SLOVENSKI STANDARD

SIST EN 10028-4:2003

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Nadomeġļ a:

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Ploġļ ati jekleni izdelki za tlaļ ne posode ï 4. del: Jekla, legirana z nikljem, s specificiranimi lastnostmi pri nizkih temperaturah

Flat products made of steels for pressure purposes - Part 4: Nickel alloy steels with specified low temperature properties

Flacherzeugnisse aus Druckbehälterstählen - Teil 4: Nickellegierte kaltzähe Stähle

Produits plats en aciers pour appareils à pression - Partie 4: Aciers alliés au nickel avec caractéristiques spécifiées a basse température

Ta slovenski standard je istoveten z: **EN 10028-4:2003**

ICS:

77.140.30

77.140.50

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EUROPEAN STANDARD

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EN 10028-4

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Supersedes EN 10028-4:1994

English version

Flat products made of steels for pressure purposes - Part 4: Nickel alloy steels with specified low temperature properties

Produits plats en aciers pour appareils à pression - Partie 4: Aciers alliés au nickel avec caractéristiques spécifiées à basse température

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This European Standard was approved by CEN on 20 February 2003.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Contents

Foreword

This document (EN 10028-4:2003) 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 2003, and conflicting national standards shall be withdrawn at the latest by December 2003.

This document supersedes EN 10028-4:1994.

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(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

EN 10028 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.

Annex A is for information only.

This document includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies requirements for flat products for pressure equipment made of nickel alloy steels as specified in Table 1.

The requirements and definitions of EN 10028-1 also apply.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 10028-1:2000 + A1:2002, *Flat products made of steels for pressure purposes – Part 1: General requirements.*

EN 10204, *Metallic products – Types of inspection documents.*

3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 10028-1 apply.

4 Dimensions and tolerances on dimensions

See EN 10028-1.

5 Calculation of mass

See EN 10028-1.

6 Classification and designation

6.1 Classification

In accordance with EN 10020, all steel grades covered by this European Standard are alloy special steels.

6.2 Designation

See EN 10028-1.

7 Information to be supplied by the purchaser

7.1 Mandatory information

See EN 10028-1.

7.2 Options

A number of options are specified in this standard and listed below. Additionally the relevant options of EN 10028-1 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).

a) delivery condition other than that specified in Table 3 (see 8.2.2);

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

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

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

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 15NiMn6 and the number 1.6228 as specified in EN 10028-4, to be delivered with inspection document 3.1.B as specified in EN 10204.

10 plates – 50 x 2000 x 10 000 – EN 10028-4 15NiMn6 – Inspection document 3.1.B

or

10 plates – 50 x 2000 x 10 000 – EN 10028-4 1.6228 – Inspection document 3.1.B.

8 Requirements

8.1 Steelmaking process

See EN 10028-1.

8.2 Delivery condition

8.2.1 The delivery condition shall be noted in the inspection document.

8.2.2 •• Unless otherwise agreed at the time of enquiry and order, the products covered by this standard shall be supplied in the usual delivery conditions specified in Table 3.

8.2.3 •• If so agreed at the time of enquiry and order, the products may be supplied in the untreated condition.

In these cases, the specified tests shall be carried out on test pieces in the usual delivery condition as given in Table 3.

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.

8.3 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.

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.	Mo max.	Nb max.	Ni	V max.
11MnNi5-3	1.6212	0,14	0,50	0,70 to 1,50	0,025	0,015	0,020	-	0,05	0,30 [b] to 0,80	0,05
13MnNi6-3	1.6217	0,16	0,50	0,85 to 1,70	0,025	0,015	0,020	-	0,05	0,30 [b] to 0,85	0,05
15NiMn6	1.6228	0,18	0,35	0,80 to 1,50	0,025	0,015	-	-	-	1,30 to 1,70	0,05
12Ni14	1.5637	0,15	0,35	0,30 to 0,80	0,020	0,010	-	-	-	3,25 to 3,75	0,05
X12Ni5	1.5680	0,15	0,35	0,30 to 0,80	0,020	0,010	-	-	-	4,75 to 5,25	0,05
X8Ni9	1.5662	0,10	0,35	0,30 to 0,80	0,020	0,010	-	0,10	-	8,50 to 10,00	0,05
X7Ni9	1.5663	0,10	0,35	0,30 to 0,80	0,015	0,005	-	0,10	-	8,50 to 10,00	0,01

[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. The content of Cr + Cu + Mo shall not exceed 0,50 %.

