SLOVENSKI STANDARD
oSIST prEN 12797:2017

01-september-2017

Trdo spajkanje - Porušitveno preskušanje trdo spajkanih spojev

Brazing - Destructive tests of brazed joints

Hartlöten - Zerstörende Prüfung von Hartlötverbindungen

Brasage fort - Essais destructifs des assemblages réalisés par brasage fort

Ta slovenski standard je istoveten z: **prEN 12797**

ICS:

25.160.50 Trdo in mehko lotanje Brazing and soldering

oSIST prEN 12797:2017 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 12797

July 2017

ICS 25.160.50

Will supersede EN 12797:2000

English Version

Brazing - Destructive tests of brazed joints

Brasage fort - Essais destructifs des assemblages réalisés par brasage fort

Hartlöten - Zerstörende Prüfung von Hartlötverbindungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 121.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

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

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

Ref. No. prEN 12797:2017 E

Contents

Page

European foreword

This document (prEN 12797:2017) has been prepared by Technical Committee CEN/TC 121 “Welding and allied processes”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 12797:2000.

In comparison with the previous edition, the main changes are:

a) the normative references have been updated;

b) the document has been revised editorially.

1 Scope

This European Standard describes destructive test procedures and test piece types necessary to perform the tests on brazed joints.

Brazed joints are used in a wide variety of assemblies and the design requirements placed upon these joints will also vary widely; there will usually be some level of strength required but this may not be explicitly stated and is frequently of minor importance compared to some other criterion, e.g. hermeticity. It follows that a test which measures strength may be totally irrelevant in assessing a joint for a particular application where strength is a minor consideration. This situation is made more complicated because brazed joints are almost invariably designed to be loaded in shear and the dimensions of the joint affect the shear strength to a much greater extent than they do the tensile strength. The tests described in this standard have been used successfully to give information on specific properties and where such information is needed, it is recommended that one of them be specified.

It is vital to recognise that for many fabrications none of these tests will be suitable and specific tests will have to be devised, which do yield the requisite information (which may be qualitative rather than quantitative). The destructive test methods described are as follows:

a) shear tests (see Clause 4);

b) tensile tests (see Clause 5);

c) metallographic examination (see Clause 6);

d) hardness tests (see Clause 7);

e) peel test (see Clause 8);

f) bend tests (see Clause 9).

Details of burst tests are not included as these are not commonly used on brazed joints.

The type of test piece described for each test can be quoted or incorporated in engineering applications standards that deal with brazed assemblies.

The results of the tests are used:

g) to determine basic data regarding filler metal performance;

h) to arrive at optimum brazing designs (including gaps) and brazing procedures;

i) to relate production results to results achieved in development.

This European Standard does not recommend the number of samples to be tested or the repeat tests allowed. Neither does it specify methods of sampling brazed joints, except to give guidance regarding the precautions necessary, nor does it comment on the acceptance criteria applicable to any of the tests.

No attempt is made to define which test or tests, if any, should be applied in any situation. This is a matter to be established before any particular method of test is selected.

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.

EN 12799:2000, *Brazing - Non-destructive examination of brazed joints*

EN ISO 4545-1, *Metallic materials - Knoop hardness test - Part 1: Test method (ISO 4545-1)*

EN ISO 5173, *Destructive tests on welds in metallic materials - Bend tests (ISO 5173)*

EN ISO 6506-1, *Metallic materials - Brinell hardness test - Part 1: Test method (ISO 6506-1)*

EN ISO 6507-1, *Metallic materials - Vickers hardness test - Part 1: Test method (ISO 6507-1)*

EN ISO 6508-1, *Metallic materials - Rockwell hardness test - Part 1: Test method (ISO 6508-1)*

EN ISO 6892-1, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1)*

EN ISO 7438, *Metallic materials - Bend test (ISO 7438)*

ISO 5187, *Welding and allied processes - Assemblies made with soft solders and brazing filler metals - Mechanical test methods*

3 General principles

Imperfections may be observed when joints are examined by destructive tests. They may reduce the quality and performance characteristics of the joint or the brazed assembly.

