British Standard

BRITISH STANDARD

BS EN
13133:2000

Brazing — Brazer approval

The European Standard EN 13133:2000 has the status of a British Standard

ICS 25.160.50

National foreword

This British Standard is the official English language version of EN 13133:2000. Together with BS EN 13134:2000 it supersedes BS 1723-4:1988 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/19, Brazing and bronze welding, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible 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.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 17 and a back cover.

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Hartlöten - Hartlöterprüfung

This European Standard was approved by CEN on 27 July 2000.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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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of an identical text or by endorsement, at the latest by February 2001, and conflicting national standards shall be withdrawn at the latest by February 2001.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 for the approval testing of brazers (as defined in 3.1) specifies basic requirements essential to the brazing process, test conditions, assessment and certificates. Because of the wide range of applications of brazing this standard does not specify detailed acceptance criteria as these are product-specific and have in each case to be agreed prior to the contract (see clause 4). It is anticipated that, where necessary, specific requirements for individual industries will be developed within this framework and detailed in the relevant application standard. The recommended format for the certificate of approval testing is given in annex A.

With regard to the approval test, the brazer should be required to show adequate practical experience and knowledge of the brazing processes, materials and safety requirements for which he is to be approved to a written procedure.

This standard applies to hand torch (flame) brazing and only to approval of brazers whose manipulative skills have a direct bearing on the outcome and effectiveness of the brazed joint. It does not apply to those who are not required to apply manipulative skill, since such approval is not normally necessary.

If a special professional education and examination in the domestic field included brazing, this standard does not apply to a brazer while he is employed in that field.

The certificate of approval testing is issued under the sole responsibility of the examiner or examining body.

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 12797 Brazing - Destructive examination of brazed joints.

EN 12799 Brazing - Non-destructive testing of brazed joints.

EN 13134 Brazing - Procedure approval.

3 Terms and definitions

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

3.1
brazer
person who performs the brazing in a manual operation, he guides the heating means and ensures the introduction of the brazing filler metal

3.2
brazing
process of joining generally applied to the joining of materials by a heating process during which the parent materials do not melt and the filler metal is drawn into the joint by capillary action. It is generally applicable to joining systems where the filler metal melts at 450 ºC or above

3.3
brazing procedure specification (BPS)
document providing the designations or values of the required variables necessary to achieve consistent brazing for the defined application

NOTE An example of the format to be used is given in annex B and EN 13134.

3.4
manufacturer
person or organization responsible for the manufacture of the brazed joints

3.5
examiner or examining body
person or organization appointed to verify compliance with the applicable standard

NOTE The examiner or examining body may be a notified body or recognized third-party, if required.

3.6
filler metal(s)
relevant metal(s) and/or alloys selected for making the joint(s)

3.7
fluxes
specific chemical compounds or mixtures designed to remove and inhibit formation of oxides of the metals during the heating cycle

3.8
test piece
assembly which is brazed together during the approval test

3.9
test specimen
sample taken from a test piece

4 Information and requirements to be agreed and to be documented

The following information and requirements shall be agreed and documented prior to the contract.

a) The application standards to be used, if any, together with any supplementary requirements (see clause 1 and 6.1).

b) The BPS, including the brazing process and the brazing variables (see 5.1).

c) The joint design for the test pieces together with relevant tolerances and the number of test pieces required (see 5.2 and 7.1).

d) The specifications of the parent materials (see 5.3).

e) The specifications of the brazing consumables (see 5.4 and 5.5).

f) The design and method of preparation of the test specimens and, where appropriate, the number to be taken from any test piece (see 7.4).

g) The acceptance/non-acceptance criteria, including (where appropriate) the level of confidence (see 7.4).

h) The principle of and procedure for retesting of a series of test pieces, including any additional requirements with regard to the number of test pieces/test specimens and any retraining and time delay conditions prior to reassessment (see 7.4).

i) The extent of visual testing and additional testing requirements for the non-destructive and/or destructive tests (see clause 8).

j) The range of approval, where this is possible (see clause 10).

k) Records and documentation.

NOTE Examples of the formats to be used are given in annexes A, B and C.

5 Brazing variables

5.1 General

The test piece shall be prepared in accordance with the BPS [see 4 b)].

