INTERNATIONAL STANDARD

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Welding — Peel and chisel testing of resistance spot, projection and seam welds

Soudage — Essais de pelage et de déboutonnage au burin appliqués aux soudures par résistance par points, par bossages et à la molette

Reference number
ISO 10447:1991(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

International Standard ISO 10447 was prepared in collaboration with the International Institute of Welding, which has been approved as an international standardizing body in the field of welding by the ISO Council.

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Welding — Peel and chisel testing of resistance spot, projection and seam welds

1 Scope

This International Standard specifies the procedure and tooling to be used for testing of resistance spot, projection and seam welds by means of peel and chisel tests.

The aim of these tests is to determine

a) the weld size;

b) the failure type;

in resistance welds made in two or more sheets, in the thickness range 0,5 mm to 3,0 mm.

2 Definitions

For the purposes of this International Standard, the following definitions apply.

2.1 chisel test: A destructive test in which welds are tested by applying a predominantly tensile force which results in stresses in the thickness direction. The force is applied using a chisel [see figure 1 a)].

A so-called non-destructive test in which weld quality is assessed by separating the welded parts between adjacents welds.

2.2 peel test: A destructive test in which welds are tested by applying a peel force which results in stresses mainly in the thickness direction of the weld. The test can be accomplished either manually as in figure 1 b), or it can be mechanized using a tensile testing machine or other suitable mechanized equipment [see figure 1 c)].

3 Test specimens

When used for quality control in production, tests shall be conducted on actual components or specimens taken from actual components.

When used for the setting of welding machines where it is not practicable to use actual components, separate welded test pieces may be used. In this case, the test pieces shall be produced from the same material as used for the component and, welded under conditions adapted to simulate and produce the same weld quality as observed in the component. The effects of different shunt or impedance conditions should be taken into account when producing the test pieces by inserting sufficient material in the throat of the machine to approximate the magnetic effect of the work piece under production conditions.

4 Effects of test equipment

4.1 Manual testing

Results obtained from a manual test are to some extent equipment and operator dependent.

4.2 Chisel testing

In the case of chisel testing, results are influenced by the following factors:

a) chisel shape — dimensions and condition;

b) hammer type — mass and type of blow;

c) test specimen — sheet thickness;

d) position of the weld in relation to the sheet and its edge;

e) position of chisel relative to the weld.

4.3 Other effects

a) In the case of the peel test, the test force should be applied to the test specimen as slowly and as evenly as possible.

