

JJG

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Extensometer (English Translation)

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1 Scope

This Regulation is applicable to the first verification, subsequent verification and in-service verification of extensometers.

2 Citations

The following documents are cited in this Regulation:

GB/T 228-2002, Metallic materials - Tensile testing at ambient temperature

GB/T 1040.1-2006, Plastics - Determination of tensile properties - Part 1:

General principles

GB/T 7314-2005, Metallic materials - Compression testing at ambient temperature

GB/T 12160-2002/ ISO 953:1999, Calibration of extensometers used in uniaxial testing

JJF 1096-2002, Calibration Specification for Calibrator of Extensometers

ASTM E83-02, Standard Practice for Verification and Classification of Extensometer System

During the use of this Regulation, please pay attention to the currently valid version of the above-cited documents.

3 Overview

3.1

Extensometer is a device for the measurement of sample line deformation when the test machine applies axial force to the sample, including the measurement, indicating or recording systems. According to the structural characteristics, it is divided into two types: electronic and mechanical.

Note: Electronic extensometers, such as resistance-strain and inductive extensometers, need to be equipped with corresponding amplifiers, computers or indicating devices to automatically record or display the measured displacement indications. Therefore, the calibration of electronic extensometer must include the entire measurement system. Mechanical extensometers, such as dial gauge, lever type, and optical extensometers, directly indicate the displacement indications by a pointer or a cursor.

5.1 Nameplate

The nameplate of the extensometer and its supporting instruments shall be marked with the instrument name, model, manufacturer name, product number and date of manufacture.

5.2 Appearance and quality

The extensometer and its accessories shall not have obvious mechanical damage; the blade, shaft tip and other structures that set the gauge length shall not have obvious wear; the indicating device and measuring mechanism shall not have defects that affect the measurement results.

5.3 Display and output

The display of the electronic extensometer shall be clear, complete and stable;
the printed results or drawn curves shall be consistent with the indicated values.

6 Control of measuring instruments

Control of measuring instruments includes: first verification, subsequent verification and in-service verification.

6.1.1 Environmental conditions

The verification temperature range shall be $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$; the temperature during the verification shall be stable; the temperature change shall not exceed 2°C ;

the air convection that affects the verification result of the extensometer is not allowed during the verification.

For the test extensometer in the temperature range of $10^{\circ}\text{C} \sim 35^{\circ}\text{C}$, if necessary, the test can also be carried out at or near the test temperature.

The extensometer and the calibrator shall be placed at the same room temperature for not less than 30 minutes; the verification shall be performed after the temperature is equilibrated.

6.1.2 Standard equipment for verification

6.1.2.1

The extensometer calibrator shall meet the requirements of JJF 1096-2002; its allowable error shall conform to the requirements of Table 2.

The relative error of the extensometer gauge length is calculated according to Formula (1).

Where:

qLe -- relative error of the extensometer gauge length, %;

$L'e$ -- measurement value of the extensometer gauge length, mm;

Le -- standard value of the extensometer gauge length, mm.

When the extensometer has multiple gauge lengths, each gauge length shall be measured separately.

For extensometers that use the sample to determine the gauge length (for example, use the sample diameter or width to determine the extensometer gauge length; for samples with lugs, use the centerline distance of the two lugs to determine the extensometer gauge length), the relative error of the tested sample gauge length shall be consistent with the allowable error of the corresponding level of the to-be-used extensometer.

6.2.4 Verification of resolution

Absolute resolution r is the minimum magnitude that can be read from the indicator of the extensometer. Relative resolution is the ratio of the minimum magnitude r that can be read from the instrument to the displacement l_i that is indicated by the extensometer. Visually inspect and calculate the resolution of the extensometer. The results shall meet the

requirements of Table 1.

6.2.5 Verification of indication error

6.2.5.1

When the temperature is stabilized, use a calibrator to pre-add at least two displacements corresponding to the calibration range of the extensometer to the extensometer before the verification. After checking that the return-to-zero is normal, apply a small negative displacement to the extensometer and return to zero position; reset the extensometer to zero.

6.2.5.2

Perform the verification according to the verification range that is determined in 4.4.

There are three sets of measurements for verification; each set of measurements generally has not less than 10 measurement points (excluding zero). According to the selected verification range, use a calibrator to apply given displacement to the extensometer point by point. When the maximum displacement of the verification range is reached, return it to the zero position.

u -- relative forward-return error of indicating-value of the extensometer, %;

l_i - return-stroke displacement indicating-value that is indicated by the extensometer at the same detection point, mm;

l_f -- forward-stroke displacement indicating-value that is indicated by the extensometer at the same detection point, mm;

6.3.1 Assess the level of the extensometer according to the verification results

of this Regulation, and issue a verification certificate. The format of the inside page of the certificate is shown in Appendix A.

The extensometer that fails to pass the verification is issued with a notice of the verification result. The unqualified items shall be indicated. For the format of the inner page, see Appendix A.

For the extensometer that is verified for multiple verification ranges and multiple gauge lengths, the level of the extensometer shall be assessed separately and a certificate in accordance with the corresponding level shall be issued.

6.3.2 At any time, if it is necessary to adjust the extensometer to meet the level requirements of its intended use, the verification result of the verification certificate shall be marked "adjusted".