5.2 Test piece

The test piece may be any design of joint which is relevant to the end work [see 4 c)]. Typically this will be a basic lap or butt joint in sheet material or a sleeve joint in tube.

The size and thickness of the materials should be similar to that which will be required to be joined in production. If desired, the test pieces can actually be production assemblies. The test pieces may be, for example, one of the types shown in annex D.

5.3 Parent materials

Parent materials shall be relevant to the end work and selected to comply with to the relevant material standards [see 4 d)].

5.4 Brazing filler metals and flux

Brazing filler metals and flux may be applied in any form but shall be the same as those to be used in production [see 4 e)].

5.5 Fuel/gases

Fuel/gases shall be selected to be relevant to the heating requirement [see 4 e)]. Typical examples include:

a) natural gas/air;

b) natural gas/oxygen;

c) propane/air;

d) propane/oxygen;

e) acetylene/air;

f) acetylene/oxygen.

5.6 Brazing torch

A torch similar to that used in production shall be used.

5.7 Joint location

On-site brazing may require a brazer to make joints in close proximity to walls, etc. Joints may be horizontal or vertical. Similar constraints on access for torches may also be encountered in mass production. Approval tests shall be designed to reproduce these conditions.

5.8 Jigs and fixtures

If necessary, jigs and fixtures shall be used to position the components of a test piece.

6 Conditions for brazing test

6.1 Test location

The approval test shall take place in a workshop but simulate the on-site limitations [see 4 a) and 5.7]. It enables one to judge the ability of the brazer to perform on-site and workshop brazing operations in the selected jointing technique.

6.2 Conduct of the test

The brazer shall prepare the parts (cutting, cleaning, etc.), set up the heating means and conduct the necessary verification to carry out the test according to the BPS.

7 Approval of test piece

7.1 General

The test pieces [see 4 c)] shall be brazed according to the BPS.

7.2 Supervision

Brazing and inspection of the test piece(s) shall be conducted in the presence of the examiner or examining body's representative.

7.3 Assessment of test piece components

The brazer shall assess the test piece components for:

a) joint fit up;

b) joint lengths;

c) degree/absence of local deformation;

and will be permitted to refuse the test piece components if he considers that these are not in accordance with the written BPS.

7.4 Inspection and retests

The test piece(s) shall be provisionally inspected by the brazer. If he assesses that the first test piece in a series is not likely to be of the required quality, he shall be permitted to make a replacement test piece.

Following the brazer's own inspection, the test pieces shall be submitted to the examiner or examining body for the relevant non-destructive and/or destructive tests as detailed in clause 8.

For the design and method of preparation of test specimens, see 4 f).

If only a single test piece is being made and it fails to comply with the specified acceptance criteria [see 4 g)], the brazer shall be advised of the reason and allowed to make a further test piece. If this second test piece fails, it shall be deemed that the brazer is not yet competent to produce joints to the specified acceptance criteria without further training after which the complete test shall be repeated. For the case of testing of a series of test pieces, see 4 h).

8 Examination and testing

8.1 Extent of testing

Each test piece shall be tested by visual examination and one or more additional appropriate tests (which would probably include a destructive test) from those given in 8.3.

8.2 Visual examination

All joints shall be visually examined [see 4 i)] in accordance with EN 12799; the brazed assembly may need to be cut open to offer an internal examination and the test may therefore be destructive.

8.3 Additional examination and testing

The basic requirement is to examine the soundness of the brazed assembly [see 4 i)].

When any of the following additional non-destructive tests are agreed are specified [see 4 i)], they shall be carried out as described in EN 12799:

a) ultrasonic examination;

b) radiographic examination;

c) penetrant testing;

d) leak testing;

e) proof testing;

f) thermography.

When any of the following destructive tests are specified [see 4 i)], they shall be carried out as described in EN 12797:

1) shear tests;

2) tensile tests;

3) metallographic examination;

4) hardness testing;

5) peel tests;

6) bend tests.

A hot tearing test, during which the test piece is pulled apart during heating and rinsed with cold water straight afterwards, may also be applicable.

