

SLOVENSKI STANDARD**SIST EN 12517-1:2006****01-julij-2006****BUXca Yý U.****SIST EN 12517:1999****SIST EN 12517:1999/A1:2003****SIST EN 12517:1999/A1:2004/AC:2004****SIST EN 12517:1999/A2:2004**

Neporušitveno preskušanje zvarnih spojev - 1. del: Ocenjevanje zvarnih spojev na jeklu, niklju, titanu in njihovih zlitinah z radiografijo - Stopnje sprejemljivosti

Non-destructive testing of welds - Part 1: Evaluation of welded joints in steel, nickel, titanium and their alloys by radiography - Acceptance levels

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Zerstörungsfreie Prüfung von Schweißverbindungen - Teil 1: Bewertung von Schweißverbindungen in Stahl, Nickel, Titan und ihren Legierungen mit Durchstrahlung - Zulässigkeitsgrenzen

Essais non destructifs des assemblages soudés - Partie 1: Évaluation par radiographie des assemblages soudés en acier, nickel, titane et leurs alliages - Niveaux d'acceptation

Ta slovenski standard je istoveten z: EN 12517-1:2006

ICS:

25.160.40

SIST EN 12517-1:2006**en**

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English Version

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This European Standard was approved by CEN on 6 February 2006.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, 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 12517-1:2006) has been prepared by Technical Committee CEN/TC 121 "Welding", 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 September 2006, and conflicting national standards shall be withdrawn at the latest by September 2006.

This document supersedes EN 12517:1998.

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).

EN 12517 comprises a series of European Standards for industrial radiographic films which is made up of the following:

EN 12517-1 Non-destructive testing of welds – Part 1: Evaluation of welded joints in steel, nickel, titanium and their alloys by radiography – Acceptance levels

EN 12517-2 Non-destructive testing of welds – Part 2: Evaluation of welded joints in aluminium and its alloys by radiography – Acceptance levels

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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.

1 Scope

This document specifies acceptance levels for indications from imperfections in butt welds of steel, nickel, titanium and their alloys detected by radiographic testing. If agreed, the acceptance levels may be applied to other types of welds or materials.

The acceptance levels may be related to welding standards, application standards, specifications or codes. This European Standard assumes that the radiographic testing has been carried out in accordance with EN 1435.

When assessing whether a weld meets the requirements specified for a weld quality level, the sizes of imperfections permitted by standards are compared with the dimensions of indications revealed by a radiograph made of the weld.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1435, *Non-destructive examination of welds — Radiographic examination of welded joints*

EN ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817:2003)*

EN ISO 6520-1, *Welding and allied processes — Classification of geometric imperfections in metallic materials — Part 1: Fusion welding (ISO 6520-1:1998)*

3 Radiographic technique

Depending on the weld quality level, radiographic technique A or B in accordance with EN 1435 is used as shown in Table 1.

Table 1 – Radiographic testing

Quality levels in accordance with EN ISO 5817	Testing techniques and classes in accordance with EN 1435	Acceptance levels in accordance with EN 12517
B	B	1
C	B ^a	2
D	A	3

^a However, the minimum number of exposure for circumferential weld testing may correspond to the requirements of class A of EN 1435.

4 General

Welded joints should be visually tested and evaluated in accordance with EN 970 before radiographic testing.

The acceptance levels in this European Standard are basically valid for evaluation of imperfections which cannot be detected and evaluated by visual testing. Surface imperfections (such as undercut and excessive penetration, surface damage, weld spatter etc.) which, due to object geometry, cannot be evaluated, but where the interpreter suspects the EN ISO 5817 quality levels are not fulfilled, shall be subject to more specific testing.

When quantification of undercut and/or excessive penetration by radiographic testing is required, specific procedures using test exposures may be applied in order to establish a basis for approximate quantification in accordance with the requirements of EN ISO 5817. This shall be specified.

5 Acceptance levels

The acceptance levels for indications are shown in Table 2 and Table 3. The types of imperfections are selected from EN ISO 5817 and defined in EN ISO 6520-1.

The symbols used in Table 2 and Table 3 are the following:

- l length of indication, in millimetres;
- s nominal butt weld thickness, in millimetres;
- t material thickness, in millimetres;
- L any 100 mm testing length, in millimetres;
- w_p width of the weld, or cross surface imperfection, in millimetres;
- h width of indication, the width or height of surface imperfection, in millimetres;
- d diameter of pore; in millimetres;
- b width of excess penetration of weld, in millimetres;
- A sum of projected areas of indications related to $L \times w_p$, in %;
- Σl summary length of imperfections within L , in millimetres.

Indications shall not be divided into different ranges L .

