INTERNATIONAL STANDARD 144

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Steel — Reverse bend testing of wire

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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 144 was drawn up by Technical Committee ISO/TC 17, *Steel,* and circulated to the Member Bodies in March 1972.

It has been approved by the Member Bodies of the following countries:

Australia	Hungary	South Africa, Rep. of
Austria	India	Spain
Belgium	Ireland	Sweden
Canada	Italy	Switzerland
Chile	Japan	Thailand
Czechoslovakia	Netherlands	Turkey
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Finland	Pakistan	U.S.S.R.
France	Portugal	
Germany	Romania	

No Member Body expressed disapproval of the document.

This International Standard cancels and replaces ISO Recommendation R 144-1960.

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Steel — Reverse bend testing of wire

1 SCOPE AND FIELD OF APPLICATION

This International Standard applies to the reverse bend testing of steel wire having a diameter or characteristic dimension equal to or greater than 0,4 mm (0.016 in). The diameter or characteristic dimension is usually not greater than 10 mm (0.4 in).

2 PRINCIPLE

The test consists of repeated bending of a test piece through 90° in opposite directions, in one plane. The test piece is gripped at one end and each bend is made over a cylindrical surface of specified radius.

3 SYMBOLS AND DESIGNATIONS

TABLE 1

Number	Symbol	Designation
1	d	Diameter of a round wire (see Figure 1)
2	a	Minimum thickness of a wire of non-circular section which it is possible to arrange between parallel clamps (see Figure 3)
3	R	Radius of curvature of cylindrical former
4	h	Distance from top of cylindrical former to bottom face of guide
5	d_g	Diameter of guide hole
6	y	Distance from centre of curvature of the cylindrical former to the top edge of the gripping faces
—	N_b	Number of reverse bends

4 TEST PIECE

4.1 The length of wire to be used as the test piece is to be as straight as possible, but it may exhibit slight curvature in the plane in which it will be bent during the test.

4.2 If straightening is necessary, it shall be done by hand or, if this is not possible, by hammering on a level surface of wood, plastics material or copper using a hammer made of one of these materials.

4.3 During straightening, the surface of the wire must not be damaged and the test piece must not be subjected to any twisting.

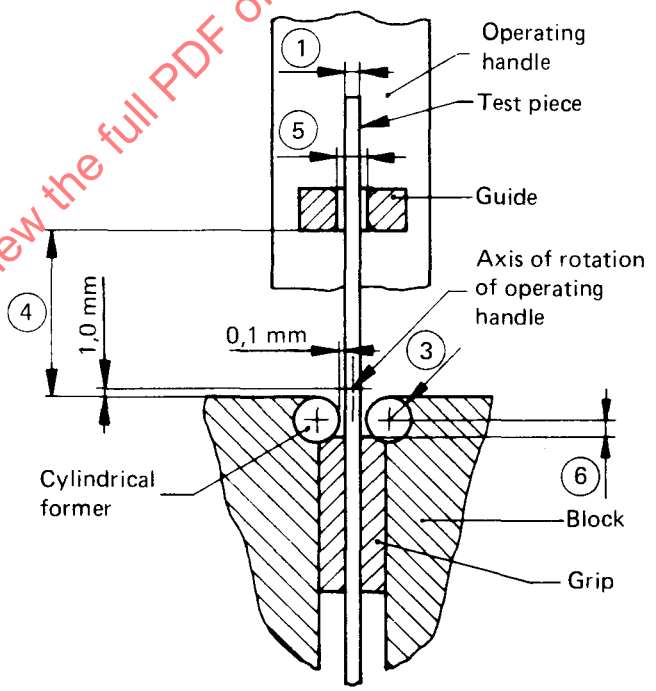

FIGURE 1 — **Essential elements of bend testing machine for wire**

5 TESTING MACHINE

5.1 General

The testing machine shall be constructed to conform with the principles indicated in Figure 1 and the essential dimensions given in Table 2.

5.2 Cylindrical formers and gripping faces

5.2.1 The cylindrical formers and the gripping faces of the blocks shall be made of material having good wear resistance with a hardness of preferably not less than 750 HV.

The design of the machine shall allow for the renewal of cylindrical formers and gripping faces.

