International Standard 5177

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Fusion welded butt joints in steel — Transverse side bend test

Joints soudés bout à bout par fusion dans l'acier — Essais de pliages transversaux latéraux

First edition — 1981-08-15

UDC 621.791.052.4 : 620.177 **Ref. No. ISO 5177-1981 (E)**

Descriptors : butt joints, butt welds, welded joints, fusion welding, tests, mechanical tests, bend tests, test specimens, dimensions.

Price based on 4 pages

Foreword

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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.

International Standard ISO 5177 was developed by Technical Committee ISO/TC 44, *Welding and allied processes*, and was circulated to the member bodies in February 1978.

It has been approved by the member bodies of the following countries :

Australia	India	Romania
Austria	Ireland	South Africa, Rep. of
Bulgaria	Italy	Spain
Canada	Japan	Sweden
Czechoslovakia	Mexico	Switzerland
Denmark	Netherlands	Turkey
Egypt, Arab Rep. of	New Zealand	United Kingdom
Finland	Norway	USA
France	Poland	USSR

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Belgium
Germany, F.R.

Printed in Switzerland

Fusion welded butt joints in steel — Transverse side bend test

1 Scope

This International Standard specifies two methods for carrying out transverse side bend tests on test pieces taken from a fusion welded butt joint in order to assess the ductility of, or the absence of internal defects in, the joint itself. It also gives the dimensions of the test pieces.

2 Field of application

This International Standard applies to ferrous materials having a thickness not less than 10 mm with butt joints made by any fusion welding process.

3 Principle

Submitting a test piece to plastic deformation by bending it without reversing the bending direction. The test piece is taken transversely from a welded joint in such a way that its width corresponds to the joint thickness.

The test may be made according to either of two methods described in clauses 6 (bending test using a former) and 7 (bending using a roller).

4 Taking of test pieces

4.1 The test piece shall be taken from a part of a welded fabrication or a welded test assembly[1] transversely to the welded joint in such a way that, after machining, the weld cross-section will remain in the middle of the length of the test piece and will correspond to its width (see figure 1).

4.2 Each test piece shall be marked in such a way that after its removal it is possible to identify its exact position in the part of the fabrication 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 for 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. If thermal cutting or other methods which could affect the cut surfaces are used, the cuts shall be at a distance from the test piece greater than or equal to 8 mm, but in any case sufficient, according to the process used not to induce alterations which could modify the test results.

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. Within the length L (see figures 3 and 4), the surfaces shall be free from scratches or notches transverse to the test piece direction.

5.2 The test piece shall have a rectangular cross-section practically constant for all its length. The cross-sectional shape shall conform to figure 1.

5.3 The upper and lower surfaces of the weld shall be dressed flush with the original surfaces of the parent metal.

5.4 The test piece thickness a shall be at least 10 mm and have a ratio with the diameter of the former or of the roller conforming to the requirements of the application standard; its width b shall be equal to the thickness of the parent metal near the welded joint.

5.5 When the original joint thickness exceeds 40 mm, it is permissible, instead of a single test piece having a width corresponding to the full joint thickness, to take several test pieces from the welded joint, provided the width b of each test piece is in the range from 20 to 40 mm and the test pieces cover the full thickness of the joint (see figure 2).[2] In such a case the position of the test piece in the welded joint thickness shall be identified.

5.6 The corners of the test pieces on the face in tension shall be rounded by machining to a radius R not exceeding 0,2 a (maximum : 3 mm).

1) "Test assemblies" are welded joints which do not belong to a fabrication but are made for purposes of approval (for example procedure qualification), control (for example production test coupons) or studies and reseach.

2) A reduced number of test pieces, or test pieces removed from different positions may be required by particular application standards.

6 Method of bend testing using a former
(see figure 3)

6.1 Before starting the bend test, the shape of the cross-section of the welded joint and its position in the test piece can be made apparent, if necessary, by lightly macro-etching the surface of the test piece to be put in tension.

6.2 The test shall be carried out by placing the test piece on two supports consisting of parallel rollers. The test piece shall be slowly and continuously bent, by applying in the middle of the span, on the axis of the weld, a concentrated load (three point bending) perpendicularly to the test piece surface.

6.3 The load shall be applied by means of a former having an end diameter D that conforms to the requirements of the application standard concerning the welded joint under examination.[1)]

6.4 The distance L (see figure 3) between the rollers shall be not greater than $L = D + 3a$.

6.5 The bend test is completed when the bending angle α (see figure 3) reaches the value given in the application standard concerning the welded joint under examination.

