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Verification Procedure for Test Equipment of Rubber Plastic Wire and Cable – Part 10: Spark Tester

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Verification Procedure for Test Equipment of Rubber Plastic Wire and Cable – Part 10: Spark Tester

1 Scope

This Part of JB/T 4278 specifies the verification items and technical requirements, the verification equipment, the verification methods, and the verification results and handling for spark tester.

This Part applies to the verification of spark tester, whether newly manufactured, in use, or after repair.

2 Normative References

The provisions in following documents become the provisions of this Part of JB/T 4278 through reference in this Part. For dated references, the subsequent amendments (excluding corrigendum) or revisions do not apply to this Part, however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

JB/T 4278.1-2011 Verification procedure for test equipment of rubber plastic wire and cable -Part 1: General

3 Verification Items and Technical Requirements

3.1 Overview

In addition to complying with the provisions of this Part, the technical requirements of spark tester shall also comply with the provisions of JB/T 4278.1-2011.

3.2 High-voltage power supply

3.2.1 Spark testers are classified according to their high-voltage power supply into power-frequency spark testers and DC spark testers. The high-voltage power supply is divided into power-frequency high-voltage power supply and DC high-voltage power supply. The power-frequency high-voltage power supply is grounded at one end, while the positive terminal of the DC high-voltage power supply is grounded. The ripple factor of the DC high-voltage power supply shall not exceed 5% of the output DC voltage.

3.2.2 The indication error of the test voltage output of the spark tester shall be ± 5%.

3.3 Test electrode

3.3.1 The bottom of the test electrode may be V-shaped or U-shaped. The effective width of the test electrode shall be no less than the outer diameter of the maximum test object plus 30 mm.

3.3.2 For metal bead chain or ring chain contact electrodes, the chain length shall be greater than the depth of the V-shaped or U-shaped bottom:

a) For beads with a diameter of 2.5 mm, the spacing between two adjacent chains shall be no greater than 5 mm. For beads with a diameter of 5.0 mm, the spacing between two adjacent chains shall be no greater than 8 mm. The distance between two adjacent beads in a string shall not exceed 2.5 mm. The beads shall be evenly distributed on the chain. The surface of the beads shall be smooth and free of burrs that could scratch the test object. Each link of the chain shall be flexible and retractable.

b) The rings shall be made of wire with a diameter greater than 0.8 mm. The narrow side of the ring shall be no larger than 5 mm. There shall be no fewer than 20 rings per 100 mm length of chain. The rings shall be evenly distributed on the chain. The surface of the rings shall be smooth and free of burrs that could scratch the test object. Each link of the ring shall be flexible and retractable.

3.4 Number of spark breakdowns

The breakdown counter shall be able to accurately record the number of spark breakdowns.

3.5 Sensitivity

The sensitivity requirement for the spark tester is that when a manual breakdown device is connected between the high-voltage power supply test electrode and ground for inspection, the spark tester shall indicate a breakdown.

3.5.1 When the spark gap of the manual breakdown device is temporarily short-circuited when the power frequency high-voltage power supply is tested at a voltage of 3 kV (rms), the steady current shall not exceed 600 μA.

3.5.2 When the spark gap of the manual breakdown device is temporarily short-circuited when the power frequency high-voltage power supply is tested at a voltage of 5 kV (rms), the steady current shall not exceed 600 μA.

3.6 Stability

3.6.1 At the maximum nominal test voltage, check by a manual breakdown device. The number of times counted by the spark tester's breakdown counter shall be consistent with the actual number of times.

3.6.2 When the high-voltage power supply is a power-frequency high-voltage power supply, a non-defective test sample with the maximum capacitance value shall be placed between the

electrodes during this test. If a suitable test sample is unavailable, a 500 pF high-voltage capacitor may be used as a substitute.

3.7 Guard electrode

3.7.1 Both ends shall have grounded guard electrodes. The width of the guard electrode shall be no less than the effective width of the test electrode and no less than 10 mm in length.

3.7.2 The guard electrode shall comply with the provisions of 3.3.2.

3.8 Inspection of Test speed

Check the maximum speed of the test sample passing the electrodes according to the method specified in this Standard.

4 Verification Instruments

4.1 Vernier caliper: Range 200 mm, graduation 0.02 mm.

4.2 Steel tape: Range 2000 mm, graduation 1 mm.

4.3 Electrostatic voltmeter: Class 1.5; or high input impedance measuring instrument: Input impedance greater than 100 MΩ, actual measurement error less than 1.5%; or voltage transformer: Class 1.0, AC voltmeter: Class 0.5.

4.4 Artificial breakdown device:

4.4.1 Artificial breakdown devices are divided into two types: those for sensitivity testing and those for stability testing. The artificial breakdown device for stability testing can be safely used at the highest nominal voltage of the spark tester.

