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Ploščati jekleni izdelki za tlačne posode - 1. del: Splošne zahteve

Flat products made of steels for pressure purposes - Part 1: General requirements

Flacherzeugnisse aus Druckbehälterstählen - Teil 1: Allgemeine Anforderungen

Produits plats en acier pour appareils à pression - Partie 1: Prescriptions générales

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English Version

**Flat products made of steels for pressure purposes - Part
1: General requirements**

Produits plats en acier pour appareils à pression -
Partie 1: Prescriptions générales

Flacherzeugnisse aus Druckbehälterstählen - Teil 1:
Allgemeine Anforderungen

This European Standard was approved by CEN on 11 May 2017.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 10028-1:2017) 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of an identical text or by endorsement, at the latest by January 2018 and conflicting national standards shall be withdrawn at the latest by January 2018.

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 10028-1:2007+A1:2009.

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 Directive 2014/68/EU.

For relationship with Directive 2014/68/EU, see informative Annex ZA, which is an integral part of this document.

A list of changes between this document and the previous version can be found in Annex A.

EN 10028, *Flat products made of steels for pressure purposes* is a series of standards that consists of the following parts:

- *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*

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

EN 10028-1:2017 (E)**1 Scope**

This European Standard specifies general technical delivery conditions for flat products for the construction of pressure equipment.

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 2014/68/EU, presumption of conformity to the Essential Safety Requirements (ESRs) of Directive 2014/68/EU is limited to technical data of materials in this European Standard (Part 1 and the other relevant part 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 2014/68/EU 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 764-5:2014, *Pressure equipment – Part 5: Inspection documentation of metallic materials and compliance with the material specification*

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

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

EN 10028-2:2017, *Flat products made of steels for pressure purposes – Part 2: Non-alloy and alloy steels with specified elevated temperature properties*

EN 10028-3:2017, *Flat products made of steels for pressure purposes – Part 3: Weldable fine grain steels, normalized*

EN 10028-4:2017, *Flat products made of steels for pressure purposes – Part 4: Nickel alloy steels with specified low temperature properties*

EN 10028-5:2017, *Flat products made of steels for pressure purposes – Part 5: Weldable fine grain steels, thermomechanically rolled*

EN 10028-6:2017, *Flat products made of steels for pressure purposes – Part 6: Weldable fine grain steels, quenched and tempered*

EN 10028-7:2016, *Flat products made of steels for pressure purposes – Part 7: Stainless steels*

EN 10029:2010, *Hot-rolled steel plates 3 mm thick or above – Tolerances on dimensions and shape*

EN 10048:1996, *Hot rolled narrow steel strip – Tolerances on dimensions and shape*

EN 10051:2010, *Continuously hot-rolled strip and plate/sheet cut from wide strip of non-alloy and alloy steels – Tolerances on dimensions and shape*

EN 10079:2007, *Definitions of steel products*

EN 10088-1:2014, *Stainless steels – Part 1: List of stainless steels*

EN 10160:1999, *Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method)*

EN 10163-2:2004, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections – Part 2: Plate and wide flats*

EN 10164:2004, *Steel products with improved deformation properties perpendicular to the surface of the product – Technical delivery conditions*

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

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

EN 10307:2001, *Non-destructive testing – Ultrasonic testing of austenitic and austenitic-ferritic stainless steels flat products of thickness equal to or greater than 6 mm (reflection method)*

EN ISO 148-1:2016, *Metallic materials – Charpy pendulum impact test – Part 1: Test method (ISO 148-1:2016)*

EN ISO 377:2013, *Steel and steel products – Location and preparation of samples and test pieces for mechanical testing (ISO 377:2013, Corrected version 2015-06-01)*

EN ISO 2566-1:1999, *Steel – Conversion of elongation values – Part 1: Carbon and low alloy steels (ISO 2566-1:1984)*

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EN ISO 2566-2:1999, *Steel – Conversion of elongation values – Part 2: Austenitic steels (ISO 2566-2:1984)*

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EN ISO 3651-2:1998, *Determination of 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 6892-1:2016, *Metallic materials – Tensile testing – Part 1: Method of test at ambient temperature (ISO 6892-1:2016)*

EN ISO 6892-2:2011, *Metallic materials – Tensile testing – Part 2: Method of test at elevated temperature (ISO 6892-2:2011)*

EN ISO 9444-2:2010, *Continuously hot-rolled stainless steel – Tolerances on dimensions and form – Part 2: Wide strip and sheet/plate (ISO 9444-2:2009)*

EN ISO 9445-1:2010, *Continuously cold-rolled stainless steel – Tolerances on dimensions and form – Part 1: Narrow strip and cut lengths (ISO 9445-1:2009)*

EN ISO 9445-2:2010, *Continuously cold-rolled stainless steel – Tolerances on dimensions and form – Part 2: Wide strip and plate/sheet (ISO 9445-2:2009)*

EN ISO 14284:2002, *Steel and iron – Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996)*

EN ISO 18286:2010, *Hot-rolled stainless steel plates – Tolerances on dimensions and shape (ISO 18286:2008)*

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ISO 9444-1:2009, *Continuously hot-rolled stainless steel – Tolerances on dimensions and form – Part 1: Narrow strip and cut lengths*

CEN/TR 10261, *Iron and steel – European standards for the determination of chemical composition*

3 Terms and definitions

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

3.1**annealing**

heat treatment consisting of heating and soaking at a suitable temperature, followed by cooling under conditions such that, after return to ambient temperature, the metal will be in a structural state closer to that of equilibrium

Note 1 to entry: In English the term “box annealing” is used when the annealing is carried out in a sealed condition to minimize oxidation.

