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MT 210-90

Electrical and electronic products for coal mine communication, testing and control – Basic test method

煤矿通信、检测、控制用电工电子产品

基本试验方法

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Electrical and electronic products for coal mine communication, testing and control – Basic test method

MT 210-90

This Standard is used in conjunction with MT 209 “Electrical and electronic products for coal mine communication, testing and control - General technical requirements” and MT 211 “Electrical and electronic products for coal mine communication, testing and control - Quality inspection rules”.

1 Subject content and scope of application

1.1 This Standard specifies the basic test method for electrical and electronic products for coal mine communication, testing and control.

1.2 This Standard applies to:

- a. Coal mine communication, signal system and equipment;
- b. Monitoring, control, regulating system, equipment and instrumentation for coal mine infrastructure, production process and environment;
- c. Measurement and control equipment and instrumentation for electromechanical equipment in coal mines.

2 Reference standards

GB 531 Test method for hardness of vulcanized rubber shore A hardness

GB 998 Basic testing methods of low voltage electric apparatus

GB 1410 Methods of test for insulation resistance, volume resistivity and surface resistivity of solid insulating electrical materials

GB 2423.1 Basic environmental testing procedures for electric and electronic products - Tests A: Cold

GB 2423.2 Basic environmental testing procedures for electric and electronic products - Tests B: Dry heat

GB 2423.3 Basic environmental testing procedures for electric and electronic products - Test Ca: Damp heat, steady state

GB 2423.4 Basic environmental testing procedures for electric and electronic products - Test Db: Damp heat, cyclic

GB 2423.5 Basic environmental testing procedures for electric and electronic products - Test Ea: Shock

GB 2423.8 Basic environmental testing procedures for electric and electronic products - Test Ed: Free fall

GB 2423.10 Basic environmental testing procedures for electric and electronic products - Test Fe: Vibration (Sinusoidal)

GB 3836.2 Electrical apparatus for explosive atmosphere - Flameproof electrical apparatus "d"

GB 3836.4 Electrical apparatus for explosive atmospheres - Intrinsically safe circuits and electrical apparatus "i"

GB 4942.2 Low voltage electrical enclosure protection class

GB 5080.1 ~ 5080.7 Equipment reliability testing

GB 6379 Precision of test methods; Determination of repeatability and reproducibility for a standard test method by interlaboratory tests

MT 209 Electrical and electronic products for coal mine communication, testing and control - General technical requirements

3 General provisions

3.1 The test items and test methods specified in the identification inspection, factory-exit inspection and type inspection of electrical and electronic products for coal mine communication, testing and control shall comply with the relevant provisions of this Standard.

3.2 The relevant standards shall specify the test method, severity level and test sequence (if any) used according to the product type and the use environment conditions.

3.3 The relevant standards shall specify the performance indicators and other relevant requirements of test specimen during the test or after the test according to MT 209.

3.4 When the conditions for carrying out overall test on large-scale products are

5 General inspection

5.1 Inspection requirements

General inspection shall include appearance inspection, structural inspection, dimensional inspection, weight inspection and other relevant inspection items specified in the relevant standards.

The appearance inspection is to inspect whether the marking, surface quality, corrosion traces, color, display clarity, flexibility and reliability of flexible parts of test specimen and other appearance requirements comply with the relevant standards.

The structural inspection is to inspect whether the parts structure, electrical assembly, mechanical assembly and other structural requirements comply with the relevant standards.

The dimensional inspection is to inspect whether the product dimension, installation dimension, parts dimension, clearance, creepage distance, explosion-proof surface dimension, explosion-proof gap and other dimensional requirements comply with the relevant standards.

The weight inspection is to inspect whether the weighing product and the parts with the required weight comply with the relevant standards.

5.2 Inspection method

5.2.1 Appearance inspection and structural inspection

Visual inspection method is generally used. In the most favorable viewing distance and appropriate illumination conditions, inspect with naked eyes with normal vision and color resolution. For those with special stringent requirements, inspect with magnifying glass or other measuring instruments.

5.2.2 Dimensional inspection and weight inspection

Inspect with qualified measuring instruments.

5.3 Details need to be specified

The relevant standards shall specify the following items:

- a. Details of inspection site and items;
- b. Criteria for defects;
- c. Details of inspection instruments (if required).

8.2.3 In the course of the test if there is no insulation breakdown, surface flashover, significant increase of leakage current or sudden drop in voltage and other phenomena, the product is determined qualified. The determination method for surface flashover and leakage current increase shall comply with Annex A of this Standard.

8.3 Details need to be specified

The relevant standards shall specify the following items:

- a. Test voltage value;
- b. Maximum allowable leakage current (if required);
- c. Test site.

9 Water pressure test

9.1 Test requirements

9.1.1 The water pressure test shall be carried out after the parts are finished, and the parts shall be fixed to simulate the actual assembly as much as possible.

9.1.2 The following parts cannot be used for water pressure test:

- a. Explosion-proof insulation sleeve in the enclosure;
- b. Plastic, ceramic enclosure with a volume less than 0.1 L (except for those with other parts casted on the enclosure wall);
- c. Parts without welds made of steel or non-ferrous metal rolling materials, such as enclosures, covers, rings, bushings, etc.

