
**Metallic materials — Ductility testing
— High speed compression test for
porous and cellular metals**

*Matériaux métalliques — Essais de ductilité — Essai de compression
à haute vitesse des métaux poreux et cellulaires*



This document is a preview generated by ERS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols and units	2
5 Principle	2
6 Testing machine	2
6.1 Type of testing machine	2
6.2 Drop weight impact testing machine	3
6.2.1 General	3
6.2.2 Weight	3
6.2.3 Pressing jig	3
6.2.4 Load cell	3
6.2.5 Displacement sensor	4
6.2.6 Absorber	5
6.3 Servo-type high-speed compression testing machine	5
6.3.1 General	5
6.3.2 Pressing jig	5
6.3.3 Load cell	5
6.3.4 Displacement sensor	5
6.3.5 Rupture pin	5
6.3.6 Stopper	5
7 Test piece	5
7.1 Preparation of test piece	5
7.2 Shape and dimensions of the test piece	6
8 Drop weight impact test	7
8.1 Preparation	7
8.2 Test	8
9 Servo-type high-speed compression test	9
9.1 Preparation	9
9.2 Test	9
10 Calculations	10
10.1 Compressive strain	10
10.2 Compressive stress	10
10.3 Compressive stress-strain curve	10
10.4 Plateau stress (σ_{pl})	10
10.5 Plateau end	10
10.6 Plateau end strain (e_{ple})	10
10.7 Energy absorption	11
11 Test report	12
Annex A (informative) Filtering of the measurement data	14
Bibliography	17

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 2, *Ductility testing*.

This second edition cancels and replaces the first edition (ISO 17340:2014), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

- the title of ISO 7500-1 has been updated in [Clause 2](#);
- a list of symbols and units has been added as [Clause 4](#);
- information about the use of adhesives in [8.2 b\)](#) has been revised;
- minor editorial changes have been made to align with ISO/IEC Directives Part 2:2018.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Porous and cellular metals have attractive properties due to their unique cell morphology. When they are used as impact energy absorbing components in automotive structures, knowledge of their high-speed compressive properties is necessary for industrial design. The high-speed compressive deformation behaviour of porous and cellular metals is quite different from their static compressive properties. Testing methods for static compressive deformation are, therefore, insufficient for characterization of high-speed compressive deformation. Standardization of a testing method for the high-speed compressive behaviour of porous and cellular metals is required.

Metallic materials — Ductility testing — High speed compression test for porous and cellular metals

1 Scope

This document specifies methods for high speed compression testing, at room temperature, of porous and cellular metals having a porosity of 50 % or more. The speed range applicable to this test method is 0,1 m/s to 100 m/s (or 1 s^{-1} to 10^3 s^{-1} in terms of the initial strain rate when the specimen height is 100 mm).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 376, *Metallic materials — Calibration of force-proving instruments used for the verification of uniaxial testing machines*

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 13314, *Mechanical testing of metals — Ductility testing — Compression test for porous and cellular metals*

ISO 80000-1, *Quantities and units — Part 1: General*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13314 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 test speed

movement speed of the pressing jig, which applies the compressive force to the test piece, when the pressing jig contacts the test piece

3.2 initial strain rate

value derived by dividing the test speed by the initial height of the test piece

3.3 sampling frequency

frequency used to sample the measurement data per unit time

3.4 drop height

initial distance between the pressure application plane of the pressing jig and the top surface of the test piece in the drop weight impact testing machine