9 Period of validity

9.1 Initial approval

The validity of the brazer's approval begins at the date when all the required tests are completed. This date may be different from the date of issue given in the certificate. A brazer's approval shall remain valid for a period of three years provided that all the following conditions are fulfilled and that the relevant certificate is signed at six month intervals by the employer.

a) The brazer shall be engaged with reasonable continuity in brazing work within the current range of approval. An interruption for a period of no longer than six months is permitted.

b) The brazer's work shall be in general accordance with the technical conditions under which the approval test is carried out.

c) There shall be no specific reason to question the brazer's skill and knowledge.

If any of these conditions are not fulfilled, the approval shall be cancelled.

9.2 Prolongation

The validity of the approval on the certificate may be prolonged for further periods of three years, within the original range of approval, provided that each of the following conditions, in addition to those detailed in 9.1, are fulfilled.

a) The production brazed joints made by the brazer are continuously of the required quality;

b) Records of tests, e.g. documentation or reports about the non-destructive or destructive tests and any comments, shall be maintained on file together with the brazer's approval certificate.

The examiner or examining body shall verify compliance with the above conditions and sign the prolongation of the brazer's approval test certificate.

10 Certificate

A certificate shall be issued to detail that the brazer has passed the performance approval test. The relevant test conditions shall be recorded on the certificate.

If the brazer fails any of the prescribed tests, no certificate shall be issued.

The certificate shall be issued under the sole responsibility of the examiner or examining body and shall contain all the information detailed in annex A. The format of annex A is recommended to be used as the brazer's approval test certificate.

The manufacturer's BPS (see annex B) shall give information about materials, brazing processes, range of approval [see 4 j)], etc., in accordance with this standard.

Annex A
(informative)

Brazer's approval record form - Part 1: Brazer's approval test certificate

Manufacturer's name and address:

Manufacturer's brazing procedure reference No.:

Examiner or examining body reference No.:

Brazer's name:

Identification:

Photograph (if required)

Method of identification:

Date and place of birth:

Employer:

Job knowledge: Acceptable/Not tested (delete as necessary)

Range of approval, if any:

Reference numbers of documents submitted to justify range of approval:

Certified that the brazer identified above has, when using the brazing procedure given in part 2 of this form, complied with the requirements of the following standards or other equivalent documents:

Name of manufacturer's representative, signature and date:

This approval is valid until:

Name date and signature of examiner or examining body's representative:

Prolongation of approval by employer (every six months)

Name of employer's representative	Position or title	Signature	Date

Prolongation of approval by examiner or examining body (every three years)

Name of examiner's representative	Position or title	Signature	Date

Annex B
(informative)

Brazer's approval record form - Part 2: Manufacturer's brazing procedure

Manufacturer's name and address:

Manufacturer's brazing procedure reference No.:

Examiner or examining body reference No.:

Details of brazing procedure:

Brazing process: Hand torch

Nozzle size and number:

Heating gas type:

Heating gas pressure:

Joint types:

Joint design
(Dimensional sketches or drawing reference, including position of joint in relation to the vertical, room temperature fit-up and joint gap at brazing temperature and any restrictions on access)

Parent material(s) and specification(s):

Brazing filler metal:
- Type and specification:
- Form:
- Method of filler metal supply:

Flux:
- Type and specification:
- Form:
- Method of flux supply:

Jig/fixture details:

Method of pre-braze cleaning:

Method of post-braze cleaning:

Post-braze heat treatment (temperature-time cycle):

Name of manufacturer's representative, signature and date:

Name of examiner of examining body's representative, signature and date:

Annex C
(informative)

Brazer's approval record form - Part 3: Test results

Manufacturer's brazing procedure reference No.:

Examiner or examining body reference No.:

Results of non-destructive and destructive tests agreed by the contracting parties

Test	Results
(to be filled in as appropriate)	(statement of compliance or non-compliance with reasons for any non-compliance)

Tests carried out in accordance with the following standards or other agreed documents:

Laboratory report reference numbers:

