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# International Standard



# 148

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

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## Steel — Charpy impact test (V-notch)

*Acier — Essai de résilience Charpy (entaille en V)*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

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 148 was developed by Technical Committee ISO/TC 17, *Steel*, and was circulated to the member bodies in December 1981.

It has been approved by the member bodies of the following countries :

Australia	India	South Africa, Rep. of
Austria	Ireland	Spain
Belgium	Italy	Sri Lanka
Brazil	Japan	Sweden
Canada	Kenya	Switzerland
China	Korea, Dem. P. Rep. of	Tanzania
Czechoslovakia	Korea, Rep. of	Turkey
Egypt, Arab Rep. of	Netherlands	USSR
Finland	Norway	Venezuela
France	Poland	
Hungary	Romania	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Germany, F.R.  
United Kingdom  
USA

This International Standard cancels and replaces ISO Recommendation R 148-1960, of which it constitutes a technical revision.

## Steel — Charpy impact test (V-notch)

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### 1 Scope and field of application

This International Standard specifies the Charpy impact (V-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 pendulum, under conditions defined hereafter, a test piece V-notched in the middle and resting on two supports. The energy absorbed is determined.

### 4 Designations

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

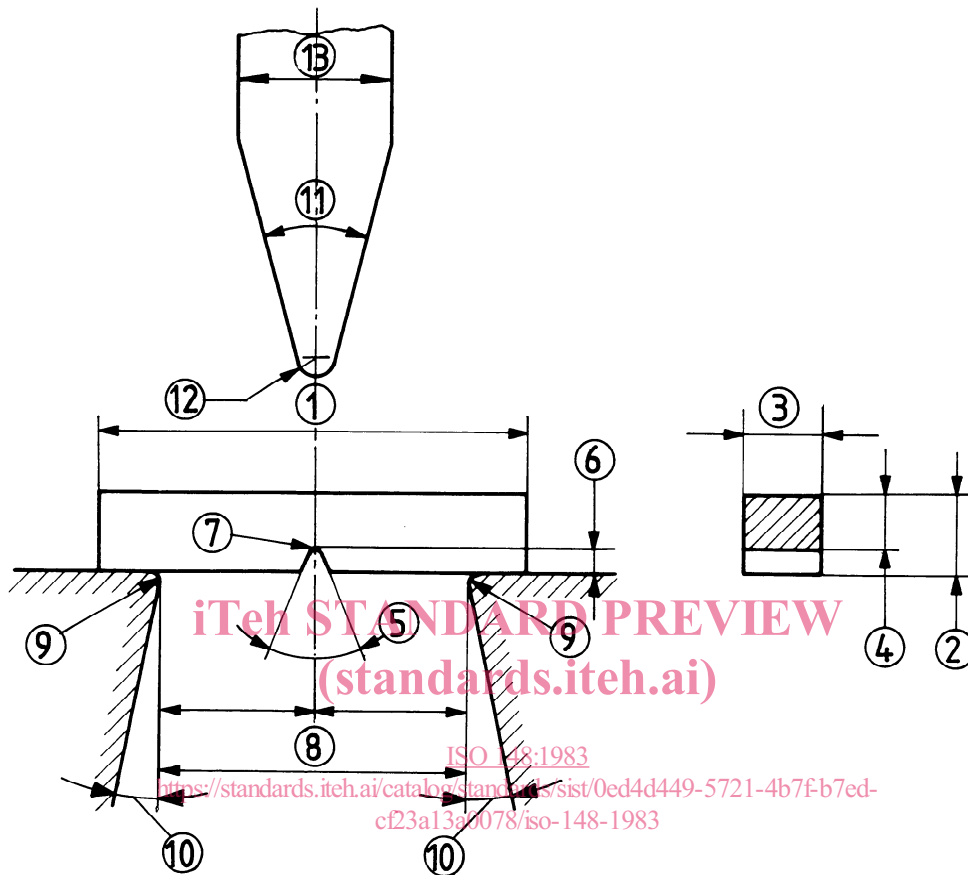


Figure 1 — Charpy impact test (V-notch)

