
**Metallic materials — Charpy pendulum
impact test —**

**Part 2:
Verification of testing machines**

*Matériaux métalliques — Essai de flexion par choc sur éprouvette
Charpy —*

Partie 2: Vérification des machines d'essai (mouton-pendule)



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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 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.

ISO 148-2 was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 4, *Toughness testing — Fracture (F), Pendulum (P), Tear (T)*.

This second edition cancels and replaces the first edition (ISO 148-2:1998), which has been technically revised.

ISO 148 consists of the following parts, under the general title *Metallic materials — Charpy pendulum impact test*:

- *Part 1: Test method*
- *Part 2: Verification of testing machines*
- *Part 3: Preparation and characterization of Charpy V-notch test pieces for indirect verification of pendulum impact machines*

Introduction

The suitability of a pendulum impact testing machine for acceptance testing of metallic materials has usually been based on a calibration of its scale and verification of compliance with specified dimensions, such as the shape and spacing of the anvils supporting the specimen. The scale calibration is commonly verified by measuring the mass of the pendulum and its elevation at various scale readings. This procedure for evaluation of machines had the distinct advantage of requiring only measurements of quantities that could be traced to national standards. The objective nature of these traceable measurements minimized the necessity for arbitration regarding the suitability of the machines for material acceptance tests.

However, sometimes two machines that had been evaluated by the direct-verification procedures described above, and which met all dimensional requirements, were found to give significantly different impact values when testing test pieces of the same material. This difference was commercially important when values obtained using one machine met the material specification, while the values obtained using the other machine did not. To avoid such disagreements, some purchasers of materials added the requirement that all pendulum impact testing machines used for acceptance testing of material sold to them must be indirectly verified by testing reference test pieces supplied by them. A machine was considered acceptable only if the values obtained using the machine agreed, within specified limits, with the value furnished with the reference test pieces.

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Metallic materials — Charpy pendulum impact test —

Part 2: Verification of testing machines

1 Scope

This part of ISO 148 covers the verification of the constructional elements of pendulum-type impact testing machines. It is applicable to machines with 2 mm or 8 mm strikers used for pendulum impact tests carried out, for instance, in accordance with ISO 148-1.

It can analogously be applied to pendulum impact testing machines of various capacities and of different design.

Impact machines used for industrial, general or research laboratory testing of metallic materials in accordance with this part of ISO 148 are referred to as industrial machines. Those with more stringent requirements are referred to as reference machines. Specifications for the verification of reference machines are found in ISO 148-3.

This part of ISO 148 describes two methods of verification.

- a) The direct method, which is static in nature, involves measurement of the critical parts of the machine to ensure that it meets the requirements of this part of ISO 148. Instruments used for the verification and calibration are traceable to national standards. Direct methods are used when a machine is being installed or repaired, or if the indirect method gives a non-conforming result.
- b) The indirect method, which is dynamic in nature, uses reference test pieces to verify points on the measuring scale.

A pendulum impact testing machine is not in compliance with this part of ISO 148 until it has been verified by both the direct and indirect methods and meets the requirements of clauses 6 and 7.

The requirements for the reference test pieces are found in ISO 148-3.

This part of ISO 148 takes into account the total energy absorbed in fracturing the test piece using an indirect method. This total absorbed energy consists of

- the energy needed to break the test piece itself, and
- the internal energy losses of the pendulum impact testing machine performing the first half-cycle swing from the initial position.

NOTE Internal energy losses are due to

- air resistance, friction of the bearings of the rotation axis and of the indicating pointer of the pendulum which can be determined by the direct method (see 6.4.5), and
- shock of the foundation, vibration of the frame and pendulum for which no suitable measuring methods and apparatus have been developed.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 148-3, *Metallic materials — Charpy pendulum impact test — Part 3: Preparation and characterization of Charpy V-notch test pieces for indirect verification of pendulum impact machines*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Definitions pertaining to the machine

3.1.1

anvil

portion of the machine that serves to properly position the test piece for impact with respect to the striker and the test piece supports, and supports the test piece under the force of the strike

3.1.2

base

that part of the framework of the machine located below the horizontal plane of the supports

3.1.3

centre of percussion

that point in a body at which, on striking a blow, the percussive action is the same as if the whole mass of the body were concentrated at the point

NOTE When a simple pendulum delivers a blow along a horizontal line passing through the centre of percussion, there is no resulting horizontal reaction at the axis of rotation.

See Figure 4.

3.1.4

centre of strike

that point on the striking edge of the pendulum at which, in the free hanging position of the pendulum, the vertical edge of the striker meets the upper horizontal plane of a test piece of half standard height (i.e. 5 mm) or equivalent gauge bar resting on the test piece supports

See Figure 4.

3.1.5

industrial machine

pendulum impact machine used for industrial, general, or most research-laboratory testing of metallic materials

NOTE 1 These machines are not used to establish reference values.

NOTE 2 Industrial machines are verified using the procedures described in this part of ISO 148.

3.1.6

reference machine

pendulum impact testing machine used to determine certified values for batches of reference test pieces