

# PV GAP RECOMMENDED SPECIFICATION

# PVRS 6

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Second edition  
2005-09

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**Charge controllers for photovoltaic (PV) stand-alone systems with a nominal system voltage below 50V. Blank detail specification —**

**Approval under the IEC System for Conformity Testing and Certification of Electrical Equipment and Components (IECEE).**

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The logo for PV GAP, featuring the letters 'PV' in a bold, sans-serif font, followed by a stylized sunburst icon, and then the letters 'GAP' in a bold, sans-serif font.

Reference number  
PVRS 6 : 2005

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PV GAP Secretariat c/o IEC Central Office  
3 rue de Varembé - PO Box 131 - 1211 Geneva 20 – Switzerland  
[www.pvgap.org](http://www.pvgap.org) Tel: 41 22 919 02 16 Fax: 41 22 919 03 00 E-mail: rk@iec.ch

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PRICE

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## FOREWORD

- 1) PV GAP (Global Approval Program for Photovoltaics) is a not-for-profit international organization, dedicated to the sustained growth of global photovoltaics (PV) markets to meet energy needs world-wide in an environmentally sound manner. Its mission is to promote and encourage the use of internationally accepted standards, quality management processes and organizational training in the design, fabrication, installation, sales and services of PV systems. To this end, it partners with PV related industries, international organizations, testing laboratories, government agencies, financing institutions, non-governmental organizations, and private foundations, in developing and developed countries.
- 2) PV GAP co-operates closely with the International Electrotechnical Commission (IEC) in respect of standardization (principally with IEC Technical Committee N° 82, Solar Photovoltaic Energy Systems) and certification (with the IEC System for Conformity Testing and Certification of Electrical Equipments and Components, IECEE).

PV GAP publishes specifications that have been developed and recommended by experts from the PV industry and other organizations, to be used as interim, recommended specifications until the corresponding IEC standards can be completed. The acceptance of these PV GAP "Recommended Specifications" is voluntary. PV GAP only recommends these specifications but disclaims any liability for their utilization.

It should be noted that, as soon as a corresponding IEC standard is issued, the PV GAP "Recommended Specification" is withdrawn. This is announced on the PV GAP website [www.pvgap.org](http://www.pvgap.org), together with information about the new IEC standard.

- 3) The present PV GAP Recommended Specification has been endorsed by the PV GAP Technical Committee, and approved by the PV GAP Executive Board. Members of the Technical Committee and the Executive Board bodies are listed on the website [www.pvgap.org](http://www.pvgap.org).

It was edited into a second edition in September 2005 to reflect the change in PV certification activity in the IEC from the IECQ to the IECEE.

- 4) General enquiries about PV GAP may be addressed to the publisher, which is the PV GAP Secretariat, c/o IEC Central Office, 3 rue de Varembé, Box 31, CH 1211 Geneva 20, Switzerland, E-mail [rk@iec.ch](mailto:rk@iec.ch), TP +41 22 919 02 16, TF +41 22 919 03 01.

The publisher will be pleased to receive any comments from users of this PV GAP Recommended Specification. All comments will be acknowledged.

Whilst every effort has been made to ensure the accuracy of the contents of this PV GAP Recommended Specification, the publisher can accept no responsibility for any errors that may have occurred.

**CHARGE CONTROLLERS FOR STAND-ALONE  
PHOTOVOLTAIC (PV) SYSTEMS  
WITH A NOMINAL SYSTEM VOLTAGE BELOW 50V**

**Blank detail specification —**

**Approval under the IEC System for  
Conformity Testing and Certification of Electrical Equipment (IECEE)**

## **1 General**

### **1.1 Scope**

This PV GAP Recommended Specification is a blank detail specification applicable to charge controllers for photovoltaic (PV) stand-alone systems with a nominal system voltage below 50V, of assessed quality.

This specification references GEF/WB China RED Project specification, March 23, 1999, requirements and methods of test to be used in detail specifications derived from this specification, and lists the technical criteria that are necessary and sufficient to assess the quality of the charge controllers in accordance with the IECEE approval procedure described in IECEE 03.

### **1.2 Normative references**

The following normative documents contain provisions which, through reference in this text, constitute provisions of this PV GAP Recommended Specification.

