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**Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections (ISO 5817:2014)**

## EESTI STANDARDI EESSÕNA

See Eesti standard EVS-EN ISO 5817:2014 sisaldab Euroopa standardi EN ISO 5817:2014 ingliskeelset teksti.

Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.

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## NATIONAL FOREWORD

This Estonian standard EVS-EN ISO 5817:2014 consists of the English text of the European standard EN ISO 5817:2014.

This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.

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Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

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English Version

Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections  
(ISO 5817:2014)

Soudage - Assemblages en acier, nickel, titane et leurs alliages soudés par fusion (soudage par faisceau exclu) - Niveaux de qualité par rapport aux défauts (ISO 5817:2014)

Schweißen - Schmelzschweißverbindungen an Stahl, Nickel, Titan und deren Legierungen (ohne Strahlschweißen) - Bewertungsgruppen von Unregelmäßigkeiten (ISO 5817:2014)

This European Standard was approved by CEN on 4 January 2014.

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

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## Foreword

This document (EN ISO 5817:2014) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with 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of an identical text or by endorsement, at the latest by August 2014, and conflicting national standards shall be withdrawn at the latest by August 2014.

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 5817:2007.

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### Endorsement notice

The text of ISO 5817:2014 has been approved by CEN as EN ISO 5817:2014 without any modification.

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## Introduction

This International Standard should be used as a reference in the drafting of application codes and/or other application standards. It contains a simplified selection of fusion weld imperfections based on the designations given in ISO 6520-1.

Some of the imperfections described in ISO 6520-1 have been used directly and some have been grouped together. The basic numerical referencing system from ISO 6520-1 has been used.

The purpose of this International Standard is to define dimensions of typical imperfections which might be expected in normal fabrication. It may be used within a quality system for the production of welded joints. It provides three sets of dimensional values from which a selection can be made for a particular application. The quality level necessary in each case should be defined by the application standard or the responsible designer in conjunction with the manufacturer, user and/or other parties concerned. The quality level shall be prescribed before the start of production, preferably at the enquiry or order stage. For special purposes, additional details may be prescribed.

The quality levels given in this International Standard provide basic reference data and are not specifically related to any particular application. They refer to types of welded joint in fabrication and not to the complete product or component itself. It is possible, therefore, that different quality levels are applied to individual welded joints in the same product or component.

It would normally be expected that for a particular welded joint the dimensional limits for imperfections could all be covered by specifying one quality level. In some cases, it may be necessary to specify different quality levels for different imperfections in the same welded joint.

The choice of quality level for any application should take account of design considerations, subsequent processing (e.g. surfacing), mode of stressing (e.g. static, dynamic), service conditions (e.g. temperature, environment) and consequences of failure. Economic factors are also important and should include not only the cost of welding but also of inspection, testing and repair.

Although this International Standard includes types of imperfection relevant to the fusion welding processes listed in [Clause 1](#), only those which are applicable to the process and application in question need to be considered.

Imperfections are quoted in terms of their actual dimensions, and their detection and evaluation may require the use of one or more methods of non-destructive testing. The detection and sizing of imperfections is dependent on the inspection methods and the extent of testing specified in the application standard or contract.

This International Standard does not address the methods used for the detection of imperfections. However, ISO 17635 contains a correlation between the quality level and acceptance level for different NDT methods.

This International Standard is directly applicable to visual testing of welds and does not include details of recommended methods of detection or sizing by non-destructive means. It should be considered that there are difficulties in using these limits to establish appropriate criteria applicable to non-destructive testing methods such as ultrasonic, radiographic, eddy current, penetrant, magnetic particle testing and may need to be supplemented by requirements for inspection, examining and testing.

The values given for imperfections are for welds produced using normal welding practice. Requirements for smaller (more stringent) values as stated in quality level B may include additional manufacturing processes, e.g. grinding, TIG dressing.

[Annex C](#) gives additional guidance for welds subject to fatigue.

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

## 1 Scope

This International Standard provides quality levels of imperfections in fusion-welded joints (except for beam welding) in all types of steel, nickel, titanium and their alloys. It applies to material thickness  $\geq 0,5$  mm. It covers fully penetrated butt welds and all fillet welds. Its principles can also be applied to partial-penetration butt welds.

(Quality levels for beam welded joints in steel are presented in ISO 13919-1.)

Three quality levels are given in order to permit application to a wide range of welded fabrication. They are designated by symbols B, C and D. Quality level B corresponds to the highest requirement on the finished weld.

Several types of loads are considered, e.g. static load, thermal load, corrosion load, pressure load. Additional guidance on fatigue loads is given in [Annex C](#).

The quality levels refer to production and good workmanship.

This International Standard is applicable to

- a) non-alloy and alloy steels,
- b) nickel and nickel alloys,
- c) titanium and titanium alloys,
- d) manual, mechanized and automatic welding,
- e) all welding positions,
- f) all types of welds, e.g. butt welds, fillet welds and branch connections, and
- g) the following welding processes and their sub-processes, as defined in ISO 4063:
  - 11 metal-arc welding without gas protection;
  - 12 submerged-arc welding;
  - 13 gas-shielded metal-arc welding;
  - 14 gas-shielded arc welding with non-consumable tungsten electrodes;
  - 15 plasma arc welding;
  - 31 oxy-fuel gas welding (for steel only).

Metallurgical aspects, e.g. grain size, hardness, are not covered by this International Standard.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1 quality level

description of the quality of a weld on the basis of type, size and amount of selected imperfections

#### 3.2 fitness-for-purpose

ability of a product, process or service to serve a defined purpose under specific conditions

#### 3.3 short imperfections

<weld 100 mm long or longer> imperfections whose total length is not greater than 25 mm in the 100 mm of the weld which contains the greatest number of imperfections

#### 3.4 short imperfections

<weld less than 100 mm long> imperfections whose total length is not greater than 25 % of the length of the weld

#### 3.5 systematic imperfections

imperfections that are repeatedly distributed in the weld over the weld length to be examined, the size of a single imperfection being within the specified limits

#### 3.6 projected area

area where imperfections distributed along the volume of the weld under consideration are imaged two-dimensionally

Note 1 to entry: In contrast to the cross-sectional area, the occurrence of imperfections is dependent on the weld thickness when exposed radiographically (see [Figure 1](#)).

#### 3.7 cross-sectional area

area to be considered after fracture or sectioning

#### 3.8 smooth weld transition

even surface with no irregularities or sharpness at the transition between the weld bead and the parent material

#### 3.9 fatigue class

**FAT<sub>x</sub>**

classification reference to S-N curve, in which x is the stress range in MPa at  $2 \cdot 10^6$  cycles

Note 1 to entry: Fatigue properties are described by S-N-Curves (Stress-Number of cycle- curves).

Note 2 to entry: See [Annex C](#).