Draft *Indian Standard*

METHOD FOR IZOD IMPACT TEST OF METALS

(Second Revision of IS 1598)

FOREWORD

This standard was first published in 1960 and subsequently revised in 1977. Major changes in the first revision are as follows:

a) The Dimensions and Tolerance of the test pieces has been modified,
b) Sampling procedure in case of Heat-treated sample has been elaborated.

This revision (*second revision*) has been undertaken to modify the scope, inclusion of references, modification of nominal dimension and machining tolerances.

In reporting the result of a test or analysis made in accordance with this standard, is to be rounded off, it shall be done in accordance with IS 2:2022 'Rules for rounding off numerical values (revised)'

1 SCOPE

This standard prescribes the method of test for notched bar (square and round) impact testing of metallic materials by Izod test. This standard does not cover the test method for the specimens made by powder metallurgy.

2 REFERENCES

The standards listed below contain provisions, which through references in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility
of applying the most recent editions of the standards indicated below.

IS no	*Title*
3766:1977	Method for Calibration of Pendulum Impact Testing Machines for Testing Metals
1757(Part 1):2020/ ISO 148-1:2016	Metallic Materials Charpy Pendulum Impact Test Part 1 Test Method

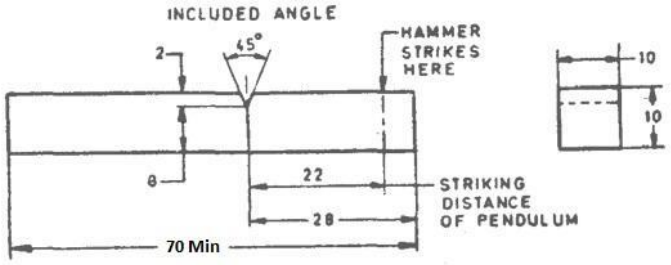
3 PRINCIPLE OF TEST

The test consists of breaking by one blow from a swinging hammer, under specified conditions, a notched test piece, gripped vertically with the bottom of the notch in the same plane as the upper face of the grips. The blow is struck at a fixed position on the face having the notch. The energy absorbed is determined.

4 TEST SPECIMEN

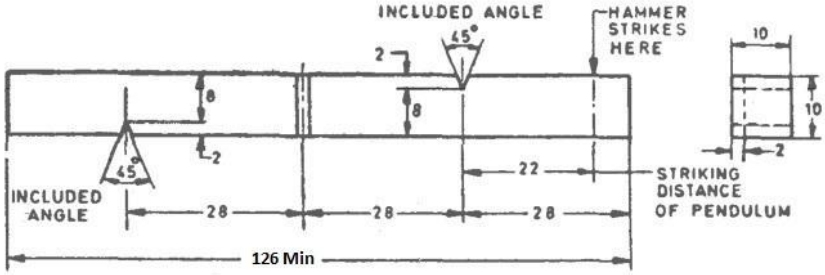
4.1 The test piece shall be of either square or round section. When heat-treated materials are being evaluated, the specimen shall be finish machined, including notching, after the final heat treatment, unless it can be demonstrated that the impact properties of specimens machined before heat treatment are identical to those machined after heat treatment

4.1.1 The test piece shall conform to the dimensions given in Fig. 1, 2 and 3 for square test pieces and Fig 5, 6 and 7 for round test pieces.



All dimensions in millimetres.

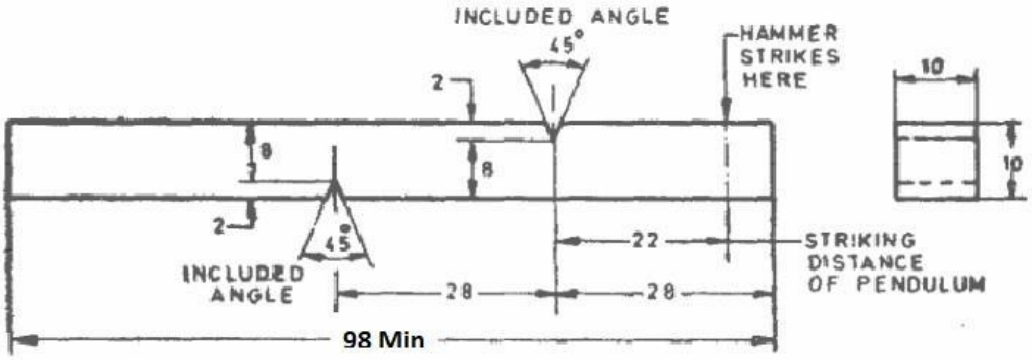
FIG. 1 SINGLE-NOTCH SQUARE TEST PIECE



All dimensions in millimetres.

