



# SLOVENSKI STANDARD

## SIST EN 12517-2:2008

01-november-2008

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### Neporušitvene preiskave zvarnih spojev - 2. del: Ocenjevanje zvarnih spojev na aluminiju in njegovih zlitinah pri radiografiji - Stopnje sprejemljivosti

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

Zerstörungsfreie Prüfung von Schweißverbindungen - Teil 2: Bewertung von Schweißverbindungen in Aluminium und seinen Legierungen mit Durchstrahlung - Zulässigkeitsgrenzen

(standards.iteh.ai)

Essais non destructifs des assemblages soudés - Partie 2 : Evaluation par radiographie des assemblages soudés en aluminium et ses alliages - Niveaux d'acceptation

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**Ta slovenski standard je istoveten z: EN 12517-2:2008**

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#### **ICS:**

25.160.40	Varjeni spoji in vari	Welded joints
77.120.10	Aluminij in aluminijeve zlitine	Aluminium and aluminium alloys

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 12517-2**

August 2008

ICS 25.160.40

English Version

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

Essais non destructifs des assemblages soudés - Partie 2:  
Évaluation par radiographie des assemblages soudés en  
aluminium et ses alliages - Niveaux d'acceptation

Zerstörungsfreie Prüfung von Schweißverbindungen - Teil  
2: Bewertung von Schweißverbindungen in Aluminium und  
seinen Legierungen mit Durchstrahlung -  
Zulässigkeitsgrenzen

This European Standard was approved by CEN on 18 July 2008.

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 12517-2:2008) 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 February 2009, and conflicting national standards shall be withdrawn at the latest by February 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.

EN 12517 *Non-destructive testing of welds* comprises a series of European Standards for acceptance levels for radiographic testing which is made up of the following parts:

- *Part 1: Evaluation of welded joints in steel, nickel, titanium and their alloys by radiography — Acceptance levels*
- *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, 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.

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**EN 12517-2:2008 (E)****1 Scope**

This European Standard specifies acceptance levels for indications from imperfections in aluminium butt welds 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 document. 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 10042, *Welding — Arc-welded joints in aluminium and its alloys — Quality levels for imperfections (ISO 10042:2005)*

EN ISO 6520-1, *Welding and allied processes — Classification of geometric imperfections in metallic materials — Part 1: Fusion welding (ISO 6520-1:2007)*

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**3 Radiographic technique**

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

**Table 1 — Radiographic testing**

Quality levels in accordance with EN ISO 10042	Testing techniques and classes in accordance with EN 1435	Acceptance levels in accordance with EN 12517-2
B	B	1
C	B <sup>a</sup>	2
D	A	3

<sup>a</sup> 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 in accordance with EN 970 and evaluated 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 (Table 2). Surface imperfections (Table 3; 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 10042 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 10042. This shall be specified.

## 5 Acceptance levels

The acceptance levels for indications are shown in Tables 2 and 3. The types of imperfections are selected from EN ISO 10042 and defined in EN ISO 6520-1.

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

- A* sum of projected areas of indications related to  $L \times w_p$  in %;
- b* width of excess penetration of weld, in millimetres;
- d* diameter of pore, in millimetres;
- d<sub>A</sub>* diameter of area surrounding a cluster, in millimetres;
- h* width of indication, the width or height of surface or cross surface imperfection, in millimetres;
- l* length of indication, in millimetres;
- L* any 100 mm testing length, in millimetres;
- s* nominal butt weld thickness, in millimetres;
- t* material thickness, in millimetres;
- w<sub>p</sub>* width of the weld in millimetres;
- $\Sigma l$  summary length of imperfections within *L*.

Any two adjacent imperfections separated by a distance smaller than the major dimension of the smaller imperfection shall be considered as a single imperfection.

Indications shall not be divided into different ranges *L*.