9.2 Test method

9.2.1 The water pressure test shall be carried out on the products one by one.

9.2.2 Products capable of maintaining for 1 min at a test pressure not less than that specified in Clause 19.2 of GB 3836. 2 without continuous dripping (dripping a drop of water in interval greater than 10 s is considered to be discontinuous dripping) are determined qualified.

9.3 Details need to be specified

The relevant standards shall specify the following items:

- a. Test pressure;

temperature, respectively. If the use position of the product has been specified, measure only at the specified position. The lamp shall be measured at five positions, i.e. upward, upward tilt 45°, horizontal, downward tilt 45°, downward.

11.2 Test method

11.2.1 In the normal working and fault conditions specified in the relevant standard, when the temperature of the sample to be tested is stable, the surface temperature is measured by means of a thermometer, a semiconductor thermometer or a thermocouple to determine the maximum surface temperature.

11.2.2 When the temperature rise of the device does not exceed 2 °C per hour, the temperature is considered stable.

11.2.3 The measured temperature shall be corrected according to the maximum ambient temperature specified in the relevant standard:

$$T_1 = T_2 - T_3 + T_4$$

where

T_1 - the maximum surface temperature, °C;

T_2 - the measured maximum surface temperature, °C;

T_3 - the ambient temperature during the measurement, °C,

T_4 - the specified maximum ambient temperature, °C.

11.3 Details need to be specified

The relevant standards shall specify the following items:

- a. Working status during the test;
- b. Surface temperature value;
- c. Maximum ambient temperature;
- d. Test voltage;
- e. Various positions of the test sample (if required).

12 Thermal stability test

12.1 Test requirements

there shall be not deformation that may affect explosion-proof performance, and not friction produced by relative movement between the parts.

14.2.2 For plastic test specimens, place two sets of equipment in a temperature regulating chamber with temperature 10 °C higher than the specified high temperature and 5 °C lower than the specified low temperature. After the temperature is stable, remove the equipment. When the specimen temperature reaches the specified high temperature and low temperature value, test according to 14.2.1.

14.3 Details need to be specified

The relevant standards shall specify the following items:

- a. Test site;
- b. Impact energy;
- c. High temperature, low temperature impact test temperature (if required).

15 Drop test

15.1 Test requirements

15.1.1 The drop test shall be carried out on portable products and sensors. For those used in coal mine, the test specified in 15.2.1 and 15.2.2 shall be carried out; for those used on the ground, only the test specified in 15.2.1 shall be carried out.

15.1.2 The transparent parts shall be facing down when the lamp is dropped. The position of the other test specimen before it is dropped is determined by the inspection organization.

15.2 Test method

15.2.1 Carry out according to the provisions of GB 2423. 8. After the test, it shall inspect the appearance and performance.

15.2.2 The assembled test specimen free fall from a height of 1 m to the cement platform at the specified position and state. The test is carried out 4 times. After the test, there shall be not deformation and damage that may affect explosion-proof performance, and not friction produced by relative movement between the parts.

15.3 Details need to be specified

The relevant standards shall specify the following items:

- a. Position before the drop (if required);

18.2.1.3 After the leading in device is subjected to the clamping test, remove the leading in device from the tensile test device, continue to tighten the bolt or compression nut with the torque of 2.2 times the measured torque; and then disassemble the leading in device and inspect, if all the parts are not damaged (except deformation of the seal ring), it is determined qualified.

18.2.2 Armored cable and shielded wire leading in device

18.2.2.1 INSERT the armored cable or shielded wire with the minimum outer diameter INTO the leading in device and fasten the armor layer with a pressure plate or compression nut. FIX the assembled leading in device TO the tensile test device; gradually TIGHTEN the bolt of pressure plate or the compression nut; APPLY a pulling force to the armor layer of the cable or wire, the pulling force is 80 times Newton of the armor layer diameter (in mm), maintain for 2 min. If the armor layer is not displaced, it is determined qualified. At the same time, it shall determine the torque applied to the bolt or compression nut when there is no displacement.

18.2.2.2 After the leading in device is subjected to the clamping test, remove the leading in device from the tensile test device, continue to tighten the bolt or compression nut with the torque of 2 times the measured torque; and then disassemble the leading in device and inspect, if all the parts are not damaged (except deformation of the seal ring), it is determined qualified.

18.3 Details need to be specified

The relevant standards shall specify the following items:

- a. The inner diameter of the seal ring and the minimum outer diameter of the cable to be introduced;
- b. Type of the cable and wire to be introduced.

19 Leading in device sealing performance test and mechanical strength test

19.1 Test requirements

Each of the leading in devices on the explosion-proof product and the seal rings of the various specified size in the leading in device shall be subjected to this test, and the test is carried out only once.

19.2 Test method

19.2.1 Sealing performance test

22.1.2 The diameter of the measuring electrode is 50 ± 1 mm.

22.1.3 If the size allows, the surface resistance of the plastic enclosure itself can also be measured.

22.2 Test method

CARRY out according to the relevant test methods in GB 1410.