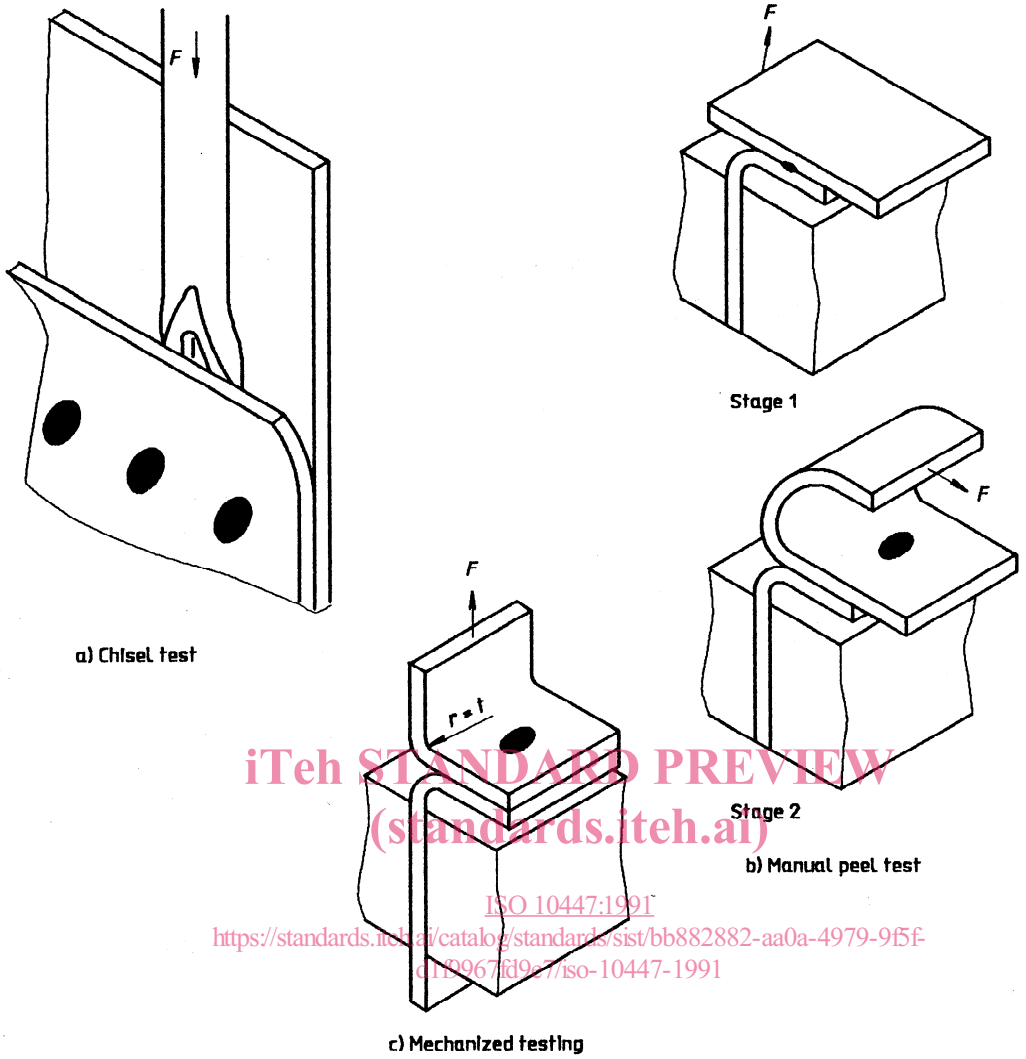


Figure 1 — Routine tests on spot welded joint

b) Crack initiation, crack growth and fracture depend on the test type and procedure used, therefore, results from routine tests have a larger scatter than from laboratory tests.

c) Results obtained from successive routine tests may also differ in weld size and fracture type.

5 Test procedure

5.1 Measurement of weld size

5.1.1 Spot and projection welds

A manual test procedure allows the measurement of the weld diameter and assessment of the failure type. In the case of mechanized testing it may also be possible to measure the force at failure.

Precautions should be taken when measuring weld size, particularly when asymmetrical weld nuggets are evident.

The maximum and minimum diameters of the weld nugget (d_1 and d_2) are measured as in figure 2. In the case of peel testing, fracture can occur away from the weld in the parent metal. If possible, this excess metal should be folded back or removed. If this is not possible, only one dimension may be measured. Use a knife edged gauge or measuring device as indicated in figure 3. The average diameter of the weld, d, can be calculated from d_1 and d_2 as follows:

$$\text{Weld diameter } d = \frac{d_1 + d_2}{2}$$

Depending upon the application, the ratio between d_1 and d_2 may be specified.

Weld diameter dimensions should be rounded down to the nearest 0,1 mm. In the case of an interface