Table 1 — Designations (see figure 1)

Number	Designation	Unit
1	Length of test piece	mm
2	Height of test piece	mm
3	Width of test piece	mm
4	Height of test piece minus depth of notch (height below notch)	mm
5	Angle of notch	deg
6	Depth of notch	mm
7	Radius of curvature of base of notch	mm
8	Distance between anvils	mm
9	Radius of anvils	mm
10	Angle of taper of anvil	deg
11	Angle at tip of striker	deg
12	Radius of curvature of tip of striker	mm
13	Width of striker	mm
—	Energy absorbed by breakage, $KV$	joule

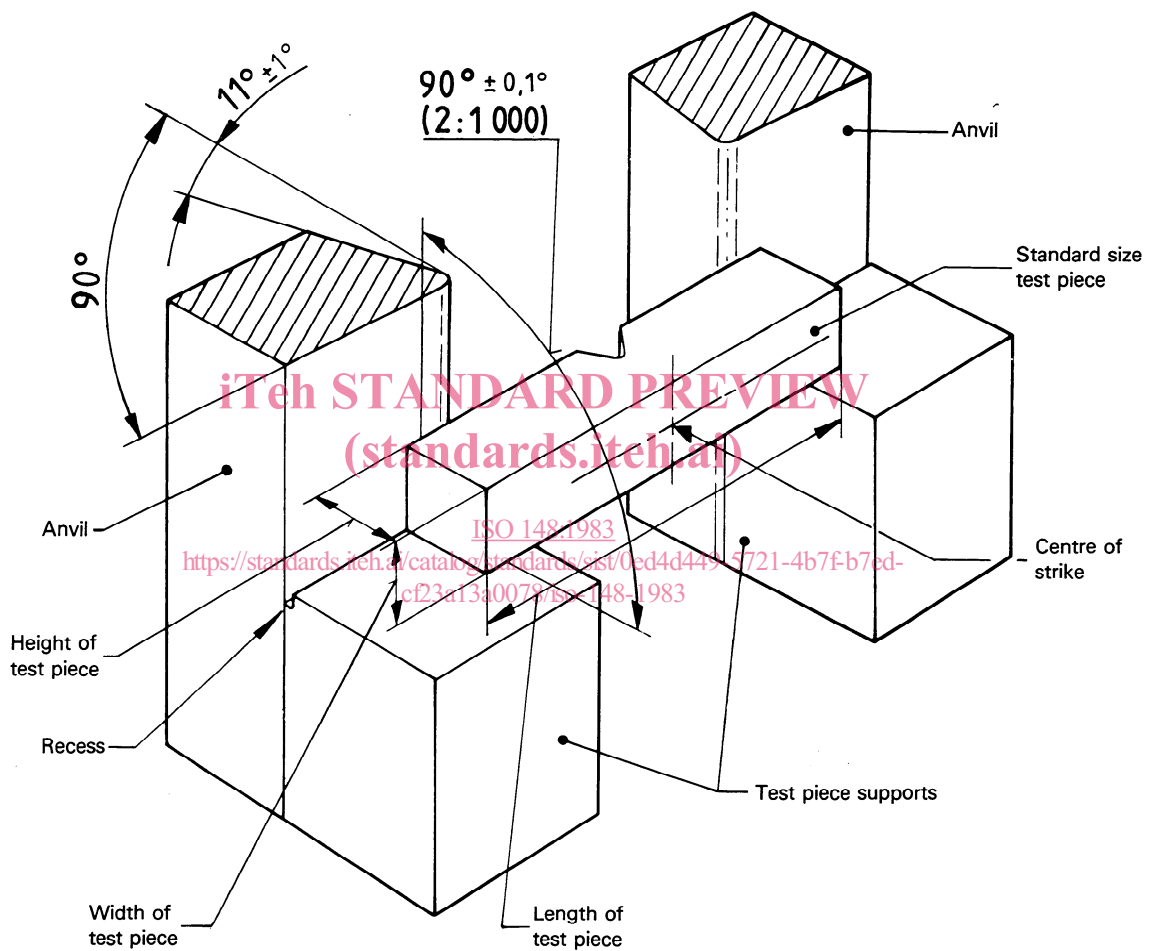


Figure 2 — Configuration of test piece supports and anvils

**5 Test pieces**

**5.1** The standard 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 V-notch of 45° included angle, 2 mm deep, with 0,25 mm root radius.