[b] For product thicknesses ≤ 40 mm, a minimum nickel content of 0,15 % is permitted.

Table 2 — Permissible product analysis tolerances on the limiting values given in Table 1 for the cast analysis

Element	Specified value in the cast analysis according to Table 1 % by mass	Permissible deviation[a] of the product analysis % by mass
C	≤ 0,18	+ 0,02
Si	≤ 0,50	+ 0,05
Mn	≤ 1,00	± 0,05
	> 1,00 to ≤ 1,70	± 0,10
P	≤ 0,015	+ 0,003
	> 0,015 to ≤ 0,025	+ 0,005
S	≤ 0,015	+ 0,003
Al	≥ 0,020	- 0,005
Mo	≤ 0,10	+ 0,03
Nb	≤ 0,05	+ 0,01
Ni	≤ 0,85	± 0,05
	> 0,85 to ≤ 3,75	± 0,07
	> 3,75 to ≤ 10,00	± 0,10
V	≤ 0,05	+ 0,01

[a] If several product analyses are carried out on one cast, and the contents of an individual element determined lie outside the permission range of the chemical composition specified for the cast analysis, then it is only allowed to exceed the permissible maximum value or fall short of the permissible minimum value, but not both for one cast.

8.4 Mechanical properties

The values given in Tables 3 and 4 (see also EN 10028-1 and clause 10) shall apply.

Table 3 — Mechanical properties at room temperature

Steel grade		Usual delivery condition [a,b] (Heat treatment symbol)	Product thickness t mm	Yield strength R_{eH} MPa min.	Tensile strength R_m MPa	Elongation after fracture A % min.
Steel name	Steel number					
11MnNi5-3	1.6212	+N (+NT)	≤ 30	285	420 to 530	24
			30 < t ≤ 50	275		
			50 < t ≤ 80	265		
13MnNi6-3	1.6217	+N (+NT)	≤ 30	355	490 to 610	22
			30 < t ≤ 50	345		
			50 < t ≤ 80	335		
15NiMn6	1.6228	+N or +NT or +QT	≤ 30	355	490 to 640	22
			30 < t ≤ 50	345		
			50 < t ≤ 80	335		
12Ni14	1.5637	+N or +NT or +QT	≤ 30	355	490 to 640	22
			30 < t ≤ 50	345		
			50 < t ≤ 80	335		
X12Ni5	1.5680	+N or +NT or +QT	≤ 30	390	530 to 710	20
			30 < t ≤ 50	380		
X8Ni9 +NT640 [a]	1.5662 +NT640 [a]	+N plus +NT	≤ 30	490	640 to 840	18
			30 < t ≤ 50	480		
X8Ni9 +QT640[a]	1.5662 +QT640[a]	+QT	≤ 30	490		
			30 < t ≤ 50	480		
X8Ni9 +QT680 [a]	1.5662 +QT680 [a]	+QT [c]	≤ 30	585	680 to 820	18
			30 < t ≤ 50	575		
X7Ni9	1.5663	+QT[c]	≤ 30	585	680 to 820	18
			30 < t ≤ 50	575		

a +N: normalized; +NT: normalized and tempered; +QT: quenched and tempered; +NT640/+QT640/+QT680: Heat treatment variant with minimum tensile strength of 640 MPa or 680 MPa.

b For temperatures and cooling conditions, see Table A.1.

c For product thickness < 15 mm, delivery conditions +N plus +NT are also applicable.