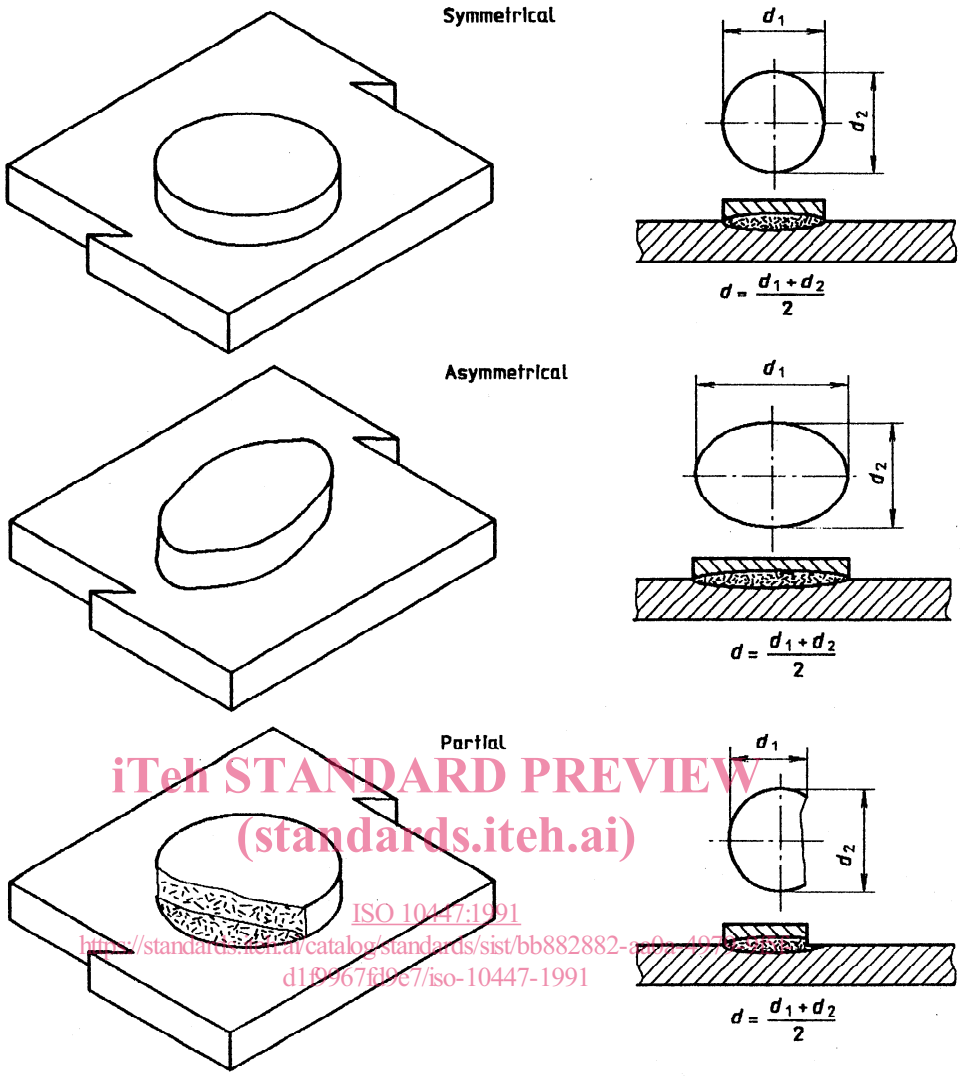


Figure 2 — Weld with plug failure

failure [see figure 3 b)], the weld diameter should be measured using a pocket lens or magnifier with an incorporated scale. If a smooth pressure welded bond zone is present, only the rough fracture zone shall be measured. Figure 3 a) illustrates a plug failure.

5.1.2 Seam welds

In the case of seam welds, the minimum width is specified.

5.2 Testing technique

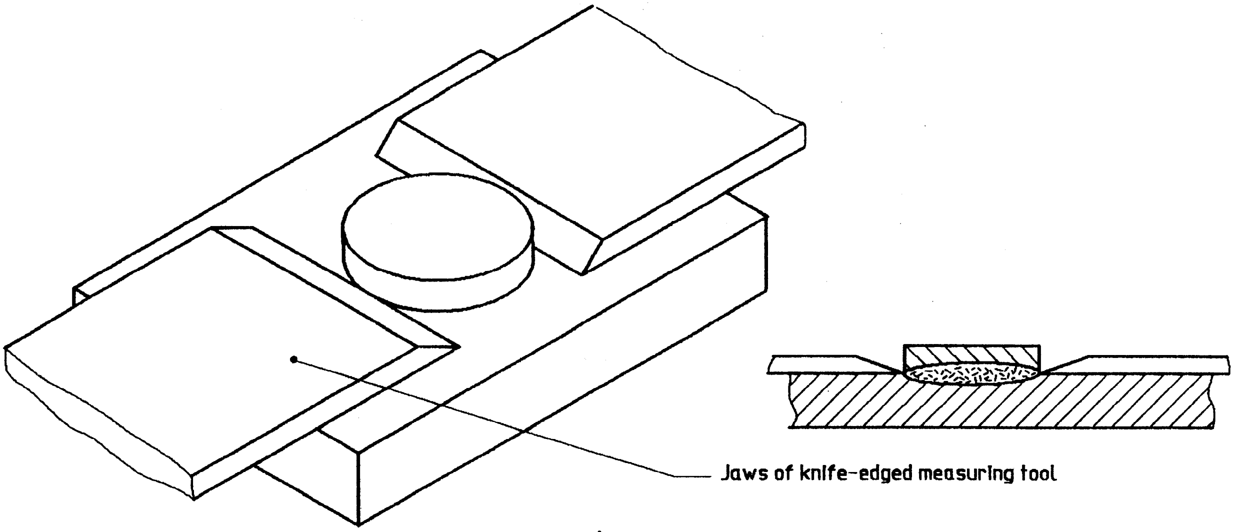
5.2.1 Chisel test

Depending on the weld diameter, two typical chisel designs with different dimensions are recommended (see figure 4). The angle of the chisel relative to the weld influences the applied load and the chisel location.