If the standard test piece cannot be obtained from the material, one of the subsidiary test pieces having a width of 7,5 or 5 mm (see table 2) shall be used, the notch being cut in one of the narrower faces.

The test pieces shall be machined all over.

**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 pieces 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
Height	10 mm	± 0,06 mm
Width :		
— Standard test piece	10 mm	± 0,11 mm
— Subsidiary test piece	7,5 mm	± 0,11 mm
— Subsidiary test piece	5 mm	± 0,06 mm
Angle of notch	45°	± 2°
Height below notch	8 mm	± 0,06 mm
Radius of curvature of base of notch	0,25 mm	± 0,025 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°
Angle between adjacent longitudinal faces of test piece	90°	± 2°

NOTE — Test pieces of widths other than those shown above, e.g. with the width the full thickness of the product, may be used provided that this is permitted in the material standard. Comparison of results, however, is only of significance when taken between test pieces of the same form and dimensions.

**5.4** Preparation shall be carried out in such a way that any alteration of the test piece, for example, due to heating or cold-working is minimized. The notch shall be carefully prepared so that no grooves appear at the base of the notch.

**5.5** The test piece may be marked on any face not in contact with supports or anvils and at a position well away from the notch in order to avoid the effects of work hardening induced by stamping.

**6 Testing machine**

**6.1** The testing machine shall be constructed and installed steady and rigid, and shall be in accordance with ISO/R 442.

The values for the principal characteristics of the testing machine are specified in table 3.

**Table 3 — Characteristics of testing machine**

Designation	Requirement
Distance between anvils	40 <sup>+0,1</sup> / <sub>0</sub> mm
Radius of anvil	1 <sup>+0,5</sup> / <sub>0</sub> mm
Angle of taper of each anvil	11° ± 1°
Maximum width of striker	18 mm
Angle of tip of striker	30° ± 1°
Radius at tip of striker	2 <sup>+0,5</sup> / <sub>0</sub> mm
Speed of striker at the instant of striking	5 to 5,5 m/s*
Angle between the faces of support and anvil	90° ± 0,1°

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

**6.2** Conditions for a standard test shall be where the nominal striking energy of the testing machine is 300 ± 10 J and where the test piece is of standard dimensions. Absorbed energies reported under these conditions shall be prefixed by *KV*.

**6.3** Testing machines with different striking energies are permitted, in which case the symbol *KV* shall be supplemented by an appropriate index.

**6.4** For a test in which a subsidiary test piece is used, the symbol *KV* shall be supplemented by indices denoting both the striking energy of the machine and the width of the test piece; for example :

*KV* 300/7,5 : striking energy 300 J, width 7,5 mm

*KV* 150/5 : striking energy 150 J, width 5 mm

**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 striker in the plane of symmetry of the notch and on the side opposite the notch.

**7.2** If the temperature of testing is not specified in the product standard, it shall be 23 ± 5 °C.

If the temperature of testing is specified in the product standard, it shall be adhered to within ± 2 °C.

For tests at temperatures other than ambient, the test piece shall be immersed in the heating/cooling medium for sufficient time to ensure that the required temperature is reached throughout the test piece. It shall be broken within 5 s from the time of removal from the medium.

The transfer device shall be designed and used so as to ensure the temperature of the test piece remains within the temperature range permitted.

**7.3** If, during the test, the test piece is deformed but not completely broken, the energy absorbed 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.

## 8 Test report

The test report shall include the following information :

- a) reference to this International Standard;
- b) identification of the test piece (e.g. type of the steel, cast number);
- c) shape and dimensions of the test piece;
- d) nominal striking energy of the pendulum;
- e) test temperature, in degrees Celsius;
- f) absorbed energy.

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