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Verification of extensometers used in uniaxial testing

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS B 7741** :1991 is replaced with **JIS B 7741** :1999.

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Verification of extensometers used in uniaxial testing

Introduction This Japanese Industrial Standard has been prepared based on **ISO/DIS 9513** *Metallic materials—Verification of extensometers used in uniaxial testing* published in 1996 without modifying the technical contents.

The portions underlined with dots in this Standard are the matters not included in the original International Standard.

1 Scope This Standard specifies a method for the static calibration of extensometers used in uniaxial testing.

The term "extensometer" is understood to mean the displacement measuring device and the system for indicating or recording this displacement.

Remarks : The International Standard corresponding to this Standard is as follows:

ISO/DIS 9513 : 1996 *Metallic materials—Verification of extensometers used in uniaxial testing*

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 indicated below shall be applied.

JIS G 0202 *Glossary of terms used in iron and steel (testing)*

JIS Z 8103 *Glossary of terms used in instrumentation*

3 Symbols, designations and definitions For the purpose of this Standard, definitions given in **JIS G 0202** and **JIS Z 8103** shall apply. Symbols used throughout this Standard are given in Table 1 together with their designation.

Table 1 Symbols and designations

Symbol	Designation	Unit
L_e	Nominal value of gauge length of extensometer	mm
L'_e	Measured value of gauge length of extensometer	mm
E_{max}	Maximum limit of calibration range	mm
E_{min}	Minimum limit of calibration range	mm
l_i	Displacement indicated by extensometer	μm
l_t	True displacement given by calibration apparatus (1)	μm
q_{Le}	Relative gauge length error	%
q	Relative bias error of extensometer	%
r	Resolution of extensometer	μm

Note (1) It is given by a set value or a reading of calibration apparatus and does not mean "true value" that is the term used in measurement.

4 **Principle** The calibration of an extensometer involves a comparison of the readings given by the extensometer with known variations in length provided by a calibration apparatus.

5 **Calibration apparatus** The calibration apparatus which allows a known displacement l_t to be applied to the extensometer, may consist of a rigid frame with suitable coaxial spindles or other fixtures to which the extensometer can be attached. The calibration apparatus shall comprise a mechanism for moving at least one of the axial spindles and a device for accurately measuring the change in length produced. The variations in length can be measured, for example, using an interferometer or gauge blocks and a comparator or a screw micrometer. The gauge blocks, comparator, micrometer used shall be calibrated by a method which is traceable to the international unit (SI) of length and their accuracy shall be known. The error of the calibration apparatus shall not be greater than one-third of the permissible error of the extensometer (see Table 2).

The resolution of the calibration apparatus shall be in accordance with Table 2.

6 **Procedure**

6.1 **Position of the extensometer** The extensometer shall be placed in the calibration apparatus in the same position and orientation in which it is used during uniaxial testing so as to avoid errors due to loss of equilibrium or deformation of any part of the extensometer.

The extensometer shall be attached in the same way as during uniaxial testing.

6.2 **Temperature at which the calibration is made** In general, the calibration of the extensometer shall be carried out at a temperature stable to within ±2℃; this temperature shall be within the range 18℃ to 28℃.

For extensometers used for uniaxial testing at temperatures within the range 10℃ to 35℃, it is recommended that the calibration be carried out at or near the test temperature, if facilities exist.

The extensometer shall be placed near the calibration apparatus or mounted on it for a sufficient length of time prior to its calibration so that the parts of the extensometer and of the calibration apparatus which are in contact shall attain the calibration temperature.

6.3 **Accuracy of gauge length of the extensometer** The gauge length of the extensometer can be measured directly or indirectly. The following indirect method is given as an example.

The extensometer is placed on a soft metal test piece in such a way that the blades or points of the extensometer leave their marks. Once the extensometer is removed, the distance between the marks on the test piece is measured.