

धातुओं के आयजोड़ संघट्ट परीक्षण—  
परीक्षण पद्धति  
(दूसरा पुनरीक्षण)

Izod Impact Test of Metals — Method  
of Test  
( Second Revision )

ICS 77.040.10

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भारतीय मानक ब्यूरो  
BUREAU OF INDIAN STANDARDS  
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI - 110002  
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## FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Mechanical Testing of Metals Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1960 and subsequently revised in 1977. This revision has been brought out to bring the standard in the latest style and format of the Indian Standards.

In addition, the following changes have been made:

- a) Scope has been modified;
- b) References clause has been added; and
- c) Nominal dimensions and machining tolerances have been modified.

The Izod impact test is a widely used method to assess the impact resistance of metals. It measures the ability of a material to withstand sudden shock or loading conditions. In this test, a notched bar-shaped specimen of the metal is clamped vertically with the notch facing outward. A pendulum or striker is released from a predetermined height, striking the specimen at its notch. The impact causes the specimen to fracture, and the energy required to break it is recorded. The result is reported in joules or foot-pounds. The Izod impact test is particularly valuable in quality control and material selection processes, as it provides critical data on a metal's toughness and resistance to fracture under dynamic conditions. Industries such as automotive, aerospace, construction, and manufacturing rely on the Izod impact test to ensure the integrity and reliability of their metal components in real-world applications.

The composition of the Committee responsible for the formulation of this standard is given in [Annex A](#).

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.

*Indian Standard***IZOD IMPACT TEST OF METALS — METHOD OF TEST***( Second Revision )***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 standard given below contain provisions, which through references in this text constitute provisions of this standard. At the time of publication, the edition indicated was 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 edition of these standards.

<i>IS No.</i>	<i>Title</i>
IS 1757 (Part 1) : 2020/ ISO 148-1 : 2016	Metallic materials — Charpy pendulum impact test: Part 1 Test method <i>(fourth revision)</i>

**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](#), [Fig. 2](#) and [Fig. 3](#) for square test pieces and [Fig 5](#), [Fig. 6](#) and [Fig. 7](#) for round test pieces.

**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.

**4.1.3** The notch shall be of V-form having an included angle of  $45^\circ \pm 1^\circ$ . 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 10 mm square ends, side of the specimen opposite to the notch.

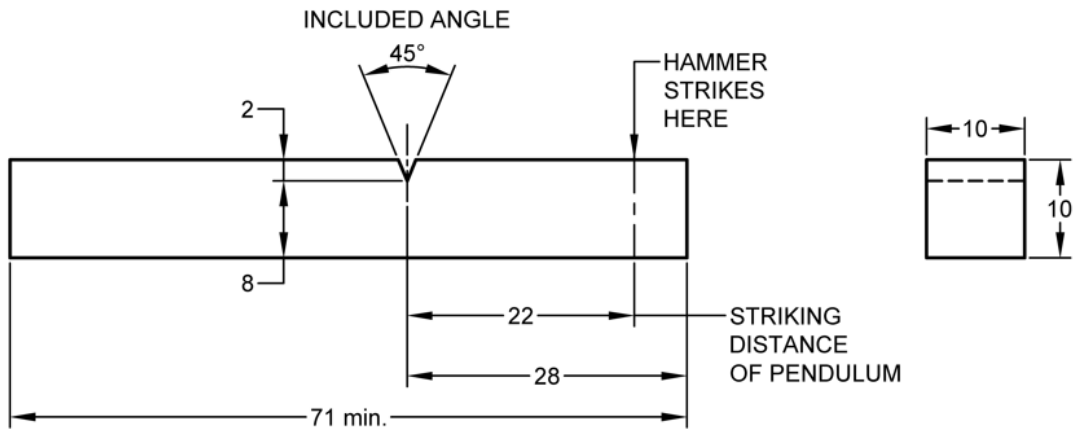
**4.1.5** Stamping and other marking processes that result in deformation of the specimen should only be used on the ends of the specimens, prior to notching.

**4.2 Square Test Pieces**

The notch shall be 2 mm deep with a root radius of 0.25 mm (*see* [Fig. 4](#)). The machining tolerances on the specified dimensions of square shaped specimen are permitted as per [Table 1](#).

