SLOVENSKI STANDARD
SIST EN 10269:2014

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Nadomešča:
SIST EN 10269:2000
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Jekla in nikljeve zlitine za pritrdilne elemente za delo pri povišanih in/ali nizkih temperaturah

Steels and nickel alloys for fasteners with specified elevated and/or low temperature properties

Stähle und Nickellegierungen für Befestigungselemente für den Einsatz bei erhöhten und/oder tiefen Temperaturen

Aciers et alliages de nickel pour éléments de fixation utilisés à température élevée et/ou basse température

Ta slovenski standard je istoveten z: **EN 10269:2013**

ICS:

77.120.40	Nikelj, krom in njune zlitine	Nickel, chromium and their alloys
77.140.20	Visokokakovostna jekla	Stainless steels

SIST EN 10269:2014 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10269

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ICS 77.120.40; 77.140.20

Supersedes EN 10269:1999

English Version

Steels and nickel alloys for fasteners with specified elevated and/or low temperature properties

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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-CENELEC Management Centre has the same status as the official versions.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 10269:2013) has been prepared by Technical Committee ECISS/TC 107 “Steels for pressure purposes”, 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of an identical text or by endorsement, at the latest by April 2014, and conflicting national standards shall be withdrawn at the latest by April 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10269:1999 and EN 10269:1999/A1:2006.

For a list of significant changes that have been made in this new version, see Annex E.

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies requirements for semi-finished products, bars and rods for fasteners with properties specified at elevated and/or low temperatures made of non-alloy and alloy (including stainless) steels and nickel alloys as given in Table 1.

The requirements of this standard may be applied also to the finished fasteners.

The general technical delivery conditions in EN 10021 also apply to products supplied in accordance with this European Standard.

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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

EN 10027-1, *Designation systems for steels — Part 1: Steel names*

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

EN 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 10108, *Round steel rod for cold heading and cold extrusion — Dimensions and tolerances*

EN 10168, *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 — European standards for the determination of chemical composition*

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

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

EN ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing (ISO 377)*

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

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1)*

EN ISO 6892-2, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature (ISO 6892-2)*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10020:2000, EN 10052:1993 and EN 10079:2007 apply.

NOTE Quenching and tempering (symbol QT) also includes direct hardening plus tempering.

3.1
normalizing forming
forming process in which the final deformation process is carried out in a certain temperature range leading to a material condition equivalent to that obtained after normalizing so that the specified values of the mechanical properties are retained even after normalizing

Note 1 to entry: Normalizing (symbol N) also includes normalizing forming here.

Note 2 to entry: The symbol for this delivery condition and for the normalized condition is N.

[SOURCE: EN 10052:1993, modified — definition changed and Notes to entry inserted]

3.2
purchaser
person or organization that orders products in accordance with this European Standard

Note 1 to entry: The purchaser is not necessarily, but may be, a manufacturer of pressure equipment in accordance with the EU Directive 97/23/EC.

Note 2 to entry: Where a purchaser has responsibilities under this EU Directive, this European Standard will provide a presumption of conformity with the essential requirements of the Directive so identified in Annex ZA.

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 10108 and EN 10278.

5 Calculation of mass

The values of density given in Annex A shall be used as the basis for the calculation of the nominal mass from the nominal dimensions. For grades not mentioned in Annex A, the following density values apply:

— for 11/12 % Cr steels: ρ = 7,70 kg/dm^3;

— for X8Ni9: ρ = 7,89 kg/dm^3;

— for austenitic CrNiMo steels: ρ = 8,00 kg/dm^3.

For all other steels a density of 7,85 kg/dm^3 applies.

6 Classification and designation

6.1 Classification

In accordance with EN 10020 the steel grades C35E, C45E and 20Mn5 are non-alloy special steels. All other steel grades are alloy special including austenitic steels. Additionally, austenitic nickel alloys are specified.

6.2 Designation

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

NOTE Explanation on the designation of nickel alloys:

– name: the preceding chemical symbols indicate the main alloy elements and the figure immediately following indicates the average content of these alloys subsequently followed by the symbol for the other added important alloy elements;

– material number: the structure is set out according to EN 10027-2 with the number 2 for the material group number; this material group comprises chemically resisting and heat resisting or creep resisting nickel and cobalt alloys.

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) the quantity required (mass or number of pieces);

b) the type of product;

c) the European Standard specifying the tolerances on dimensions and shape (see Clause 4) and the tolerance of mass and, if the relevant European Standard permits the purchaser certain options, e.g. regarding edge finishes or tolerance classes, specific information on these aspects;

d) the nominal dimensions of the product;

e) the number of this European Standard;

f) the material name or number;

g) the delivery condition (see 8.2);

h) the surface quality class (see 8.5);

i) the type of inspection document (see 9.1).

