INTERNATIONAL STANDARD 698

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Filler rods for braze welding — Determination of conventional bond strength on steel, cast iron and other metals

Métaux d'apport de soudobrasage — Détermination de la résistance d'accrochage conventionnelle sur acier, fonte et autres métaux

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Descriptors : welding, braze welding, filler metal, tests, bonding strength, metals, steel, cast iron.

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 44 has reviewed ISO Recommendation R 698 and found it technically suitable for transformation. International Standard ISO 698 therefore replaces ISO Recommendation R 698-1968 to which it is technically identical.

ISO Recommendation R 698 was approved by the Member Bodies of the following countries :

Australia	India	Romania
Austria	Ireland	Spain
Brazil	Israel	Sweden
Canada	Italy	Switzerland
Chile	Japan	United Kingdom
Denmark	Netherlands	U.S.S.R.
Egypt, Arab Rep. of	New Zealand	Yugoslavia
France	Portugal	

The Member Bodies of the following countries expressed disapproval of the Recommendation on technical grounds :

Belgium
Germany
South Africa, Rep of
U.S.A.

The Member Body of the following country disapproved the transformation of ISO/R 698 into an International Standard :

Germany

Printed in Switzerland

Filler rods for braze welding — Determination of conventional bond strength on steel, cast iron and other metals

0 INTRODUCTION

This International Standard is a companion to ISO 688, *Filler rods for braze welding — Determination of characteristics of deposited metal.*

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies methods of test for filler rods for braze welding, to determine the conventional bond strength on

- steel,
- cast iron,
- other metals and alloys.

2 REFERENCE

ISO 82, *Steel — Tensile testing.*

3 GENERAL

The conventional bond strength of a braze welding filler metal on a parent metal is determined by means of a tensile test in which the stress is applied to the normal cross-sectional area of the test piece.

4 DETERMINATION OF CONVENTIONAL BOND STRENGTH ON STEEL

4.1 Assembly

4.1.1 *Type of assembly and choice of parent metal*

4.1.1.1 In order to determine the conventional bond strength of braze welding filler metals on steel, a single Vee butt joint assembly without a gap, as shown in figure 1, shall be braze welded.

4.1.1.2 The plates shall be of mild steel. The faces of the bevel, which shall be smooth, as well as the immediately surrounding areas (over a width of 10 to 15 mm), shall be cleaned of oxide and other surface contamination and degreased before assembly.

4.1.2 *Operating conditions*

4.1.2.1 The thickness of the plates and the operating conditions shall be as specified in table 1, according to the diameter of the filler rod[1].

TABLE 1

Diameter of filler rod, mm	2	2,5	3,15	4	5	6,3
Thickness, *e*, of plates, mm	5	5	8	10	10	10
Acetylene consumption of blowpipe, l/h*	150	150	200	250	315	315
Number of runs	2 to 3					

* The operator should ensure that the acetylene consumption of his blowpipe corresponds as closely as possible to the value shown.

4.1.2.2 The assembly shall be made by the leftward method, welding upward, the plates being in a slightly inclined position (approximately 30°). As the straightening of the plates after welding is forbidden, precautions shall be taken to keep the assembly as flat as possible.

The blowpipe shall be fed with correctly purified acetylene and with oxygen having a minimum purity of 98 %. The flame shall be neutral,[2] unless otherwise recommended by the manufacturer of the filler rod. The nature of the flame, whether neutral or oxidizing, shall be stated in the test report.

4.1.2.3 If a cleaning flux is necessary, the flux appropriate to the filler rod being tested shall be applied.

1) Care should be taken to ensure a level joint assembly.

2) A flame is said to be neutral when the ratio of oxygen to acetylene is nearly equal to 1.

4.2 Tensile tests

4.2.1 *Preparation of tensile test pieces*

4.2.1.1 Six test pieces shall be taken as shown in figure 2.

4.2.1.2 After removal of the excess metal by machining from the two faces, the rectangular tensile test pieces shall be machined as shown in figure 3. The edges shall be machined rectilinear, parallel and rounded to a radius not exceeding 2 mm.