Table 2 — Acceptance levels for indications in butt welds

No	Type of internal imperfections in accordance with EN ISO 6520-1	Acceptance level 3 <sup>a</sup>	Acceptance level 2 <sup>a</sup>	Acceptance level 1
1	Cracks (100)	Not permitted	Not permitted	Not permitted
2a	Gas pores (2011)	$d \leq 0,4s$ , max. 6 mm	$d \leq 0,3s$ , max. 5 mm	$d \leq 0,2s$ , max. 4 mm
2b	Porosity (2012) material thickness 0,5 mm to 3 mm	$A \leq 6\%$ $L = 100$ mm	$A \leq 2\%$ $L = 100$ mm	$A \leq 1\%$ $L = 100$ mm
2c	Porosity (2012) material thickness > 3 mm to 12 mm	$A \leq 10\%$ $L = 100$ mm	$A \leq 4\%$ $L = 100$ mm	$A \leq 2\%$ $L = 100$ mm
2d	Porosity (2012) material thickness > 12 mm to 30 mm	$A \leq 15\%$ $L = 100$ mm	$A \leq 6\%$ $L = 100$ mm	$A \leq 3\%$ $L = 100$ mm
2e	Porosity (2012) material thickness > 30 mm	$A \leq 20\%$ $L = 100$ mm	$A \leq 8\%$ $L = 100$ mm	$A \leq 4\%$ $L = 100$ mm
3 <sup>b</sup>	Clustered (localized) porosity (2013)	$d_A \leq 25$ mm or $d_{A,max} \leq w_p$	$d_A \leq 20$ mm or $d_{A,max} \leq w_p$	$d_A \leq 15$ mm or $d_{A,max} \leq w_p/2$
4 <sup>c</sup>	Linear porosity (2014)	$l \leq 25$ mm $L = 100$ mm	Not permitted	Not permitted
5 <sup>d</sup>	Elongated cavities (2015) and wormholes (2016)	$l \leq 0,4s$ , max. 6 mm	$l < 0,3s$ , max. 4 mm	$l < 0,2s$ , max. 3 mm
6	Oxide inclusion (303)	$l < s$ , max. 10 mm	$l < 0,5s$ , max. 5 mm	$l < 0,2s$ , max. 3 mm
7	Tungsten inclusions (3041)	$l < 0,4s$ , max. 6 mm	$l < 0,3s$ , max. 4 mm	$l < 0,2s$ , max. 3 mm
8 <sup>e</sup>	Lack of fusion (401)	Permitted, but only intermittently and not breaking the surface  $l \leq 25$ mm, $L = 100$ mm	Not permitted	Not permitted
9 <sup>e</sup>	Lack of penetration (402)	$l < 25$ mm, $L = 100$ mm	Permitted provided welded from both sides and not breaking the surface  $l \leq 25$ mm, $L = 100$ mm	Not permitted

<sup>a</sup> Acceptance levels 3 and 2 may be specified with suffix *X* which denotes that all indications over 25 mm are unacceptable.

<sup>b</sup> See Annex C, Figure C.1 and Figure C.2 (normative).

<sup>c</sup> See Annex C, Figure C.3 and Figure C.4 (normative).

<sup>d</sup> See Annex C, Figure C.5 and Figure C.6 (normative).

<sup>e</sup> If the length of the weld is below 100 mm, the maximum length of indications shall not exceed 25 % of that weld.



**Table 3 — Surface imperfections: The acceptance levels are those defined for visual testing. These imperfections are normally evaluated by visual testing**

No	Type of surface imperfections in accordance with EN ISO 6520-1	Acceptance level 3 <sup>a</sup>	Acceptance level 2 <sup>a</sup>	Acceptance level 1
10	Crater cracks (104)	$l \leq 0,4s$	Not permitted	Not permitted
11a	Continuous undercut (5011)	Smooth transition is required $h \leq 0,2t$ , max. 1 mm	Smooth transition is required $h \leq 0,1t$ , max. 0,5 mm	Not permitted
11b	Intermittent undercut (5012)	Smooth transition is required $h \leq 0,2t$ , max. 1,5 mm $l \leq 25$ mm	Smooth transition is required $h \leq 0,1t$ , max. 1 mm $l \leq 25$ mm	Smooth transition is required $h \leq 0,1t$ , max. 0,5 mm $l \leq 25$ mm
12	Excess penetration (504)	$h \leq 5$ mm	$h \leq 4$ mm	$h \leq 3$ mm
13	Root concavity (515)	$l \leq 25$ mm $h \leq 0,2t$ , max. 1,5 mm	$l \leq 25$ mm $h \leq 0,1t$ , max. 1 mm	$l \leq 25$ mm $h \leq 0,05t$ , max. 0,5 mm
14	Shrinkage groove (5013)	$l \leq 25$ mm $h \leq 0,2t$ , max. 1,5 mm	$l \leq 25$ mm $h \leq 0,1t$ , max. 1 mm	$l \leq 25$ mm $h \leq 0,05t$ , max. 0,5 mm

<sup>a</sup> Acceptance levels 3 and 2 may be specified with suffix X which denotes that all indications over 25 mm are unacceptable.