

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

The European Standard EN ISO 5817:2003 has the status of a British Standard

ICS 25.160.40

National foreword

This British Standard is the official English language version of EN ISO 5817:2003. It is identical with ISO 5817:2003. It supersedes BS EN 25817:1992 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/-/1, Briefing committee for welding, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

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Summary of pages

This document comprises a front cover, an inside front cover, the EN ISO title page, the EN ISO foreword page, the ISO title page, pages ii to v, a blank page, pages 1 to 26, the Annex ZA page, the Annex ZB page, an inside back cover and a back cover.

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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 5817:2003)

Soudage - Assemblages en acier, nickel, titane et leurs alliages soudés par fusion (soudage par faisceau haute énergie exclu) - Niveaux de qualité par rapport aux défauts (ISO 5817:2003)

Schweißen - Schmelzschweißverbindungen an Stahl, Nickel, Titan und deren Legierungen (ohne Strahlschweißen) - Bewertungsgruppen von Unregelmäßigkeiten (ISO 5817:2003)

This European Standard was approved by CEN on 1 September 2003.

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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.

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Foreword

This document (EN ISO 5817:2003) 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 DS.

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 April 2004, and conflicting national standards shall be withdrawn at the latest by April 2004.

This document supersedes EN 25817:1992.

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 ZB, which is an integral part of this document.

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.

Endorsement notice

The text of ISO 5817:2003 has been approved by CEN as EN ISO 5817:2003 without any modifications.

NOTE Normative references to International Standards are listed in Annex ZA (normative).

INTERNATIONAL STANDARD

EN ISO 5817:2003

**ISO
5817**

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

*Soudage — Assemblages en acier, nickel, titane et leurs alliages
soudés par fusion (soudage par faisceau exclu) — Niveaux de qualité
par rapport aux défauts*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 5817 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Unification of requirements in the field of metal welding*.

This second edition cancels and replaces the first edition (ISO 5817:1992), which has been technically revised.

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 factory-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 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 the types of welded joint in a fabricated structure and not to the complete product or component itself. It is possible, therefore, that different quality levels be 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, test 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.

The need for detecting imperfections is not subject of this International Standard. 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, penetrate, magnetic particle testing and may need to be supplemented by requirements for inspection, examining and testing.

The values for imperfections take into consideration normal welding practice. Higher specifications require additional manufacturing processes, e.g. grinding or welding under stringent laboratory conditions or special welding processes.

Requests for official interpretations of any aspect of this International Standard should be directed to the Secretariat of ISO/TC 44/SC 10 via your national standards body. For a complete listing consult www.iso.org.

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 above 0,5 mm.

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. The quality levels refer to production quality and not to the fitness-for-purpose (see 3.2) of the product manufactured.

This International Standard applies to:

- unalloyed and alloy steels;
- nickel and nickel alloys;
- titanium and titanium alloys;
- manual, mechanized and automatic welding;
- all welding positions;
- all types of welds, e.g. butt welds, fillet welds and branch connections;
- the following welding processes and their defined sub-processes in accordance with ISO 4063:
 - 11 metal-arc welding without gas protection;
 - 12 submerged-arc welding;
 - 13 gas-shielded metal-arc welding;
 - 14 gas-shielded welding with non-consumable 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 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.

ISO 2553:1992, *Welded, brazed and soldered joints — Symbolic representation on drawings*

ISO 4063:1998, *Welding and allied processes — Nomenclature of processes and reference numbers*

ISO 6520-1:1998, *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 and size 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

one or more imperfections of total length not greater than 25 mm in any 100 mm length of the weld or a maximum of 25 % of the weld length for a weld shorter than 100 mm, the range with most imperfections being applicable

3.4 systematic imperfection

imperfections that are distributed at regular distances in the weld over the weld lengths to be examined, the sizes of the single imperfections being within the limits of the imperfections given in Table 1

3.5 projected area

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

In contrast to the surface crack area the occurrence of imperfections is dependent on the weld thickness when exposed radiographically (see Figure 1).

3.6 cross-section area

area to be considered after fracture or sectioning