FIG. 2 THREE-NOTCH SQUARE TEST PIECE

4.1.2 In each case the plane of symmetry of the notch shall be perpendicular to the longitudinal axis of the test piece. The surface of the specimen shall be smooth and free from grooves running parallel to the plane of symmetry of the notch.



All dimensions in millimetres.

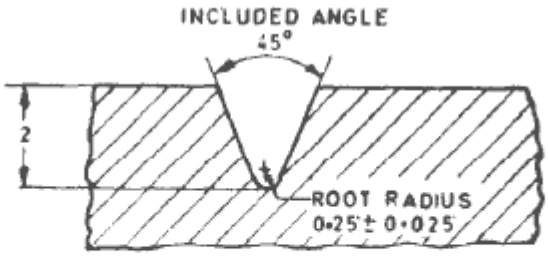
FIG. 3 TWO-NOTCH SQUARE TEST PIECE

4.1.3 The notch shall be of V-form having an included angle of 45±1°. The notch may be made by any machining method. The notch shall be carefully prepared so that no groove appears at the base of the notch.

4.1.4 Identification marks shall only be placed in the following locations on specimens: Either of the 10mm square ends, side of the specimen opposite to the notch.

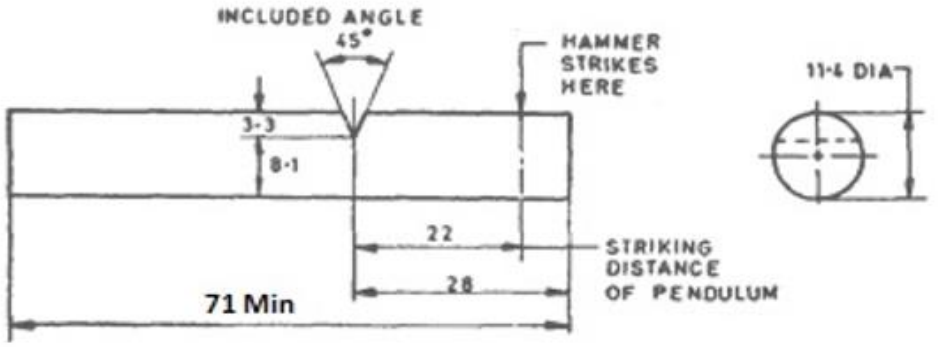
4.1.5 Stamping and other marking processes that result in deformation of the specimen should only be used on the ends of the specimens, prior to notching.

4.2 Square Test Pieces - The notch shall be 2 mm deep with a root radius of 0.25 mm (*see* Fig. 4).



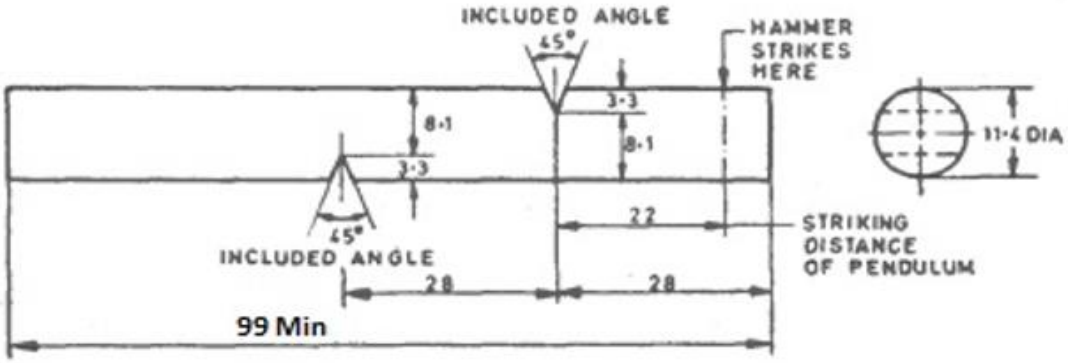
All dimensions in millimetres.

