

LIMITED WARRANTY AND SPECIFICATIONS

Between

Techno Sun S. L. Unipersonal

and

Kaneka Corporation

For Kaneka Thin film PV Modules

(GEA type)

KANEKA CORPORATION

OVERSEAS MARKETING

PV BUSINESS DEVELOPMENT DIVISION

3-2-4, NAKANOSHIMA, KITA-KU
OSAKA 530-8288, JAPAN



Effective from August 01, 2004**A. Limited Warranty****1. Scope and period of warranty**

This warranty applies exclusively to you for the Kaneka thin-film silicon photovoltaic modules (hereinafter referred to as the MODULES) you purchased directly from Kaneka Corporation (hereinafter referred to as Kaneka) or its sales agent. The warranty is limited to the terms and conditions stated herein

2. Terms of warranty

Product name	Type	Material/workmanship	Output
GEA type	Amorphous	5 years after the shipment from Kaneka	90% of the specified minimum output of the module for a 12-year period, 80% of the specified minimum output of the module for a 25-year period after shipment from Kaneka

(1) Warranty on material and workmanship

Kaneka warrants that the MODULES have been manufactured conforming to the prescribed specifications and are free from defects in material and/or workmanship for a period set out in the above table. If any non-conformity to the specifications or defect in material and/or workmanship is found during the period set out in the above table, Kaneka will repair or replace the MODULES.

Warranty on workmanship shall not apply any defects of the MODULES arising from installation. For details, please see Item 3. Warranty Exemptions.

(2) Warranty on Output

Kaneka warrants that the MODULES generate the output set out in the above table for the period set out in the same. If the output becomes less than that during the period, Kaneka will replace the MODULES. Kaneka may, at its sole discretion, compensate the output shortage by adding equivalent MODULES.

(3) If any defects are found, you will notify Kaneka or its sales agent of the following items immediately:

- a) Product Name
- b) Serial number of the MODULES
- c) Details of the defect

(4) Repair, replacement, or addition of the MODULES shall be performed free of charge only if the MODULES are found to be non-conforming to the specifications,

defective in material or workmanship, or short in output through an inspection by Kaneka. Kaneka's inspection shall be final and decisive for the existence or non-existence of the defect, non-conformity and/or output shortage.

- (5) Repair, replacement, or addition of the MODULES shall be the sole and exclusive remedy under this warranty. Kaneka hereby disclaim any other responsibility or liability in connection with MODULES.
- (6) If any of defects in material or workmanship, non-conforming to the specifications or output shortage are not found through an inspection by Kaneka, the MODULES shall be returned to you. You shall bear all shipment cost incurred by Kaneka.
- (7) If Kaneka requests you to repair the MODULES, you shall repair in accordance with Kaneka's instruction for your original consumer purchasers.
- (8) If Kaneka requests you to replace the MODULES, and if you have its available stock, you shall replace the MODULES for your original consumer purchasers.
- (9) NO WARRANTIES, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, HAVE BEEN MADE UNLESS EXPRESSLY INCLUDED HEREIN.
- (10) Measurements of maximum output of the MODULES shall be made in the outdoors by Kaneka for the sake of the proportion to the actual one. This output shall be the one that Kaneka warrants. The methods of the measurements are stated herein.
 - a) The Method of the Measurements
 - 1) There shall be $850\text{W}/\text{m}^2$ or more of solar irradiation in the place where the measurement is carried out. The solar irradiation shall be measured by a pyranometer placed parallel to the MODULES.
 - 2) The maximum output of the MODULES shall be measured according to I-V measurement method.
 - 3) Utilizing the module temperature measured simultaneously, the maximum output shall be converted into the output with $1\text{kW}/\text{m}^2$ solar irradiation and 25°C of module temperature by calculation (hereinafter referred to as W_1).
 - 4) W_1 shall be the one that Kaneka warrants.
(Hereinafter this method is referred to as "outdoor output measurement")
 - b) Kaneka warrants that the output of the MODULES measured 25 years after the installation with the methods above conforms to the formulas below. However, Kaneka shall not warrant if 25 years and 6 months have passed since the shipment from Kaneka.

$$\begin{aligned} W_1 &\geq \text{Warranted Output (hereinafter referred to as } W_2) \quad (\text{W}) \\ W_2 &= \text{Minimum tolerance of the maximum nominal output} \times 0.8 \quad (\text{W}) \\ &= \text{Maximum nominal output} \times 0.95 \times 0.8 \quad (\text{W}) \end{aligned}$$

c) Alternative to the Outdoor Output Measurement

In case it is impossible to take the outdoor output measurement method, it may be substituted by one of the following methods.

