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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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Safety requirements for photovoltaic modules

光伏组件安全要求

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5.1.1 General Requirements

5.1.1.1 Photovoltaic modules should have sufficient insulation protection measures.

Dangerous live parts should not be directly exposed and should be tested through accessible means. Verification (see 6.3.4).

5.1.1.2 Photovoltaic modules should maintain the insulation performance required for safe operation in humid environments and should pass a wet leakage current test (see 6.3.3).

For surface-mounted photovoltaic modules... For photovoltaic modules with an area not exceeding

0.1 m², the insulation resistance should be not less than 400 MΩ; for photovoltaic modules with an area greater than

0.1 m², the measured insulation resistance should be... The insulation resistance multiplied by the area of the photovoltaic module should be no less than 40 MΩ·m².

5.1.1.3 Photovoltaic modules using polymer materials as front or back sheets should still provide sufficient electrical conductivity under mechanical contact or cutting stress.

Protective measures should be taken to avoid the risk of electric shock. It should pass a scratch resistance test (see 6.3.5).

5.1.1.4 Photovoltaic modules shall be able to withstand overvoltage caused by switching of low-voltage equipment and shall pass a pulse voltage test (see 6.3.8).

5.1.1.5 The electrical clearances and creepage distances of photovoltaic modules shall comply with the requirements of Appendix A.

5.1.2 Insulation Protection Based on the requirements of GB/T 17045-2020, photovoltaic module insulation protection is divided into Class II, Class 0, and Class III, with corresponding levels of protection provided in designated areas. The photovoltaic modules used should meet the insulation protection requirements in Table 1.

5.1.3 Electrical components

5.1.3.1 Components providing thin-layer insulation in photovoltaic modules shall have sufficient insulation thickness to meet the requirements of A.3.1, and shall be certified by insulation thickness. Experiment (see 6.3.1).

5.1.3.2 The internal wiring of photovoltaic modules should have a sufficiently large current-carrying capacity to meet the relevant functions and should comply with GB/T 20047.1-2025. The requirements of section 6.3.2.

5.1.3.3 External wires and cables of photovoltaic modules shall have the ability to maintain electrical protection under environmental stress and shall comply with GB/T 20047.1-Requirements of

5.1.3.4 The lead cables of photovoltaic modules should be able to withstand mechanical loads such as tension and torque during installation and use, and should not detach or be damaged. If there is a fault or electrical malfunction, a lead end strength test should be performed (see 6.3.7).

5.1.3.5 The external DC connectors for photovoltaic modules shall comply with the requirements of

6.3.5 in GB/T 20047.1-2025, and the junction boxes shall comply with... The requirements of

6.3.6 in GB/T 20047.1-2025.

5.1.3.6 The front and back panels of photovoltaic modules shall comply with the requirements of

6.3.7 in GB/T 20047.1-2025.

5.1.3.7 The insulation barrier of photovoltaic modules shall meet the requirements of

6.3.8 in GB/T 20047.1-2025.

5.1.3.8 The electrical connection of photovoltaic modules shall comply with the requirements of

6.3.9 in GB/T 20047.1-2025.

5.1.3.9 The bypass diodes of photovoltaic modules shall comply with the requirements of

5.2.1 General Requirements

5.2.1.1 Photovoltaic modules should be able to withstand hot spots, and the hot spots generated during operation in various application scenarios should not cause a fire hazard to the photovoltaic modules. Risk. It should pass the hot spot durability test (see 6.4.1).

5.2.1.2 When the bypass diode of a photovoltaic module is operating, its junction temperature should not exceed the maximum rated junction temperature specified by the manufacturer. This should be achieved through the bypass diode. Tube thermal test (see 6.4.2) and bypass diode functional test (see 6.4.3).

5.2.1.3 Photovoltaic modules should not overheat, catch fire, or suffer permanent damage under reverse current conditions. They should pass a reverse current overload test (see...). (6.4.4) The maximum temperature on the outer surface of the photovoltaic module during the test should not exceed 170 °C.

5.2.1.4 The external polymer components of photovoltaic modules should be capable of resisting external fire sources and preventing the spread of flames. The flammability rating of materials used in composite components (excluding junction boxes, connectors, cables, and thin-layer insulation components) shall not be lower than that specified in GB/T 5169.16. Level V-1.

5.2.2 Fire Safety of Building Photovoltaic Modules Photovoltaic modules used in buildings should meet at least the B1 rating requirements specified in section

5.3.2 of GB 8624-2025 for their combustion performance, and should... Pass the flammability rating test (see 6.4.7).

5.3.1 General Requirements

5.3.1.1 Photovoltaic modules shall be free of any inaccessible burrs, sharp edges, or pointed corners that could cause harm. This shall be verified through visual inspection (see 6.2) and... Sharp edge test (see 6.5.1).

5.3.2 Static Mechanical Load Photovoltaic modules should be able to withstand static loads. Photovoltaic modules with rigid planar structures and rigid frames should be mounted on fixed supports. For installation methods, the front-side design load should be no less than 2400 Pa, and the rear-side design load should be no less than 1600 Pa. Other types of photovoltaic modules adopt... For fixed bracket installation, the design load on the front and back of the photovoltaic modules should not be less than 1600 Pa. Tracking brackets and flexible photovoltaic systems can also be used. The design load of photovoltaic modules installed using brackets, special clamps, or other mounting methods should ensure the mechanical structural safety of the photovoltaic modules during use. This should be verified through... Static mechanical load test (see 6.5.2).

5.3.3 Dynamic Mechanical Load Photovoltaic modules should be able to withstand dynamic loads. They should pass a dynamic mechanical load test (see 6.5.3).

5.3.4 Damage Protection If a photovoltaic module is damaged by impact under the specified installation method, the middle layer of the photovoltaic module should not break, and the photovoltaic module should not break due to surface fragmentation. The internal circuitry is exposed by peeling off the wafers. The module must pass a component breakage test (see 6.5.4). Class 0 photovoltaic modules are exempt from the component breakage test.

5.3.5 Hail Resistance Photovoltaic modules should be resistant to hail impact and should not break after a specified hail test. They should pass the hail test (see 6.5.5).

5.4 Restrictions on Hazardous Substances

5.4.1 Photovoltaic modules shall not leak harmful substances that cause environmental pollution or harm to human health.

5.4.2 The arsenic content (calculated as arsenic trioxide) in the glass components of photovoltaic modules should not exceed 0.005% (50 ppm). It should pass through a hazardous substance testing process. (Arsenic) detection (see 6.6).

6.3 Electrical safety test

6.3.1 Insulation Thickness Test The test shall be conducted according to section 10.5 of GB/T 20047.2-2025, and the measured insulation thickness shall be greater than that corresponding to the photovoltaic standard in Table A.1 or Table A.2. Requirements for component insulation protection category.

6.3.2 Insulation Test The test shall be conducted in accordance with section 10.13 of GB/T 20047.2-2025.

6.3.3 Wet leakage current test The test shall be conducted in accordance with section 10.14 of GB/T 20047.2-2025.

6.3.4 Contact Test The test shall be conducted in accordance with section 10.9 of GB/T 20047.2-2025.

6.3.5 Scratch resistance test The test shall be conducted in accordance with section 10.10 of GB/T 20047.2-2025.

6.3.6 Continuity test of equipotential bonding The test shall be conducted in accordance with section 10.11 of GB/T 20047.2-2025.