INTERNATIONAL STANDARD

ISO 14317

Second edition
2015-04-01

Sintered metal materials excluding hardmetals — Determination of compressive yield strength

Matériaux métalliques frittés, à l'exclusion des métaux-durs — Détermination de la limite d'élasticité en compression

Reference number
ISO 14317:2015(E)

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Published in Switzerland

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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.

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).

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

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 119, *Powder metallurgy*, Subcommittee SC 3, *Sampling and testing methods for sintered metal materials (excluding hardmetals)*.

This second edition cancels and replaces the first edition (ISO 14317:2006), which has been technically revised.

Sintered metal materials excluding hardmetals — Determination of compressive yield strength

1 Scope

This International Standard specifies a method for the determination of the compressive yield strength of sintered metal materials, excluding hardmetals.

This method is applicable to sintered materials (excluding hardmetals) that might or might not have been subjected to heat treatment after sintering and also to materials that have been sized or coined after sintering.

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

3 Test method

Test pieces shall be tested in compression, with a machine which has been calibrated to class 1, in accordance with ISO 7500-1. In this test, machined or compacted test cylinders are compressed axially to their yield points while measuring strain with an extensometer with an error of strain not exceeding the greater of: fixed error (0,000 2 m/m), relative error (±0,5 % of strain).

The top and bottom anvil contact faces shall be parallel within 0,002 mm/cm. Faces shall be polished to achieve a good finish, less than 0,4 *Ra*. To avoid imprinting, care shall be taken to ensure that contact faces are always harder than test pieces. To improve parallelism, it is acceptable practice to use an adjustable bearing block (ball and cone self-aligning device) in the test machine.

No lubrication is required between sample and anvil faces.

4 Test piece

The test piece shall be nominally 9,0 mm in diameter (D) and 27,0 mm in length (L); L/D ratio of 3:1. It shall be machined from a compacted specimen, such as the Charpy impact test bar (see ISO 5754). The compressive test specimen axis will therefore be perpendicular to the direction of compaction of the compacted specimen from which it is machined. Cylindrical end faces shall be machined to be perpendicular to the sample centre axis, within 0,005 mm/cm.

The test piece shall be cleaned prior to testing. Measure the diameter to the nearest 0,005 mm.

5 Procedure

5.1 Place the test piece on end on the centre of the anvil. Close the top anvil so as to make light contact with the test piece. Engage the extensometer: gauge lengths of 12,7 mm are typical. Gauge length points shall be at least 1/2 test sample diameter away from end faces.

5.2 Loading rates shall not exceed 0,05 mm/min.

5.3 Apply load until the stress strain curve has safely passed the 0,1 % strain mark. Stop loading and then unload.

6 Expression of results

Assuming an initial straight line increment on the stress strain curve, draw a parallel line anchored at the bottom strain axis through the 0,1 % mark (see 0*m* offset in Figure 1). The drawn line intersects the curve at the yield point and the yield load can be determined (see Figure 1).

In the event that the curve is not initially straight, extend the initial unload line to the strain axis. Move that line to the 0,1 % strain mark and its upper intercept (*r*) will denote yield load (see Figure 2).

Calculate the compressive yield strength (cys) by dividing the load, in newtons, by area, in square millimetres, to report the result in megapascals at the 0,1 % strain level.

7 Test report

The test report shall include the following information:

a) reference to this International Standard (i.e. ISO 14317);

b) all details necessary for identification of the test sample process condition at the time of testing: machined or compacted, angularity between sample axis, and original pressing direction;

