SLOVENSKI STANDARD
SIST EN 10028-3:2009

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Nadomeġļa:
SIST EN 10028-3:2003

Ploġļ ati jekleni izdelki za tlaļ ne posode - 3. del: Variva drobnozrnata jekla, normalizirana

Flat products made of steels for pressure purposes - Part 3: Weldable fine grain steels, normalized

Flacherzeugnisse aus Druckbehälterstählen - Teil 3: Schweißgeeignete Feinkornbaustähle, normalgeglüht

Produits plats en aciers pour appareils à pression - Partie 3: Aciers soudables à grains fins, normalisés

Ta slovenski standard je istoveten z: **EN 10028-3:2009**

ICS:

77.140.30	Jekla za uporabo pod tlakom	Steels for pressure purposes
77.140.50	Ploġļ ati jekleni izdelki in polizdelki	Flat steel products and semi-products

SIST EN 10028-3:2009 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10028-3

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ICS 77.140.30; 77.140.50

Supersedes EN 10028-3:2003

English Version

Flat products made of steels for pressure purposes - Part 3: Weldable fine grain steels, normalized

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This document (EN 10028-3:2009) 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of an identical text or by endorsement, at the latest by December 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.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 10028-3:2003.

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.

1 Scope

This European Standard specifies requirements for flat products for pressure equipment made of weldable fine grain steels as specified in Table 1.

NOTE 1 Fine grain steels are understood as steels with a ferritic grain size of 6 or finer when tested in accordance with EN ISO 643.

The requirements and definitions 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 3 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*

EN 10229:1998, *Evaluation of resistance of steel products to hydrogen induced cracking (HIC)*

3 Terms and definitions

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

4 Dimensions and tolerances on dimensions

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 The steel grades covered by this document are given in four qualities:

a) room temperature quality (P ... N),

b) elevated temperature quality (P...NH),

c) low temperature quality (P...NL1) and

d) special low temperature quality (P...NL2).

6.1.2 The grades P275NH, P275NL1, P355N, P355NH and P355NL1 are non-alloy quality steels, the grades P275NL2 and P355NL2 are non-alloy special steels and the grades P460NH, P460NL1 and P460NL2 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) tests in the simulated normalized condition (see 8.2.2);

2) delivery of products in the untreated condition (see 8.2.3);

3) maximum carbon equivalent value (see 8.3.3);

4) tensile properties for increased product thicknesses (see Table 4, footnote c);

5) modified values for R_{eH} and R_m for grades P460NH and P460NL1 (see Table 4, footnote d)

6) application of the $R_{p0,2}$ values of Table 5 for the corresponding P...NL1 and P…NL2 grade (see 8.4.2);

7) $R_{p0,2}$ values at elevated temperatures for increased product thicknesses (see Table 5, footnote b);

8) specification of a minimum impact energy of 40 J (see NOTE to 8.4.1 and Table 6);

9) HIC test in accordance with EN 10229 (see 8.7);

10) mid thickness test pieces for the impact test (see Clause 10);

11) verification of impact energy for longitudinal test pieces (see clause 11);

12) use of test solution B for the HIC test with agreed acceptance criteria (see Annex A).

7.3 Example for ordering

10 plates with nominal dimensions, thickness = 50 mm, width = 2000 mm, length = 10 000 mm, made of a steel grade with the name P275NL2 and the number 1.1104 as specified in EN 10028-3, to be delivered with inspection certificate 3.1 as specified in EN 10204:

10 plates – 50 x 2000 x 10000 – EN 10028-3 P275NL2 - Inspection certificate 3.1.

or

10 plates – 50 x 2000 x 10000 – EN 10028-3 1.1104 – Inspection certificate 3.1.

8 Requirements

8.1 Steelmaking process

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

8.2 Delivery condition

8.2.1 Unless otherwise agreed at the time of enquiry and order (see 8.2.3), the products covered by this document shall be supplied in the normalized condition.

For steels with a minimum yield strength ≥ 460 MPa, delayed cooling or additional tempering may be necessary for small product thicknesses and in special cases. If such a treatment is performed, this shall be noted in the inspection document.

8.2.2 •• Normalizing may, at the discretion of the manufacturer, be replaced with normalizing rolling for the steel grades P275NH, P275NL1, P275NL2, P355N, P355NH, P355NL1 and P355NL2 (see 3.1 in EN 10028-1:2007 + A1:2009). In this case, additional tests on simulated normalized samples with an agreed frequency of testing may be agreed at the time of enquiry and order to verify that the specified properties are complied with.

8.2.3 •• If so agreed at the time of enquiry and order, products covered by this document may also be delivered in the untreated condition.

In these cases, testing shall be carried out in the simulated normalized condition (but see 8.2.1).

NOTE Testing in a simulated heat treated condition does not discharge the processor from the obligation of providing proof of the specified properties in the finished product.

8.2.4 Information on welding is given in EN 1011-1 and EN 1011-2.

NOTE Excessive post weld heat treatment (PWHT) conditions can decrease the mechanical properties. When 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 the holding time in hours,

exceeds the critical value $P_{crit.}$ of

— 17,3 for all steel grades except P460NH, P460NL1 and P460NL2
— 16,7 in the case of steel grade P460NH and
— 16,3 in the case of steel grades P460NL1 and P460NL2,

the purchaser should in his enquiry and order inform the manufacturer accordingly and, where appropriate, tests on simulated heat treated samples may 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

8.3.1 The requirements of Table 1 shall 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.

Table 1 — Chemical composition (cast analysis) [a]

Steel grade		% by mass														
Steel name	Steel number	C max.	Si max.	Mn	P max.	S max.	Al_{total} min.	N max.	Cr max.	Cu max.	Mo max.	Nb max.	Ni max.	Ti max.	V max.	Nb + Ti + V max.
P275NH	1.0487	0,16	0,40	0,80 [b] to 1,50	0,025	0,010	0,020 [c,d]	0,012	0,30 [e]	0,30 [e]	0,08 [e]	0,05	0,50	0,03	0,05	0,05
P275NL1	1.0488					0,008										
P275NL2	1.1104				0,020	0,005										
P355N	1.0562	0,18	0,50	1,10 to 1,70	0,025	0,010	0,020 [c,d]	0,012	0,30 [e]	0,30 [e]	0,08 [e]	0,05	0,50	0,03	0,10	0,12
P355NH	1.0565															
P355NL1	1.0566					0,008										
P355NL2	1.1106				0,020	0,005										
P460NH	1.8935	0,20	0,60	1,10 to 1,70	0,025	0,010	0,020 [c,d]	0,025	0,30	0,70 [f]	0,10	0,05	0,80	0,03	0,20	0,22
P460NL1	1.8915					0,008										
P460NL2	1.8918				0,020	0,005										

[a] Elements not listed in this table shall not be intentionally added to the steel without the agreement of the purchaser except for finishing the cast. All appropriate measures shall be taken to prevent the addition from scrap or other materials used in steelmaking of these elements which may adversely affect the mechanical properties and usability.

[b] For product thicknesses < 6 mm, a minimum Mn content of 0,60 % is permitted.

[c] The Al_{total} content may fall short this minimum if niobium, titanium or vanadium are additionally used for nitrogen binding.

[d] If only aluminium is used for nitrogen binding, a ratio $\frac{Al}{N} \geq 2$ shall apply.

[e] The sum of the percentages by mass of the three elements chromium, copper and molybdenum shall not exceed 0,45 %.

[f] If the percentage by mass of copper exceeds 0,30 %, the percentage by mass of nickel shall be at least half the percentage by mass of copper.