INTERNATIONAL STANDARD

ISO 3312

Second edition
1987-07-15

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Sintered metal materials and hardmetals — Determination of Young modulus

Matériaux métalliques frittés et métaux-durs — Détermination du module de Young

Reference number
ISO 3312 : 1987 (E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 3312 was prepared by Technical Committee ISO/TC 119, *Powder metallurgy.*

This second edition cancels and replaces the first edition (ISO 3312 : 1975), of which it constitutes a minor revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Printed in Switzerland

Sintered metal materials and hardmetals — Determination of Young modulus

1 Scope and field of application

This International Standard specifies a method for the determination of the dynamic (adiabatic) Young modulus by longitudinal oscillations of sintered metal materials and hardmetals.

2 Reference

ISO 2738, *Permeable sintered metal materials — Determination of density, oil content and open porosity.*

3 Principle

Excitation of ultrasonic longitudinal oscillations in a test piece and determination of the resonance frequency of its natural oscillations.

4 Symbols and units

Symbol	Designation	Unit
L	Length of test piece	mm
ϱ	Density	g/cm^3
f	Frequency of natural oscillations	Hz
E	Young modulus	N/mm^2

5 Apparatus

5.1 Fixture, for mounting test piece.

5.2 Ultrasonic oscillator, having a continuous control of frequencies in the range from 20 to 100 kHz.

5.3 Device, for determining resonance frequency.

6 Preparation of test pieces

6.1 The test pieces shall be at least 60 mm long and may have either a round or a rectangular cross-section. The test piece with round cross-section shall be $6 \pm 0{,}2$ mm in diameter. The cross-section of the rectangular test piece shall be $(6 \pm 0{,}2)$ mm $\times$ $(8 \pm 0{,}2)$ mm.

6.2 The surface layer shall be removed to a depth of at least 0,1 mm. The surface roughness shall be $R_a \leqslant 1{,}25$ µm.

6.3 The ends of the test piece shall be ground and shall be parallel to within 0,02 mm.

6.4 The test piece shall be free of surface cracks or other structural defects and shall be cleaned immediately before being tested.

7 Procedure

7.1 Determine the density of the test piece to the nearest 0,01 g/cm^3 according to ISO 2738.

7.2 Measure the length of the test piece to the nearest 0,1 mm.

7.3 Mount the test piece in the apparatus. Smoothly increase the frequency of the oscillator until the lowest frequency of the natural longitudinal oscillations of the test piece is obtained. Determine the resonance frequency to the nearest 50 Hz.

8 Expression of results

8.1 Young modulus is given by the following equation:

$$E = 4 \times 10^{-9} \times L^2 \times \varrho \times f^2$$

8.2 Report the result rounded to the nearest 5×10^3 N/mm^2.