5.2.2 The radius of the cylindrical formers shall not differ from the nominal dimension by more than the tolerance given in Table 2 and, in any event, the radii of the formers shall not differ from each other by more than 0,05 mm.

5.2.3 The axes of the formers shall be parallel and in the same plane to within 0,1 mm (see also 6.2).

5.2.4 The gripping faces shall project slightly beyond the surface of the cylindrical formers to a distance which does not exceed 0,1 mm, as measured by the clearance between the test piece and each cylindrical former on a line joining the centres of curvature.

5.2.5 The top edge of the gripping faces shall be below the centres of curvature of the cylindrical formers by a distance of 1,5 mm for formers of radius equal to or less than 2,5 mm, and 3 mm for formers of larger radius.

5.3 Bending arm and guide arm

5.3.1 The distance of the pivoting axis of the bending arm from the top of the cylindrical formers shall be 1,0 mm for all sizes of former.

5.3.2 The angular movement of the bending arm shall be limited by stops so that the centre line of the arm will describe a 90° arc.

5.3.3 The distance from the top of the cylindrical former to the under side of the guide arm shall be in accordance with Table 2.

5.3.4 The holes in the guide arm shall widen out at each end and have a diameter in accordance with Table 2.

5.3.5 To ensure correct alignment of the test piece and contact with the cylindrical former when testing small sizes of wire over formers of radius equal to or less than 2,5 mm, the guide arm shall be fitted with a tensioning device, capable of applying a load to the wire of preferably not less than 1 % and not more than 3 % of the nominal or specified breaking load (maximum load associated with tensile strength) of the wire.

6 PROCEDURE

6.1 Select the radius of former, R, distance, h, and diameter of hole, d_g, according to wire diameter as given in Table 2. For wires of special shape, refer to the material specification.

6.2 With the bending arm in the vertical position, introduce the test piece through one of the holes in the guide arm. Hold one end of the wire between the gripping faces of the blocks so that the test piece is perpendicular to the axes of the cylindrical formers.

6.2.1 Non-circular test pieces are to be placed so that the greater dimension is parallel or approximately parallel to the gripping faces, as shown in Figure 3.

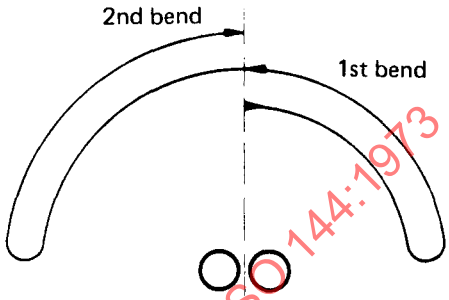

FIGURE 2 – **Method of counting bends**

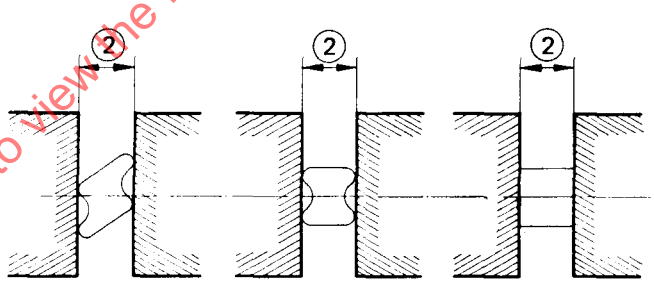

FIGURE 3 – **Examples of positioning of non-circular test pieces**

6.3 Bend the end of the wire in the guide arm over one cylindrical former through 90° and then back to the vertical position. This counts as one reverse bend.

6.3.1 Then bend the wire through 90° in the opposite direction over the other cylindrical former and back to the vertical position. Continue this process alternately to right and left until complete fracture occurs.

6.3.2 With the method of counting given in 6.3.1, the bend in which the wire fractures is only counted if the break occurs when the wire is being bent back to the vertical position.

6.4 If the testing machine has an automatic counter operating at the limit stops, then the first bend down through 90° counts as one bend and the second bend is represented by the 180° bend in the opposite direction.

6.4.1 Subsequent bends are counted for each 180° movement, but the bend in which fracture occurs is not counted.