INTERNATIONAL STANDARD

ISO 14556

First edition
2000-05-01

AMENDMENT 1
2006-07-01

Steel — Charpy V-notch pendulum impact test — Instrumented test method

AMENDMENT 1: Annex D — Instrumented Charpy V-notch pendulum impact test of sub-size test pieces

Aciers — Essai de flexion par choc sur éprouvette Charpy à entaille en V — Méthode d'essai instrumenté

AMENDEMENT 1: Annexe D — Essai de flexion par choc instrumenté sur éprouvettes Charpy à entaille en V de dimensions réduites

Reference number
ISO 14556:2000/Amd.1:2006(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

Amendment 1 to ISO 14556:2000 was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 4, *Toughness testing — Fracture (F), Pendulum (P), Tear (T)*.

Steel — Charpy V-notch pendulum impact test — Instrumented test method

AMENDMENT 1: Annex D — Instrumented Charpy V-notch pendulum impact test of sub-size test pieces

Page iii, **Contents**

Add

after **Annex C**.

Change the page number of the Bibliography to **21**.

Page iv, **Foreword**

Replace the last sentence with the following:

"Annexes A to D of this International Standard are for information only."

Page 14

Insert the following annex before the Bibliography.

Annex D
(informative)

Instrumented Charpy V-notch pendulum impact test of sub-size test pieces

D.1 Introduction

This annex defines the instrumented Charpy V-notch pendulum impact testing of sub-size test pieces on steel products and the requirements concerning the measurement and recording equipment.

This International Standard can be applied, by agreement, to other metallic materials and to other impact testing machines, such as drop-weight towers or high-speed servo-hydraulic machines.

This test provides further information on the fracture behaviour of the tested product.

The user should be aware that data obtained from sub-size test pieces may not be directly comparable to those obtained from full-size standard Charpy V-notch test pieces and that suitable correlation procedures have to be employed.

D.2 Apparatus

D.2.1 Testing machine

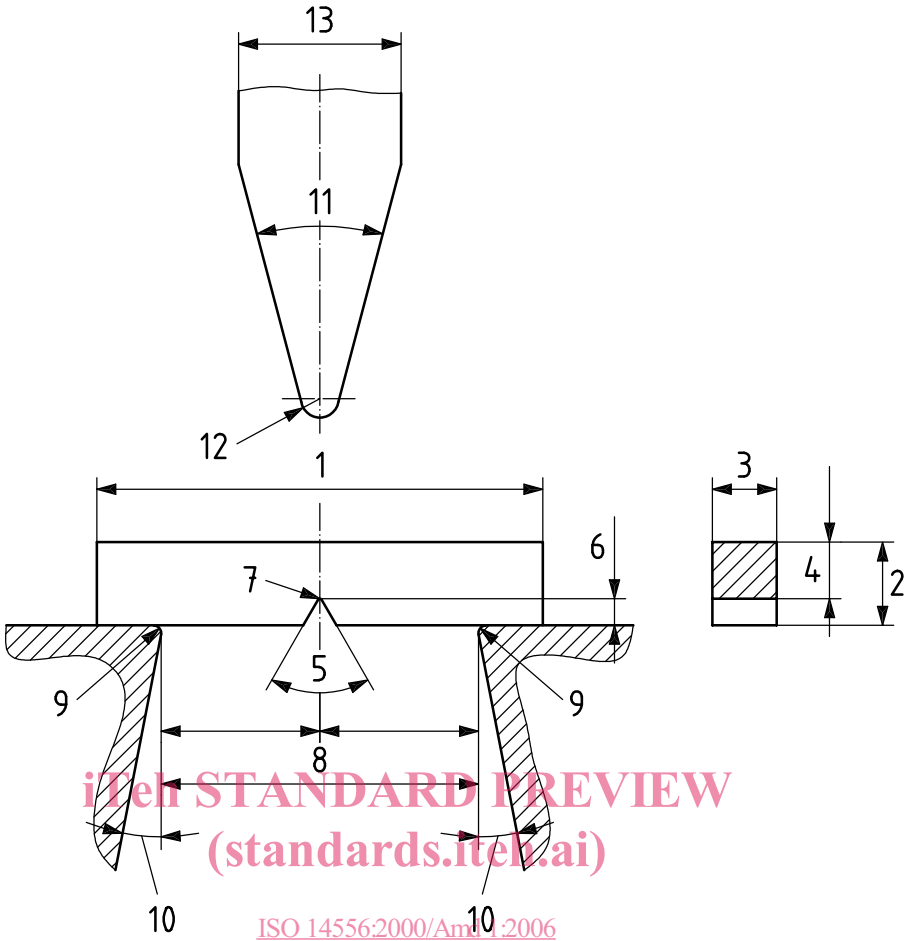
The testing machine is similar to that used for conventional Charpy V-notch test pieces, with the exception of the following characteristics, which have to be suitably modified taking into account the dimensions of the test piece (Figure D.1): impact velocity, distance between the anvils, positioning of the specimen with respect to the striking edge.