22.3 Details need to be specified

The relevant standards shall specify the insulation resistance of the plastic surface.

23 Working environment temperature test

23.1 Test requirements

23.1.1 If the difference between the maximum temperature and the ambient temperature is less than 5 °C after the temperature of the test specimen is stable, non-heat-dissipation test specimens shall be used for the temperature test. If the difference between the maximum temperature and the ambient temperature is more than 5 °C after the temperature of the test specimen is stable, heat-dissipation test specimens shall be used for the temperature test.

23.1.2 When the sudden temperature change will have a detrimental effect on the test specimen, the gradual temperature change test method shall be used. When the sudden temperature change will not have a detrimental effect on the test specimen, the sudden temperature change test method may be used.

23.1.3 After the temperature of the test specimen is stable, the duration of the test shall comply with 5.1 of GB 2423.1 and 5.1 of GB 2423.2.

23.1.4 The test temperature shall be at least equal to the working ambient temperature specified in the relevant standard.

23.2 Test method

23.2.1 Working environment low temperature test

The test specimen in power-on state shall be tested according to the relevant test method in GB 2423.1. After the temperature of the test specimen is stable, maintain at this temperature for at least 2 h. Test the performance at the end of the test and inspect the appearance.

23.2.2 Working environment high temperature test

temperature for at least 16 h. And then recovery in the environmental conditions specified in 4.1 of this Standard, the recovery time shall be sufficient to achieve temperature stability, but not less than 1 h. Finally test the performance indicators and inspect the appearance.

24.2.2 Storage environment high temperature test

The test specimen in power-off state shall be tested according to the relevant test method for non-heat-dissipation test specimens in GB 2423.2. After the temperature of the test specimen is stable (the difference between the temperature of all parts of the test specimen and the specified temperature is within 3 °C), maintain at this temperature for at least 16 h. And then recovery in the environmental conditions specified in 4.1 of this Standard, the recovery time shall be sufficient to achieve temperature stability, but not less than 1 h. Finally test the performance indicators and inspect the appearance.

24.3 Details need to be specified

The relevant standards shall specify the following items:

- a. Test temperature class;
- b. Either sudden change test method or gradual change test method is used;
- c. Test duration and recovery time (if required);
- d. Performance indicators and appearance requirements for the test.

25 Vibration test

25.1 Test requirements

25.1.1 Generally it shall vibrate on three mutually perpendicular axes in turn. For test specimen with complete symmetry of the structure and properties, it allows to omit the test in the symmetrical direction, i.e. only test in two directions.

25.1.2 If limited by the vibration device, for test specimen which allows to change the normal placement position, the test of three (or two) axial vibrations may be carried out by changing the position of the test specimen.

25.1.3 For test specimen used with shock absorbers, it shall normally be tested together with the shock absorber. When the test specimen used with shock absorbers needs to be tested with the shock absorber removed, the relevant standards must specify special installation and test requirements.

25.1.4 If the vibration test is to be carried out in the working state, the test specimen

the test, test the performance indicators and inspect the appearance and structure.

26.3 Details need to be specified

The relevant standards shall specify the following items:

- a. Working state;
- b. Installation method of test specimen (if required);
- c. Test severity level (peak acceleration, pulse duration, waveform);
- d. Performance indicators and appearance requirements for the test.

27 Transportation test

27.1 Test requirements

The test specimen must be products of complete packaging in accordance with the relevant provisions.

27.2 Test method

27.2.1 SELECT from the following two methods:

- a. PLACE the packaged equipment on a simulated vehicle transport test bed for 2 h;
- b. PLACE the packaged equipment in the middle of the vehicle and fix it. The load of the vehicle shall not exceed 1/3 of the rated load of the vehicle. The vehicle runs 100 km on the road of the Grade 3 highway with the running speed of 20 ~ 40 km/h.

27.2.2 Post-test inspection:

- a. The packing box shall be no significant deformation and damage;
- b. The appearance, structure and performance of the equipment (including accessories) shall comply with the provisions of the product standard.

27.3 Details need to be specified

The relevant standards shall specify the following items:

- a. Test method (one in 27.2.1);
- b. Performance indicators and appearance requirements for the test.

appearance.

28.3 Details need to be specified

The relevant standards shall specify the following items:

- a. Working state;
- b. Test method;
- c. Test severity level;
- d. Recovery time;
- e. Insulation resistance, dielectric strength requirements;
- f. Performance indicators and appearance requirements to be inspected (including explosion-proof surfaces).

29 Anti-interference test

CARRY out according to the provisions of Clause 12 of GB 998.

30 Reliability test

The reliability test shall comply with the provisions of GB 5080.1 ~ 5080.7, as well as the relevant national product technical standards.

31 Strength test and explosion proof test

CARRY out according to the provisions of Clauses 18, 19 and 20 of GB 3836.2.

32 Intrinsically safe spark test

CARRY out according to the relevant provisions of Clause 8 of GB 3836.4.

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