1. GEF/WB China Renewable Energy Development (RED) Project Specification: March 23, 1999, pages 20, 21 and 28 *Charge Controller for PV System* (reproduced in PVRS 6A)
2. China Renewable Energy Development (RED) Project Specification: March 23, 1999, pages 59 to 72 *Charge Controller Testing Procedure* (reproduced in PVRS 6A)
3. IECEE 03: 2008-10, *Rules of Procedure of the Scheme of the IECEE for Mutual Recognition of Conformity Assessment Certificates for Electrotechnical Equipment and Components (CB-FCS)*.

### **1.3 Informative references**

1. Operating Guide of the CB-FCS Scheme, see [www.iecee.org](http://www.iecee.org)

#### 1.4 Front page of detail specification

The layout of the front page of a detail specification shall be as follows (see key below)

(1)	IECEE PVRS 6 AAxxxx Edition: 200x Page 1 of x	(2)
(3)	Charge controller for photovoltaic (PV) stand-alone system with nominal system voltage below 50V, of assessed quality, in accordance with :  GEF/WB China RED Project: March 23, 1999 (relevant extracts in PVRS 6A: 2000-06)	(4)
Type (on/off, PWM, etc)		
Rating (PV current (A), load current (A)):		(5)
Block schematic drawing		(6)
(7)	Outline drawing  Dimensions in millimetres	(8)
Electrical characteristics (see 2.1)		(9)
Mechanical and environmental characteristics (see 2.2 and 2.3)		(10)
Information about manufacturers who have products approved according to this detail specification is available on the IECEE website <a href="http://www.iecee.org">www.iecee.org</a> .		

#### Key to front page:

The numbers between brackets on the front page correspond to the following indications which should be given.

#### Identification of the detail specification

- (1) The name of the National Standards Organization under whose authority the detail specification is published and, if applicable, the organization from whom the detail specification is available.
- (2) The IECEE logo and the number allotted to the completed detail specification by the National Standards Organization or the IECEE Member Body (IECEE PVRS 6 is the IECEE provisional document reference allocated by the IECEE Secretariat to the blank detail specification PVRS 6 published by PV GAP. AA is the country identifier, e.g. CN for China, FR for France, DE for Germany, IN for India, US for USA).



## 2.2 Mechanical characteristics

Terminal diameter (in the range from min - max)	mm
Mounting orientation	
Encapsulation	
Mass	kg
Case material finish	
Case dimensions	mm
Case properties (material)	
Fasteners	
Degree of protection (IP code)	
Cables (recommanded diameter)	mm
Spare parts	

## 2.3 Environmental characteristics

Range of operating temperature	°C
Range of storage temperature	°C
Maximum relative humidity	%

## 2.4 Additional information (not for inspection purposes)

For example

- service life
- warranty period

## 3 Approval procedure

### 3.1 General

The approval procedure shall be in accordance with IEC 60300-3.

NOTE Approval includes current registration/certification to ISO 9001 (see 7.2.i) of IEC 60300-3.

### 3.2 Primary stage of manufacture

The primary stage of manufacture is that stage (or those stages) of the manufacturing operation at which, and beyond which, the manufacturer shall demonstrate that he has control over all aspects of the processes that affect the quality of the finished product.

NOTE – A manufacturer, himself, does not necessarily have direct control of all aspects of any preceding processes, although he does have the responsibility for accepting the quality achieved by them.

This may be that stage of the manufacturing operation at which partly manufactured components can be evaluated economically without precise knowledge of the preceding processes.

The primary stage of manufacture is the interconnection of the components (including sub-assemblies) to form the complete charge controller.

### 3.3 Subcontracting

Where an organization chooses to subcontract any process that affects product conformity with requirements, the organization shall ensure control over such processes. Control of such subcontracted processes shall be identified within the quality management system (as specified in 4.1, General requirements, of ISO 9001:2000, with reference to outsourcing.)

Subcontracting of the primary and subsequent stages of manufacture is permitted. The PV GAP seal holder of the product shall ensure quality system conformity with ISO 9001.

### 3.4 Technical requirements

Sampling, testing, and pass criteria shall be in accordance with Reference 2.