3.2**normalizing**

heat treatment consisting of austenitizing followed by air cooling

3.3**normalizing rolling**

rolling 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 mechanical properties are still met even after subsequent normalizing

3.4**thermomechanical rolling**

forming process in which the final deformation takes place within a certain range of temperatures leading to a material condition having certain properties which cannot be obtained or preserved by a single heat treatment

Note 1 to entry: Thermomechanical rolling (symbol M) may include processes of increased cooling rates with or without tempering including self-tempering but excluding definitively direct quenching and tempering.

3.5**quenching**

operation after austenitizing which consists of cooling a workpiece more rapidly than in still air

Note 1 to entry: Quenching includes direct quenching.

3.6**tempering**

heat treatment applied to a ferrous product, generally after quenching, or another heat treatment to bring the properties to the required level, and consisting of heating to specific temperatures ($< A_{c1}$) and soaking one or more times, followed by cooling at an appropriate rate

3.7

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 listed in Annex ZA.

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 Tolerances on dimensions

The tolerances on dimensions for the products shall be agreed at the time of enquiry and order with reference to the dimensional standards listed in Table 1.

Table 1 — Product form and valid standards for tolerances on dimensions and shape

| Product form | | Steels according to EN 10028-2:2017 to EN 10028-6:2017 | Stainless steels according to EN 10028-7:2016 |
|--------------------------------|---|--|---|
| Hot rolled plates | | EN 10029 ^a | EN ISO 18286 |
| Continuously hot rolled strip | Wide strip, sheet/plate cut from strip / slit strip | EN 10051 ^c | EN ISO 9444-2 |
| | Narrow strip, cut lengths | EN 10048 | EN 10048 or ISO 9444-1 |
| Continuously cold rolled strip | Wide strip, sheet/plate cut from strip | EN 10028-1:2017 | EN ISO 9445-2 ^b |
| | Narrow strip, cut lengths | — | EN ISO 9445-1 |

^a Unless otherwise agreed at the time of enquiry and order, class B as specified in EN 10029 shall apply to the tolerance on thickness of plates.

^b EN ISO 9445-2 contains options providing wider dimensional choice.

^c For plates in thicknesses $t \geq 3$ mm cut from strip, EN 10029 may also be agreed.

5 Calculation of mass

A density of 7,85 kg/dm³ shall be used as the basis for the calculation of the nominal mass from the nominal dimensions of all steels of EN 10028-2:2017 to EN 10028-6:2017. Calculations for density of stainless steels shall be based on density values given in EN 10088-1:2014, Annex E.

6 Classification and designation

6.1 Classification

6.1.1 The classification of the steel grades in accordance with EN 10020 is given in the specific parts of EN 10028.

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6.1.2 Steels covered in EN 10028-7:2016 are additionally classified according to their structure into:

- ferritic steels;
- martensitic steels;
- austenitic steels;
- austenitic-ferritic steels.

NOTE For more details, see EN 10088-1.

6.2 Designation

The steel grades specified in the individual parts of EN 10028 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.

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 required;
- b) type of flat product;
- c) European Standard specifying the tolerances on dimensions, shape and mass (see Clauses 4 and 5) and, if the relevant European Standard permits the purchaser certain options, e.g. regarding edge finishing or tolerance classes, specific information on these aspects;
- d) nominal dimensions of the product;
- e) number of the relevant part of this European Standard;
- f) steel name or number;
- g) delivery condition, if it differs from the usual condition specified in EN 10028-2:2017, EN 10028-3:2017, EN 10028-4:2017, EN 10028-5:2017 or EN 10028-6:2017; for stainless steels – the process route selected from the relevant table of EN 10028-7:2016;
- h) inspection document to be issued (see 9.1.1).

7.2 Options

A number of options are specified in this part of EN 10028 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 products shall be supplied in accordance with the basic specification (see 7.1).

- 1) deviating dimensional tolerances standard or class or option given in the dimensional tolerance standard (see Clause 4);
- 2) specification of the steelmaking process (see 8.1.1);
- 3) specification of special classes for the reduction of area (see 8.4.2);
- 4) verification of internal soundness (see 8.6);
- 5) one or several of the optional tests (see Table 2);
- 6) deviating frequency of testing (see 10.1.1 and 10.1.3);
- 7) deviating delivery condition (see 10.2.1.3);
- 8) use of longitudinal test pieces for the impact test (see 10.2.2.3);
- 9) specification of an analytical method (see 11.1);
- 10) temperature of the tensile test at elevated temperature (see 11.3);
- 11) deviating testing temperature for the impact test (see 11.4);
- 12) marking method (see 12.1);
- 13) special marking (see 12.2 and 12.3).

7.3 Examples of ordering

Examples of ordering are given in the relevant Part 2, 3, 4, 5, 6 or 7 of this European Standard.

8 Requirements

8.1 Steelmaking process

8.1.1 Unless a special steelmaking process has been agreed at the time of enquiry and order, the steelmaking process shall be left at the discretion of the manufacturer.

8.1.2 Steels other than stainless steels shall be fully killed.

8.2 Delivery condition

See the individual parts of EN 10028 (see also 3.1 to 3.6).

8.3 Chemical composition

8.3.1 Cast analysis

The cast analysis reported by the steel producer shall comply with the requirements of the individual parts of EN 10028.