

PV GAP RECOMMENDED SPECIFICATION

PVRS 8

First edition
2000-06

**Inverters for stand-alone photovoltaic (PV)
systems.**

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

PV GAP

Reference number
PVRS 8 : 2000

PV GAP RECOMMENDED SPECIFICATION

PVRS 8

First edition
2000-06

**Inverters for stand-alone photovoltaic (PV)
systems.**

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

©PV GAP 2000

Copyright - all rights reserved

No part of this publication may be reproduced or utilised in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

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



PRICE

USD 20

Contents

Foreword.....	3
1 General	4
1.1 Scope	4
1.2 Normative references	4
1.3 Informative reference	4
1.4 Front page of detail specification	5
2 Characteristics	6
2.1 Electrical characteristics	6
2.2 Mechanical characteristics	6
2.3 Environmental characteristics.....	7
2.4 Additional information (not for inspection purposes)	7
3 Qualification Approval procedure.....	7
3.1 General	7
3.2 Primary stage of manufacture	7
3.3 Subcontracting	8
3.4 Technical requirements	8
3.5 Increased severity	8
3.6 Preparation of detail specifications	8
3.7 Product identification and traceability	9
4 Quality conformance inspection.....	10
5 Modifications	12
6 Marking	12
7 Documentation	13
8 Annexes	13

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 with the IEC System for Conformity Testing and Certification of Electrical Equipment 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, 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.
- 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, 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.

INVERTERS FOR PHOTOVOLTAIC (PV) STAND-ALONE SYSTEMS

Blank detail specification

Qualification Approval under the IEC Quality Assessment System for Electronic Components (IECQ)

1 General

1.1 Scope

This PV GAP Recommended Specification is a blank detail specification applicable to inverters for photovoltaic (PV) stand-alone systems, 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 inverters

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 22, 23 and 29 *DC/AC Inverters* (reproduced in PVRS 8A)
2. GEF/WB China Renewable Energy Development (RED) Project Specification: March 23, 1999, pages 44 to 57 *Stand-alone Inverter Testing Procedure* (reproduced in PVRS 8A)
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)*.
4. *ISO 9001: 1994, Quality systems - Model for quality assurance in design, development, production, installation and servicing*
5. *ISO 9002: 1994, Quality systems - Model for quality assurance in production, installation and servicing*

1.3 Informative references

1. Operating Guide of the CB-FCS Scheme, see www.iecee.org
2. IEC Guide 102: 1996, *Electronic Components — Specification Structures for Quality Assessment (Qualification Approval and Capability Approval)*

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 xx AAxxxx Edition: 200x Page 1 of x	(2)
(3)	Inverter for photovoltaic (PV) stand-alone system, of assessed quality, in accordance with : GEF/WB China RED Project: March 23, 1999	(4)
	Type Rating	(5)
	Geographical locations where inverter has been accepted for use	(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 www.iecee.org .	

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 8 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).

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

- typical efficiency curve
- service life
- warranty period
- available controls
- expandability options
- available inverter options
- Short-circuit protectionYes/no
- Input terminal reverse polarity protectionYes/no
- Lightning protectionYes/no
- RF filter in battery inlet.....Yes/no
- RF filter in AC outlet.....Yes/no
- Load current A
- Input current A

3 Qualification Approval procedure

3.1 General

The approval procedure shall be in accordance with IEC 60384-14

NOTE Approval includes current registration/certification to ISO 9001 (see 5.1 h of IEC 60384-14)

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.” (IEC Guide 102: 1996)

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

3.3 Subcontracting

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 or ISO 9002, as appropriate.

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

- *electromagnetic compatibility;*
- *mechanical shock;*
- *temperature stresses, damp heat, cyclical;*
- *insulation resistance;*
- *temperature stress under critical conditions;*
- *resistance to heat and fire;*
- *mechanical sturdiness of case;*
- *IP code (access and ingress);*
- *robustness of terminations.*

Reporting, and issuing of the Qualification Approval certificate, shall be in accordance with IEC 603 (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 603 rules and the allocation of a number. After completion of the testing in accordance with IEC 603 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.

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
GROUP A INSPECTION (100%) Subgroup A1 1 Visual inspection Appearance, labels, documentation Dimensions (gauging)	ND		As in Table 1 of Normative reference 2 See the outline drawing in item (7) of the cover page of this specification and any related tables.
Subgroup A2 None	ND		
GROUP B INSPECTION Covering additional important characteristics None			

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	
GROUP C INSPECTION (periodic) Subgroup C1 2 Efficiency vs power level 3 Load (output power) 4 Input voltage range 5 Frequency check 9 Protection functions 2 Efficiency vs. power level	ND		24	4	0	

Subclause number and test (see Note 1) of Reference 2	D or ND	Conditions of test	Sample size and acceptance criterion (see Note 1)			Performance requirements
			p	n	c	
Subgroup C2 6 Voltage harmonics 7 Noise, acoustic 8 Quiescent current 2 Efficiency vs. power level	ND		24	2	0	
<p>NOTE 1: in this table :</p> <p>p = periodicity (in months)</p> <p>n = sample size</p> <p>c = acceptance criterion (permitted number or non-conforming items)</p> <p>NOTE 2: The function-test (2) is repeated after several tests. Doing this, it is sufficient to determine only the efficiency with a power output level of 75% of the nominal power. This function test should not reveal a deviation of the efficiency higher than $\pm 5\%$ of the values measured the first time in subgroup C1</p>						

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 Qualification Approval.

6 Marking

Marking of the inverter shall be in accordance with 3.5.11 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 inverter 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 3.5.12 of Normative reference 1.

In addition, for each inverter released under the IECCE (this release is optional. The purchaser may decide only to require that the supplier holds and maintains Qualification Approval to the detail specification derived from this Blank Detail Specification), a manufacturer's or distributor's Declaration of Conformity shall be included.

8 Annexes

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

Reproduced in Switzerland
Central Office of the IEC
3, rue de Varembé
GENEVA