NOTE This blank detail specification cannot add requirements that do not exist in Reference 2, such as

- *voltage drop compensation;*
- *mechanical shock;*
- *temperature stresses, damp heat, cyclical;*
- *insulation resistance;*
- *temperature stress under critical conditions;*
- *running without a battery;*
- *running with exhausted battery;*
- *voltage measuring lines;*
- *temperature sensor lines;*
- *resistance to heat and fire;*
- *mechanical sturdiness of case;*
- *IP code (access and ingress);*
- *robustness of terminations.*

Reporting, and issuing of the Conformity Assessment Certificate shall be in accordance with 7.2 of IEC 03.

### 3.5 Increased severity

Detail specifications derived from this blank detail specification may make the severities of test, the end-of-test requirements, or the sampling levels, more severe. These severities, or requirements, can never be made less stringent.

### 3.6 Preparation of detail specifications

An individual manufacturer may prepare a detail specification from this blank detail specification and submit it to the responsible national organization for verification of compliance to the IEC 03 rules and the allocation of a number. After completion of the testing in accordance with the chosen National Certification Body of the CB-FCS, the manufacturer or the responsible national organization shall publish the detail specification.

Alternatively, a group of manufacturers may act together to produce a common detail specification with one of them accepting the responsibility for the submission for verification and the allocation of a number, the procedure being the same as above.

The above actions may be in co-operation with one or more customers.

Detail specifications may also be prepared by a responsible national organization or by an IEC technical committee (in this case, IEC TC 82, Solar photovoltaic energy systems).

### 3.7 Product identification and traceability

The minimum period shall be as prescribed by the National Certification Body referred to in 3.6 above.

#### 4 Quality conformance inspection

Quality conformance inspection comprises the tests stated in table 1:

- group A: lot-by-lot (100% inspection) tests;
- group C: periodic tests.

**Table 1 — Test schedule for quality conformance inspection**

Test No. in Table 1 of Normative reference 2	Destructive or non-destructive	Conditions of test	Performance requirements
<p><b>GROUP A INSPECTION (100%)</b></p> <p><b>Subgroup A1</b></p> <p>1 Visual inspection</p> <p>Appearance, labels, documentation</p> <p>Dimensions (gauging)</p>	<p>ND</p>		<p>As in Table 1 of normative reference 2</p> <p>See the outline drawing in item (7) of the cover page of this specification and any related tables.</p>
<p><b>Subgroup A2</b></p> <p>None</p>	<p>ND</p>		
<p><b>GROUP B INSPECTION</b></p> <p><b>Covering additional important characteristics</b></p> <p>None</p>			

Test No. in Table 1 of Normative reference 2	D or ND	Conditions of test	Sample size and acceptance criterion (see Note 1)			Performance requirements
			p	n	c	
<b>GROUP C INSPECTION (periodic)</b> <b>Subgroup C1</b> 2 adjustment of set points 3 Array HVD 4 LVD 5 Temperature compensation 9 Protection functions 3 Array HVD 4 LVD	ND	If option is specified	24	4	0	
<b>Subgroup C2</b> 6 Quiescent current 7 Voltage drop 8 Vibration 3 Array HVD 4 LVD	ND		24	2	0	
<b>Subgroup C3</b> 10 Over voltage protection 10 Over current protection 3 Array HVD 4 LVD	D		24	1	0	
NOTE 1: in this table : p = periodicity (in months) n = sample size c = acceptance criterion (permitted number or non-conforming items)						
NOTE 2: The function-tests (3 and 4) are repeated after several tests. Doing this, it is sufficient to determine only the end-of charge thresholds with a load current of 50% of I <sub>i max</sub> . This function test should not reveal a deviation of the voltage thresholds higher than ±100 mV of the values measured the first time in subgroup C1						

**5 Modifications**

Any change in the design, materials, components or processing of the system may require a repetition of some or all of the qualification tests to maintain approval.

## 6 Marking

Marking of the charge controller shall be in accordance with 3.3.9 of normative reference 1. The detail specification may also require that, in addition, the following be marked:

- a clear labelling of all displays;
- characteristic fuse values.

Marking of the charge controller package may also be required, for example

- manufacturer's name, monogram or symbol;
- type or model number;
- serial or batch number;
- precautionary warning concerning special requirements for storage or handling.

## 7 Documentation

The documentation shall be in accordance with 3.3.10 of normative reference 1.

## 8 Annexes

Annexes may be included if necessary, to show more details of the charge controller.

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Central Office of the IEC  
3, rue de Varembe  
GENEVA