- i) After ambient temperature in the sunshine reported by the Meteorological Agency have reached 20°C for at least 20 consecutive days, the maximum output measured by a solar simulator with Standard Test Conditions (STC) may take the place of W_1 .
- ii) The maximum output measured by a solar simulator with Standard Test Conditions (STC) after having the MODULES annealed with the given conditions (160°C, 1hour) in order to expel the influence of the climate condition to the output of the MODULES may also displace W_1 .

*This measurement is a rupture test. If output shortage is not found through the test, you shall bear the cost to replace the MODULES.

d) Other Conditions

The MODULES shall be warranted only if they are installed under the “normal condition”: the MODULES are not to be placed in an area exposed to brine or mist of brine, an area where snow piles up on them significantly. The MODULE shall also be installed where the ambient temperature is from -20 to 40°C, and with angle more than 5°. With the light-receiving glass surface of the MODULES cleaned The output measurements shall be made according to IEC60904-1.

3. Warranty Exemptions

This warranty does not apply to the following defects in material or workmanship, non-conformity to the specifications or shortage in output caused by the following reasons:

- (1) failure to comply with the installation/handling procedures and precautions described in the module installation manual, operational manual, “Instruction for using KANEKA PV modules”, caution labels, and other written information provided by Kaneka;
- (2) use for unusual purposes;
- (3) use under an unusual condition or environment;
- (4) any modification to the MODULES which has not been approved by Kaneka;
- (5) force majeure, such as fire, explosion, war, riot, earthquake, eruption, tidal wave, lightning, induced lighting, snow, freeze, frost, briny air, ground movement, ground cracking, earth flow, and pollution; provided, however, that exemption for these reasons for which IEC set out the standard shall applies when they exceed IEC’s standard;
- (6) noise, voltage fluctuation, and other trouble in an grid connected commercial power supply system;
- (7) negligence or intention of you, the original consumer purchaser or a third party;
- (8) naturally occurred scratches, stains, mechanical wear, rust, mold, degradation, discoloring, and other alteration that occurred after shipment from Kaneka but do not affect the power generation performance or mechanical strength of the product.

4. Kaneka disclaims any and all warranty for the MODULES in the cases that:

- a) the warranty period for the MODULES has been expired;
- b) you fail to notify Kaneka immediately after the defect is discovered or should be discovered;
- c) the MODULES are repaired by anyone other than Kaneka except when Kaneka instructed you to do so.

B. Specifications –GEA type

1. Module Specifications

Table 1.

PRODUCT: THIN-FILM SILICON PV MODULE			
MODEL: GEA211	DATE: August 01, 2004		
SPECIFICATION LISTS	UNIT	VALUE	REMARK
Performance at STC (stabilized)			Tolerance: $\pm 10\%$
Nominal Power (Pmax)	W	60.0 tolerance from +10% to -5%	
Open Circuit Voltage (Voc)	V	92.0	
Short Circuit Current (Isc)	A	1.19	
Voltage at Pmax (Vpm)	V	67.0	
Current at Pmax (Ipm)	A	0.90	
Max. System Voltage	V	530	
Dimension	mm	990 \pm 2.5 x 960 \pm 2.5	
Depth	mm	40 \pm 1.0	
Weight	kg	13.7	
(REMARK) During initial 6 weeks of operation, the MODULE has higher electrical output than rated output (See Performance at STC (stabilized)). The Pmax may be higher by 32% and Imp may be higher by 18%.			

Table 2.