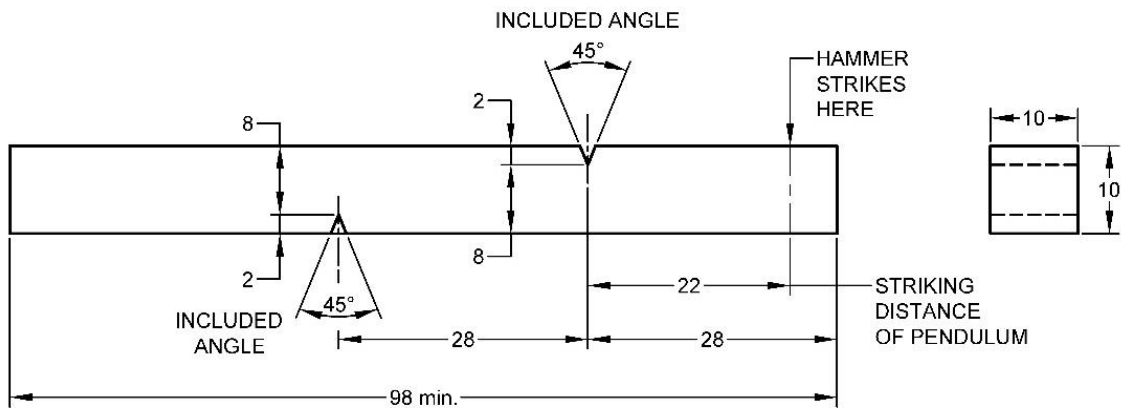
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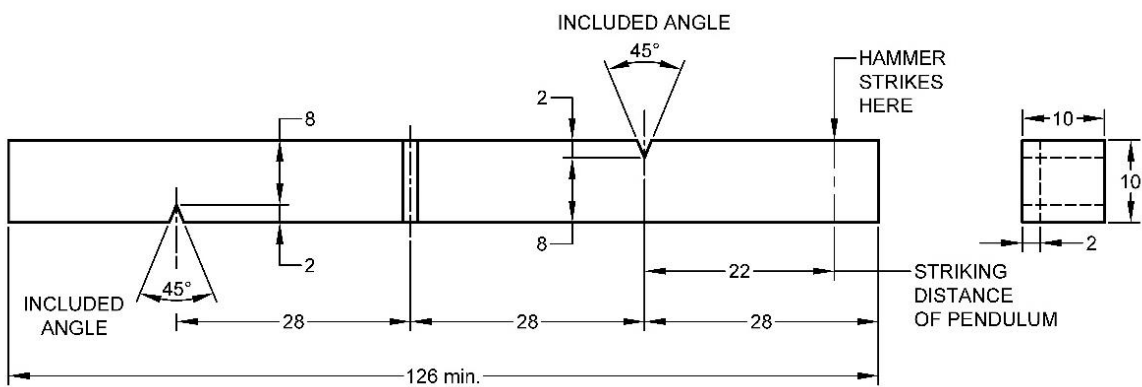
All dimensions in millimetres.

FIG. 1 SINGLE-NOTCH SQUARE TEST PIECE



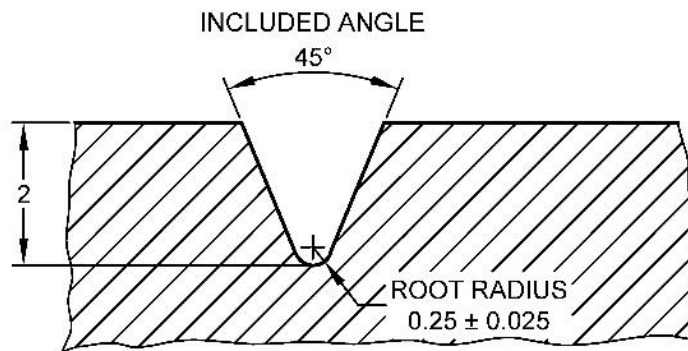
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FIG. 2 TWO-NOTCH SQUARE TEST PIECE



