
Brazing — Imperfections in brazed joints

Brasage fort — Défauts dans les assemblages réalisés par brasage fort

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Foreword

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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 18279 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 12, *Soldering and brazing materials*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read “...this European Standard...” to mean “...this International Standard...”.

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Foreword

This document (EN ISO 18279:2003) has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DS, in collaboration with Technical Committee ISO/TC 44 "Welding and allied processes".

This European Standard EN ISO 18279:2003 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2004 and conflicting national standards shall be withdrawn at the latest by June 2004.

Annexes A and B are informative.

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.

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Introduction

Brazed joints usually contain imperfections of various types, some of which will be detrimental in almost every case but others may be detrimental or harmless, depending entirely on the service requirements of the joint in question. Therefore it will frequently be necessary to classify the imperfections in a brazed joint and then try to assess the significance of their effects on the behaviour of the joint in service. The classification is, relatively, easy and Table 1 describes the imperfections that most commonly occur. The assessment of significance is not easy (see also Annex A).

For welded joints, there has been extensive work carried out for many years on the significance of imperfections in service but such work has not been carried out on brazed joints. Moreover the work on welded joints is only rarely relevant to brazed joints, mainly because of differences in geometry and stressing. Therefore this standard cannot give definitive quality levels for brazed joints. These can only be produced as experience is gained from industrial applications. However, Annex B gives some suggestions for quality levels for general applications, which may be of help where detailed information is not available. It has to be emphasized that the use of quality levels can only be successful if the imperfections that are relevant to the application of the brazed joint are determined.

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1 Scope

This European Standard details a classification of imperfections that can occur in brazing joints. In addition guidance is provided on quality levels and suggested limits for imperfections are detailed.

For requirements not covered by this standard, reference is to be made to other sources, e.g. statutory regulations, codes of practice and technical delivery conditions.

No information is given on how imperfections are to be assessed in individual cases because this depends on the requirements for the particular brazed joint. These imperfections are not always detectable by the use of non-destructive testing alone.

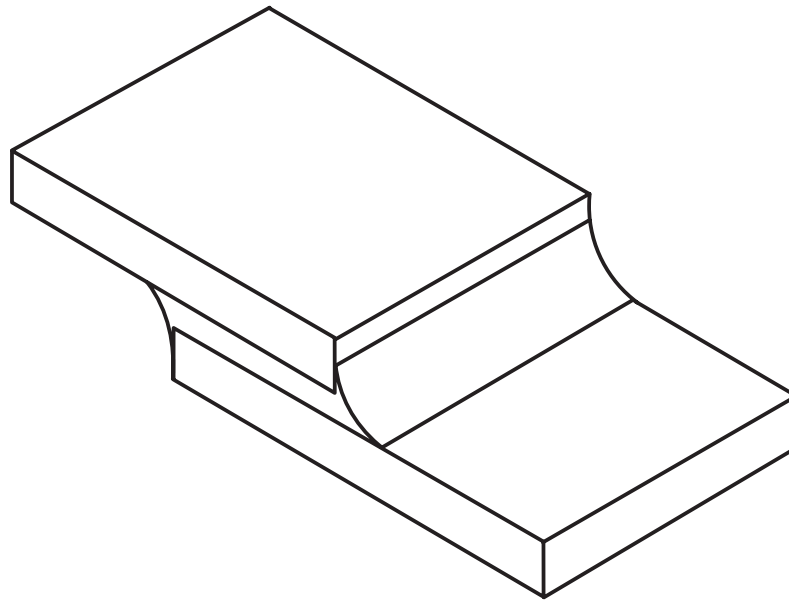
The standard covers only imperfections that can occur in connection with brazing without the effect of any additional service loads. Only the type, shape and position of such imperfections are covered; no indication is given of the conditions of occurrence or causes.

For requirements for brazed joints which are relevant and essential to the particular function of the component, reference should be made to the relevant documentation, e.g. manufacturing documents or procedure sheets.

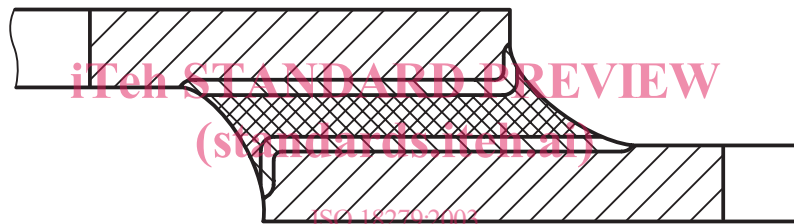
NOTE It is important that these requirements be precisely prescribed and that compliance with them be verifiable. Compliance may be established by testing either the brazed assembly itself or a test piece produced under comparable conditions. The requirements should be established and fully documented before any classification is undertaken.

This European Standard does not lay down requirements for acceptance levels for imperfections since these will differ very markedly, depending on the application, but it does suggest some quality levels which may be of value in the absence of more detailed information.