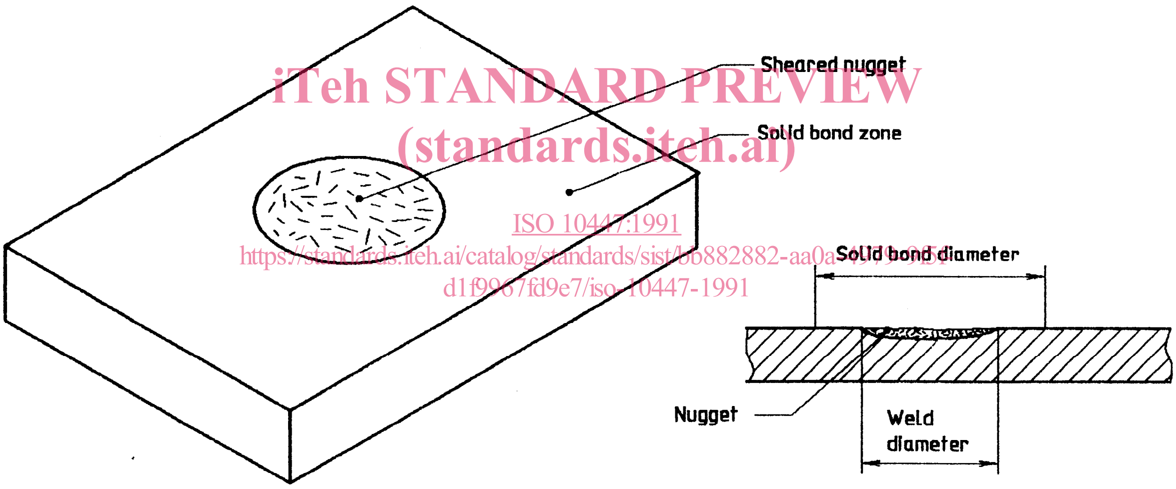
The recess in the chisel for the weld is only necessary if the axis of the chisel is placed at the centre of the weld. Using a recessed chisel reduces scatter in the results.

If the chisel is placed immediately adjacent to the weld, the force depends on the position of the chisel applied to the weld. Normally, the chisel is driven manually between the sheets by a hammer. Mechanized equipment may be used, especially when testing thick or high strength steels.

The chisel test can also be used as a "so-called" non-destructive test. In this case, a chisel is driven between the welded parts and adjacent to the weld until the material yields or bends sharply at the point of welding. The test shall be stopped when pulling a plug is indicated without fracture or failure in the weld. It shall not be continued beyond this point to



a) Plug failure



b) Interface failure

Figure 3 — Measuring nugget diameter

where the sheet metal adjacent to the weld is fractured. In the case of a weld between more than two sheet thicknesses, the test shall be made between each adjacent pair of sheets. If the welds are satisfactory after testing, the components shall be tapped back into an acceptable shape.

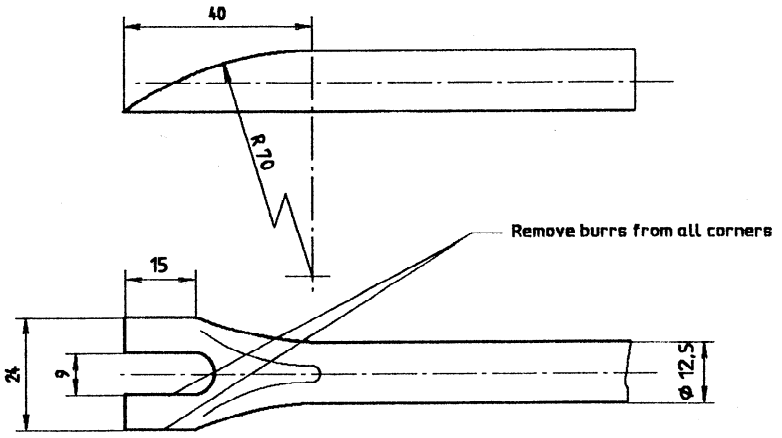
When testing seam welds, care should be taken to ensure fracture occurs around the weld.

5.2.2 Peel test

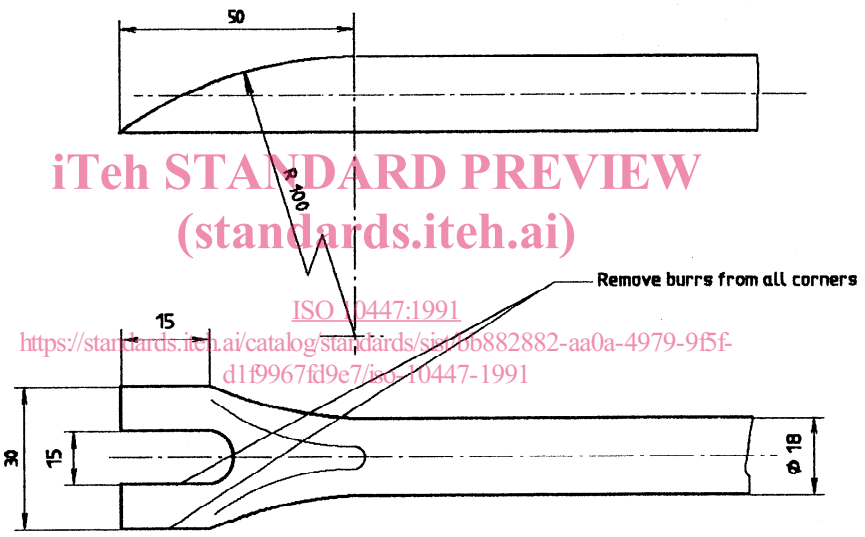
In the case of manual testing, the weld is peeled apart, using pincers or a roller tool. In the latter case, a tool of diameter 30 mm is recommended for material with thicknesses of 1 mm or less (see figure 5).