7.2 Options

A number of options are specified in this European Standard 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 supplier shall supply in accordance with the basic specification (see 7.1):

1) special melting process (see 8.1);

2) test on simulated treated samples (see 8.2.3);

3) stress relieving treatment (see 8.2.4);

4) verification of internal soundness (see 8.6 and Table 12, footnote g);

5) inspection certificate 3.2 (see 9.1);

6) product analysis, its extent (see Table 12, footnote b) and the number of test pieces (see 10.1.1);

7) verification of strength properties by tensile test at elevated temperatures (see Table 12, footnote d);

8) verification of impact properties of austenitic steels by impact test at 20°C (see Table 12, footnote e);

9) verification of impact properties by impact test at low temperature (see 11.5 and Table 12, footnote f);

10) additional tests (see Table 12, footnote h);

11) hardness test (see Table 12);

12) specification of an analytical method (see 11.1);

13) temperature of the verification tensile test at elevated temperature (see 11.4 and Table 12);

14) special marking (see 12.2);

15) testing of intergranular corrosion resistance (see 11.6.5 and Table 12);

16) S-content for special applications (see Table 1, footnote b);

17) steel grade 1.4980 for cryogenic purposes (see Table 10, footnote d);

18) verification of the surface quality (see Table 12).

7.3 Example of ordering

2 t rounds made of a steel grade with the name X8Ni9 and the number 1.5662 as specified in EN 10269 of 30 mm diameter; dimensional tolerances as specified in EN 10060; surface quality class B in accordance with EN 10221; inspection certificate 3.1 as specified in EN 10204:

2 t rounds EN 10060–30–Steel EN 10269–X8Ni9–EN 10221–class B–Inspection certificate 3.1
or
2 t rounds EN 10060–30–Steel EN 10269–1.5662–EN 10221–class B–Inspection certificate 3.1

8 Requirements

8.1 •• Melting process

Unless a special melting process is agreed at the time of enquiry and order, the melting process for the starting material in accordance with this European Standard shall be at the discretion of the manufacturer.

Steels other than stainless steels shall be fully killed.

8.2 Delivery condition

8.2.1 General

In order to check if the steel grades listed in Table 1 fulfil the PED requirements, consult Tables 4, 6, 8 and 10.

8.2.2 • Table 3 covers delivery conditions +A, +S, +AC normally applied for further processing (such as shearing, cold heading, etc.).

Table 4 and Table 5 cover delivery conditions normally applied without additional heat treatment after delivery.

The purchaser shall specify in his enquiry and order the delivery condition required.

Depending on the type (e.g. billet) and the dimensions of the product and the intended type of further processing the material, in special cases the delivery in the untreated condition may be agreed.

8.2.3 •• When delivery in a condition not covered in Table 4 or Table 5 is agreed, for the verification of compliance with the requirements of this European Standard tests on simulated treated samples may be agreed at the time of enquiry and order. In the case of billets, this simulated treatment may also include a hot forming operation.

8.2.4 •• By agreement at the time of enquiry and order, for the steels for quenching and tempering a stress relieving treatment after straightening may be specified. See footnote c) in Table B.1.

8.3 Chemical composition

8.3.1 The information in Table 1 applies for the chemical composition according to the cast analysis.

8.3.2 The product analysis shall not deviate from the specified values of the cast analysis as specified in Table 1 by more than the values given in Table 2.

8.3.3 For austenitic steels intergranular corrosion may occur.

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.

8.4 Mechanical properties

8.4.1 General

The hardness and mechanical properties specified in this European Standard apply when billets, bars and rods are delivered in a condition given in Table 3, 4 or 5 and where the relevant tests are carried out in accordance with the sampling and testing conditions given in 10.2 and Clause 11.

However, it should be noted that the mechanical property values for delivered bars and rods shall conform to the requirements irrespective of whether they are verified or not.

In the case of billets verification of the capability of the material to comply with the property requirements for the bars by testing simulated heat treated test pieces may be agreed.

8.4.2 Hardness and mechanical properties at room temperature

The mechanical properties at room temperature and at 20 °C (impact energy) are specified in Tables 3, 4 and 5. They apply for the relevant specified heat treatment condition and dimensions.

8.4.3 Mechanical properties at elevated temperatures

The values in Table 6 and Table 7 apply for the 0,2 % proof strength at elevated temperatures.

The values in Table 8 and Table 9 apply for the tensile strength at elevated temperatures.

Reference data of strength values for 1 % (plastic) creep and creep rupture are given in Table C.1.

Reference data for relaxation properties are given in Table D.1.

In the case of billets verification of the capability of the material to comply with the property requirements for the bars by testing simulated heat treated test pieces may be agreed.

8.4.4 Mechanical properties at low temperatures

Low temperature impact energy values are specified in Table 10 and Table 11.

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.

8.5 • Surface condition

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

The purchaser shall specify a surface quality class in accordance with EN 10221.

8.6 • 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 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 European Standard by specific inspection.

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

If an inspection document 3.1 is specified, the manufacturer shall operate a quality assurance system, certified by a competent Body established as legal entity within the European Union and having undergone a specific assessment for materials.

NOTE See Directive 97/23/EC, Annex I, section 4.3, third paragraph and for further information the Guidelines of the EU Commission and the Member States for its interpretation (see e.g. Guidelines 7/2 and 7/16).