PRODUCT: THIN-FILM SILICON PV MODULE				
MODEL: GEA211		DATE: August 01, 2004		
SPECIFICATION LISTS		UNIT	VALUE	REMARK
Insulation test	1000 V d.c. + twice system voltage	μA	less than 50(No dielectric breakdown or surface cracking).	IEC61646 10.3
	500 V d.c.	MΩ	not less than 50 (at 500 V d.c.)	
Thermal cycling test		-	(requirements) -No intermittent open-circuit or ground faults detected during the test. -No evidence of major visual defects. -Insulation resistance shall meet the same requirements as for the initial measurements. -The degradation of maximum output power at STC shall not exceed 5 % of the value measured before the test.	IEC61646 10.11
Humidity freeze test		-		IEC61646 10.12
Damp heat test		-		IEC61646 10.13
Robustness of termination test		-		IEC61646 10.14
Twist test		-		IEC61646 10.15
Mechanical load test		-		IEC61646 10.16
Hail test		-		IEC61646 10.17
Wet leakage current test		μA	less than 14.1	IEC61646 10.20

1.1 Materials**1.1.1 Photovoltaic cell**

Amorphous silicon-based

1.1.2 Superstrate (glass substrate)

Float glass (dimensions: 980 ± 1 mm x 950 ± 1 mm x 5 ± 0.2 mm, squareness: 1/300 or less)

1.1.3 Back cover sheet

Stacked fluorine-based films (reference thickness: 0.18 mm) are fusion bonded by using EVA resin (reference thickness: 400 μ m).

1.1.4 Wiring material

Solder-coated copper ribbon (thickness: 180 μ m or less)

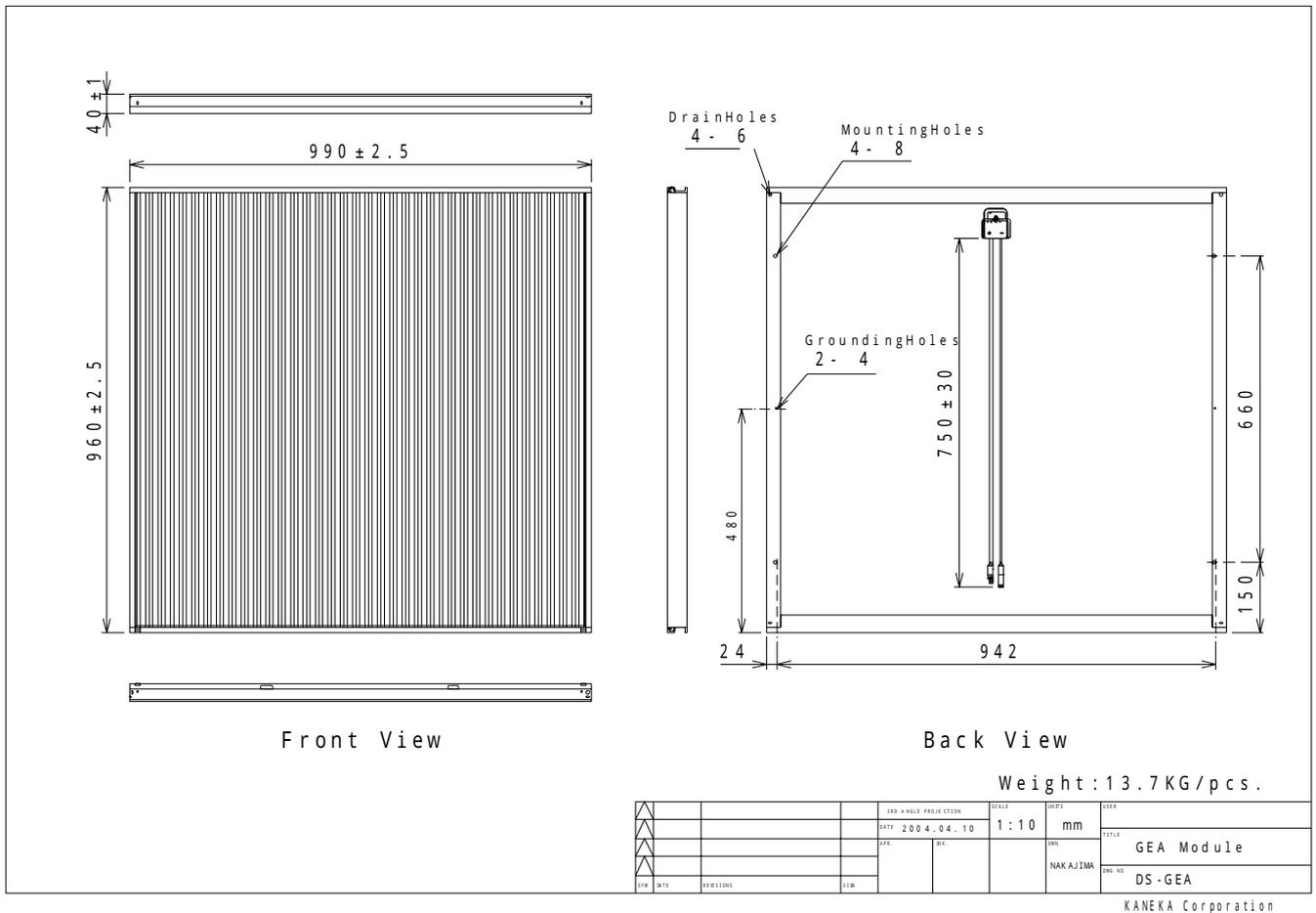
1.1.5 Frame, junction box, output cable, connectors