FIG. 4 ENLARGED VIEW OF NOTCH FOR SQUARE TEST PIECE



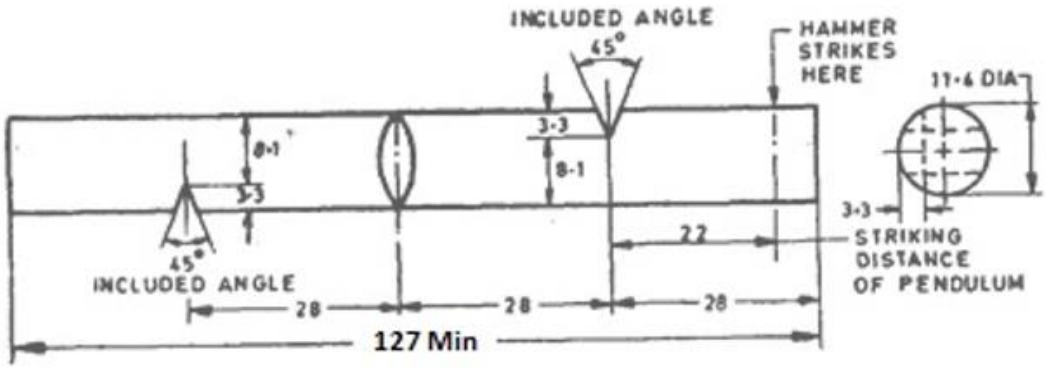
All dimensions in millimetres.

FIG. 5 SINGLE-NOTCH ROUND TEST PIECE



All dimensions in millimetres,

FIG. 6 TWO-NOTCH ROUND TEST PIECE



All dimensions in millimetres.

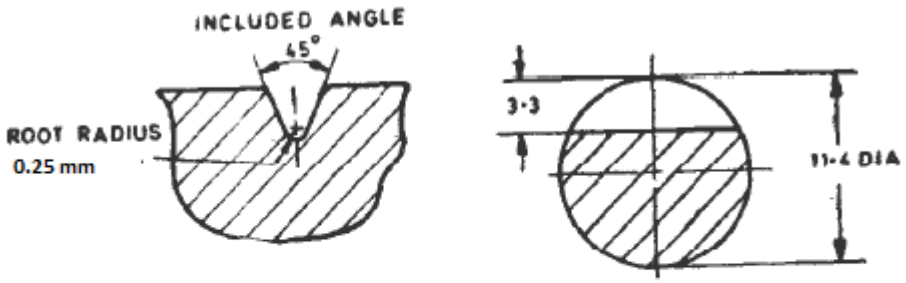
FIG. 7 THREE-NOTCH ROUND TEST PIECE

4.2.1 The following Machining tolerances on the specified dimensions of square shaped specimen are permitted:

Item	Nominal Dimension	Machining Tolerances	
		Ferrous Test Piece	Non- Ferrous Test Piece
Length			
Single Notch	70 mm, *Min*	-	-
Two Notch	98 mm, *Min*	-	-

Three Notch	126 mm, *Min*	-	-
Thickness	10 mm	± 0.11 mm	± 0.05 mm
Width	10 mm	± 0.11 mm	± 0.05 mm
Angle of Notch	45°	± 2°	± 1°
Root Radius of notch	0.25 mm	± 0.025 mm	± 0.025 mm
Depth below notch	8 mm	± 0.1 mm	± 0.025 mm
Distance of notch from end of test piece and from adjacent notch	28 mm	± 0.42 mm	± 0.42 mm
Angle between plane of symmetry of notch and the axis of the test piece	90°	± 2°	± 1°

4.3 Round Test Pieces - The notch shall be 3.30 mm deep at the position of its maximum depth in the specimen. It shall have a root radius of 0.25 mm (*see* Fig. 8)



All dimensions in millimetres.

FIG. 8 ENLARGED SECTION OF NOTCH FOR ROUND TEST PIECE

4.3.1 The following Machining tolerances on the specified dimensions are permitted:

Item	Nominal Dimension	Machining Tolerances	
		Ferrous Test Piece	Non- Ferrous Test Piece
Length			
Single Notch	71 mm, *Min*	-	-
Two Notch	99 mm, *Min*	-	-
Three Notch	127 mm, *Min*	-	-
Diameter	11.4 mm	± 0.14 mm	± 0.07 mm
Angle of Notch	45°	± 2°	± 1°
Root Radius of notch	0.25 mm	± 0.025 mm	± 0.025 mm
Depth below notch	8.1 mm	± 0.1 mm	± 0.05 mm
Distance of notch from end of test piece and from adjacent notch	28 mm	± 0.42 mm	± 0.5 mm

Angle between plane of symmetry of notch and the axis of the test piece	90°	± 2°	± 1°

5 TESTING MACHINES

5.1 The testing machine shall be of rigid construction and installation.

5.1.1 The following conditions shall be satisfied:

a)	Distance between base of notch (top of grips) and point of specimen hit by the hammer (L of Fig. 9)	22 ± 0.5 mm
b)	Angle between top face of grips and face holding the specimen vertical	90° ± 1°
c)	Angle at tip of hammer	75° ± 1°
d)	Angle between normal to the specimen and the underside face of the hammer at striking point	10° ± 1°
e)	Speed of hammer at impact	3 to 4 m/s
f)	Striking Energy	165 ± 3.4 J

5.1.1.1 Testing machines with different striking energies, with an accuracy of ± 2 percent are permitted, particularly where lower capacities shall provide better discrimination with materials of low energy absorption. When recording the energy absorbed, the striking energy of the machine shall also be indicated.