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 document. It shall also be agreed which party shall issue the certificate.

9.1.2 The inspection certificate 3.1 or 3.2 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 in the case of quenched and tempered or tempered products);

— C03 Test temperature;

— C10-C13 Tensile test at room temperature and, if applicable, at elevated temperatures;

— C40-C43 Impact test, if applicable;

— C50-C69 Hardness test, if applicable;

— C71-C92 Cast analysis and, if applicable, product analysis and steelmaking process;

— D01 Marking and dimensional checking and, if applicable, verification of the surface quality;

— D02-D99 NDT, if applicable;

— Z Validation.

9.2 Verification tests to be carried out

The mandatory and optional tests to be carried out, the size of the test units, and the number of samples and test pieces to be taken are specified in Table 12.

9.3 Re-tests

For re-tests, sorting and reprocessing the requirements of EN 10021 shall apply.

10 Sampling

10.1 Frequency of testing

10.1.1 •• For the product analysis, unless otherwise agreed, one sample per cast shall be taken for determining the elements indicated with numerical values for the particular steel grade in Table 1.

10.1.2 The test unit for the other tests shall be the batch of products or part thereof coming from the same cast and having been heat treated in the same batch and in the same heat treatment facility[1)]. The maximum diameter may be 1,25 times the smallest diameter in the batch, provided all diameters are within the same diameter range as specified in the corresponding tables of this European Standard (see Table 4 to Table 11).

For rectangular cross-sections the term "diameter d" should be replaced by "b – smaller dimension of the rectangular cross-section" (see Figure 1).

10.2 Selection and preparation of samples and test pieces

10.2.1 Sampling and sample preparation

10.2.1.1 Sampling and sample preparation shall be in accordance with the requirements of EN ISO 14284 and EN ISO 377. In addition, the requirements in 10.2.2 shall apply to the mechanical tests.

10.2.1.2 If the products are not to be delivered in the usual delivery condition (see 8.2.3), the samples shall be treated to the usual delivery condition prior to the test.

10.2.1.3 The samples shall be taken in accordance with Figure 1. All test pieces including those for the hardness test shall be taken from the same location.

10.2.2 Preparation of test pieces

10.2.2.1 Round test pieces shall be prepared in accordance with Figure 1 for the tensile test at room temperature in accordance with EN ISO 6892-1 and, where applicable, for the tensile test at elevated temperature in accordance with EN ISO 6892-2.

10.2.2.2 Three longitudinal V-notched test pieces in accordance with Figure 1 and in accordance with EN ISO 148-1 shall be prepared for the impact test.

11 Test methods

11.1 •• 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 European Standards is given in CEN/TR 10261.

11.2 Hardness test

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

11.3 Tensile test at room temperature

The tensile test at room temperature shall be carried out in accordance with EN ISO 6892-1 using a proportional test piece of gauge length $L_o = 5{,}65\sqrt{S_o}$ (S_o = cross-sectional area of the parallel length of the test piece).

1) 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 0,2 % proof strength, the tensile strength, the elongation after fracture and, if applicable, the reduction of area shall be determined.

11.4 •• Tensile test at elevated temperature

The 0,2 % proof strength or tensile strength at elevated temperature shall be determined in accordance with EN ISO 6892-2. Verification shall be obtained at one of the temperatures given in Table 6 to Table 9. This temperature shall be agreed at the time of enquiry and order.

11.5 Impact test

The impact test shall be carried out in accordance with EN ISO 148-1 at 20 °C (unless otherwise agreed), on V-notched test pieces and by using a 2 mm striker (KV_2).

The minimum impact energy values apply for the mean of three test pieces. One individual value may be lower than the specified value provided that it is not less than 70 % of this value.

If the above conditions are not met, an additional set of three test pieces shall be taken from the same sample and shall be tested. In order to regard the test unit as acceptable after testing the second set, the following requirements shall also be met:

a) the mean value of six tests shall be greater than or equal to the specified minimum value;

b) not more than two of the six individual values shall be less than the specified minimum value;

c) not more than one of the six individual values shall be less than 70 % of the specified minimum value.

If these requirements are not met, the sample product shall be rejected and re-tests shall be carried out on the remainder of the test unit.

11.6 Other testing

11.6.1 Visual examination of the surface condition shall be carried out without optical aids.

11.6.2 The dimensions of the products shall be checked.

11.6.3 If a non-destructive (e.g. ultrasonic) verification test has been agreed for checking internal soundness (see 8.6), the requirements shall also be agreed.

11.6.4 The manufacturer shall take suitable measures to prevent materials becoming mixed up.

11.6.5 At time of enquiry and order the testing of intergranular corrosion according to EN ISO 3651-2 may be agreed.

12 Marking

12.1 The products or the bundles or boxes shall be marked in a suitable way such that it is possible to determine the cast, the batch, the steel grade and the origin of the delivery (see Table 13).

12.2 •• Special marking may be agreed at the time of enquiry and order.