Destructive tests may be needed to determine the effects of the brazing process or any subsequent heat treatment on the properties of the joint (e.g. parent materials, filler metals, internal stresses).

This European Standard does not give guidance regarding the cause of the imperfection or its effect upon the joint quality or the effects of single or multiple defects upon the performance characteristics of the brazed assembly. This will depend upon the life-limiting processes to which the joint is subjected and the life requirements and performance specific to the brazed assembly.

The majority of brazed joints are designed with the component parts in a lap configuration. Because of the capillary nature of a brazed joint, most imperfections will be contained within the joint region, with the principal axes parallel to the plane of the joint. Any other imperfections are likely to have been caused by stresses in the brazing metal or the parent materials, or were already present before brazing. Guidance is given regarding the types of imperfection that are observed when destructive tests are applied; these are defined diagrammatically in Annex A.

The importance of tolerance to typical imperfections, the cause for rejection, the method of imperfection interpretation and the method of presentation of observations have to be established before a specific method of test is selected.

The use of any method should always be considered in relation to testing as a whole. The benefits of using any particular method can only be obtained by consideration of results in conjunction with results obtained by using other test methods. The most appropriate method or methods of testing should be selected.

The methods of destructive examination are not associated with any particular type of test piece but lay down the general principles of the types of testing described. It is emphasized that a satisfactory

examination method can only be developed and used after taking into account all the relevant factors regarding the equipment to be used and the characteristics of the test pieces being examined.

The use of the methods of test described enables results from different organizations to have a greater validity when compared, and their use provides designers with basic data on the performance of brazing filler metals and brazed constructions. However, it is essential to appreciate that the results achieved, as with all mechanical tests, are not fundamental, and that the values obtained depend upon the conditions of the test, the condition of the brazing filler metal, the design of the joint and the quality achieved by the brazing process. The brazing process produces joints that are not homogeneous as they are made up of parent materials and a filler metal.

Many factors (such as the joint gap, brazing cycle, diffusion of the filler into the parent material, etc.) will affect the mechanical properties of the joint. Therefore expert knowledge is required to assess whether it is possible to repeat in production the mechanical properties achieved in test pieces.

4 Shear tests

4.1 General

Many designs of test specimen have been used to produce shear data for brazed joints. The great majority of brazed joints are designed to be stressed in shear, and it is not possible to convert the results obtained from butt brazed joints into shear strengths. Test pieces detached from brazed assemblies may be difficult to manufacture into standard shear test specimens; multi-jointed assemblies produce similar problems, where the presence of one defective joint may not reduce the overall strength but can cause failure in service. The shear specimen should essentially be simple in design and economic to manufacture and test.

In all cases, particularly if there is a wide scatter in the results, the effect of non-bonded areas and other imperfections observed by non-destructive examination and the visual examination of the fracture surfaces should be considered.

4.2 Principle

The principle of the test is to subject the test specimen to mechanical loading in shear to fracture and assess its mechanical properties when subjected to these methods of loading.

4.3 Test pieces and specimens

The details of the test pieces and specimens to be used shall be established before any testing is undertaken, and may be, for example, one of the following types:

a) Type I as shown in Figure 1;

b) Type II as shown in Figure 2.

The dimensions shown in Figures 1 and 2 are those typically used but it may be necessary to vary these to reflect specific applications.

4.4 Procedure

The test shall be conducted generally in accordance with the principles of ISO 5187.

4.5 Test results and information to be reported

The test results and information to be reported shall include the following:

a) test piece and details including dimensions, tolerances and brazed joint gap and method of preparation;

b) references, e.g. contract number, part number, location on brazed structure, as applicable;

c) date of test;

d) brazing filler metal;

e) parent materials;

f) brazing process details;

g) test specimen type;

h) number of test specimens;

i) type of test machine;

j) temperature of test;