5.1.2 The weight of the anvil and its foundation shall be at least 40 times the weight of the hammer.

5.1.3 The plane of swing of the hammer shall be perpendicular to the Izod vice within 3 in 1000.

5.1.4 The radius of the centre of percussion about the axis of rotation shall be equal to the radius of the striker about this axis within a tolerance of ± 1 percent.

5.1.5 The machine shall be verified in accordance with IS 3766 and shall satisfy the relevant requirements of that standard.

5.1.6 The machine shall also satisfy the conditions stated in Fig. 9 and 10.

6. TEST REQUIREMENTS

6.1 Perform a routine procedure for checking impact machines at the beginning of each day, each shift, or just prior to testing on a machine used intermittently.

6.2 Check the machine with a free swing. The indicating device shall indicate zero on machines reading directly in absorbed energy.

6.3 The longitudinal axis of the test piece shall lie in the plane of swing of the centre of gravity of the hammer.

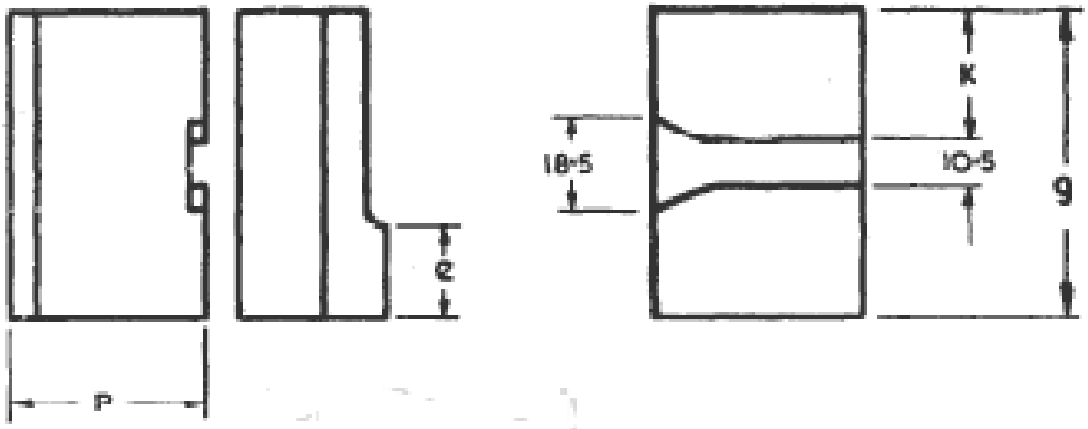
6.4 The notch shall be positioned so that its plane of symmetry coincides with the top face of the grips.

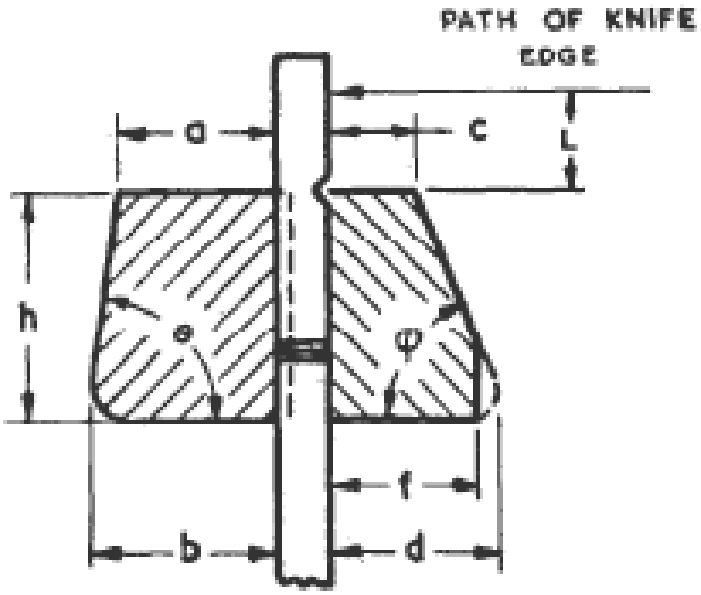
6.5 The notch shall be at right angles to the plane of swing of the centre of gravity of the hammer. This is ensured by form of the test pieces and method of grip.