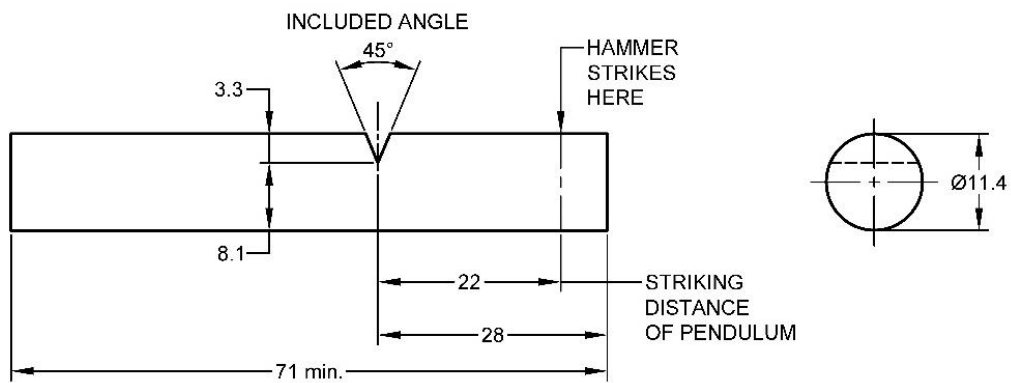
All dimensions in millimetres.

FIG. 3 THREE-NOTCH SQUARE TEST PIECE



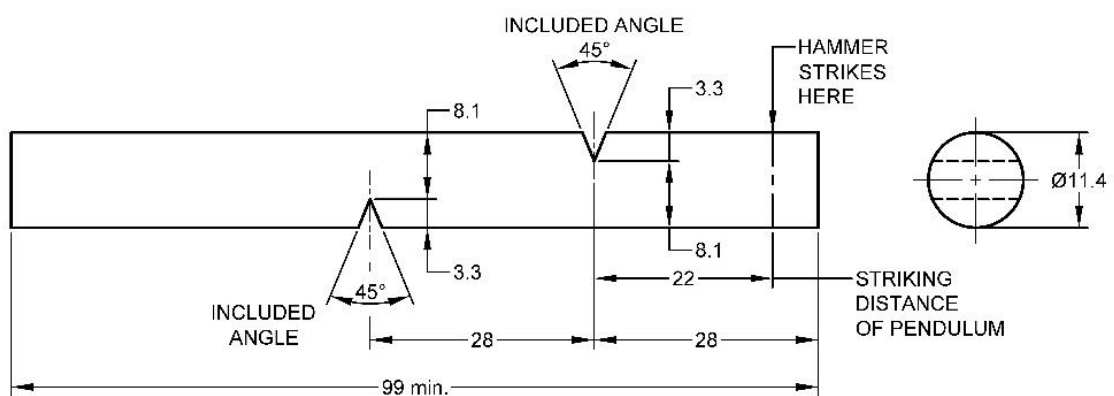
All dimensions in millimetres.

FIG. 4 ENLARGED VIEW OF NOTCH FOR SQUARE TEST PIECE



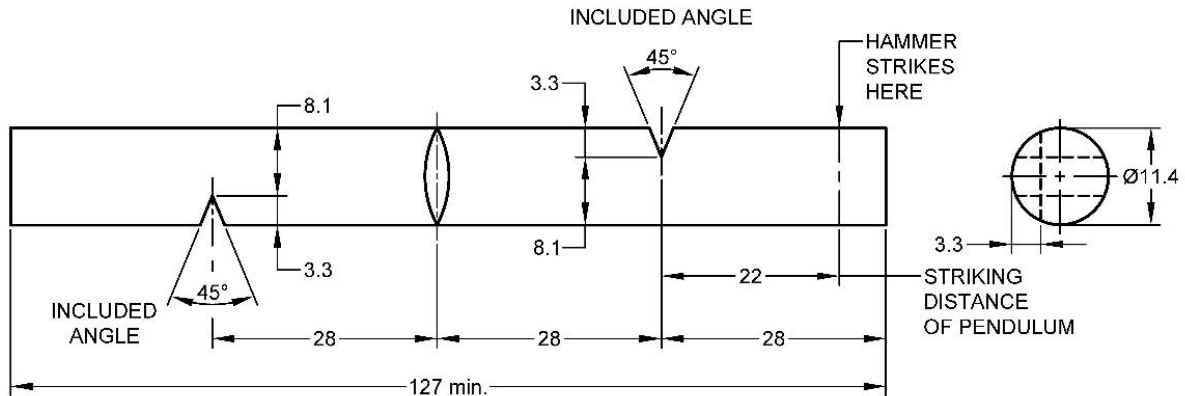
All dimensions in millimetres.