Frame: aluminum extrusion mold (inner-brim-type frame)

Junction box and cable: Onamba's NMC750D1 (PVC-jacketed cross linked high-resistant polyethylene, MC connectors)

1.2 Dimensions

GEA type – Refer to the following diagram.



1.3 Standard operating conditions

The MODULES should be installed at a place where they can receive sufficient sunlight. Places subjected to seawater or snowfall (1 m or more) should be avoided. Ambient temperature should be in the range between -20 °C and 40 °C.

2. Packing Specifications (GEA type)

Standard Shipment Lot: 40ft container (1100pcs, 66.00kW)

25pcs are packed in a carton, and one carton is placed on a pallet.

3. If the specifications hereof are changed, Kaneka will notify such change in writing to you as soon as possible.

C. Installation Manual

1. Module dimensions

GEA type – Refer to the diagram.

2. Installation of the MODULES

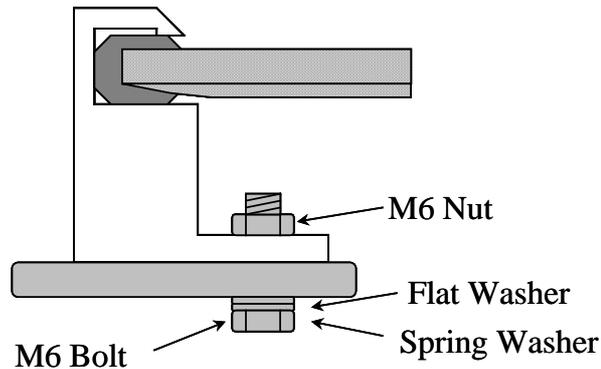
Fix the MODULES to rails with M6 bolts and nuts (4 pairs per module).

The MODULES should be installed with the cell-strings vertically.

The MODULES are recommended to be installed with angle more than 15°.

The MODULES are prohibited to be installed with angle less than 5°.

[Module mounting diagram]



3. Connecting cables

When connecting cables, push the plus and minus connectors against each other while twisting them until they are fully engaged.

4. Ground-connecting

All the MODULES should be ground-connected if necessary.

5. Maintenance

Under the normal use maintenance is not necessary. The dirt on the surface of the MODULES will be washed away by rain.

6. Warning

- a) Do not disassemble the MODULES, as this may cause fire, electric shock and injury.
- b) Do not shock the MODULES, as this may break the glass part and cause malfunction, electric shock and injury.
- c) Do not use organic solvent in order to clean the MODULES surface.
- d) Beware of electric shock and short-circuit, as the MODULES generate high voltage current when exposed to light.
- e) Wear a safety belt and protection gloves when installing the MODULES to prevent falling and electric shock.
- f) Conform to “Instruction for using KANEKA PV modules”.