JJG

NATIONAL METROLOGICAL VERIFICATION REGULATION

OF THE PEOPLE'S REPUBLIC OF CHINA

JJG 475-2008

Replacing JJG 475-1986

Electronic Universal Testing Machine

电子式万能试验机

Issued on: June 12, 2008 **Implemented on: December 12, 2008**

Issued by: General Administration of Quality Supervision, Inspection and Quarantine of the PRC

Verification Regulation of Electronic Universal Testing Machine

1 Scope

This Regulation is applicable to the first verification, subsequent verification, and in-use verification of electronic universal testing machine (hereinafter referred to as testing machine). Type evaluation and verification of the electronic tension (or compression) testing machine may be carried out with reference to this Regulation.

2 References

This Regulation refers to the following documents:

GB/T 2611-1992 “General requirements for testing machines”

GB/T 16491-1996 “Electronic universal testing machines”

GB/T 16825.1-2002 “Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Verification and calibration of the force-measuring system”

JJG 139-1999 “Verification Regulation of Universal Tension and Compression Testing Machine”

JJG 762-2007 “Verification Regulation for Extensometer”

When using this Regulation, care shall be taken to use the current valid edition of the above references.

3 Terms and units of measurement

3.1 Resolution

The ability of indicating device to meaningfully distinguish two adjacent values of the indicated amount.

3.2 Discrimination threshold

The maximum input change which produces an imperceptible change response

installation levelness shall not exceed 0.2/1000. A space of not less than 0.7 m shall be left around the testing machine. Its working environment shall be clean, no vibration, no corrosive medium, and no strong electromagnetic interference. The change in the power voltage is within ±10% of the rated voltage.

6.1.3 The electrical control of the testing machine shall be safe, reliable, and flexible. Data measurement, transmission, calculation, display, and printing systems shall be accurate.

6.2 Performance of testing machine

The testing machine frame shall have sufficient rigidity and test space. It shall be able to carry out all kinds of tests conveniently and facilitate the installation and use of sample, sample clamping device, testing machine's accessories, and standard dynamometer. The testing machine, during the application and removal of forces, shall be smooth and free of shock and vibration. The accessories of the testing machine shall comply with the requirements of GB/T 16491-1996 and related test methods.

6.3 Moving beam

6.3.1 The levelness of the moving beam shall be within 0.2/1000. The moving beam shall be smooth when moving within the working stroke.

6.3.2 The guide members of moving beam or chuck have no significant wear or defects.

6.3.3 The installation of the stand column and the fixed beam is not loose.

6.4 Force measuring system

6.4.1 The force measuring system shall be capable of continuously indicating the test force applied to the sample at any time. During the application or removal of the test force, the indication of force shall be smooth; there shall be no shock, stagnation, or abnormal jump.

6.4.2 The testing machine shall be capable of accurately indicating and retaining the maximum test force before the sample is broken or removed.

6.4.3 The force measuring system shall have the function of zero setting or zero clearing.

6.4.4 The force measuring system shall generally have a calibration procedure which facilitates verification.

6.4.5 Indicating device

7 Measuring instrument control

7.1 Verification conditions

7.1.1 Environmental conditions

The testing machine shall be verified at room temperature (10~35)°C and relative humidity not more than 80%. The temperature fluctuation during the verification process is not more than 2°C.

7.1.2 Standard instruments for verification

7.1.2.1 The level 0.5 testing machine is verified by using a level 0.1 standard dynamometer or a dedicated weight with a recurrence force value error within ±0.1%. The level 1 and 2 testing-machine is verified by using a level 0.3 standard dynamometer or a dedicated weight with a recurrence force value error within ±0.1%.

7.1.2.2 A coaxiality tester with an accuracy of ±2% (or other measuring devices with an accuracy equivalent) or a heavy hammer.

7.1.2.3 A stopwatch with a resolution of 0.01s.

7.1.2.4 The first-order dial gauge (0.01 mm) of (0~30)mm range, the first-order dial gauge (0.001 mm) of (0~1)mm range, and the magnetic stand; the steel ruler with a range of 1000 mm and an error of ±0.2 mm.

7.1.2.5 A level with a division value of 0.02 mm/m.

7.1.2.6 Sound level meter (A weighting network).

7.1.2.7 Extensometer calibrator: The error of the calibrator shall not be greater than 1/3 of the tolerance of the extensometer.

7.1.2.8 Class 10 insulation resistance measuring instrument.

7.1.2.9 Coaxiality test samples made of steel or copper and aluminum (The gauge length is not less than 100 mm. The diameter of the gauge length is usually not less than 10 mm. The coaxiality between the gauge length and the two heads is φ0.02mm).

7.2 Verification items and verification methods

a) For multi-range testing machines: The verification points for each measuring range shall not be less than 5, generally evenly distributed for 20%, 40%, 60%, 80%, 100% of each range.

b) For single-range testing machines: SELECT 5 verification points at approximately equal intervals in 20%~100% of the full range. For verification points below 20% of the full range, it shall select approximately 10%, 5%, 2%, 1%, 0.5%, 0.2%, and 0.1%... up to the lower limit of the range.

Note: The lower limit of the range is determined by the multiple of the resolution:

- Level 0.5: 400r;

- Level 1: 200r;

- Level 2: 100r.

c) For a testing machine which automatically shifts the range: In each range of constant resolution, select at least 2 verification points.

7.2.8.6 3 sets of measurements shall be made with incremental force. Before each set of measurements, it shall adjust the zero point. The zero reading shall be read after the force is completely removed for about 60 s.

The zero relative error is calculated according to formula (6):

$$f_0 = \frac{F_{i0}}{F_N} \times 100\% \qquad (6)$$

7.2.8.7 Relative error of indication value and relative error of indication value repeatability

Calculate the arithmetic mean of 3 measurements for each verification point. USE the following formula to calculate the relative error of indication value and the relative error of indication value repeatability.

(a) When reading on the dynamometer based on the indicating device of the testing machine, the relative error q of indication value and the relative error b of indication value repeatability are calculated according to the following formulas:

7.2.10.1 START the testing machine. Within the range of applying (102%~110%)F_N test force, the safety device shall meet the requirements of 6.5.1 of this Regulation.

7.2.10.2 USE an insulation resistance measuring instrument to measure the insulation resistance between the power cord and the casing. It shall meet the requirements of 6.5.2 of this Regulation.

7.2.10.3 START the testing machine. When the beam reaches the set position of its working range, the limiting device shall meet the requirements of 6.5.3 of this Regulation.

7.2.11 Verification of noise

7.2.11.1 Before measuring the noise of the testing machine, the background (ambient) noise shall be measured first. Its value shall be at least 10 dB(A) lower than the noise level of the testing machine. If the difference is less than 3 dB(A), the measurement result is invalid. If the difference is (3~10)dB(A), the test data shall be processed according to the instruction manual for sound level meter.

7.2.11.2 When verifying, let the testing machine be in normal working condition. PLACE the microphone of sound level meter horizontally toward the sound source, 1.0 m away from the testing machine and 1.5 m from the ground. The measurement points around the testing machine shall not be less than 6. The maximum measured at each measurement point is used as the noise of the testing machine. The measurement result shall meet the requirements of subclause 6.6 of this Regulation.

7.3 Processing of verification results

The testing machine which has passed the verification is issued with a verification certificate. The unqualified testing machine is issued with a notice of the verification result, with unqualified items indicated.

7.4 Verification period

The verification period of the testing machine is generally not more than 1 year. For the qualified testing machine after the repair, the verification period shall not exceed half a year.

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