SLOVENSKI STANDARD
SIST EN 12797:2001

01-december-2001

Trdo spajkanje - Porušitveno preskušanje 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: **EN 12797:2000**

ICS:

25.160.50 Trdo in mehko lotanje Brazing and soldering

SIST EN 12797:2001 **en**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12797

July 2000

ICS 25.160.50

English version

Brazing - Destructive tests of brazed joints

Brasage fort - Essais destructifs des assemblages réalisés par brasage fort

Hartlöten - Zerstörende Prüfung von Hartlötverbindungen

This European Standard was approved by CEN on 2 July 2000.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 12797:2000 E

Contents

Foreword

This European Standard has been prepared by 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of an identical text or by endorsement, at the latest by January 2001, and conflicting national standards shall be withdrawn at the latest by January 2001.

This European Standard 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 ZA, which is an integral part of this standard.

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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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 then 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:

1) to determine basic data regarding filler metal performance;

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

3) 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

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 910	Destructive tests on welds in metallic materials - Bend tests
EN 10002-1	Metallic materials - Tensile testing - Part 1: Method of test (at ambient temperature)
EN 10003-1	Metallic materials - Brinell hardness test - Part 1 : Test method
EN 10109-1	Metallic materials - Hardness test - Part 1 : Rockwell test (scales A, B, C, D, E, F, G, H, K) and Rockwell superficial (scales 15N, 30N, 45N, 15T, 30T and 45T)
EN 12799:2000	Brazing - Non-destructive examination of brazed joints
ISO 4545	Metallic materials - Hardness test - Knoop test
ISO 5187	Welding and allied processes - Assemblies made with soft solders and brazing filler metals - Mechanical test methods
EN ISO 6507-1	Metallic materials - Vickers hardness test - Part 1: Test method (ISO 6507-1:1997)
ISO 7438	Metallic materials - Bend test

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.

NOTE 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;

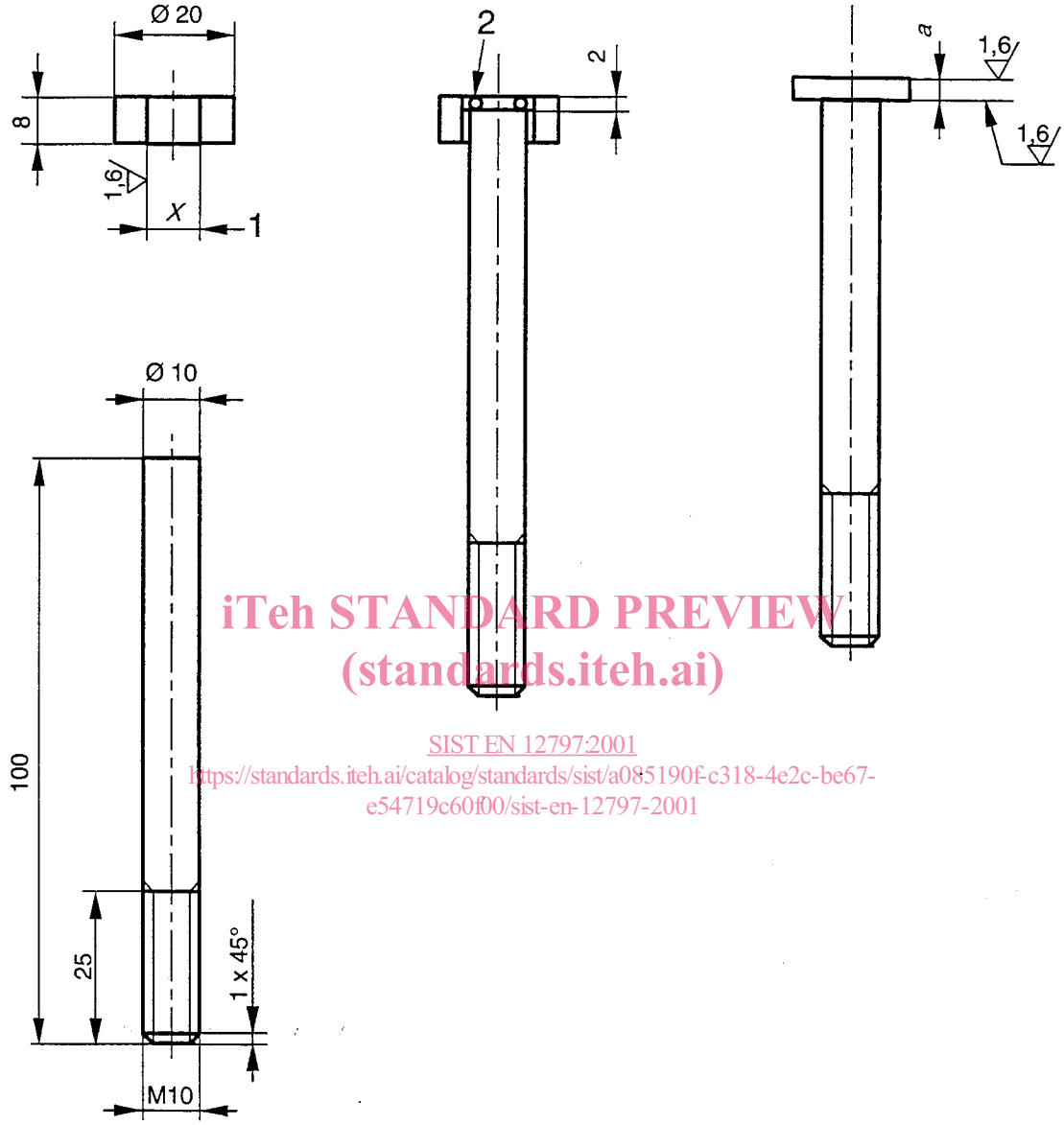
k) Numerical results;