4.4.2 The artificial breakdown device for sensitivity testing consists of a metal needle forming a high-voltage test electrode, a microammeter, and the necessary current-limiting resistor. The artificial breakdown device for stability testing consists of a metal needle forming a high-voltage test electrode.

4.4.3 The metal plate and the metal needle rotate relative to each other; with the needle tip passing over the plate at a period of 1 time per second. For power-frequency high-voltage power supply, each test duration is 0.025 s; for DC high-voltage power supply, each test duration is 0.0005 s. The gap between the metal plate and the metal needle is (0.25 ± 0.05) mm, adjusted with a 0.25 mm feeler gauge.

4.4.4 An AC or DC microammeter with an artificial breakdown device for sensitivity testing, with an appropriate range, is used to measure the short-circuit steady-state current at 3 kV for power-frequency high-voltage power supply; or measure the short-circuit steady-state current at 5 kV for DC high-voltage power supply. To limit the short-circuit steady-state current to 600

u – nominal test voltage, in V.

5.7 Sensitivity test

5.7.1 Power-frequency high-voltage power supply

5.7.1.1 Adjust the test voltage to 3 kV. Connect an artificial breakdown device for sensitivity testing between the high-voltage terminal and ground; and connect a current-limiting resistor in series to limit the short-circuit steady-state current to 600 μA or less.

5.7.1.2 Start the artificial breakdown device and rotate it 20 times. The number of times counted by the breakdown counter of the power-frequency spark tester shall be consistent with the actual number of breakdowns.

5.7.2 DC high-voltage power supply

5.7.2.1 Adjust the test voltage to 5 kV. Connect an artificial breakdown device for sensitivity testing between the high-voltage terminal and ground; and connect a current-limiting resistor in series to limit the short-circuit steady-state current to 600 μA or less.

5.7.2.2 Start the artificial breakdown device and rotate it 20 times. The number of times counted by the breakdown counter of the DC spark tester shall be consistent with the actual number of breakdowns.

5.8 Stability test

5.8.1 Power-frequency high-voltage power supply

5.8.1.1 Place a non-defective test sample with the maximum capacitance value between the electrodes as specified. The insulation or sheath of the test sample shall be made of PVC; and the core or armor shall be grounded.

If a suitable test sample is unavailable, a 500 pF high-voltage capacitor may be used as a substitute. Connect one end of the high-voltage capacitor to the test electrode, and the other end to ground.

5.8.1.2 Connect a 500 pF high-voltage capacitor between the high-voltage terminal and ground.

5.8.1.3 Connect the artificial breakdown device for the stability testing between the high-voltage terminal and ground.

5.8.1.4 Increase the test voltage to the maximum nominal voltage.

5.8.1.5 Start the artificial breakdown device and rotate it 20 times. The stability of the power-frequency spark tester shall comply with the provisions of 3.6.1.

5.8.1.6 Restart the artificial breakdown device and rotate it 20 times. While the artificial

breakdown device is rotating, increase the test voltage from 3 kV to the maximum nominal voltage, adjusting it up and down twice continuously. The number of times counted by the breakdown counter of the power-frequency spark tester shall be consistent with the actual breakdown count.

5.8.1.7 During periodic calibration of the power-frequency spark tester, the stability test may be conducted at the highest voltage used by the spark tester by placing a non-defective test sample of the largest size between the electrodes.

5.8.1.8 During periodic calibration of the power-frequency spark tester, the stability test does not implement the provisions of 5.8.1.2.

5.8.2 DC high-voltage power supply

5.8.2.1 Connect the artificial breakdown device for the stability testing between the high voltage terminal and ground.

5.8.2.2 Increase the test voltage to the maximum nominal voltage.

5.8.2.3 Start the manual breakdown device and rotate it 20 times. The stability of the DC spark tester shall comply with the provisions of 3.6.1.

5.8.2.4 Restart the artificial breakdown device and rotate it 20 times. While the artificial breakdown device is rotating, increase the test voltage from 5 kV to the maximum nominal voltage, adjusting it up and down twice continuously. The number of times counted by the breakdown counter of the DC spark tester shall be consistent with the actual number of breakdowns.

NOTE 1: When conducting the tests specified in 5.7 and 5.8, the trigger signal shall be disconnected to ensure that the power supply to the test transformer is not disconnected.

NOTE 2: When conducting the test specified in 5.7, the steel needle shall be replaced for each test. The needle tip shall have a taper of no more than 60° and a diameter of no more than 2 mm, or an equivalent needle shall be used.

NOTE 3: When conducting the test specified in 5.8, a thicker steel needle may be used to prevent the needle tip from melting, or an HB pencil lead may be used in place of the steel needle.

6 Verification Results and Handling

6.1 A verification certificate shall be issued for spark testers that pass verification; a verification result notice shall be issued for those that fail verification. The certificate shall specify the maximum speed of the test electrode. The cover pages of the verification certificate and verification result notice are provided in Appendixes A and B of JB/T 4278.1-2011.

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