INTERNATIONAL STANDARD

ISO 4136

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Fusion-welded butt joints in steel — Transverse tensile test

Joints soudés bout à bout par fusion dans l'acier — Essai de traction transversale

Reference number
ISO 4136 : 1989 (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 approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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Fusion-welded butt joints in steel — Transverse tensile test

1 Scope

This International Standard specifies the sizes of test pieces and the test procedure for carrying out transverse tensile tests in order to determine the tensile strength of a fusion-welded butt joint.[1)]

This International Standard applies to ferrous materials with butt joints made by any fusion welding process.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1302 : 1978, *Technical drawings — Method of indicating surface texture on drawings.*

ISO 6892 : 1984, *Metallic materials — Tensile testing.*

3 Principle

Application of a tensile load, until rupture, to a test piece, taken transversely from a welded joint.

Unless otherwise specified, the test shall be carried out at ambient temperature.

Unless otherwise stated for specific points in this International Standard, the general principles of ISO 6892 shall apply.

4 Taking of test pieces

4.1 The test piece shall be taken from a part of a welded manufactured product or from a welded test assembly[2)] transversely to the welded joint in such a way that, after machining, the weld axis will remain in the middle of the parallel length of the test piece.

4.2 Each test piece shall be marked in such a way that, after it has been removed, it is possible to identify its exact position in the manufactured product or in the test assembly from which it has been taken. No heat treatment shall be applied to the test assemblies unless it is specified or allowed by the application standard dealing with the welded joint to be tested. Details of any heat treatment shall be recorded in the test report.

4.3 The test piece shall be taken by appropriate means. Shearing is excluded for thicknesses of more than 8 mm. If thermal cutting or other cutting method which could affect the cut surfaces is used to cut the thickness of the part of the welded construction or of the test assembly, the cuts shall be made at a distance from the surfaces of the final parallel length of the test piece greater than or equal to 8 mm.

5 Machining of the test piece

5.1 The test piece shall be finished by machining or grinding, suitable precautions being taken to avoid superficial strain-hardening or excessive heating of the material. The surfaces shall be free from scratches or notches transverse to the test piece direction.

5.2 The surfaces of the test piece shall be machined in such a way that, unless otherwise specified in the application standard, the weld reinforcement, the penetration bead and irregularities at the surface between weld metal and parent metal are removed.

1) This test is not suitable for determining the yield point and the elongation of the weld metal.

2) "Test assemblies" are welded joints which are not obtained from a manufactured product, but are made for purposes of approval (e.g. procedure qualification), control (e.g. production test coupons) or studies and research.

5.3 In general, the thickness of the test piece, a, shall be equal to the thickness of the parent metal near the welded joint. It is permissible, however, to take several test pieces from the welded joint to cover the full thickness of the joint, instead of a single test piece having the full joint thickness (see figure 1).[1] In such cases, the position of the test piece in the welded joint thickness shall be identified.

5.4 The thickness of the test piece shall be constant along the entire parallel length and the radius at the shoulder; the shape and dimensions shall conform to those given in table 1 with reference to the symbols of figure 2.

Table 1 — Dimensions of test piece

Total length		L_t	to suit particular testing machine
Width of shoulder		b_1	b_2 + 12 mm
Width of parallel length	plates	b_2	25 mm
	pipes***	b_2	⩾20 mm*
Parallel length		L_c	⩾L_s + 60 mm**
Radius at shoulder		r	⩾35 mm

* For small diameter pipes, this dimension may be reduced, if necessary.

** L_s is the maximum width of the weld after machining.

*** For small diameter pipes, the test may be carried out on the whole pipe, if necessary.

For test pieces machined from pipe, flattening of the gripped ends may be necessary; however, this flattening and the possible resulting variation in thickness shall not affect the zone of the parallel length and the shoulder.

6 Test methods

Load the test piece gradually and continuously in a direction perpendicular to the weld axis until rupture occurs. The speed of loading shall be as uniform as possible; in any case, possible variations of loading speed during testing shall be progressive and without abrupt changes (see ISO 6892).

