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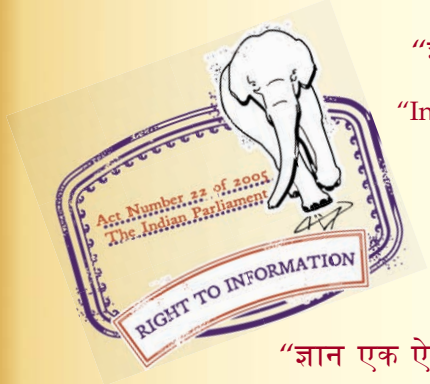

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IS : 1716 - 1985
(Superseding IS : 6878-1973)
(Reaffirmed 2006)

Indian Standard

METHOD FOR REVERSE BEND TEST FOR METALLIC WIRE

(Second Revision)

UDC 669-426 : 620·177·6

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 2 *May* 1986

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Indian Standard

METHOD FOR REVERSE BEND TEST FOR METALLIC WIRE

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 28 February 1985, after the draft finalized by the Methods of Physical Tests Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first published in 1960 and revised in 1971. While reviewing this standard in light of the work done by ISO/TC 164 'Mechanical testing of metals' at the international level, the Methods of Physical Tests Sectional Committee decided to revise this standard so as to have a single reference Indian Standard on method for reverse bend test for metallic wires. With the publication of this standard, IS : 6878-1973* shall be superseded as the requirements of IS : 6878-1973* have been covered in this standard.

0.3 In this revision the lower limit of the size of the wire for which this test is applicable has been reduced from 0·4 mm to 0·3 mm and the radius of the cylindrical support to be used for testing of different sizes of wires has been specified.

0.4 In the preparation of this standard, assistance has been derived from ISO : 7801 - 1984 'Metallic materials — wire-reverse bend test', issued by the International Organization for Standardization (ISO).

0.5 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960†.

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1. SCOPE

1.1 This standard specifies the method for determining the ability of metallic wire of diameter or thickness 0·3 to 10 mm inclusive to undergo

*Method of reverse bend testing of copper and copper alloy wire.

†Rules for rounding off numerical values (*revised*).

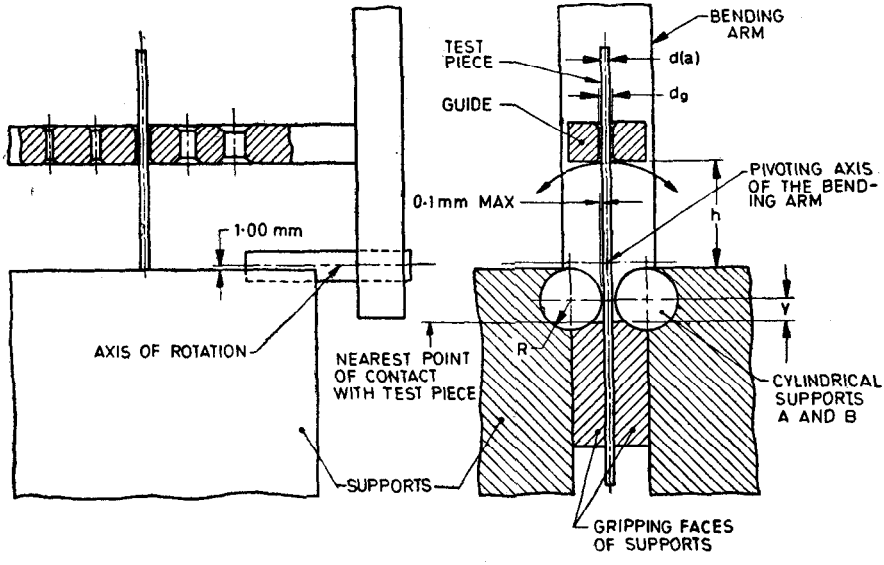
plastic deformation during reverse bending. The range of diameters or thicknesses for which this standard is applicable may be more exactly specified in the relevant product standard.