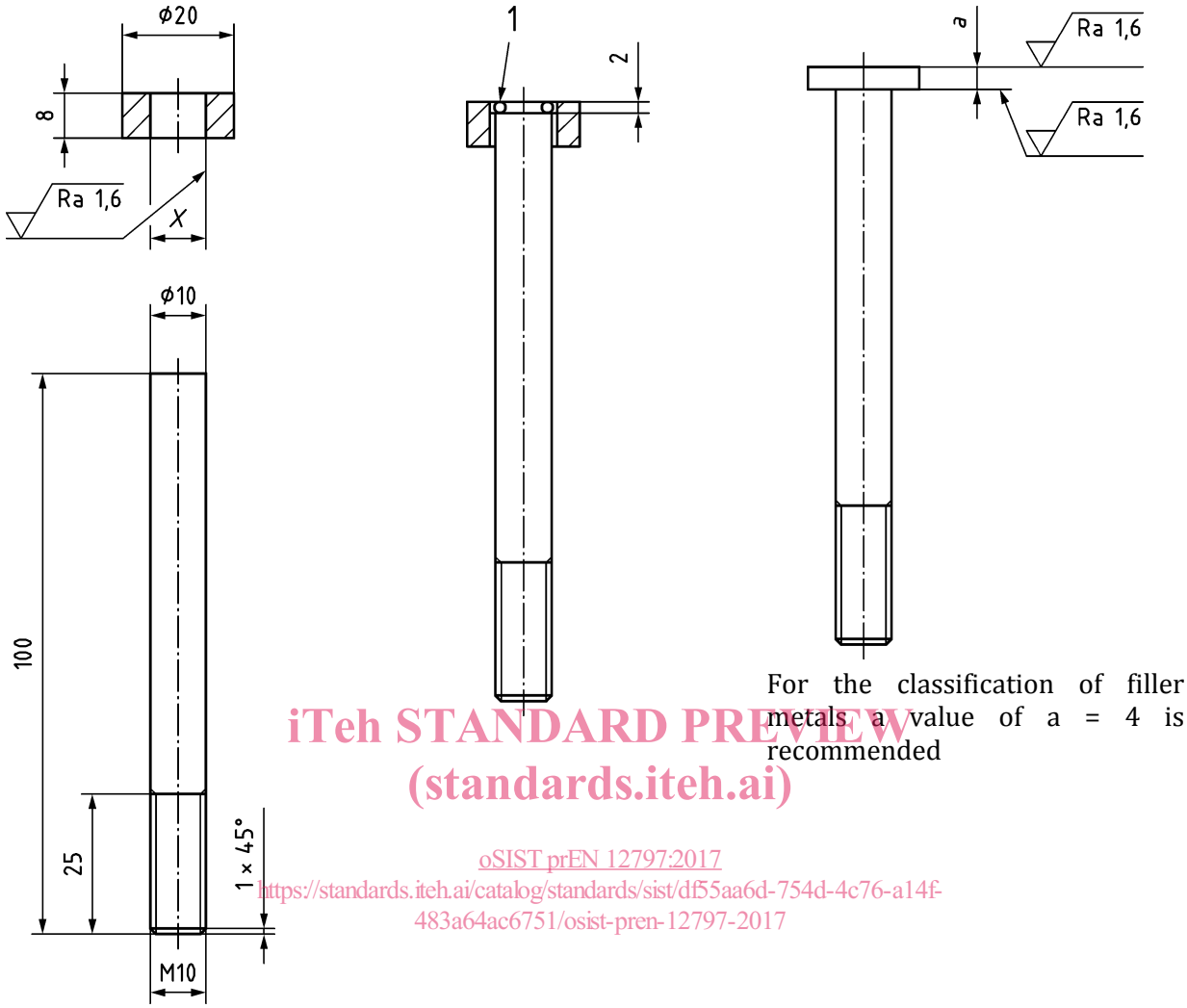
k) numerical results;

l) position of fracture;

m) appearance of fracture surface (imperfections if failure is in the brazed joint);

n) name of laboratory and authorizing signature.

