

## Specification of photovoltaic module

## 1. Application

This specification is applicable for the multi-crystalline photovoltaic module KG160GX-LFE-S. This module is compliant with IEC 61215 ed.2 (including mechanical load test 2400Pa) and IEC 61730-1/2.

## 2. Electrical Specification

## (1) Electrical Performance

Maximum power	(Pmax)	1 6 0 W ± 1 0 %
Maximum power voltage	(Vpm)	1 8 . 7 V
Maximum power current	(Ipm)	8 . 5 6 A
Open circuit voltage	(Voc)	2 2 . 7 V
Short circuit current	(Isc)	9 . 1 3 A
Maximum system voltage		6 0 0 V
Module efficiency		1 5 . 9 %
Series fuse rating		1 5 A
Reduction of efficiency(from 1000W/m <sup>2</sup> to 200W/m <sup>2</sup> )		3 . 3 %
Standard test condition (STC)		Cell temperature 2 5 °C Spectrum AM1.5, Irradiance level 1kW/m <sup>2</sup>

The power output value measurements are carried out in accordance with IEC 60904-9 as tested at the junction box terminals per the calibration and testing standards of Kyocera which are valid at the date of manufacture of the PV Module(s). Kyocera's calibration standards shall be compliant with the standards applied by international institutions accredited for this purpose.

## (2) Performance at Nominal Operating Cell Temperature

NOCT		4 5 °C
Maximum power		1 1 4 W
Maximum power voltage		1 6 . 7 V
Maximum power current		6 . 8 3 A
Open circuit voltage		2 0 . 8 V
Short circuit current		7 . 3 9 A
Test condition		Ambient temperature : 20°C Spectrum AM1.5 , Irradiance level 0.8kW/m <sup>2</sup>

## (3) Electrical characteristics

Fig.6 shows I-V characteristics of KG160GX-LFE-S at various cell temperatures.

Fig.7 shows maximum power, open circuit voltage, maximum power voltage, short circuit current and maximum power current of KG160GX-LFE-S at various cell temperatures.

Fig.8 shows I-V characteristics of KG160GX-LFE-S at various irradiance levels.

Fig.9 shows open circuit voltage and short circuit current of KG160GX-LFE-S at various irradiance levels.

## (4) Conversion formula of output characteristics

$$(i) I_2 = I_1 + I_{SC} (I_{SR} / I_{MR} - 1) + \alpha (T_2 - T_1)$$

$$(ii) V_2 = V_1 + \beta (T_2 - T_1) - R_S (I_2 - I_1) - K \cdot I_2 (T_2 - T_1)$$

$\alpha$ (Current temperature coefficient)	5. 3 5 $\times 10^{-3}$ A/ $^{\circ}$ C (0. 0 6 %/ $^{\circ}$ C)
$\beta$ (Voltage temperature coefficient)	- 0. 8 1 $\times 10^{-1}$ V/ $^{\circ}$ C (- 0. 3 6 %/ $^{\circ}$ C)
$R_S$ (Internal series resistance)	0. 1 8 9 $\Omega$
K (Curve correction factor)	1. 6 5 $\times 10^{-3}$ $\Omega$ / $^{\circ}$ C
Max. power temperature coefficient	- 0. 7 2 W/ $^{\circ}$ C (- 0. 4 5 %/ $^{\circ}$ C)
Max. power current temperature coefficient	2. 2 6 $\times 10^{-3}$ A/ $^{\circ}$ C (0. 0 3 %/ $^{\circ}$ C)
Max. power voltage temperature coefficient	- 0. 9 0 $\times 10^{-1}$ V/ $^{\circ}$ C (- 0. 4 8 %/ $^{\circ}$ C)

$I_1, V_1$  Coordinates of points on the measured characteristic

$I_2, V_2$  Coordinates of the corresponding points on the characteristic

$I_{SC}$  Measured short-circuit current of the test specimen

$I_{MR}$  The measured short-circuit current of the reference device

$I_{SR}$  The short-circuit current of the reference device at the standard or other desired irradiance

