



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS R 1659 : 2003
(JFCA/JSA)

**Testing methods for elastic modulus
of porous fine ceramics**

ICS 81.060.30

Reference number : JIS R 1659 : 2003 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from Japan Fine Ceramics Association (JFCA)/Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law. Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Date of Establishment: 2003-10-20

Date of Public Notice in Official Gazette: 2003-10-20

Investigated by: Japanese Industrial Standards Committee

Standards Board

Technical Committee on Ceramics

JIS R 1659:2003, First English edition published in 2004-03

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

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Printed in Japan

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Testing methods for elastic modulus of porous fine ceramics

1 Scope This Japanese Industrial Standard specifies testing methods for elastic modulus at ordinary temperature of porous fine ceramics used as high functional materials or heat insulation materials such as a filter material, space shuttle heat insulation tile and the like. That having a material porosity of approximately 30 % to 90 % is taken as the subject in this Standard.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 0621 *Definitions and designations of geometrical deviations*

JIS B 7502 *Micrometer callipers*

JIS B 7503 *Dial gauges*

JIS B 7507 *Vernier, dial and digital callipers*

JIS B 7721 *Verification and calibration of the force measuring system of the tension/compression testing machines*

JIS K 7100 *Plastics—Standard atmospheres for conditioning and testing*

JIS Z 8401 *Guide to the rounding of numbers*

3 Definitions Definitions of principal terms in this Standard shall be as follows.

- a) **static elastic modulus in bend** An isothermal elastic modulus obtained from the relation between the stress and the strain which are obtained by applying a static bending load to a test piece to measure the elastic deformation generated thereby.
- b) **dynamic elastic modulus in bend** A thermal insulation static modulus obtained from measurement of a resonance frequency (resonance method) by applying forced bending vibration to a test piece.

4 Classification of testing methods and principle of application This Standard uses a bending resonance method as a dynamic elastic modulus in bend testing method based on a static elastic modulus in bend testing method.

5 Drying of test piece, and test temperature and humidity Drying conditions of a test piece in testing and conditions for temperature and humidity in testing shall be as follows.

5.1 Drying of test piece

5.1.1 Dryer For a dryer, an electric thermostat capable of being kept at 105 °C to 120 °C in temperature.

5.1.2 Balance For measurement of dry mass, that of 5 mg in reciprocal sensibility and 100 g to 200 g in weighing or that having a precision at least equivalent thereto shall be used.

5.1.3 Drying method Dry a test piece preliminarily at 105 °C to 120 °C to constant weight. Measure the mass using the balance, and when the mass has not been changed 10 mg or over, it is regarded as constant weight.

5.2 Test temperature and humidity A test shall be carried out in a room of class 2 in standard temperature condition and class 2 in standard humidity condition which are specified in **JIS K 7100** [23 °C ± 2 °C in temperature and (50 ± 5) % in relative humidity].

6 Static elastic modulus in bend testing method

6.1 Apparatus

6.1.1 Tester and guide For a tester, a material tester or a static loading tester of a mechanical type or an oil hydraulic type in accordance with **JIS B 7721** shall be used. Precision in load indication of the tester shall be capable of measuring within ± 1 % of a true load.

Further, the tester shall be equipped with a means for indicating a strain within ± 1 % in precision, and a bending jig by 3 points or 4 points supporting as given in Fig. 1 shall be annexed. To measure the strain, any one of measurement with a wire resistance strain gauge, measurement of displacement at the central part of a test piece, and measurement of displacement of a loading point may be applied.

When a test for elastic modulus in bend of materials having a large texture size is carried out with a strain gauge, in the case where the texture size of the material is akin to a maximum tolerable strain gauge length (1 mm) of 3 points bending as describes in **6.3.5 a)**, the test shall be executed with 4 points bending test method without adopting the 3 points bending test method.

6.1.2 Supporting tool A supporting tool shall be basically structured as given in Fig. 1 and composed of a supporting base, a supporting roll, a loading roll and a loading base. The supporting roll and the loading roll shall be made of materials having 147 GPa or over in elastic modulus and being free from generating plastic deformation in testing. Raising the rigidity of a loading system as high as possible is taken into consideration and an attention shall be taken not to generate twist in the test piece with a loading system supporting tool.