2. PRINCIPLE OF TEST

2.1 The reverse bend test consists of repeated bending, through 90° in opposite directions, of a test piece held at one end, each bend being over a cylindrical support of a specified radius.

3. SYMBOLS AND DESIGNATIONS

3.1 Symbols and designations used in reverse bend testing of wires shall be as specified in Fig. 1.



Symbol	*Designation*
d	Diameter of round wire
a	Minimum thickness of wire of non-circular section capable of being held between parallel grips (*see* Fig. 2)
R	Radius of cylindrical supports
h	Distance from the top tangential plane of supports to the bottom face of guide
d_g	Diameter of guide hole
y	Distance from a plane, defined by the axes of the cylindrical supports, to the nearest point of contact with the test piece
N_b	Number of reverse bends

FIG. 1 ESSENTIAL ELEMENTS OF BEND TESTING MACHINE FOR WIRE

4. TESTING EQUIPMENT

4.1 General — The testing machine shall be constructed so as to conform with the principles indicated in Fig. 1 and the essential dimensions given in Table 1.

TABLE 1 DIMENSIONS AND TOLERANCES

(*Clauses* 4.1, 4.2.3, 4.3.2 *and* 6.2)

All dimensions in millimetres.

Nominal Diameter or Thickness of Wire	Radius of Cylindrical Support	Distance	Diameter of Guide Hole (*see* Note)
(1)	(2)	(3)	(4)
d(a)	R	h	d_g
$0{\cdot}3 \leqslant d(a) \leqslant 0{\cdot}5$	$1{\cdot}25 \pm 0{\cdot}05$	15	2·0
$0{\cdot}5 < d(a) \leqslant 0{\cdot}7$	$1{\cdot}75 \pm 0{\cdot}05$	15	2·0
$0{\cdot}7 < d(a) \leqslant 1{\cdot}0$	$2{\cdot}5 \pm 0{\cdot}1$	15	2·0
$1{\cdot}0 < d(a) \leqslant 1{\cdot}5$	$3{\cdot}75 \pm 0{\cdot}1$	20	2·0
$1{\cdot}5 < d(a) \leqslant 2{\cdot}0$	$5 \pm 0{\cdot}1$	20	2·0 and 2·5
$2{\cdot}0 < d(a) \leqslant 3{\cdot}0$	$7{\cdot}5 \pm 0{\cdot}1$	25	2·5 and 3·5
$3{\cdot}0 < d(a) \leqslant 4{\cdot}0$	$10 \pm 0{\cdot}1$	35	3·5 and 4·5
$4{\cdot}0 < d(a) \leqslant 6{\cdot}0$	$15 \pm 0{\cdot}1$	50	4·5 and 7·0
$6{\cdot}0 < d(a) \leqslant 8{\cdot}0$	$20 \pm 0{\cdot}1$	75	7·0 and 9·0
$8{\cdot}0 < d(a) \leqslant 10{\cdot}0$	$25 \pm 0{\cdot}1$	100	9·0 and 11·0

Note — Where appropriate, the smaller diameter of hole is to be used for the smaller nominal diameter of wire (*see* col 1) and the larger diameter of hole for the larger diameter of wire (*see also* col 1). For diameters within ranges given in col 1, the appropriate size of hole is to be chosen to ensure free movement of the wire.

4.2 Cylindrical Supports and Gripping Faces

4.2.1 The cylindrical supports and the gripping faces shall be of sufficient hardness.

4.2.2 The radius of cylindrical support r shall not differ from its nominal dimension by more than the tolerance given in Table 1.

4.2.3 The axis of cylindrical supports shall be perpendicular to the plane of bend and shall be parallel and in the same plane to within 0·1 mm.

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

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

4.3 Bending Arm and Guide

4.3.1 The distance of the pivoting axis of the bending arm from the top of the cylindrical supports shall be 1·0 mm for all sizes of supports.