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



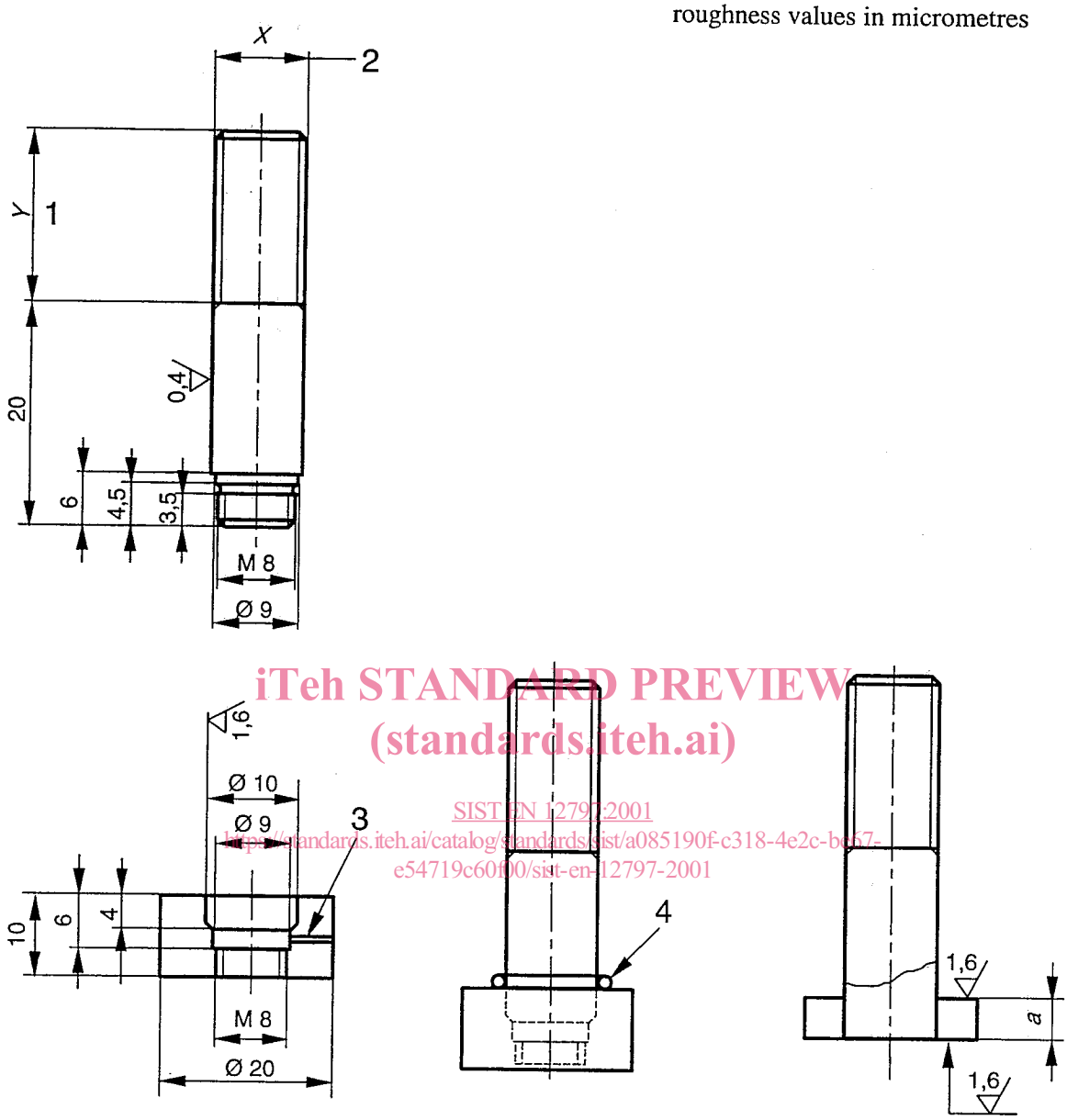
For the classification of filler metals a value of $a = 4$ is recommended

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

Key
1 X : According to the gap required
2 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
1 *Y*: According to the jig used
2 *X*: According to the gap required
3 Gas outlet
4 Filler metal

Figure 2 - Type II shear test piece and specimen dimensions