$T_1$  The measured temperature of the test specimen

$T_2$  The standard or other desired temperature

## 3. Physical Specification

Product No.	AC-700278 (for replacement module) AC-700279 (for single-packaged module) AC-700280 (for twenty-packaged modules)
Drawing No.	AC-568509
Dimension	1500 × 668 × 36 mm
Weight	12.5 kg
Bypass diode	Installed

## 4. Limits

Operating temperature (Cell temperature)	-40°C to 90°C
Mechanical load (to IEC61215 ed.2)	Pressure 2400Pa

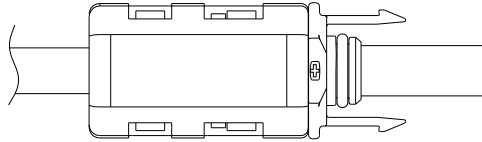
## 5. Production Test Procedure

No	Item	Test method	Criterion	Apparatus
1	Visual inspection and structure test	-Illumination 400~700lx	-No flaws distortion stains etc. that damage appearance. -Ref. to the drawing of the product	-Visual -Scale
2	Electrical performance test	-Cell temperature 25°C -Spectrum AM1.5 -Irradiance level 1kW/m <sup>2</sup>	•Described in 2.(1)	-Solar simulator
3	Insulation test	DC2200V, 1min	-No dielectric breakdown	-Insulation tester
4	Insulation resistance test	DC1000V	-Over 500MΩ	-Insulation resister tester

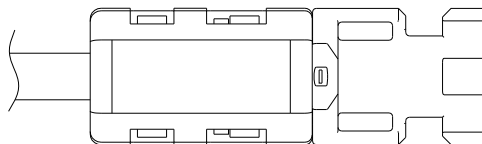
## 6. Output Connector

Distinguish the positive and negative terminals by the shapes and "+" / "-" marks of the connectors. Refer to the following for details.

- 1) Positive pole terminal (Fig.1)  
Model: PV-03 (made by SMK)  
Connector symbol: +



- 2) Negative pole terminal (Fig.2)  
Model: PV-03 (made by SMK)  
Connector symbol: -



## 7. Terms of Use

- 1) Do not use this module for any purpose except for photovoltaic systems.
- 2) This module does not have fire prevention capability.
- 3) In case of roof-integrated installation, please make sure to use a waterproof substructure. This module shall not be used for the purpose of waterproofing a roof.
- 4) Do not use mirrors or lenses to artificially concentrate sunlight on the module.
- 5) No blocking diode is installed in this module.
- 6) Install this module in the area without corrosive gases.
- 7) This module should not be installed in the area with direct exposure to saltwater droplet (Guideline : within 50 meters of a saltwater body).  
In the zone between 50 meters and 200 meters from a saltwater body, this module shall be installed only on roof-top.
- 8) For proper operation and to avoid damage from high temperature and moisture, modules require adequate air flows across the backside of the module.
- 9) When storing, keep modules in ventilated conditions, away from high temperature and high humidity environment.
- 10) Do not keep the module outside with cover such as waterproof canvas and/or plastic sheet for temporary storage. This condition might cause "Glass Weathering Phenomenon" such as stripes on the glass surface of the module, depending on the storage period and condition.
- 11) Do not disassemble the module.
- 12) Do not remove, damage or alter module label in order to keep the label information legible.

