otherwise agreed at the time of enquiry and order, the choice of a suitable physical or chemical analytical method for the product analysis shall be at the discretion of the manufacturer. In cases of dispute, the analysis shall be carried out by a laboratory approved by both parties. In this case, the analysis method to be used shall be agreed taking into account the relevant existing European Standards. The list of available documents is given in prCEN/TR 10261.

9.6.2 Tensile test

9.6.2.1 The tensile test at room temperature shall be carried out as specified in EN 10002-1, generally using a proportional test piece of gauge length $L_0 = 5{,}65\sqrt{S_o}$ (S_0 = cross-sectional area of the test piece).

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

9.6.2.2 The tensile test at elevated temperatures if agreed shall be carried as specified in EN 10002-5.

If the tensile test at elevated temperatures is specified, the 0,2 %-proof strength shall be verified for ferritic and martensitic steels. For austenitic-ferritic steels, the 0,2 %-proof strength and the tensile strength shall be determined. In case of austenitic steels, the 0,2 %-proof strength, the 1,0 %-proof strength and the tensile strength shall be determined.

•• Unless a test temperature for which values are specified has been agreed at the time of enquiry and order, the test shall be carried out 300 °C except for austenitic-ferritic steels for which the test shall be carried out at 250 °C.

9.6.3 Impact test

The impact test on V-Notch test pieces shall be carried out as specified in EN 10045-1.

The average values of a set of three test pieces shall be equal to or greater than the specified value. One individual value may be below the specified value, provided that it is not less than 70 % of that value.

If the above conditions are not satisfied then an additional set of three test pieces may be taken at the discretion of the manufacturer from the same sample and tested. To consider the test unit as conforming, after testing the second set, the following conditions shall be satisfied simultaneously:

— average value of six test pieces shall be equal to or greater than the specified value;

— not more than two of six individual values may be lower than the specified value;

— not more than one of the six individual values may be lower than 70 % of the specified value.

If these conditions are not satisfied the sample product is rejected and retests may be carried out on the remainder of the test unit.

9.6.4 Other tests

9.6.4.1 If a test on the resistance to intergranular corrosion has been agreed, this shall be carried out in accordance with EN ISO 3651-2.

9.6.4.2 If a Brinell hardness test has been agreed, this shall be carried out in accordance with EN ISO 6506-1.

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

9.6.4.4 The surface condition of the products shall be checked for conformity with 8.6 by visual examination without optical aids or, at the discretion of the manufacturer, by an approved automated process.

9.6.4.5 If an ultrasonic test has been agreed for verification of internal soundness, the requirements of EN 10308 shall apply.

10 Marking

10.1 The products or the bundle or boxes shall be marked in a suitable way such that it is possible to determine the cast, the steel grade and the origin of the delivery (see Table 14).

10.2 •• Any other marking may be agreed at the time of enquiry and order.