
INTERNATIONAL STANDARD



83

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

Steel — Charpy impact test (U-notch)

Acier — Essai de résilience Charpy (entaille en U)

First edition — 1976-11-01

iTeh STANDARD PREVIEW
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ISO 83:1976

<https://standards.iteh.ai/catalog/standards/sist/4bfd3931-4f80-442c-b0ca-0fee6520bd0b/iso-83-1976>

UDC 669.14 : 620.17

Ref. No. ISO 83-1976 (E)

Descriptors : steels, mechanical tests, Charpy impact tests, test specimen conditioning, test equipment, testing conditions.

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 83 was drawn up by Technical Committee ISO/TC 17, *Steel*, and was circulated to the Member Bodies in May 1975.

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

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The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Austria
Canada
U.S.A.

This International Standard cancels and replaces ISO Recommendation R 83-1959, of which it constitutes a technical revision.

Steel – Charpy impact test (U-notch)

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the Charpy impact test (U-notch) method for determining the impact strength of steel.

2 REFERENCE

ISO/R 442, *Verification of pendulum impact testing machines for testing steels.*

3 PRINCIPLE

The test consists in breaking by one blow from a swinging hammer, under conditions defined hereafter, a test piece U-notched in the middle and supported at each end. The energy absorbed is determined.

4 SYMBOLS AND DESIGNATIONS

The symbols and designations applicable to this International Standard are as indicated in figure 1 and in table 1.

TABLE 1 – Symbols and designations

Number	Symbol	Designation
1	—	Length of test piece
2	<i>a</i>	Thickness of test piece
3	<i>b</i>	Width of test piece
4	—	Thickness of test piece minus depth of notch
5	—	Depth of notch
6	—	Radius of curvature of base of notch
7	<i>L</i>	Distance between supports
8	—	Radius of curvature of supports
9	—	Taper of supports
10	—	Angle at tip of hammer
11	—	Radius of curvature of hammer
	<i>KU</i>	Energy absorbed, in joules

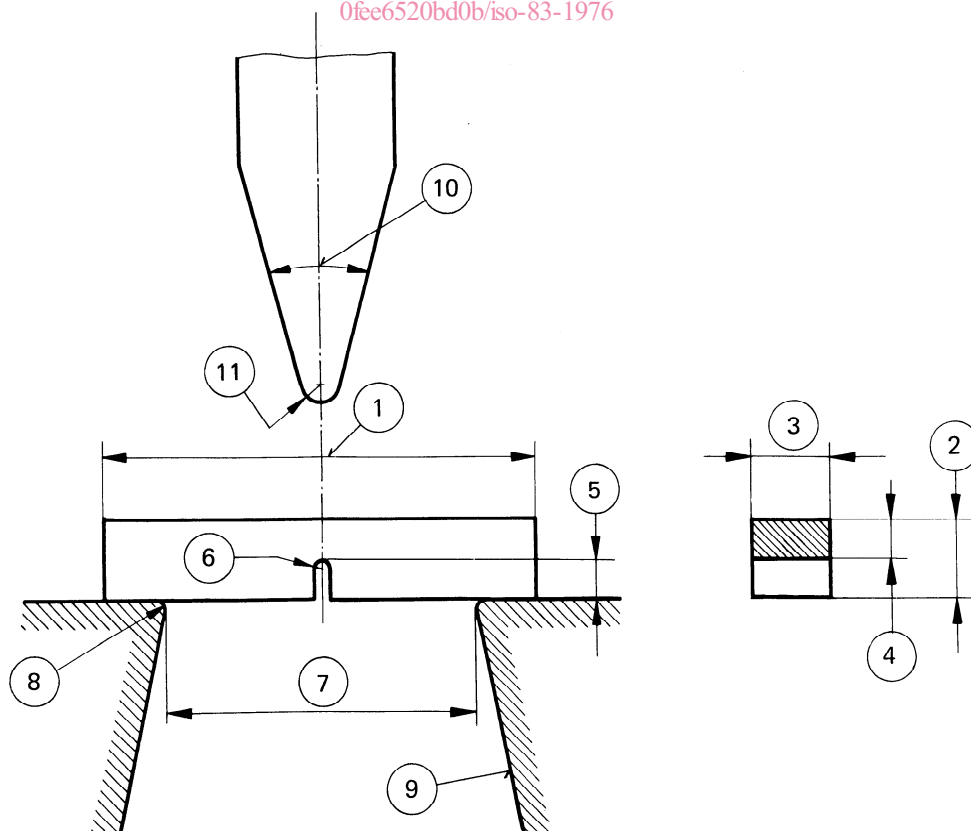


FIGURE 1 – Charpy impact test (U-notch) – Designation numbers

5 TEST PIECES

5.1 The test piece shall be 55 mm long and of square section with 10 mm sides. In the centre of the length there shall be a U-notch (or key-hole notch), 5 mm deep (unless otherwise specified), rounded off at the base with a radius of 1 mm. The test piece shall be machined all over. The key-hole notch consists of a 2 mm diameter hole and a sawcut of width less than 2 mm. For the vast majority of materials there is no significant difference between the test results obtained with key-hole or U-notches of equal (5 mm) depth.