The applied force may be generated by means of a normal tensile testing machine or other suitable mechanized equipment.

Dimensions in millimetres



a) Chisels for weld diameter ≤ 8 mm



b) Chisels for weld diameter ≤ 13 mm

Figure 4 — Typical dimensions of chisels

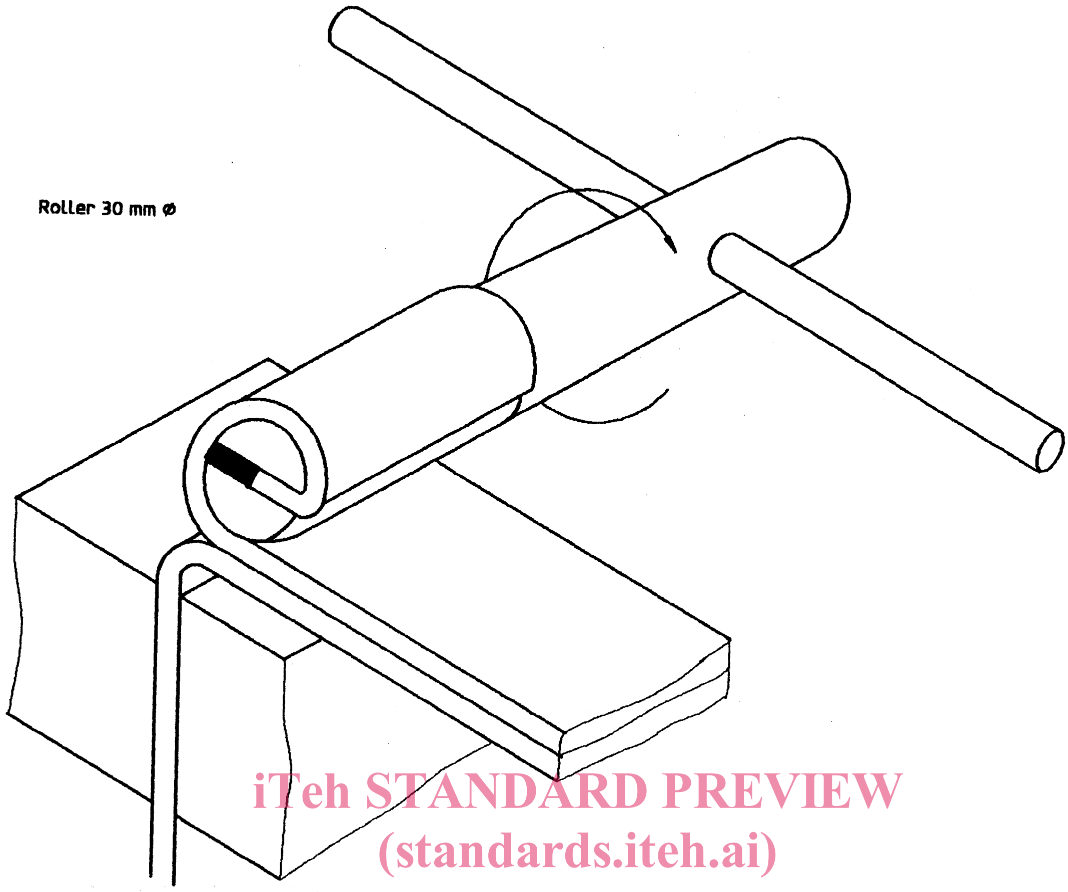


Figure 5 — Roller for manual peel test; material thickness up to 1 mm

6 Test report

A test report shall include the following, unless alternative requirements are agreed between the supplier and the customer:

a) reference to this International Standard;

b) type of test;

c) weld size;

d) fracture type;

e) welding process;

f) welding conditions;

g) welding equipment;

h) material and material conditions;

i) other data by agreement.

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