6.5.1 The test piece shall be gripped tightly in the anvil grips.

6.6 During testing of the two- and three-notch test pieces the material remaining for testing after each test shall be examined to ensure that the correct length of test piece is available above the next notch and any undesirable deformed metal shall be removed to ensure that the form and length of the test piece are correct before further testing.

6.7 Unless otherwise stated in the relevant material specification, an impact test shall consist of three specimens taken from a single test coupon or test location, the average value of which shall comply with the specified minimum, but in no case below either two-thirds of the specified minimum or 7 Joules whichever is greater. If more than one value is below the specified minimum, or if one value is below the greater of 7 Joules or two-thirds of the specified minimum, a retest of three additional specimens shall be made, each of which should have a value equal to or exceeding the specified minimum.

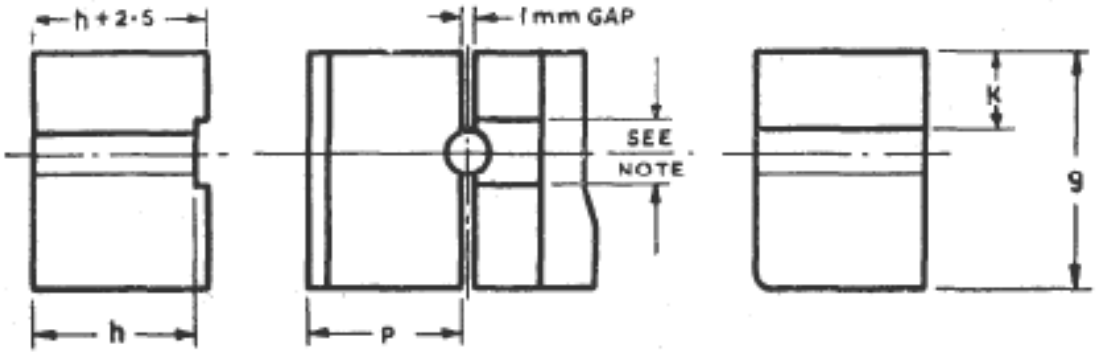


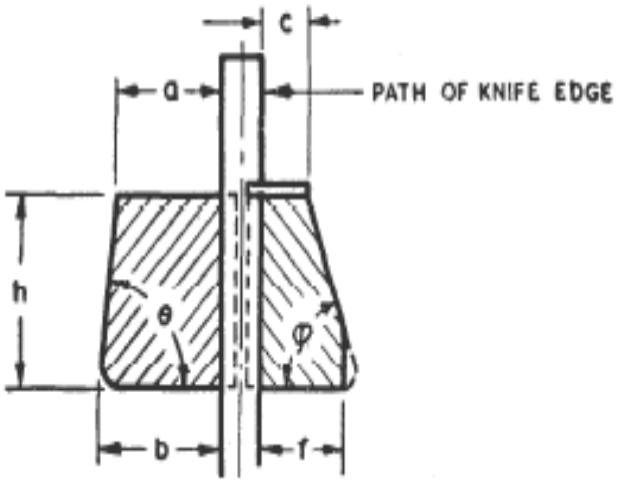


NOTE — Dimensions a, b, c, d, e, f, g, k, and the angle 0 and should be obtained from the actual grips in the machine, the dimension h should be checked and, if necessary, corrected to make L equal to 22 mm.

All dimensions in millimetres.

FIG. 9 VIEW OF GRIPS AND MODE OF ASSEMBLY FOR TESTING SQUARE SPECIMEN





Note - See note under Fig. 9 for dimensions *a*, *b*, *c*, etc. Slot for gauge for setting test piece notch parallel to knife edge and level with top of vice.

All dimensions in millimetres.

FIG. 10 VIEW OF GRIPS AND MODE OF ASSEMBLY FOR TESTING ROUND SPECIMEN

6.5.1 The impact value shall be quoted in joules.

6.6 The temperature of the test piece at the moment of breaking shall not differ from the specified temperature by more than ± 2 C unless some other tolerance is agreed. If the temperature of testing is not specified, it shall be taken as 27'C subject to the above tolerance. In all cases, the temperature of test shall be recorded.

NOTE-In view of the difficulties of carrying out the Izod test at other than ambient temperatures, it is recommended that Charpy V-notch test be used for testing at sub-ambient and elevated temperatures as per IS 1757 (Part 1)

6.7 If, during the test, the test piece is not completely broken, the impact value obtained is indefinite. The test report should state that the test piece was unbroken by joules.