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a) Simple brazed assembly



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Key



Parent material



Parent material affected by brazing (heat affected zone (HAZ))



Diffusion-transition zone



Braze metal

NOTE Extent of HAZ will vary with materials and brazing process.

b) Section through assembly in a)

Figure 1 — Schematic of brazed assembly

2 Terms and definitions

For the purposes of this European Standard the areas of a brazed assembly are defined as shown schematically in Figure 1. In addition the following term and definition apply.

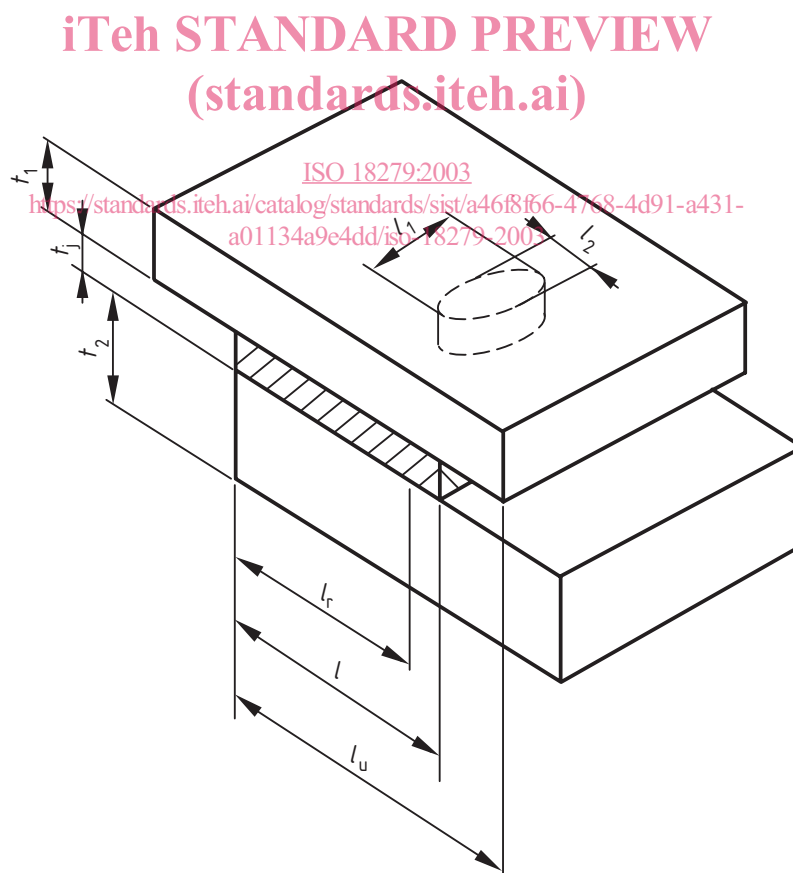
2.1 imperfections

irregularities in the brazed joint, deviations from the intended relative positions of the parts joined by brazing and from the intended shape of the brazed component, where such deviations are dependent on the brazing

3 Symbols

The following symbols are used:

- l length of the brazed overlap;
- l_r required brazed length;
- l_u length of overlap before brazing;
- $l_{1,2}$ dimensions of the brazed imperfection;
- t_j thickness of brazed joint;
- $t_{1,2}$ wall or plate thickness or thicknesses.



NOTE This figure illustrates a planar imperfection.

Figure 2 — Symbols used for dimensions

4 Classification

4.1 General

The imperfections are classified into six groups as follows:

- group I Cracks;
- group II Cavities;
- group III Solid inclusions;
- group IV Bonding imperfections;
- group V Shape and size imperfections;
- group VI Miscellaneous imperfections.

Imperfections are identified by designations.

A further distinction can be made between the external and internal imperfections that may occur in brazed joints.

4.2 External imperfections

External imperfections in brazed joints include:

- underfill;
- cracks;
- surface-breaking porosity;
- incomplete fillet;
- overlap;
- localized melting;
- rough surface of seam;
- flux seepage;
- discoloration;
- spatter;
- residual flux;
- surface erosion of parent material.

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4.3 Internal imperfections

Internal imperfections in brazed joints include:

- cracks;
- filling imperfections;

- solid inclusions;
- gas entrapment;
- flux inclusion;
- lack of fusion;
- excessive alloying of filler material and parent material (sometimes called erosion).

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Table 1 — Classification of imperfections

Designation	Description	Remarks	Drawing
I Cracks			
1A ^a AAA	crack	<p>Limited separation of the material, predominantly two-dimensional extension. A crack may be longitudinal or transverse</p> <p>It can lie in one or more of the following :</p> <ul style="list-style-type: none"> in the braze metal at the interface and including the diffusion zone In the HAZ in the unaffected parent material 	
1A ^a AAB			
1A ^a AAC			
1A ^a AAD			
1A ^a AEE			
^a <ul style="list-style-type: none"> - In the case of an intergranular crack, change this second symbol 'A' to the symbol 'F'. - In the case of a transgranular crack, change this second symbol 'A' to the symbol 'H'. 			