5.2 The plane of symmetry of the notch shall be perpendicular to the longitudinal axis of the test piece.

5.3 The tolerances on the specified test piece dimensions shall be as given in table 2.

TABLE 2 – Tolerances on specified test piece dimensions

Designation	Nominal dimension	Machining tolerance
Length	55 mm	± 0,60 mm
Thickness	10 mm	± 0,11 mm
Width	10 mm	± 0,11 mm
Depth of notch	5 mm	± 0,09 mm
Radius of curvature of base of notch	1 mm	± 0,07 mm
Distance of plane of symmetry of notch from ends of test piece	27,5 mm	± 0,42 mm
Angle between plane of symmetry of notch and longitudinal axis of test piece	90°	± 2°

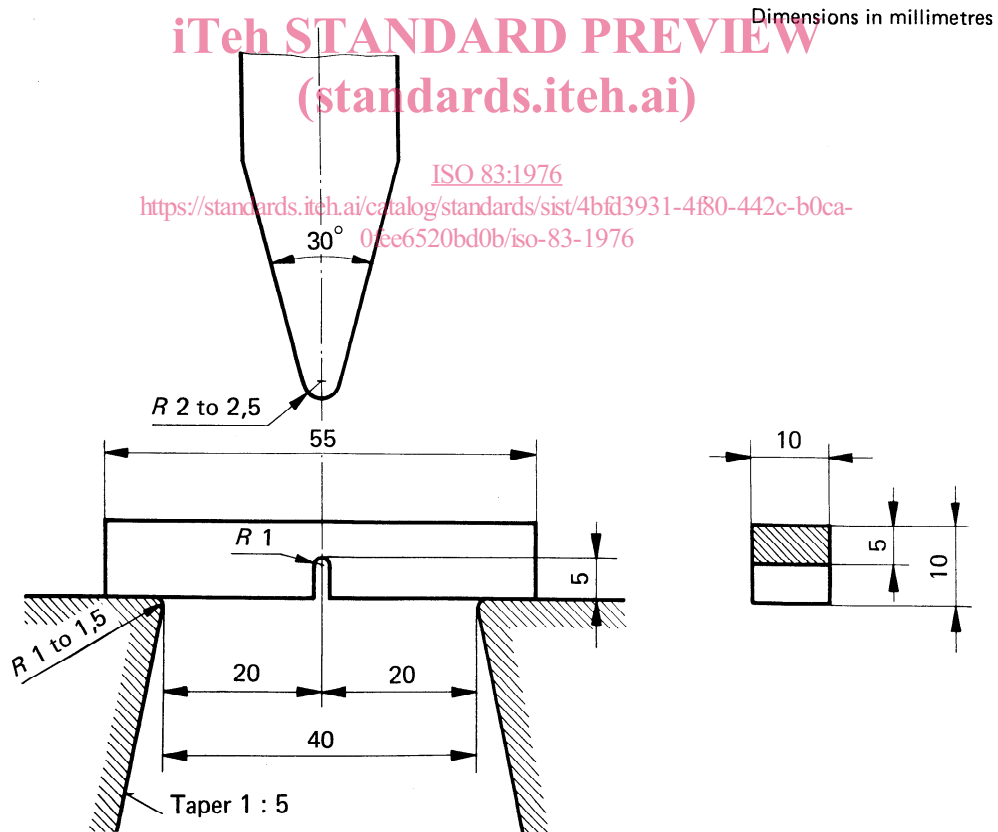


FIGURE 2 – Charpy impact test (U-notch) – Dimensions

5.4 The notch may be made by any machining method. The notch shall be carefully prepared so that no grooves appear at the base of the notch.

6 TESTING MACHINE

6.1 The testing machine shall be constructed and installed steady and rigid.

6.1.1 The testing machine shall have the characteristics specified in table 3.

TABLE 3 – Characteristics of testing machine

Designation	Requirement
Distance between supports	40 + 0,5 0 mm
Radius of curvature of supports	1 to 1,5 mm
Taper of supports	1 : 5
Angle at tip of hammer	30° ± 1°
Radius of curvature of hammer	2 to 2,5 mm
Speed of hammer at the instant of striking	5 to 5,5 m/s*

* For machines manufactured prior to the publication of this International Standard, a velocity of 4,5 to 7 m/s is permissible by agreement between the interested parties.

6.1.2 The plane of swing of the hammer shall be vertical. The machine shall be constructed so that the loss of energy (such as from translation, rotation or vibration) in the machine framework during a test is negligible.

6.1.3 The centre of percussion shall be at the point of impact of the hammer.

6.1.4 The accuracy of the graduation of the scale of the machine shall be ± 0,5 % of the maximum striking energy of the machine.

6.2 For a standard test, the striking energy of the testing machine shall be 300 ± 10 J. The energy absorbed under these conditions, using the 5 mm deep U-notch, is denoted by *KU*.

6.3 Testing machines with different striking energies are permitted, in which case the value *KU* is supplemented by an appropriate index.

6.4 The use of U-(key-hole) notches other than the 5 mm deep notch is also denoted by an index; for example :

KU 100/3 : striking energy 100 J, 3 mm deep notch;

KU 300/3 : normal striking energy, 3 mm deep notch.

6.5 The testing machine shall be verified in accordance with ISO/R 442.

7 TEST REQUIREMENTS

7.1 The test piece shall lie squarely against the supports with the plane of symmetry of the notch within 0,5 mm of the plane midway between them. It shall be struck by the hammer in the plane of symmetry of the notch and on the side opposite the notch.

7.2 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 20 °C in temperate climates and 27 °C in tropical climates, subject in each case to the above tolerance. In all cases the temperature of test shall be recorded.

7.3 If, during the test, the test piece is not completely broken, the energy value obtained is indefinite. The test report shall state that the test piece was unbroken by x J.

NOTE – It is emphasized that only results on test pieces of identical dimensions should be compared.

There is no general process for converting the results obtained by one method of test into those which would be obtained by another method of test.

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