



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS R 1630 : 1997

**Test methods for tensile strength of
fine ceramic joint**

ICS 81.060.01

Descriptors : ceramics, special ceramics, bonding, adhesion tests, tensile strength,
tensile testing

Reference number : JIS R 1630 : 1997 (E)

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

Date of Establishment: 1997-04-20

Date of Public Notice in Official Gazette: 1997-04-21

Investigated by: Japanese Industrial Standards Committee

Divisional Council on Ceramics

JIS R 1630 : 1997, First English edition published in 1997-10

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

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 1997

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

Test methods for tensile strength of fine ceramic joint

1 Scope This Japanese Industrial Standard specifies the test methods for tensile strength at room temperature and elevated temperature of fine ceramic joint used for the high strength materials of mechanical parts, structures, etc. However, if the application of this Standard is difficult, the test methods specified in **JIS R 1606** may also be used, as appropriate.

Remarks: The normative references to this Standard are as follows:

JIS B 0601 *Surface roughness — Definitions and designation*

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 R 1606 *Testing methods for tensile strength of fine ceramics at room and elevated temperature*

JIS Z 8401 *Rules for rounding off of numerical values*

2 Definitions For the main terms used in this Standard the following definitions apply:

- (1) **fine ceramic joint** The joint coupling or junction of fine ceramic and metal or fine ceramics each other (including the joint interface caused by brazing, diffusion joining, cementing, etc.)
- (2) **tensile stress** The quotient of the tensile load loaded on a test piece divided by the sectional area of the test piece before testing (Pa).
- (3) **joint tensile strength** The maximum tensile stress during tensile test (Pa).
- (4) **gauge part** The parallel parts between the tabs being adhered to both ends of the test piece. The joint and strain gauge are positioned between these tabs.
- (5) **tabs** Two sets each consisting of two sheets being adhered to both ends of the test piece. Usually, a pinhole is drilled or shoulder parts are provided.
- (6) **loading apparatus** The apparatus which holds the tabs at both ends of the test piece, and loads the tensile load in the tensile test. Usually, the pin system or shoulder-part hanging system is used, and the universal joint is included.
- (7) **maximum strain** The maximum value of strains measured by plural strain gauges being adhered to the gauge part of the test piece at the strain measurement in tensile test.
- (8) **minimum strain** The minimum value of strains measured by plural strain gauges being adhered to the gauge part of the test piece at the strain measurement in tensile test.

- (9) **bending strain component** The percentage value (%) of bending strain produced in the gauge part of the test piece, due to discrepancy of upper and lower loading axes, divided by the mean strain at the strain measurement in tensile test.
- (10) **strain gauge** The foil gauge to be used in the measurement of the strain.
- (11) **elevated temperature** The temperature range exceeding the room temperature where the lowering of adhesion strength at joint interface and tab is not remarkable at the measurements, and the joint tensile strength is measurable.

3 Equipments and instruments

3.1 Testing machine The testing machine shall be capable of keeping the displacement velocity of crosshead constant, and measuring the loads within an accuracy $\pm 1 \%$ of the maximum load.

3.2 Loading equipment The loading equipment shall be as follows:

- (1) The loading equipment shall not cause plastic deformation and destruction during the tests, and materials which will not cause adhesion with the tabs of test piece at the test temperature shall be used.
- (2) The loading equipment of such construction that the longitudinal direction of the test piece is held on the center line of the upper and lower loading axes of the testing machine, and that the bending strain component produced on the gauge part is suppressed to 10 % or under. The recommendable loading equipment is that of pin system or shoulder hanging system which employs double universal joints, and in accordance with Attached Fig. 1.

3.3 Strain measuring equipment The strain measuring equipment shall consist of a measuring instrument and a strain gauge, and be in accordance with the following:

- (1) **Measuring instrument** As to the measuring instrument, whichever of the static strain meter or dynamic strain meter may be used. However, the meter of such structure shall be used, that it can measure at least at four points (for rectangular section test piece) or three points (for circular section test piece) and record the measured values simultaneously.
- (2) **Strain gauge** The strain gauge shall be the type suitable for the measurement of tensile strain, and for the test piece of circular section, that with dimensions suitable for the curvature of the test piece shall be used.

3.4 Micrometer callipers The micrometer callipers for external measurement specified in **JIS B 7502**, or that at least equivalent thereto in accuracy shall be used.

3.5 Dial gauge The dial gauge with minimum scale of 0.01 mm specified in **JIS B 7503**, or that at least equivalent thereto in accuracy shall be used.

3.6 Vernier calliper The vernier calliper, with minimum reading length of 0.05 mm specified in **JIS B 7507**, or that at least equivalent thereto in accuracy shall be used.