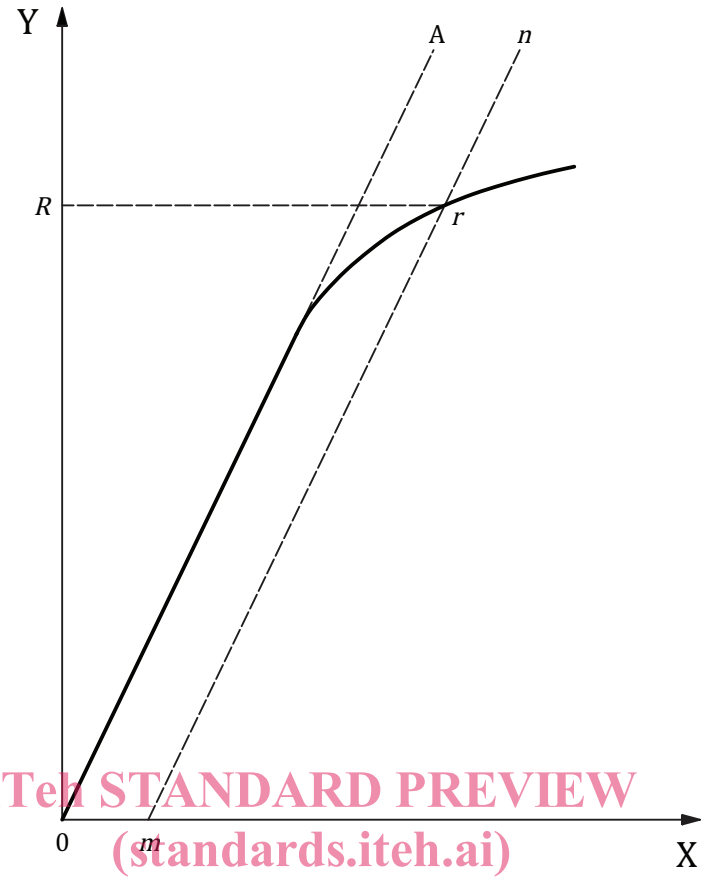
c) the result obtained;

d) all operations not specified in this International Standard, or regarded as optional;

e) details of any occurrence which might have affected the result.

8 Precision statement

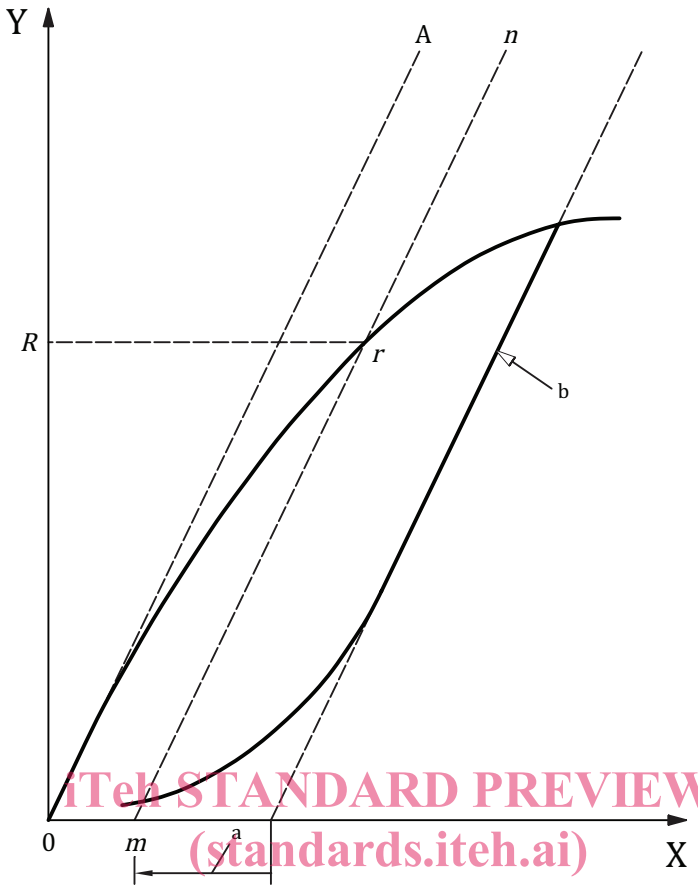
Data are under development.



Key

X strain
Y stress
0*m* specified offset
r upper intercept
R compressive yield strength
A Young's modulus under compressive stress

Figure 1 — Stress strain diagram for determination of compressive yield strength by the offset method



Key

X strain
Y stress
0*m* specified offset
r upper intercept
R compressive yield strength
A Young's modulus under compressive stress
a Move parallel line to *m*, typically 0,1 %.
b Unload line.

Figure 2 — Stress strain diagram for determination of compressive yield strength by the offset method; load line nonlinear

Bibliography

[1] ISO 5754, *Sintered metal materials, excluding hardmetals — Unnotched impact test piece*