7 Expression of results

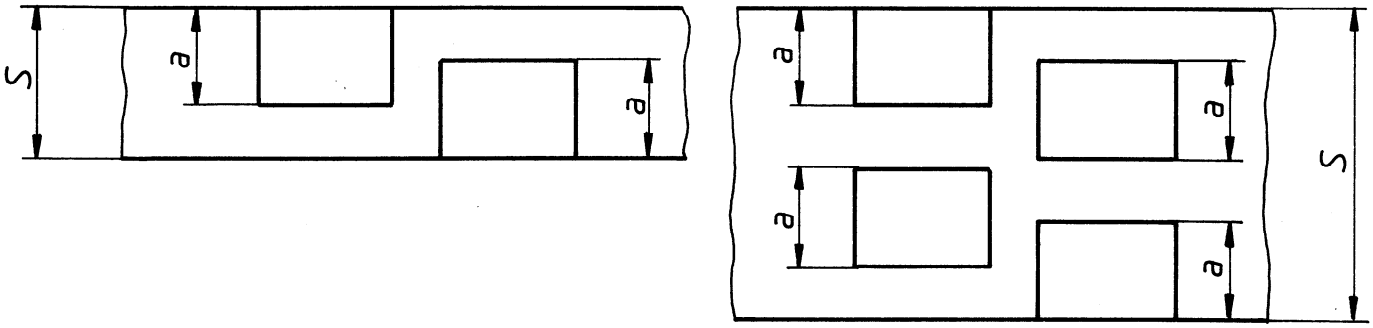
7.1 The tensile strength, R_m, shall be calculated as the ratio of maximum load sustained by the test piece during testing to the original cross-sectional area of the test piece in the parallel length, expressed in newtons per square millimetre or in megapascals.

7.2 After rupture of the test piece, the fracture surfaces shall be examined and the existence of any defects shall be recorded, including their type and amount.

7.3 The position of the fracture shall be noted and reported. If necessary, the side of the test pieces may be macro-etched to assist location.

7.4 The results of the test shall be evaluated in accordance with the appropriate application standard dealing with the welded joint to be tested.

1) A reduced number of test pieces or test pieces taken from other positions may be required by the application standard dealing with the welded joint to be tested.

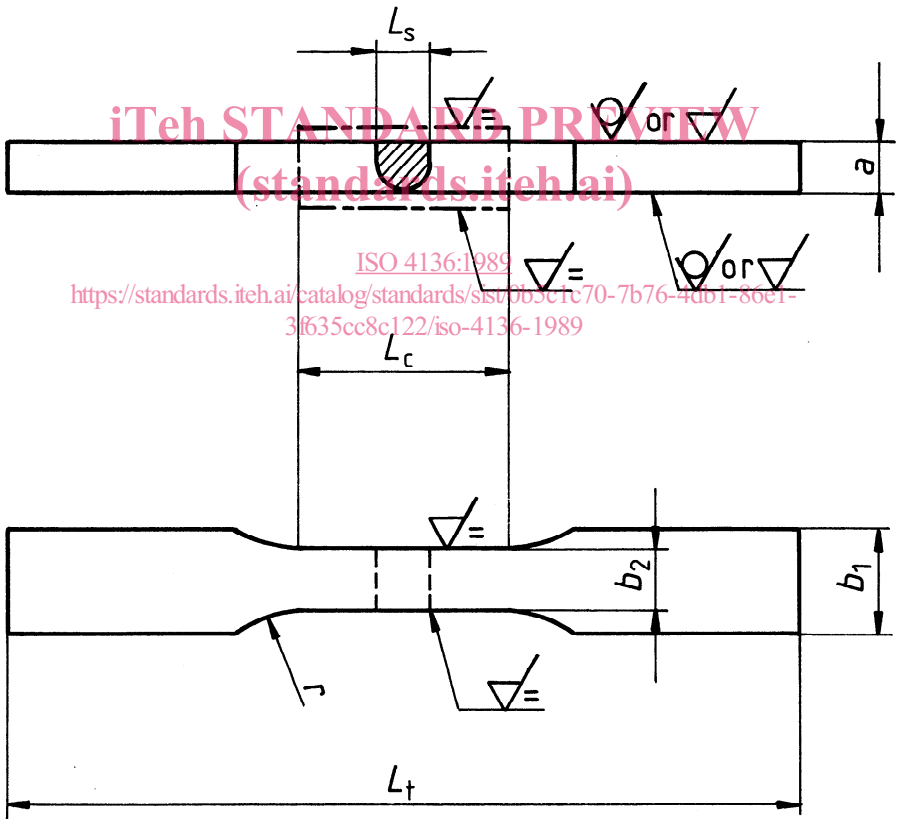


S = thickness of the joint

a = thickness of the test piece

NOTE — It is not necessary to have overlapping stamping, nevertheless the case is not excluded.

Figure 1 — Position of test pieces in thick joints



NOTE — Symbols used in this figure to indicate surface texture are defined in ISO 1302.

Figure 2 — Test piece

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Descriptors : welding, welded joints, butt welds, tests, tension tests, test specimens.

Price based on 3 pages