7 Method of bend testing using a roller
(see figure 4)

7.1 The test shall be carried out by firmly clamping one end of the test piece in a testing device having two parallel rollers. The test piece shall be slowly and continuously bent by applying a concentrated load on the test piece by means of the rotation of the outer roller, having a radius R, through an arc centred on the axis of the inner roller.

7.2 The diameter D of the inner roller shall conform to the requirements of the application standard concerning the welded joint under examination.[2)]

7.3 The test is completed when the bending angle α, (see figure 4) reaches the value given in the application standard concerning the welded joint under examination.

8 Results

After bending, both the external surface and the sides of the test piece shall be examined.

The evaluation of the bent test piece shall be made in accordance with the appropriate application standard for the welded joint under examination.

In the test report the method of bending shall be recorded.

1) When it is not otherwise specified in the application standard concerning the welded joint under examination, the diameter D of the former should be chosen in such a way that, after bending, the width L_S of the weld face is included in an angle not exceeding 90° (see figure 3).

2) When it is not otherwise specified in the application standard concerning the welded joint under examination, the diameter D of the inner roller should be chosen in such a way that, after bending, the width L_S of the weld face is included in an angle not exceeding 90° (see figure 4).

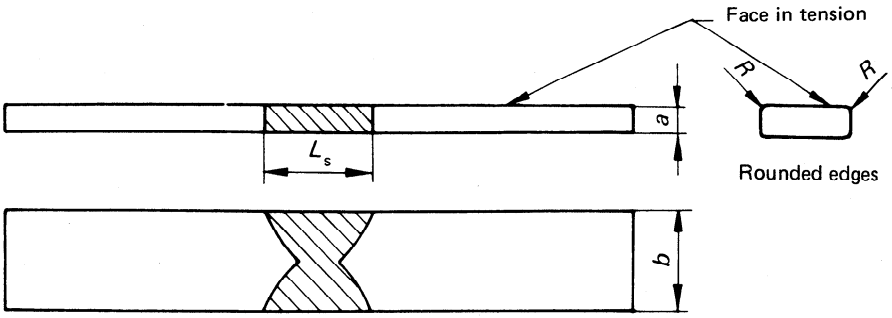
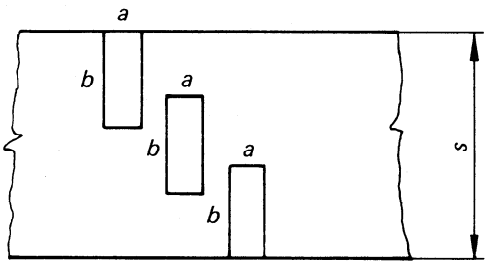


Figure 1



a = thickness of the test piece
b = width
L_s = width of the weld
S = thickness of the joint

