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Non-destructive testing of welds – Acceptance levels for radiographic testing – Part 1: Steel, nickel, titanium and their alloys (ISO 10675-1:2016)

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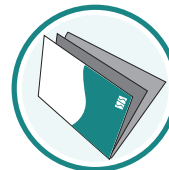
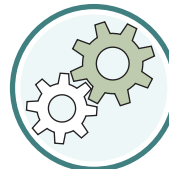
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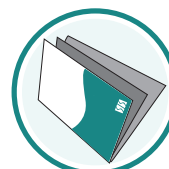
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Europastandarden EN ISO 10675-1:2016 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 10675-1:2016.

Denna standard ersätter SS-EN ISO 10675-1:2013, utgåva 1.

The European Standard EN ISO 10675-1:2016 has the status of a Swedish Standard. This document contains the official English version of EN ISO 10675-1:2016.

This standard supersedes the Swedish Standard SS-EN ISO 10675-1:2013, edition 1.

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EUROPEAN STANDARD

EN ISO 10675-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2016

ICS 25.160.40

Supersedes EN ISO 10675-1:2013

English Version

Non-destructive testing of welds - Acceptance levels for radiographic testing - Part 1: Steel, nickel, titanium and their alloys (ISO 10675-1:2016)

Essais non destructifs des assemblages soudés -
Niveaux d'acceptation pour évaluation par
radiographie - Partie 1: Acier, nickel, titane et leurs
alliages (ISO 10675-1:2016)

Zerstörungsfreie Prüfung von Schweißverbindungen -
Zulässigkeitsgrenzen für die Durchstrahlungsprüfung -
Teil 1: Stahl, Nickel, Titan und deren Legierungen (ISO
10675-1:2016)

This European Standard was approved by CEN on 14 December 2016.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN ISO 10675-1:2016) has been prepared by Technical Committee ISO/TC 44 “Welding and allied processes” in collaboration with Technical Committee CEN/TC 121 “Welding and allied processes” 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 June 2017, and conflicting national standards shall be withdrawn at the latest by June 2017.

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 ISO 10675-1:2013.

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

Endorsement notice

The text of ISO 10675-1:2016 has been approved by CEN as EN ISO 10675-1:2016 without any modification.

Non-destructive testing of welds — Acceptance levels for radiographic testing —

Part 1: Steel, nickel, titanium and their alloys

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 can be applied to other types of welds or materials.

The acceptance levels can be related to welding standards, application standards, specifications or codes. This document assumes that the radiographic testing has been carried out in accordance with ISO 17636-1 and ISO 17636-2.

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 documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

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

ISO 17636-1, *Non-destructive testing of welds — Radiographic testing — Part 1: X- and gamma-ray techniques with film*

ISO 17636-2, *Non-destructive testing of welds — Radiographic testing — Part 2: X- and gamma-ray techniques with digital detectors*

ISO 17637, *Non-destructive testing of welds — Visual testing of fusion-welded joints*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at <http://www.electropedia.org/>

— ISO Online browsing platform: available at <http://www.iso.org/obp>

SS-EN ISO 10675-1:2017 (E)**4 Radiographic technique**

Welded joints shall be visually tested and evaluated in accordance with ISO 17637 before radiographic testing.

Depending on the weld quality level, radiographic technique A or B in accordance with ISO 17636-1 or ISO 17636-2 shall be used, as shown in [Table 1](#).

Table 1 — Radiographic testing

Quality levels in accordance with ISO 5817	Testing techniques and classes in accordance with ISO 17636-1 and ISO 17636-2	Acceptance levels in accordance with this document
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 ISO 17636-1 or ISO 17636-2.

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 ISO 5817. This shall be specified in the adopted specification/procedure.

5 Acceptance levels

The acceptance levels of this document 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 ISO 5817 quality levels are not fulfilled, shall be subject to more specific testing.

The acceptance levels for indications are shown in [Table 2](#) and [Table 3](#). The types of imperfections are selected from ISO 5817 and defined in 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 base material thickness, in millimetres;
- L any 100 mm testing length;
- w_p width of the weld, in millimetres;
- h width of indication, the width or height of surface imperfection, in millimetres;
- d diameter of pore, in millimetres;
- d_A diameter of pore envelope area;

- b width of excess penetration of weld, in millimetres;
- A sum of projected areas of indications related to each $L \times w_p$, in % (see Annex B);
- 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 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
3b	Clustered (localized) porosity (2013)	$d_A \leq w_p$, max. 25 mm $L = 100$ mm	$d_A \leq w_p$, max. 20 mm $L = 100$ mm	$d_A \leq w_p/2$, max. 15 mm $L = 100$ mm
4	Linear porosity (2014)	$l \leq s$, max. 75 mm $d \leq 0,4s$, max. 4 mm $L = 100$ mm	$l \leq s$, max. 50 mm $d \leq 0,3s$, max. 3 mm $L = 100$ mm	$l \leq s$, max. 25 mm $d \leq 0,2s$, 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
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 $\Sigma l \leq 25$ mm, $L = 100$ mm	Not permitted	Not permitted
12 ^e	Lack of penetration (402)	$\Sigma l \leq 25$ mm, $L = 100$ 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 Figure C.1 and Figure C.2 (normative).

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

^d See 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.