Table 2 – Acceptance levels for internal indications in butt welds

No.	Type of internal imperfections in accordance with EN ISO 6520-1	Acceptance level 3 ^a	Acceptance level 2 ^a	Acceptance level 1
1	Cracks (100)	Not permitted	Not permitted	Not permitted
2a	Porosity and gas pores (2012, 2011) Single layer	$A \leq 2,5 \%$ $d \leq 0,4s$, max. 5 mm $L = 100$ mm	$A \leq 1,5 \%$ $d \leq 0,3s$, max. 4 mm $L = 100$ mm	$A \leq 1 \%$ $d \leq 0,2s$, max. 3 mm $L = 100$ mm
2b	Porosity and gas pores (2012, 2011) Multilayer	$A \leq 5 \%$ $d \leq 0,4s$, max. 5 mm $L = 100$ mm	$A \leq 3 \%$ $d \leq 0,3s$, max. 4 mm $L = 100$ mm	$A \leq 2 \%$ $d \leq 0,2s$, max. 3 mm $L = 100$ mm
3 ^b	Clustered (localized) porosity (2013)	$A \leq 16 \%$ $d \leq 0,4s$, max. 4 mm $L = 100$ mm	$A \leq 8 \%$ $d \leq 0,3s$, max. 3 mm $L = 100$ mm	$A \leq 4 \%$ $d \leq 0,2s$, max. 2 mm $L = 100$ mm
4a ^c	Linear porosity (2014) Single layer	$A \leq 8 \%$ $d \leq 0,4s$, max. 4 mm $L = 100$ mm	$A \leq 4 \%$ $d \leq 0,3s$, max. 3 mm $L = 100$ mm	$A \leq 2 \%$ $d \leq 0,2s$, max. 2 mm $L = 100$ mm
4b ^c	Linear porosity (2014) Multilayer	$A \leq 16 \%$ $d \leq 0,4s$, max. 4 mm $L = 100$ mm	$A \leq 8 \%$ $d \leq 0,3s$, max. 3 mm $L = 100$ mm	$A \leq 4 \%$ $d \leq 0,2s$, max. 2 mm $L = 100$ mm
5 ^d	Elongated cavities (2015) and wormholes (2016)	$h < 0,4s$, max. 4 mm $\Sigma l \leq s$, max. 75 mm, $L=100$ mm	$h < 0,3s$, max. 3 mm $\Sigma l \leq s$, max. 50 mm, $L=100$ mm	$h < 0,2s$, max. 2 mm $\Sigma l \leq s$, max. 25 mm, $L=100$ mm
6 ^e	Shrinkage cavity (202) (other than crater pipes)	$h < 0,4s$, max. 4 mm $l \leq 25$ mm	Not permitted	Not permitted
7	Crater pipe (2024)	$h \leq 0,2t$, max. 2 mm $l \leq 0,2t$, max. 2 mm	Not permitted	Not permitted
8 ^d	Slag inclusions (301), flux inclusions (302) and oxide inclusions (303)	$h < 0,4s$, max. 4 mm $\Sigma l \leq s$, max. 75 mm $L = 100$ mm	$h < 0,3s$, max. 3 mm $\Sigma l \leq s$, max. 50 mm $L = 100$ mm	$h < 0,2s$, max. 2 mm $\Sigma l \leq s$, max. 25 mm $L = 100$ mm
9	Metallic inclusions (304) (other than copper)	$l \leq 0,4s$, max. 4 mm	$l \leq 0,3s$, max. 3 mm	$l \leq 0,2s$, max. 2 mm

(to be continued)

Table 2 (concluded)

No.	Type of internal imperfections in accordance with EN ISO 6520-1	Acceptance level 3 ^a	Acceptance level 2 ^a	Acceptance level 1
10	Copper inclusions (3042)	Not permitted	Not permitted	Not permitted
11 ^e	Lack of fusion (401)	Permitted, but only intermittently and not breaking the surface $\Sigma l \leq 25 \text{ mm}$, $L = 100 \text{ mm}$	Not permitted	Not permitted
12 ^e	Lack of penetration (402)	$\Sigma l \leq 25 \text{ mm}$, $L = 100 \text{ mm}$	Not permitted	Not permitted

^a Acceptance levels 3 and 2 may be specified with suffix X, which denotes that all indications over 25 mm are unacceptable.

^b See Annex C, Figure C.1 and Figure C.2 (normative)

^c See Annex C, Figure C.3 and Figure C.4 (normative)

^d See Annex C, Figure C.5 and Figure C.6 (normative)

^e If the length of the weld is below 100 mm, then the maximum length of indications shall not exceed 25% of that weld.

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