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

**Table 1 Machining Tolerances on the Specified Dimensions for Square Test Pieces**

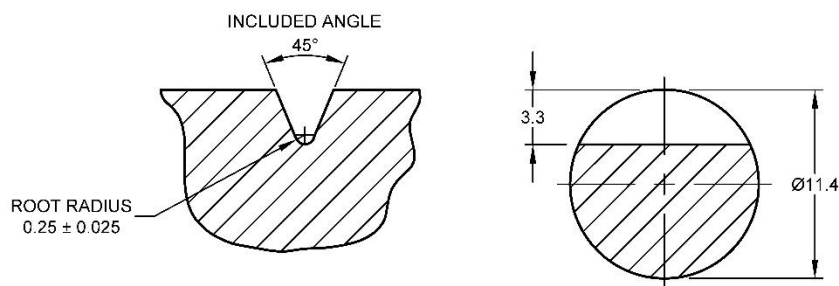
(Clause 4.2)

Sl No.	Item	Nominal Dimension	Machining Tolerances	
			Ferrous Test Piece	Non-Ferrous Test Piece
(1)	(2)	(3)	(4)	(5)
i)	Length			
	a) Single notch	70 mm, <i>Min</i>	—	—
	b) Two notch	98 mm, <i>Min</i>	—	—
	c) Three notch	126 mm, <i>Min</i>	—	—
ii)	Thickness	10 mm	± 0.11 mm	± 0.05 mm
iii)	Width	10 mm	± 0.11 mm	± 0.05 mm
iv)	Angle of notch	45°	± 2°	± 1°
v)	Root radius of notch	0.25 mm	± 0.025 mm	± 0.025 mm
vi)	Depth below notch	8 mm	± 0.1 mm	± 0.025 mm
vii)	Distance of notch from end of test piece and from adjacent notch	28 mm	± 0.42 mm	± 0.42 mm
viii)	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). The

machining tolerances on the specified dimensions of round test pieces are permitted as per Table 2.



All dimensions in millimetres.

FIG. 8 ENLARGED SECTION OF NOTCH FOR ROUND TEST PIECE

**Table 2 Machining Tolerances on the Specified Dimensions for Round Test Pieces**

(Clause 4.3)

SI No.	Item	Nominal Dimension	Machining Tolerances	
			Ferrous Test Piece	Non-Ferrous Test Piece
(1)	(2)	(3)	(4)	(5)
i)	Length			
	a) Single notch	71 mm, <i>Min</i>	–	–
	b) Two notch	99 mm, <i>Min</i>	–	–
	c) Three notch	127 mm, <i>Min</i>	–	–
ii)	Diameter	11.4 mm	± 0.14 mm	± 0.07 mm
iii)	Angle of notch	45°	± 2°	± 1°
iv)	Root radius of notch	0.25 mm	± 0.025 mm	± 0.025 mm
v)	Depth below notch	8.1 mm	± 0.1 mm	± 0.05 mm
vi)	Distance of notch from end of test piece and from adjacent notch	28 mm	± 0.42 mm	± 0.5 mm
vii)	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 ( <i>L</i> of Fig. 9) | 22 mm ± 0.5 mm | c) Angle at tip of hammer  | 75° ± 1°       |
| b) Angle between top face of grips and face holding the specimen vertical                                      | 90° ± 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 m/s to 4 m/s |
|  |                | f) Striking energy   | 165 J ± 3.4 J  |

Testing machines with different striking energies, with an accuracy of  $\pm 2$  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 1 000.

**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  $\pm 1$  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 [Fig. 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.

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.