NOTE Only in the case of test machines with available energy not greater than 50 J, the quality of the instrumentation can be assessed by comparing the total impact energy, W_t, from the instrumentation with the absorbed energy indicated by the machine dial, KV. If deviations between the values exceed ± 0,5 J, the following should be investigated:

a) the friction of the machine;

b) the calibration of the measuring system;

c) the software used.



Reference number	Designation	Value
1	Specimen length	27 mm ± 0,50 mm
2	Specimen height	4 mm ± 0,05 mm
3	Specimen width	3 mm ± 0,05 mm
4	Height below notch	3 mm ± 0,05 mm
5	Angle of notch	60°± 1°
6	Notch depth	1 mm ± 0,05 mm
7	Notch-root radius	0,1 mm ± 0,025 mm
8	Distance between anvils (span)	22 mm $^{+0,10}_{0}$ mm
9	Radius of anvils	1 mm $^{+0,50}_{0}$ mm
10	Angle of taper of anvils	11°± 1°
11	Angle of taper of striker	30°± 1°
12	Radius at tip of striker	2 mm $^{+0,50}_{0}$ mm
13	Width of the striker	6 mm to 12 mm

Notch length to edge: 90° ± 2° — Adjacent sides shall be at 90° ± 1°.

Finish requirements: roughness *Ra* 2 on notched surface and *Ra* 4 on the other two surfaces.

Figure D.1 — Impact test on sub-size Charpy V-notch specimen

D.2.2 Force measuring system

Due to the more dynamic behaviour of sub-size test pieces with respect to full-size test pieces, the force measuring system (transducer, amplifier, recording system) shall have an upper frequency of at least 250 kHz. If only the maximum force and the absorbed energy are to be measured from the curve, an upper frequency limit of 100 kHz is sufficient.

NOTE 1 The dynamic assessment of the force measuring chain can be simplified by measuring the maximum value of the first initial peak. By experience, the dynamics of the measurement chain can be considered satisfactory, if a steel V-notch sub-size test piece shows an initial peak greater than $(0{,}23 \times v_o)$ kN.

NOTE 2 Experience shows that, with the sub-size test piece shown in Figure D.1, nominal impact forces up to 4 kN occur for most steel types.

D.2.3 Calibration

An example of the support block for the static calibration of a 2 mm striker used for testing sub-size test pieces is shown in Figure D.2.