4.2.2 *Tensile test requirements*

The tests shall be made at ambient temperature, unless otherwise specified, and in accordance with ISO 82.

4.3 Expression of results

Wherever the break occurs, the conventional bond strength, expressed in newtons per square millimetre, shall be obtained by dividing the total breaking load, expressed in newtons, by the initial cross-sectional area of the test piece, expressed in square millimetres. The position of the break shall be stated in the test report.

5 DETERMINATION OF CONVENTIONAL BOND STRENGTH ON CAST IRON

5.1 Assembly

5.1.1 *Type of assembly and choice of parent metal*

5.1.1.1 In order to determine the conventional bond strength of braze welding filler metals on cast iron, a double Vee butt joint assembly with a gap made between bevelled grey cast iron bars, as shown in figure 4, shall be braze welded.

5.1.1.2 The bars shall be of grey cast iron having a tensile strength of about 250 N/mm^2.

5.1.1.3 The faces of the bevel, as well as the immediately surrounding areas (over a width of 10 to 15 mm), shall be carefully machined or filed, but not ground, and then degreased before assembly.

5.1.2 *Operating conditions*

5.1.2.1 The operating conditions shall be as specified in table 2.

TABLE 2

Diameter of filler rod, mm	**⩾ 3,15**
Acetylene consumption of blowpipe, l/h*	250 to 315, according to diameter of filler rod
Number of runs	see 5.1.3

* The operator should ensure that the acetylene consumption of his blowpipe corresponds as closely as possible to the value shown.

5.1.2.2 The assembly shall be made by the leftward method, the bars being horizontal.

The blowpipe shall be fed with correctly purified acetylene and with oxygen having a minimum purity of 98 %. The flame shall be neutral,[1] unless otherwise recommended by the manufacturer of the filler rod. The nature of the flame, whether neutral or oxidizing, shall be stated in the test report.

5.1.2.3 If a cleaning flux is necessary, the flux appropriate to the filler rod being tested shall be applied.

5.1.3 *Operating procedure*

The operating procedure shall be as follows :

- a root run shall be made;
- the assembly shall be turned over and a root run shall be made on the opposite side;
- each face of the bevels shall be "buttered";
- one bevel shall be filled to half its depth;
- after turning over, the second bevel shall be filled completely by one or two runs;
- after turning over again, the first bevel shall be completely filled.

5.2 Tensile tests

5.2.1 *Preparation of tensile test pieces*

5.2.1.1 Three test pieces shall be taken.

1) A flame is said to be neutral when the ratio of oxygen to acetylene is nearly equal to 1.

5.2.1.2 The tensile test pieces shall be machined as shown in figure 5.

5.2.2 *Tensile test requirements*

The tests shall be made at ambient temperature, unless otherwise specified, and in accordance with ISO 82.

5.3 Expression of results

Wherever the break occurs, the conventional bond strength, expressed in newtons per square millimetre, shall be obtained by dividing the total breaking load, expressed in newtons, by the initial cross-sectional area of the test piece, expressed in square millimetres. The position of the break shall be stated in the test report.

6 DETERMINATION OF CONVENTIONAL BOND STRENGTH ON OTHER METALS

6.1 Principle

In order to determine the conventional bond strength of braze welding filler rods on parent metals other than cast iron and steel, and on alloys, two cases must be considered :

a) **Wrought metals :** proceed as indicated for steel (see clause 4);

b) **Cast metals :** proceed as indicated for cast iron (see clause 5).

6.2 Assembly

For each type of parent metal, the operating procedures shall be those appropriate to that metal.

