

भारतीय मानक ब्यूरो

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भारतीय मानक मसौदा

धात्विक सामग्री — लचीलापन परीक्षण — छिद्रयुक्त एवं जालीदार

धातुओं के लिए उच्च गति संपीडन परीक्षण

(IS 17419 का पहला पुनरीक्षण)

Draft Indian Standard

**Metallic Materials — Ductility Testing — High Speed
Compression Test for Porous and Cellular Metals**

(First Revision of IS 17419)

(ISO 17340 : 2020, MOD)

ICS 77.040.10

Mechanical Testing of Metals
Sectional Committee, MTD 3

Last date of comment:
26/07/2024

NATIONAL FOREWORD

This draft standard is identical ISO 17340 : 2020 'Metallic materials — Ductility testing — High speed compression test for porous and cellular metals' issued by the International Organization for Standardization (ISO), and subject to its finalization, is to be adopted by the Bureau of Indian Standards on the recommendation of the Mechanical Testing of Metals Sectional Committee and approval of the Metallurgical Engineering Division Council.

This standard was originally published in 2020. The portions given in dotted underlines are the matters not specified in the corresponding international standard. A list of technical modifications is given in National Annex C.

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.

Except the deviations identified in National Annex C, the remaining text of the ISO standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions and terminologies are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- Wherever the words 'International Standard' appear referring to this standard, it should be read as 'Indian Standard'

- b) Comma (,) has been used as a decimal marker while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exists. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the edition indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
ISO 376 : 2011 Metallic materials — Calibration of force-proving instruments used for the verification of uniaxial testing machines	IS 4169 : 2014 /ISO 376 : 2011 Metallic materials - Calibration of force proving instruments used for the verification of uniaxial testing machines (<i>Second Revision</i>)	Identical
ISO 7500-1 : 2018, Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines —Calibration and verification of the force-measuring system	IS 1828 (Part 1) : 2022 / ISO 7500-1 : 2018 Metallic materials - Calibration and verification of static uniaxial testing machines - part 1: Tension/compression testing machines - Calibration and verification of the force-measuring system	Identical
ISO 13314 : 2011 Mechanical testing of metals — Ductility testing — Compression test for porous and cellular metals	IS 17937 : 2022 / ISO 13314 : 2011 Mechanical testing of metals Ductility testing Compression test for porous and cellular metals	Identical
ISO 80000-1 : 2022 Quantities and units — Part 1: General	IS/ISO 80000-1 : 2022 / ISO 80000-1 : 2022 Quantities and Units Part 1 General	Identical

In reporting the result of a test or analysis made in accordance with this standard, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical-values (*second revision*)'.

The Scope of the standard is as follows:

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).

The complete document/text of ISO 17340 : 2020 'Metallic materials — Ductility testing — High speed compression test for porous and cellular metals' may be made available, on request to:

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National Annex C

(National Foreword)

Clause/Sub clause	Modifications
3.6 plateau stress	<p>Add 'σ_{pl} - arithmetical mean of the stresses at 0,1 or smaller strain intervals between 20 % and 30 % or 20 % and 40 % compressive strain.</p> <p>NOTE The strain range/interval, 20 % and 30 % or 20 % and 40 %, for arithmetical mean varies depending on the plateau end strain.'</p>
3.7 plateau end	<p>Add 'point in the stress-strain curve at which the stress is 1,3 times the plateau stress.</p> <p>See Figure B.1.</p> <p>NOTE If this point does not adequately represent the end of the plateau range, another stress can be selected which corresponds to the curve trace.'</p>
3.8 energy absorption	<p>Add 'W - area under the stress-strain curve up to 50 % strain or up to the plateau end strain, e_{ple}.'</p> <p>NOTE The energy absorption up to other strain values can also be determined.'</p>
3.9 energy absorption efficiency	<p>Add 'energy absorption divided by the product of the maximum compressive stress within the strain range and the magnitude of the strain range.'</p>
8.4 (d) Operation check	<p>Add 'The displacement data is recorded as per clause 6.2.5.</p> <p>NOTE A safety guard preferably transparent (made up of poly carbonate sheet) may be recommended rather than opaque one. It will be useful to record the test event by high speed video camera to better understand the deformation behaviour of specimens. Warning to operator: No one should stand in front of the machine while operation as the fragments generated during the test may cause severe injuries.'</p>
Annex B	<p>Add 'Annex B - Stress-strain curve to determine the characteristic values from compression testing of porous and cellular metals.'</p>