



SLOVENSKI STANDARD SIST EN 10028-5:2009

01-september-2009

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Flat products made of steels for pressure purposes - Part 5: Weldable fine grain steels, thermomechanically rolled

Flacherzeugnisse aus Druckbehälterstählen - Teil 5: Schweißgeeignete Feinkornbaustähle, thermomechanisch gewalzt

Produits plats en acier pour appareils à pression - Partie 5: Aciers soudables à grains fins, laminés thermomécaniquement

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Ta slovenski standard je istoveten z: EN 10028-5:2009

ICS:

- 77.140.30 Jekla za uporabo pod tlakom Steels for pressure purposes
- 77.140.50 Ú[[z aeá \ |^} áá á^ \ áá Flat steel products and semi-products
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SIST EN 10028-5:2009 en,fr,de

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN 10028-5

June 2009

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Supersedes EN 10028-5:2003

English Version

Flat products made of steels for pressure purposes - Part 5: Weldable fine grain steels, thermomechanically rolled

Produits plats en acier pour appareils à pression - Partie 5:
Aciers soudables à grains fins, laminés
thermomécaniquement

Flacherzeugnisse aus Druckbehälterstählen - Teil 5:
Schweißgeeignete Feinkornbaustähle, thermomechanisch
gewalzt

This European Standard was approved by CEN on 14 May 2009.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

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.

CEN members are the national standards bodies of 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 United Kingdom.

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Foreword

This document (EN 10028-5:2009) 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 December 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

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 10028-5:2003.

This European Standard consists of the following parts, under the general title *Flat products made of steels for pressure purposes*:

- Part 1: General requirements
- Part 2: Non-alloy and alloy steels with specified elevated temperature properties
- Part 3: Weldable fine grain steels, normalized
- Part 4: Nickel alloy steels with specified low temperature properties
- Part 5: Weldable fine grain steels, thermomechanically rolled
- Part 6: Weldable fine grain steels, quenched and tempered
- Part 7: Stainless steels

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

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.

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.

EN 10028-5:2009 (E)

1 Scope

This European Standard specifies the requirements for flat products for pressure equipments made of thermomechanically rolled steels as specified in Table 1.

The steels are not suitable for hot forming.

NOTE 1 At the time of publication of this European Standard, no sufficient data for the standardization of the elevated temperature properties of these steels was available. If their use at such temperatures is intended the conditions for this should be specially agreed between the interested parties.

The requirements of EN 10028-1:2007 + A1:2009 also apply.

NOTE 2 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 (Part 1 and this Part 5 of the series) 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 10028-1:2007 + A1:2009, *Flat products made of steels for pressure purposes – Part 1: General requirements*

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

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10028-1:2007 + A1:2009 apply.

4 Dimension and tolerances

See EN 10028-1:2007 + A1:2009.

5 Calculation of mass

See EN 10028-1:2007 + A1:2009.

6 Classification and designation

6.1 Classification

6.1.1 This European Standard covers the steel grades given in Table 1 in three qualities:

- a) the basic series (P...M)
- b) series with low temperature properties down to -40 °C (P...ML1);
- c) series with low temperature properties down to -50 °C (P...ML2).

6.1.2 In accordance with EN 10020 all the steels specified in this document are alloy special steels.

6.2 Designation

See EN 10028-1:2007 + A1:2009.

7 Information to be supplied by the purchaser

7.1 Mandatory information

See EN 10028-1:2007 + A1:2009.

7.2 Options

A number of options are specified in this document and listed below. Additionally the relevant options of EN 10028-1:2007 + A1:2009 apply. If the purchaser does not indicate a wish to implement any of these options at the time of enquiry and order, the products shall be supplied in accordance with the basic specification (see also EN 10028-1:2007 + A1:2009).

- 1) providing data on suitable welding conditions (see 8.2.3) ;
- 2) maximum carbon equivalent (see 8.3.3);
- 3) specification of a minimum impact energy of 40 J (see Note to 8.4 and Table 5);
- 4) mid thickness test pieces for the impact test (see Clause 10).

7.3 Example for ordering

10 plates with nominal dimensions, thickness = 50 mm, width = 2 000 mm, length = 10 000 mm, made of a steel grade with the name P355ML2 and the number 1.8833 as specified in EN 10028-5, inspection certificate 3.1 as specified in EN 10204:

10 plates – 50 x 2 000 x 10 000 – EN 10028-5 P355ML2 – Inspection certificate 3.1

or

10 plates – 50 x 2 000 x 10 000 – EN 10028-5 1.8833 - Inspection certificate 3.1.

8 Requirements

8.1 Steelmaking process

See EN 10028-1:2007 + A1:2009.

8.2 Delivery condition

8.2.1 The products covered by this European Standard shall be supplied in the thermomechanically rolled condition.

8.2.2 The steels specified in this European Standard are suitable for welding processes in current use (see Notes 1 to 3 to 8.2.3).

8.2.3 •• The manufacturer shall, if requested, provide the purchaser with data on suitable welding conditions determined on the basis of weld procedure tests.

NOTE 1 With increasing product thickness and strength level cold cracking can occur. Cold cracking is caused by the following factors in combination:

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- a) the amount of diffusible hydrogen in the weld metal;
- b) brittle structure of the heat affected zone;
- c) tensile stress concentrations in the welded joint.

NOTE 2 When using recommendations as laid down, for example in EN 1011-1 and EN 1011-2, the recommended welding conditions and the various welding ranges of the steel grades can be determined depending on the product thickness, the applied welding energy, the design requirements, the electrode efficiency, the welding process and the weld metal properties.

NOTE 3 Excessive post weld heat-treatment (PWHT) conditions can decrease the mechanical properties. Where in stress relieving the intended time temperature parameter

$$P = T_s (20 + \lg t) \times 10^{-3} ,$$

where

T_s is the stress relieving temperature in K and

t is holding time in hours,

exceeds the critical value of $P_{crit.} = 17,3$ the purchaser should in his enquiry and order inform the manufacturer accordingly and, where appropriate, tests on simulated post weld heat treated samples can be agreed to check whether after such a treatment the properties specified in this European Standard can still be regarded as valid.

8.3 Chemical composition

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8.3.1 The requirements of Table 1 apply for the chemical composition according to the cast analysis.

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

8.3.3 •• A maximum value for the carbon equivalent in accordance with Table 3 may be agreed upon at the time of enquiry and order.

8.4 Mechanical properties

The values given in Tables 4 and 5 (see also EN 10028-1:2007 + A1:2009 and Clause 10) shall apply.

NOTE Optionally, a minimum impact energy value of 40 J may be specified for temperatures where lower minimum values are specified (see Table 5, footnote a).

8.5 Surface condition

See EN 10028-1:2007 + A1:2009.

8.6 Internal soundness

See EN 10028-1:2007 + A1:2009.

For possible verification, see also EN 10028-1:2007 + A1:2009.

9 Inspection**9.1 Types of inspection and inspection documents**

See EN 10028-1:2007 + A1:2009.

9.2 Tests to be carried out

See EN 10028-1:2007 + A1:2009.

9.3 Retests

See EN 10028-1:2007 + A1:2009.

10 Sampling

See EN 10028-1:2007 + A1:2009.

For the impact test, deviating from EN 10028-1:2007 + A1:2009, Table 3, footnote f, the preparation of test pieces taken from the mid thickness may be agreed at the time of enquiry and order. In this case, test temperatures and minimum impact energy values shall also be agreed.

11 Test methods

See EN 10028-1:2007 + A1:2009.

12 Marking

See EN 10028-1:2007 + A1:2009.

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