Figure 2

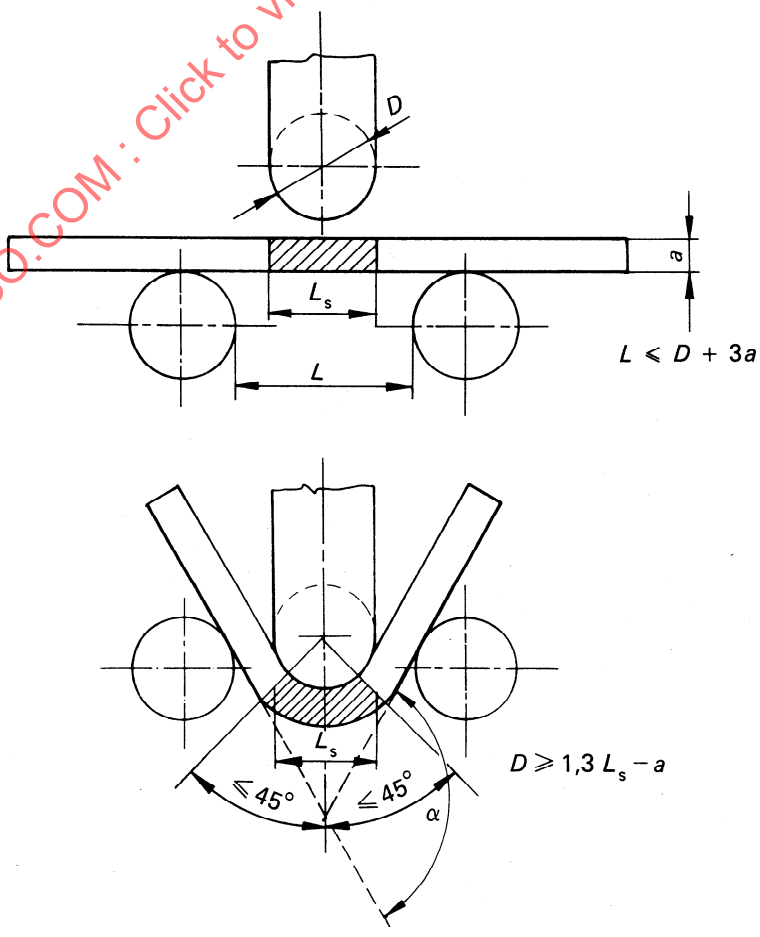


Figure 3

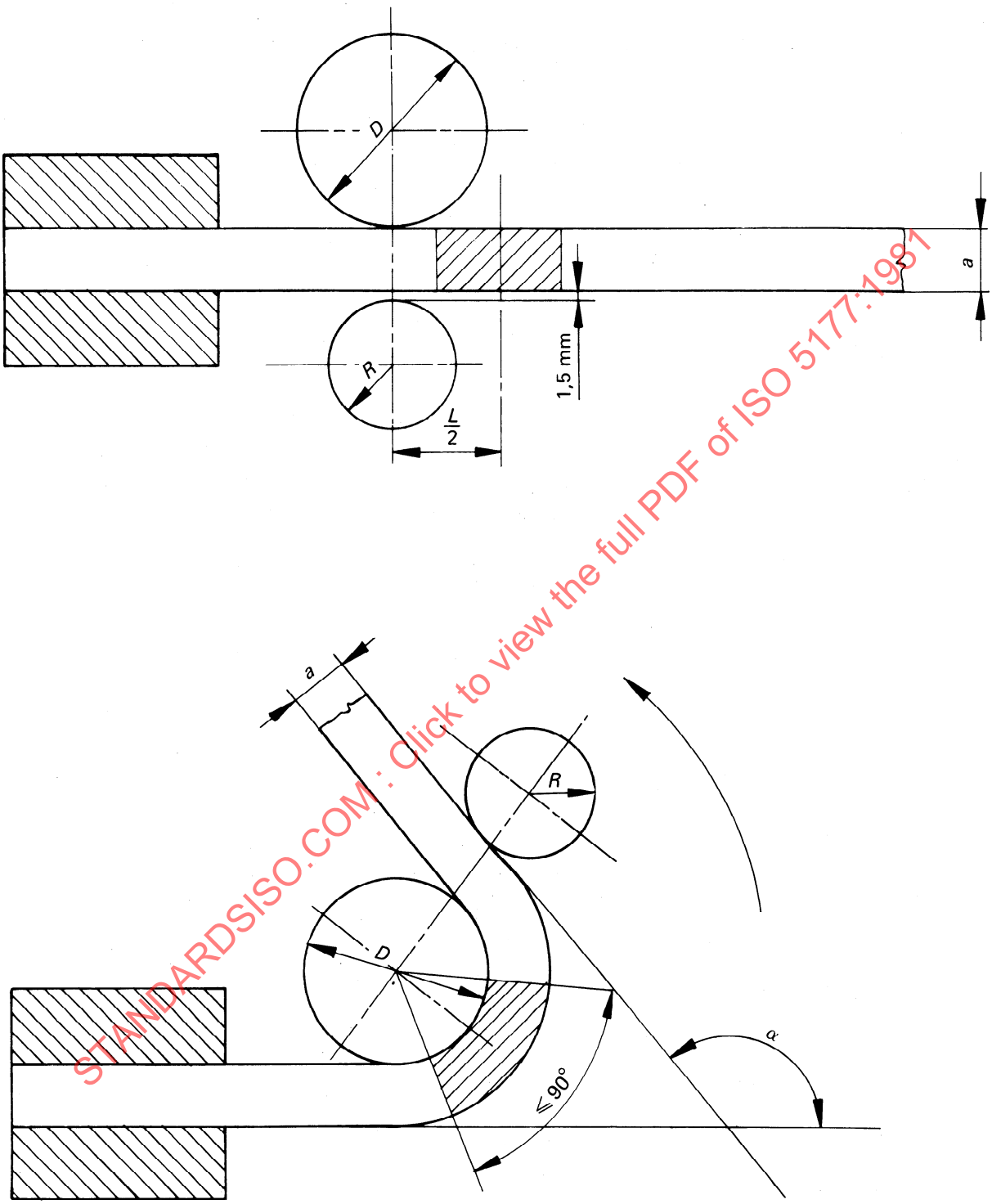


Figure 4