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

GB/T 9535-1998

**Crystalline silicon terrestrial photovoltaic(PV) modules-design
qualification and type approval**

地面用晶体硅光伏组件设计鉴定和定型

(English Translation)

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1 Scope and object

This International Standard lays down IEC requirements for the design qualification and type approval of terrestrial photovoltaic modules suitable for long-term operation in general open-air climates, as defined in GB/T 4797.1. It applies only to crystalline silicon types. Standards for thin-film modules and other environments, such as marine or equator conditions, are under consideration.

This standard does not apply to modules used with concentrators.

The object of this test sequence is to determine the electrical and thermal characteristics of the module and to show, as far as is possible within reasonable constraints of cost and time, that the module is capable of withstanding prolonged exposure in climates described in the scope. The actual lifetime expectancy of modules so qualified will depend on their design, their environment and the conditions under which they are operated.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 2421-1989 Basic environmental testing procedures for electric and electronic products -

General and guidance (eqv IEC 68-1:1988)

GB/T 2423.3-1993 Basic environmental testing procedures for electric and electronic products

- Test Ca: Damp heat, steady state (eqv IEC 68-2-3:1984)

GB/T 2423.29-1982 Basic environmental testing procedures for electric and electronic products -Test U: robustness of terminations and integral mounting devices (eqv IEC 68-2-21:1980)

GB/T 2828-1987 Sampling procedures and tables for lot-by-lot inspection by attributes (Apply to inspection of successive lots or batches)

GB/T 4797.1-1984 Environmental conditions appearing in nature of electric and electronic products; Temperature and humidity

GB/T 6495.1-1996 Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics (idt IEC 904-1:1987)

GB/T 6495.3-1996 Photovoltaic devices - Part 3: Measurement principles for terrestrial

photovoltaic (PV) solar devices with reference spectral irradiance data (idt IEC 904-3:1989)

GB/T 6495.4-1996 Procedures for temperature and irradiance corrections to measured I-V - characteristics of crystalline silicon photovoltaic devices (idt IEC 891:1987) Amendment No.1 (1992)

IEC 904-9:1996 Photovoltaic device - Part 9: Solar simulator performance requirements

QC 001 002:1986 Rules of Procedure of the IEC Quality Assessment System for Electronic Components (IECQ) Amendment No.1(1992)

3 Sampling

Eight modules for qualification testing (plus spares as desired) shall be taken at random from a production batch or batches, in accordance with the procedure given in GB/T 2828. The modules shall have been manufactured from specified materials and components in accordance with the relevant drawings and process sheets and have been subjected to the manufacturer's normal inspection, quality control and production acceptance procedures. The modules shall be complete in every detail and shall be accompanied by the manufacturer's handling, mounting and connection instructions, including the maximum permissible system voltage.

When the modules to be tested are prototypes of a new design and not from production, this fact shall be noted in the test report (see Clause 8).

4 Marking

Each module shall carry the following clear and indelible markings:

- name, monogram or symbol of manufacturer;
- type or model number;
- serial number;
- polarity of terminals or leads (color coding is permissible);
- maximum system voltage for which the module is suitable.

The date and place of manufacture shall be marked on the module or be traceable from the serial number.

5 Testing

The modules shall be divided into groups and subjected to the qualification test sequences in

Figure 1, carried out in the order laid down. Each box refers to the corresponding subclause

in this standard. Test procedures and severities, including initial and final measurements where necessary, are detailed in Clause 10.

NOTE: Where the final measurements for one test serve as the initial measurements for the next test in the sequence, they need not be repeated. In these cases, the initial measurements are omitted from the test.

In carrying out the tests, the tester shall strictly observe the manufacturer's handling, mounting and connection instructions. Test given in 10.4 may be omitted if the temperature coefficients

alpha and beta are already known.

Test conditions are summarized in Table 1.

6 Pass Criteria

A module design shall be judged to have passed the qualification tests, and therefore to be IEC type approved, if each test sample meets all the following criteria:

- a) the degradation of maximum output power at standard test conditions (STC) does not exceed the prescribed limit after each test nor 8 % after each test sequence;
- b) no sample has exhibited any open-circuit or ground fault during the tests;
- c) there is no visual evidence of a major defect, as defined in Clause 7;
- d) the insulation test requirements are met after the tests.

If two or more modules do not meet these test criteria, the design shall be deemed not to have met the qualification requirements. Should one module fail any test, another two modules meeting the requirements of Clause 3 shall be subjected to the whole of the relevant test sequence from the beginning. If one or both of these modules also fail, the design shall be deemed not to have met the qualification requirements. If, however, both modules pass the test sequence, the design shall be judged to have met the qualification requirements.

10.2.1 Purpose

To determine how the electrical performance of the module varies with load at STC (cell temperature: $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, irradiance: $1000 \text{ W} \cdot \text{m}^{-2}$), standard solar spectral irradiance distribution conforms to the provisions of GB/T 6495.3) using natural sunlight or a class A simulator conforming to the requirements of GB/T 6495.1.