Dimensions in millimetres

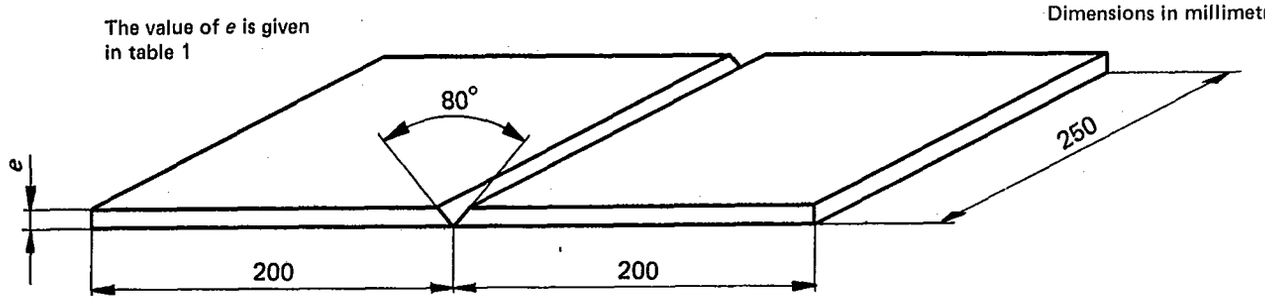

FIGURE 1 — **Preparation of assembly for braze-welding (steel)**

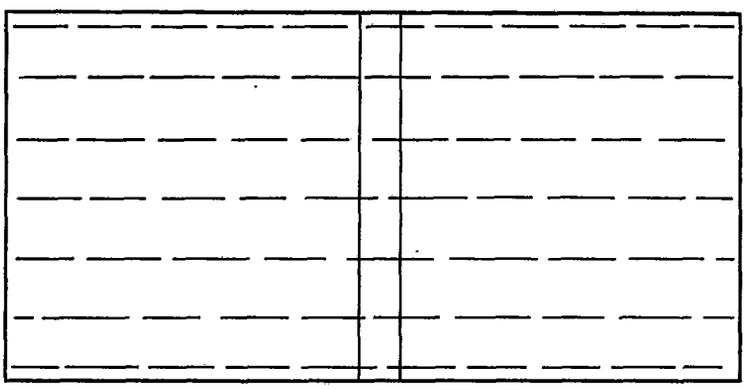

FIGURE 2 — **Position of test pieces (steel)**

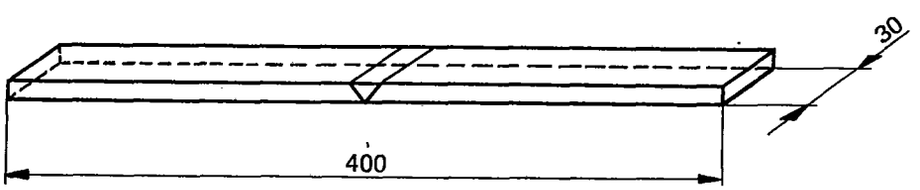

FIGURE 3 — **Dimensions of prepared test piece (steel)**

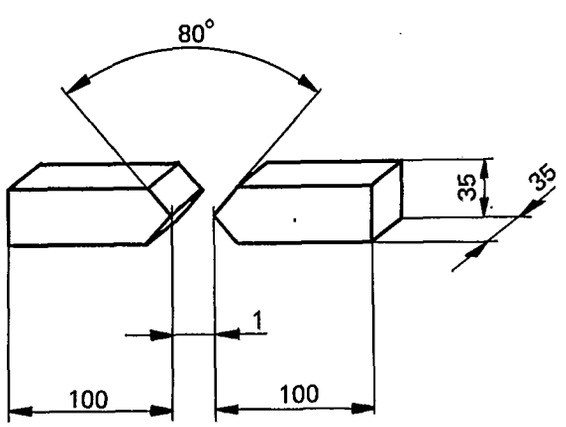

FIGURE 4 — **Preparation of assembly for braze-welding (cast iron)**

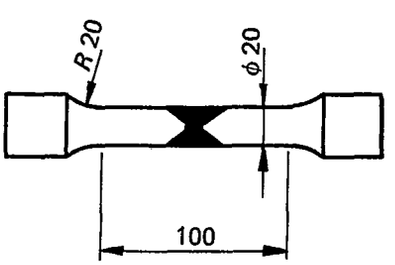

FIGURE 5 — **Dimensions of prepared test piece (cast iron)**