4.3.2 The holes in the guide shall widen out at each end and have a diameter in accordance with Table 1.

5. TEST PIECE

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

5.2 If straightening is necessary, it shall be done by hand or, if this is not possible, by hammering on a level surface of wood, plastic material or copper using a hammer of a similar material.

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

5.4 Wire with a localized sharp curvature shall not be straightened.

6. TEST PROCEDURE

6.1 The test shall be carried out at ambient temperature unless otherwise specified.

6.2 The radius of the support R, the distance h, and the diameter of the hole d_g shall be selected according to the wire diameter as given in Table 1.

6.3 The test piece shall be inserted with the bending arm vertical, through one of the holes in the guide as indicated in Fig. 1. The lower end of the test piece shall be held between the grips so that the test piece is perpendicular to the axes of the cylindrical supports.

NOTE — Non-circular test piece shall be placed so that the greater dimension shall be parallel, or approximately parallel, to the gripping faces as shown in Fig. 2.

6.4 The test piece shall be bent through 90° alternatively in opposite directions. One bend consists of bending the free end of the test piece

through 90° and returning it to its original position. The following bend shall be made in the opposite direction as shown in Fig. 3. The testing between successive bends shall not be interrupted.

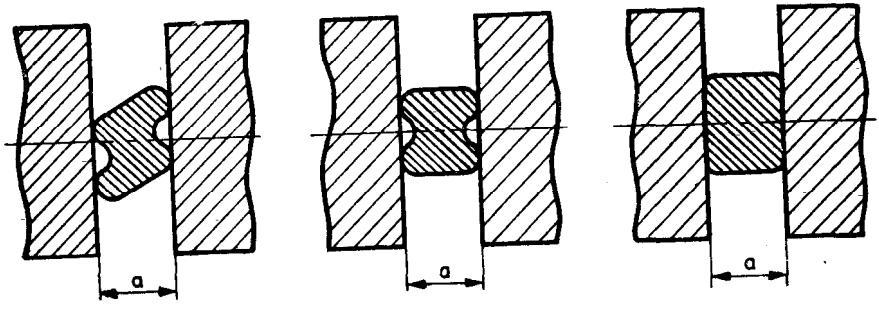


FIG. 2 EXAMPLES OF POSITION OF NON-CIRCULAR TEST PIECES

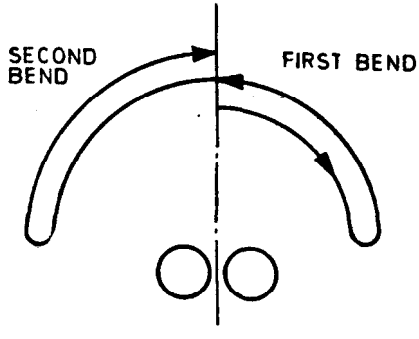


FIG. 3 METHOD OF COUNTING REVERSE BENDS

6.5 The test piece shall be bent at a uniform rate without shock, not exceeding one bend per second. If necessary, the rate of bending shall be reduced to ensure that the heat generated does not affect the result of the test.

6.6 To ensure continuous contact between the test piece and the cylindrical supports during the test, some form of constraint may be applied. This may be in the form of a tensile stress not greater than 2 percent of the value of the nominal tensile strength, unless otherwise specified in the relevant standard.

6.7 The test shall be continued until the number of bends specified in the relevant standard is completed, or cracking visible without the use of magnifying aids is seen to occur.

6.7.1 Alternatively, if specified in the relevant standard, the test shall be continued until complete fracture of the test piece occurs.

6.8 The bend during which the failure of test piece occurs shall not be counted into the number of bends N_b.

7. TEST REPORT

7.1 The test report shall include the following information:

a) Reference to this standard;

b) Identification of the test piece (for example, type of the material, cast number, etc);

c) Nominal diameter d or minimum thickness a of the test piece;

d) Details regarding the preparation of the test piece (for example, straightening);

e) Test conditions (for example, radius R of the cylindrical supports, application of tensile stress);

f) Criterion for ending the test; and

g) Test result.