Dimensions in millimetres

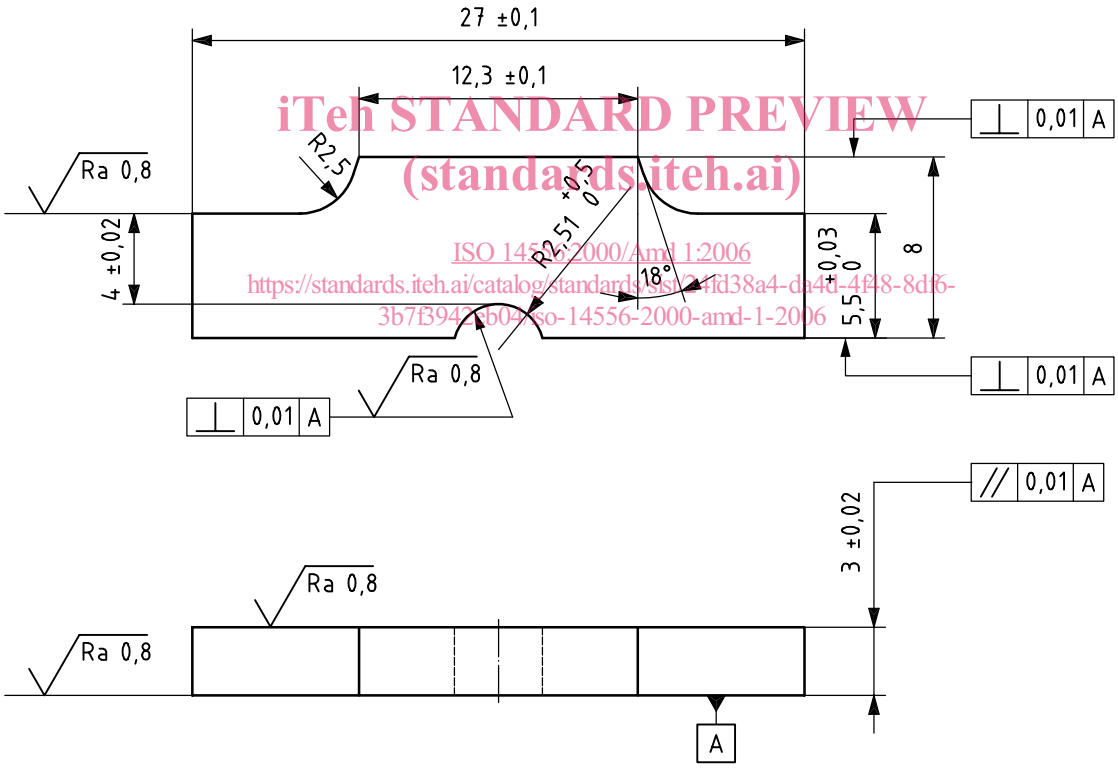


Figure D.2 — Example of a support block for the calibration of a 2 mm striker used for testing sub-size test pieces

D.2.4 Recording apparatus

An 8 bit analogue-digital converter with a sampling rate of 500 kHz (2 µs sample interval) is necessary; however, 12 bit is recommended.

D.3 Test piece

The test piece is a sub-size Charpy V-notch test piece, conforming to the dimensions specified in Figure D.1. Other specimen geometries can be used, by agreement; designs of other sub-size test pieces that have been successfully used are shown in Figure D.3.

NOTE Some aspects of the present test procedure may not be fully applicable to other sub-size test pieces.

Side-grooving of the test piece is optional.

D.4 Test procedure

D.4.1 Test temperature

The temperature of the test piece at impact shall be within ± 2 °C of the nominal test temperature. The temperature shall be measured in the notch area; uncertainty in temperature measurements has to be accounted for.

Due to the small size of the test piece, in tests below or above room temperature, special attention should be given to temperature control within the above-mentioned tolerance. Consequently, techniques for conditioning the specimen temperature *in situ* (on location) are preferred; if a liquid or gaseous medium is used for cooling or heating the test piece, the time of transfer from the bath to the impact position shall be appropriately minimised in order to meet the above-mentioned temperature tolerance.

D.4.2 Test velocity

The velocity of the moving striker at impact can be chosen within a range of values (normally from 1,0 ms^{-1} to 5,5 ms^{-1}), according to the specific characteristics of the material to be tested. In choosing the impact velocity, and consequently the potential energy W_p available for the test, the following criterion shall be satisfied:

$$W_p \geqslant 3W_m$$

NOTE Experience shows that impact velocities above 4 ms^{-1} are not advisable for sub-size test pieces, since excessive oscillations are then superimposed on the initial portion of the test diagram and errors in the evaluation of the force-displacement curve can occur.