Dimensions in millimetres, surface roughness values in micrometres



For the classification of filler metals a value of a = 4 is recommended

a) Test piece details **b) Test piece before brazing** **c) Test specimen after machining**

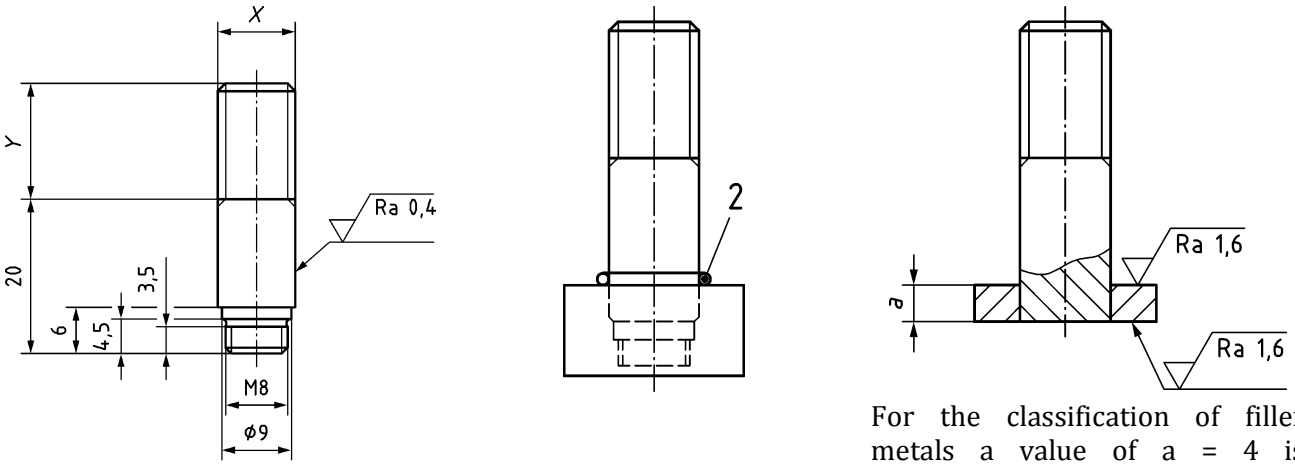
Key

X according to the gap required

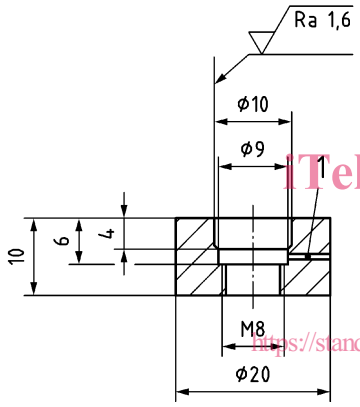
1 filler metal

Figure 1 — Type I shear test piece and specimen dimensions

Dimensions in millimetres, surface roughness values in micrometres



For the classification of filler metals a value of a = 4 is recommended



a) Test piece details **b) Test piece before brazing** **c) Test specimen after brazing and machining**

Key

Y according to the jig used

X according to the gap required

1 gas outlet

2 filler metal

Figure 2 — Type II shear test piece and specimen dimensions

5 Tensile tests

5.1 General

Many designs of test specimen have been used to produce tensile data for brazed joints. The tensile specimen should essentially be simple to design and economic to manufacture and test.

The test results should be evaluated taking into consideration the requirements of EN ISO 6892-1 and the requirements of each specific test. In all cases, and particularly if there is a wide scatter in the results, the effects of non-bonded areas and other imperfections observed by non-destructive examination and the visual examination of the fracture surfaces should be considered.

5.2 Principle

The principle of the test is to subject the test specimen to mechanical loading in tension, to fracture and to assess its mechanical properties when subjected to this method of loading.

5.3 Test pieces and specimens

The details of the test pieces and specimens to be used shall be established before any testing is undertaken, and may be, for example, one of the following types.

a) Type I as shown in Figure 3;

b) Type II as shown in Figure 4;

c) Type III as shown in Figure 5.

The dimensions shown in Figures 3, 4 and 5 are those typically used but it may be necessary to vary these to reflect specific applications.

5.4 Procedure

The test shall be conducted generally in accordance with the principles of ISO 5187 and EN ISO 6892-1.

Tensile tests shall be carried out normally on a fixture on a machine possessing adjustable clamps, in order to avoid unintentional bending stresses in the specimens causing spurious results.