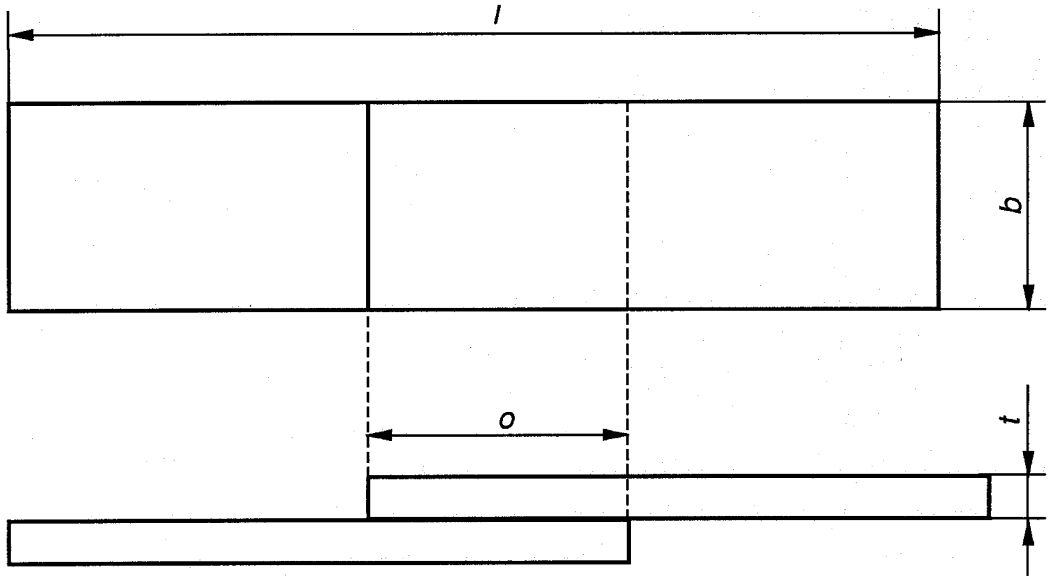
Name of manufacturer's representative, signature and date:

Name of examiner or examining body's representative, signature and date:

Annex D
(informative)

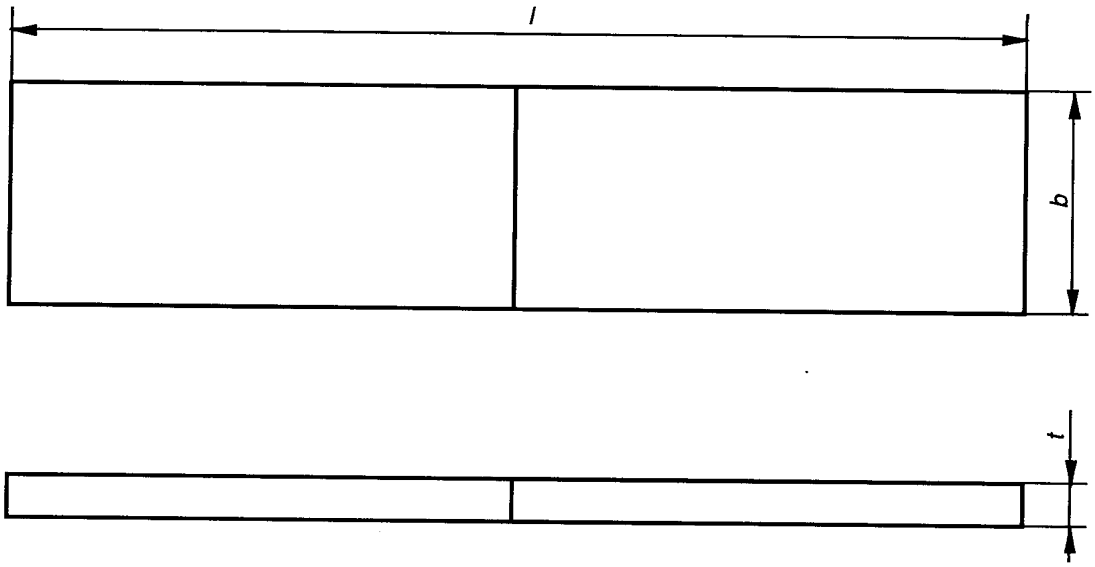
Examples of test pieces

Examples of test pieces are shown in Figures D.1 to D.4.



