

**PV GAP  
RECOMMENDED  
SPECIFICATION**

**PVRS 5**

2003-12

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**Lead-acid batteries for solar photovoltaic energy systems (modified automotive batteries).**

**Blank detail specification —**

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

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FOREWORD ..... 3

1 General ..... **Error! Bookmark not defined.**

    1.1 Scope ..... 4

    1.2 Normative references ..... 4

    1.3 Informative reference ..... 4

    1.4 Front page of detail specification ..... 5

2 Characteristic values of the lead-acid battery (modified automotive battery)..... 6

3 Qualification Approval procedure ..... 6

    3.1 General ..... 6

    3.2 Primary stage of manufacture ..... 6

    3.3 Subcontracting ..... 7

    3.4 Technical requirements ..... 7

    3.5 Increased severity ..... 7

    3.6 Preparation of detail specifications ..... 7

    3.7 Product identification and traceability ..... 7

4 Quality conformance inspection ..... 7

5 Modifications likely to affect Qualification Approval ..... 8

6 Modifications that do not require re-testing ..... 9

7 Declaration of conformity ..... 9

8 Annexes ..... 9

## 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 joins 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 Equipment and Components, IECCE).

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 are listed on the website [www.pvgap.org](http://www.pvgap.org).
- 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.

While 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.

# **Lead-acid batteries for solar photovoltaic energy systems (modified automotive batteries)**

## **Blank detail specification —**

### **Qualification Approval under the IEC Quality Assessment System for Electronic Components (IECEE)**

#### **1 General**

##### **1.1 Scope**

This PV GAP Recommended Specification is a blank detail specification applicable to lead-acid batteries for solar photovoltaic energy systems (modified automotive batteries), of assessed quality. Lead-acid batteries according to this specification are provided for operation in Solar Home System applications. However, as lead-acid batteries, they are also suitable for other applications, as described in the manufacturer's data sheets.

This specification references PV GAP Recommended Specification PVRS 5A 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 batteries 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.

PVRS 5A: 2003 *Lead-acid batteries for solar photovoltaic energy systems— General requirements and methods of test for modified automotive batteries*

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 reference**

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 detail specification shall be as follows (see key on following page)

(1)	IECEE PVRS 5 AAxxxx Edition: 200x Page 1 of x	(2)
Lead-acid batteries for solar photovoltaic energy systems (modified automotive batteries) of assessed quality in accordance with:  PVRS 5A: 2003	(3)	(4)
Type :		(5)
Construction:		(6)
Rated capacity $C_{10}$	(7)	Nominal voltage : (8)
Recommended maximum voltage		(9)
Recommended minimum voltage		(10)
Information about manufacturers who have components 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 5 is the IECEE provisional document reference allocated by the IECEE Secretariat to the blank detail specification. AA is the country identifier, e.g. FR for France, DE for Germany, IN for India, US for USA).
- (3) The number and the year of availability of the IEC standard or relevant specification concerning test and measurement procedures for the lead-acid batteries and/or sectional specification; also national reference, if different.
- (4) If different from the IECEE number, the national number of the detail specification, date of issue and any further information required by the national system, together with any amendment numbers.

**Identification of the lead-acid battery (modified automotive battery)**

- (5) Type: for example, deep cycle, vented, valve-regulated
- (6) Construction: flat plate, tubular plate
- (7) Rated capacity  $C_{10}$  (Ah)
- (8) Nominal voltage (V)
- (9) Recommended maximum voltage (V)
- (10) Recommended minimum voltage (V)

**2 Characteristic values of the lead-acid battery (modified automotive battery)**

(characteristics)	(unit)	(tolerance)
<b>capacity <math>C_{10}</math></b>	Ah	±5%
<b>charge efficiency under low SOC conditions</b>	%	±5%
— Faradaic 0,96 flat plate/0,94 tubular plate		
— Energy 0,89 flat plate/ 0,84 tubular plate		
<b>cycling endurance</b>	%	±5%
— $C_{10}$ capacity decrease between 1st and 15th cycle		
— $C_{10}$ capacity decrease between 1st and 50th cycle		
<b>charge retention</b>	%	±5%

**3 Qualification Approval procedure****3.1 General**

The approval procedure shall be in accordance with IEC 60343-03

NOTE Approval includes current registration/certification to ISO 9001 (see 5.1 h of IEC 60343-03)

**3.2 Primary stage of manufacture**

Plate assembly. The manufacturer of the plates, on whom the overall quality and reliability of the battery is strongly dependent, shall have a quality system that meets the requirements of ISO 9001: 2000 for the manufacturing site.

### **3.3 Subcontracting**

Subcontracting of the primary and subsequent stages of manufacture is permitted.

### **3.4 Technical requirements**

Technical requirements shall be in accordance with PVRS 5A

NOTE This blank detail specification cannot add requirements that do not exist in PVRS 5A. This is because PVRS 5A was prepared by the PV GAP Technical Committee in which all relevant experts may participate.

Reporting, and issuing of the Conformity Assessment Certificate, shall be in accordance with IEC 60300-3 (see in particular clauses 7, 8 and 9) and clause 20 of normative reference 1.

### **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 60300 rules and the allocation of a number. After completion of the testing in accordance with IEC 60300 and in agreement 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 for maintenance of records 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.

All tests of table 1 are mandatory. Where a subgroup contains cumulative tests, the order of the tests is mandatory. Specimens subjected to tests denoted as destructive (D) shall not be released for delivery.

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

Subclause number and Test of PVRS 5	Destructive or non-destructive	Conditions of test	Performance requirements
<b>GROUP A INSPECTION (100%)</b>			
<b>Subgroup A1</b>	<b>ND</b>		
19 marking and documentation			
19.1 marking		check that marking is present	clause 19

Subclause number and Test (see Note 1) of PVRS 5A	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>						
15 C <sub>10</sub> capacity	ND		12	5	-	clause 15.5
16 charge efficiency	ND		12	3	-	clause 16.3
17 cycling endurance	ND		12	3	-	clause 17.4
<b>GROUP C INSPECTION (periodic)</b>						
<b>Subgroup C2</b>						
18 charge retention	ND	Follows C <sub>10</sub> capacity test	12	2	-	clause 18.6
NOTE 1 - In this table:	p = periodicity (in months) n = sample size c = acceptance criterion (permitted number of non-conforming items)					

## 5 Modifications likely to affect Qualification Approval

For the modifications listed below, the Qualification Approval tests in PVRS 5A shall be repeated as indicated :

(under consideration)

## **6 Modifications that do not require re-testing**

Provided that all structural components, materials used and processes remain the same, the following modifications shall not require re-testing:

(under consideration)

## **7 Declaration of conformity**

For each delivery, a manufacturer's or distributor's Declaration of Conformity shall be included. The name and the site of the manufacturer of the battery plates shall be stated on the Declaration of Conformity.

## **8 Annexes**

Annexes to the detail specification may be included if necessary, to show more details the battery.