
**Refractories — Determination of
dynamic Young's modulus (MOE) at
elevated temperatures by impulse
excitation of vibration**

*Produits réfractaires — Détermination du module de Young
dynamique (MOE) à hautes températures par excitation de vibration
par impulsion*



This document is a preview generated by ELS



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
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword.....	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	3
5 Significance and use	3
6 Apparatus	4
7 Sampling	5
8 Test specimens	5
8.1 Specimen geometry.....	5
8.2 Specimen dimensions.....	6
8.3 Surface finishing of specimens.....	6
9 Procedure	6
9.1 Specimen drying.....	6
9.2 Determination of specimen mass and dimension.....	6
9.3 Loading of the test specimen.....	6
9.4 Determination of the room temperature Young's modulus.....	6
9.5 Determination of fundamental flexural resonant frequency.....	7
9.5.1 Method A: Isothermal measurement at pre-set temperature.....	7
9.5.2 Method B: Continuous measurement during ramping to test temperature.....	8
10 Calculations	8
11 Test report	8
Annex A (informative) Factors affecting accuracy of determinations	10
Annex B (informative) Calculation of Young's modulus at room temperature (according to ISO 12680-1)	11

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 33, *Refractories*.

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.

Refractories — Determination of dynamic Young's modulus (MOE) at elevated temperatures by impulse excitation of vibration

1 Scope

This document specifies a method for determining the dynamic Young's modulus of rectangular cross-section bars and circular cross-section specimens of refractories by impulse excitation of vibration at elevated temperature. The dynamic Young's modulus is determined using the resonant frequency of the specimen in its flexural mode of vibration.

This document does not address the safety issues associated with its use. It is responsibility of the users of this standard to establish appropriate safety and health practices.

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 5022, *Shaped refractory products — Sampling and acceptance testing*

ISO 8656-1, *Refractory products — Sampling of raw materials and unshaped products — Part 1: Sampling scheme*

ISO 12680-1, *Methods of test for refractory products — Part 1: Determination of dynamic Young's modulus (MOE) by impulse excitation of vibration*

ISO 16835, *Refractory products — Determination of thermal expansion*

IEC 60584-1, *Thermocouples — Part 1: EMF specifications and tolerances*

IEC 60584-2, *Thermocouples — Part 2: Tolerances*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

modulus of elasticity

MOE

ratio of stress to strain below the *proportional limit* (3.2)

3.2

proportional limit

greatest stress which a material is capable of sustaining without deviation from proportionality of stress to strain (Hooke's Law)