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Electrical equipment of industrial machines - Insulation resistance test specifications

工业机械电气设备 绝缘电阻试验规范

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Electrical equipment of industrial machines - Insulation resistance test specifications

1 Scope

This standard specifies the test equipment requirements, test methods, test scope, test records for the insulation resistance test of electrical & electronical equipment and system, of industrial machinery.

This standard applies to the insulation resistance test of electrical & electronical equipment and system, of industrial machinery

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard; 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.

GB 5226.1-2008 Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC60204-1:2005, IDT)

GB/T 10064-2006 Methods of test for the determination of the insulation resistance of solid insulating materials (IEC 60167:1964, IDT)

GB/T 18216.1-2000 Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. - Equipment for testing, measuring or monitoring of protective measuring - Part 1: General requirements (idt IEC 61557-1:1997)

GB/T 18216.2-2002 Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. - Equipment for testing, measuring or monitoring of protective measuring - Part 2: Insulation resistance (idt IEC 61557-1:1997)

3 Terms and definitions

The following terms and definitions apply to this standard.

18216.2-2002 apply to this standard.

4.1 Output voltage of the test equipment

The output voltage of the insulation resistance test equipment shall be DC voltage, which has a nominal output voltage (U_N) of 500 V (d.c.).

4.2 Open-circuit output voltage of the test equipment

The open-circuit output voltage (U_q) of the insulation resistance test equipment shall not exceed 1.5 times the nominal output voltage (U_N).

4.3 Output current of the test equipment

The output current (I_N) of the insulation resistance test equipment shall be at least 1 mA.

4.4 Peak value of measurement current

The peak value of the measurement current shall not exceed 15 mA; any AC component present shall not exceed 1.5 mA peak value.

5 Test method

The insulation resistance test shall comply with the provisions of GB 5226.1-2008 and GB/T 10064-2006.

Before the insulation resistance test, it shall disconnect the external power supply circuit of the entire electrical equipment; it shall make disconnection between the circuit under test and the protective grounding circuit.

Compile the test procedure for insulation resistance. According to the prepared test procedures for insulation resistance, use the insulation resistance testing equipment, that meets the requirements of Chapter 4, for testing.

The output voltage (U_a) of the measuring equipment is applied, between the conductors of the circuit under test and the protective grounding circuit. The measurement data shall be recorded. When powered by a hand-cranked generator, the value shall be valid, only when measured at nominal rpm.

6 Test scope

6.1 General requirements

The testing scope of insulation resistance shall include the power input terminals and output terminals of the power switch of the entire electrical equipment, as well as all power circuit wires. If there is a dedicated power inlet terminal group, the insulation

resistance test shall also be carried out, at the same time as the power switch and all power circuit wires. These circuits in the entire electrical equipment, that exceed the PELV voltage, can be tested when required.

6.2 Insulation resistance testing of power circuit

Power circuit wires and related components, including power input terminals, output terminals, actuators of power switches (such as motors, electromagnets, electromagnetic clutches, etc.), shall be tested for insulation resistance. The measured insulation resistance shall not be less than 1 MΩ.

6.3 Insulation resistance testing of individual component circuits

When the whole electrical equipment is composed of one or more individual parts, the insulation resistance test can be carried out, on the individual parts of the whole electrical equipment. When insulation resistance testing is required for individual component circuits, it shall meet the continuity requirements of the protective grounding circuit of the entire electrical equipment. The insulation resistance, which is measured for the circuit of individual components, shall not be less than 1 MΩ; meanwhile the insulation resistance, which is measured for the circuits of each individual component, shall be calculated according to the parallel resistance, AND converted into the insulation resistance of the entire electrical equipment. The insulation resistance of the entire electrical equipment shall still not be less than 1 MΩ.

6.4 Insulation resistance testing of some parts or devices

For some components in electrical equipment, such as busbars, buses, busbar systems or bus ring devices, the minimum allowable insulation resistance is allowed to be lower, but not less than 50 kΩ. The measured insulation resistance value is recorded separately, which does not participate in the conversion of the insulation resistance of the entire electrical equipment.

If electrical equipment contains surge protection devices, which may operate during the test, THEN, it is allowed to take any of the following measures:

- Disconnect these devices; OR

- Reduce the test voltage value, so that it is lower than the voltage protection level of the surge protection device, BUT not lower than the upper limit peak value of the power supply voltage (phase-to-phase).

6.5 Insulation resistance testing of the entire electrical equipment

When necessary, the insulation resistance test can be carried out, for the circuit that exceeds the PELV voltage, in the entire electrical equipment at the same time; the measured insulation resistance shall not be less than 1 MΩ.

Appendix A

(Informative)

Examples and brief descriptions of insulation resistance tests for electrical equipment of industrial machinery

A.1 Brief description

This Appendix gives the circuit diagram of a certain electrical equipment of industrial machinery (Figure A.1 ~ Figure A.6), as the circuit diagram of the insulation resistance testing of the electrical equipment of industrial machinery. Figure A.1 and Figure A.2 is the main circuit and control circuit power supply. Figure A.3 shows the PELV-containing slip ring and the corresponding actuator; the actuator is a relatively independent individual component; this Appendix only takes the individual component with PELV as an example; if it is higher than the insulation resistance as detected by the individual part of PELV, it shall also participate in the conversion of the insulation resistance of the whole electrical equipment. Figure A.4 to Figure A.6 is the control circuit.

A.2 Test procedures of insulation resistance

A.2.1 Detection of insulation resistance of power circuit

a) Cut off the power supply line of the electrical equipment under test.

b) Close the power switch.

c) Connect F1, F6, F14, F11, F12, F13.

d) Short-circuit the terminals U11 and 29 on T2.

e) Disconnect the control circuit from the protective grounding circuit.

f) Apply the output voltage of the measuring equipment (U_a) [not less than 500 V (d.c.)], between U and the protective grounding circuit.

g) Record testing data.

h) Restore the circuit. Make the whole electrical equipment work normally.

A.2.2 Insulation resistance testing of PELV's slip rings and actuators

a) Disconnect the power supply line of the electrical equipment from the power supply.

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