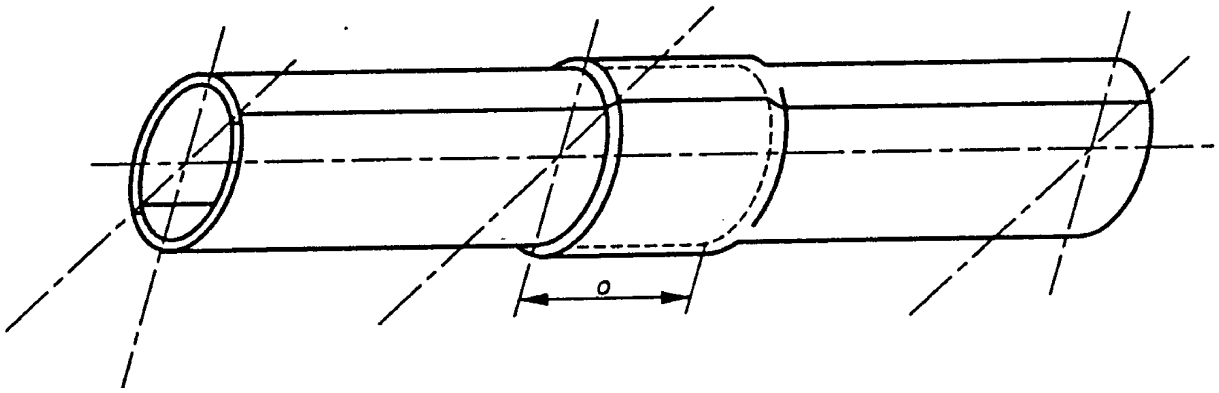
Key
b is the width
l is the total length
t is the thickness
o is the overlap length

Figure D.1 - Test piece - Lap joint



Key
b is the width
l is the total length
t is the thickness

Figure D.2 - Test piece - Butt joint



Key
o is the overlap

Figure D.3 - Test piece - Simple lap joint

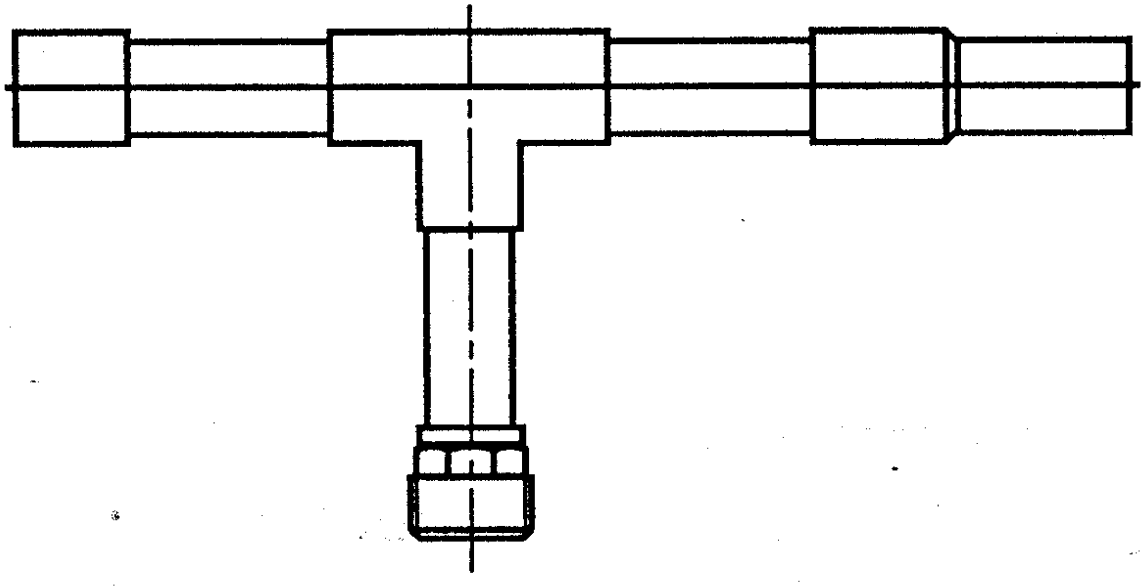


Figure D.4 - Test piece - Multiple joints

Annex ZA
(informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives

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 Directive 97/23/EEC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment.

> **WARNING** Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

The following clauses of this standard as detailed in Table ZA.1, are likely to support requirements of the Directive 97/23/EEC.

Compliance with these clauses of this standard provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

Table ZA.1 - Correspondence between this European Standard and Directive 97/23/EEC

Clauses/sub-clauses of this European Standard	Essential requirements of Directive 97/23/EEC	Qualifying remarks/Notes
ALL CLAUSES	Annex 1, section 3.1.2	Permanent joining - Brazer approval

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