
**Metallic materials — Measurement
of fracture toughness at impact
loading rates using precracked
Charpy-type test pieces**

*Matériaux métalliques — Mesure de la ténacité d'éprouvettes type
Charpy préfissurées soumises à un chargement d'impact*



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Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 4, *Toughness testing — Fracture (F), Pendulum (P), Tear (T)*.

Introduction

This International Standard is closely related to ISO 14556 and was derived from a draft procedure prepared by the Working Party “European Standards on Instrumented Precracked Charpy Testing” of the European Structural Integrity Society (ESIS) Technical Subcommittee on Dynamic Testing at Intermediate Strain Rates (TC5).

Metallic materials — Measurement of fracture toughness at impact loading rates using precracked Charpy-type test pieces

1 Scope

This International Standard specifies requirements for performing and evaluating instrumented precracked Charpy impact tests on metallic materials using a fracture mechanics approach. Minimum requirements are given for measurement and recording equipment such that similar sensitivity and comparable measurements are achieved.

Dynamic fracture mechanics properties determined using this International Standard are comparable with conventional large-scale fracture mechanics results when the corresponding validity criteria are met. Because of the small absolute size of the Charpy specimen, this is often not the case. Nevertheless, the values obtained can be used in research and development of materials, in quality control, and to establish the variation of properties with test temperature under impact loading rates.

Fracture toughness properties determined through the use of this International Standard may differ from values measured at quasistatic loading rates. Indeed, an increase in loading rate causes a decrease in fracture toughness when tests are performed in the brittle or ductile-to-brittle regimes; the opposite is observed (i.e. increase in fracture toughness) in the fully ductile regime. More information on the dependence of fracture toughness on loading (or strain) rate is given in Reference [1]. In addition, it is generally acknowledged that fracture toughness also depends on test temperature. For these reasons, the user is required to report the actual test temperature and loading rate for each test performed.

In case of cleavage fracture of ferritic steels in the ductile-to-brittle transition region, variability can be very large and cannot be adequately described by simple statistics. In this case, additional tests are required and the analysis is to be performed using a statistical procedure applicable to this type of test, see for example Reference [2].

NOTE Modifications to the analytical procedures prescribed in Reference [2] might be necessary to account for the effect of elevated (impact) loading rates.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 148-2, *Metallic materials — Charpy pendulum impact test — Part 2: Verification of testing machines*

ISO 12135, *Metallic materials — Unified method of test for the determination of quasistatic fracture toughness*

ISO 14556, *Steel — Charpy V-notch pendulum impact test — Instrumented test method*

ISO 26203-2, *Metallic materials — Tensile testing at high strain rates — Part 2: Servo-hydraulic and other test systems*

3 Symbols

For the purposes of this International Standard, the following symbols given in [Table 1](#) apply.