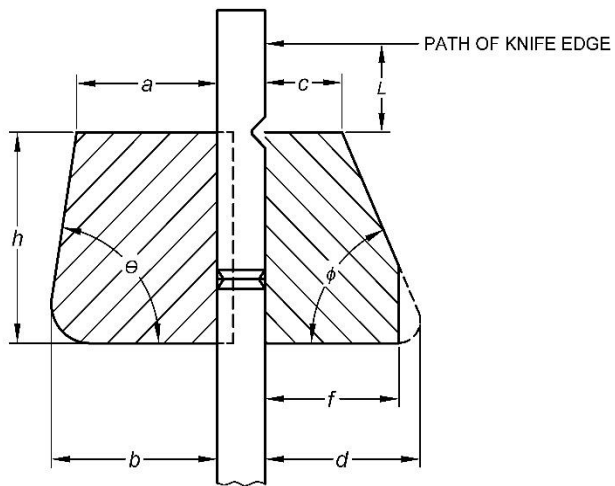
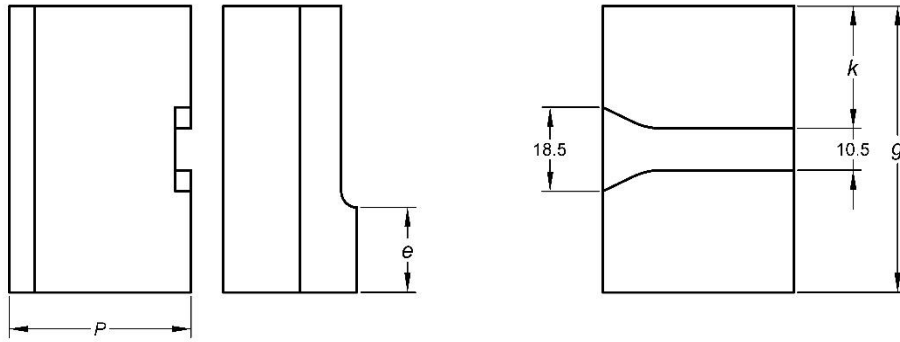
The impact value shall be quoted in joules.

**6.8** 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).

**6.9** 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.

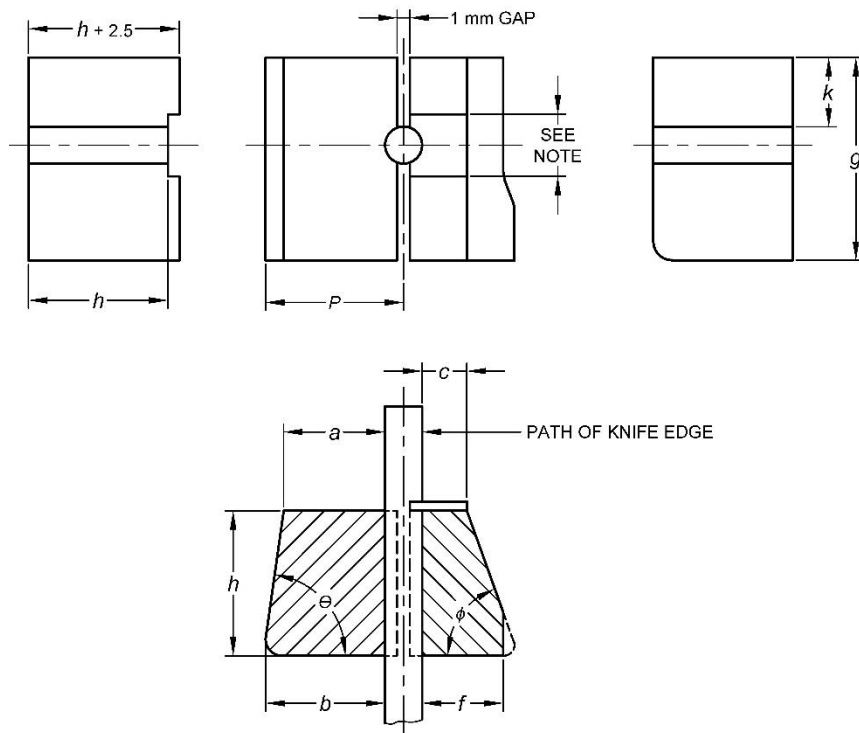




NOTE — Dimensions  $a$ ,  $b$ ,  $c$ ,  $d$ ,  $e$ ,  $f$ ,  $g$ ,  $h$ ,  $k$  and the angle  $\theta$  and should be obtained from the grips in the machine, the dimension  $h$  should be checked and, if necessary, corrected to make  $L$  equal to 22 mm.

All dimensions in millimetres.

FIG. 9 VIEW OF GRIP 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 or vice.

All dimensions in millimetres.

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

## ANNEX A

*(Foreword)*

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### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

Telephones: 2323 0131, 2323 3375, 2323 9402

Website: [www.bis.gov.in](http://www.bis.gov.in)

### Regional Offices:

	Telephones
Central : 601/A, Konnectus Tower -1, 6 <sup>th</sup> Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	{ 2323 7617
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