## 8. Installation

- 1) Installation should be done according to local regulation.
- 2) Make enough space at back side of the module to keep ventilated condition.
- 3) Do not seal / block the drainage hole of the module frame. (Refer to the drawing of the product.)
- 4) Do not put, attach or contact anything on the back sheet of the module because it may damage the back sheet.
- 5) While the module is operating, or when a load is applied, do not connect or disconnect the output cable.
- 6) The frame is coated with anodic oxide, however there is a possibility of electrical corrosion due to a type of metal contacted with the frame. Therefore, please select galvanized mounting structure, fixing components. In case that ungalvanized metal products are used, please put sealant between the PV module frame and such ungalvanized metal. In addition, discontinuity of zinc layer on the frame may cause electrical corrosion. Therefore, please select durable galvanized components.
- 7) In snowy area, as slipping snow may cause damage to frames, installation methods which can prevent damage should be chosen.
- 8) In order to avoid electrical shock, grounding modules should be carried out.
- 9) Clamp cables with weatherproof cable clamps.
- 10) Do not step on the module to prevent damage.
- 11) Do not drop the module or strike the module with tools etc.
- 12) Use appropriate system cable as per instruction of the connector manufacturer.

For detailed instruction, refer to KYOCERA INSTALLATION MANUAL provided separately.

## 9. Others

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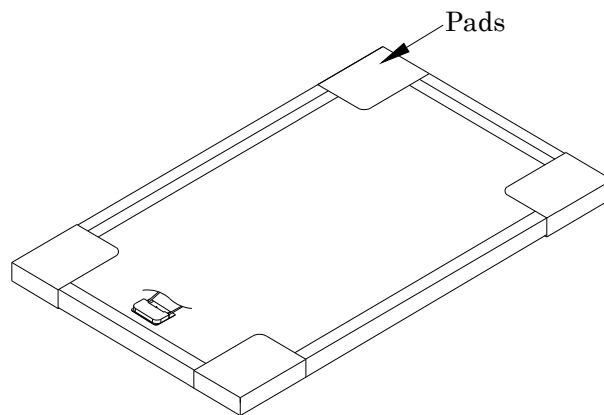
## 10. Packing

- (1) Modules are packed as the figure below.
- (2) For dimensions and weight, see the following table.

Table of dimensions and weight

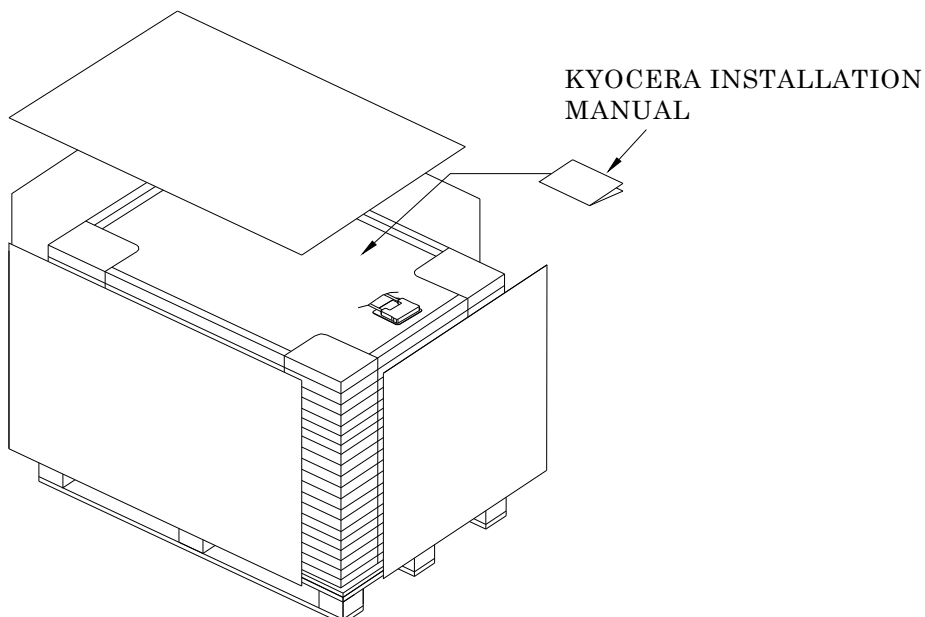
Packing type	Packing dimension (mm) Length × Width × Height	Gross weight (kg)
Packing for 1 module	approx. 1505 × 675 × 40	approx. 13.0
Loaded modules on a pallet (20 modules)	approx. 1515 × 680 × 940	approx. 276

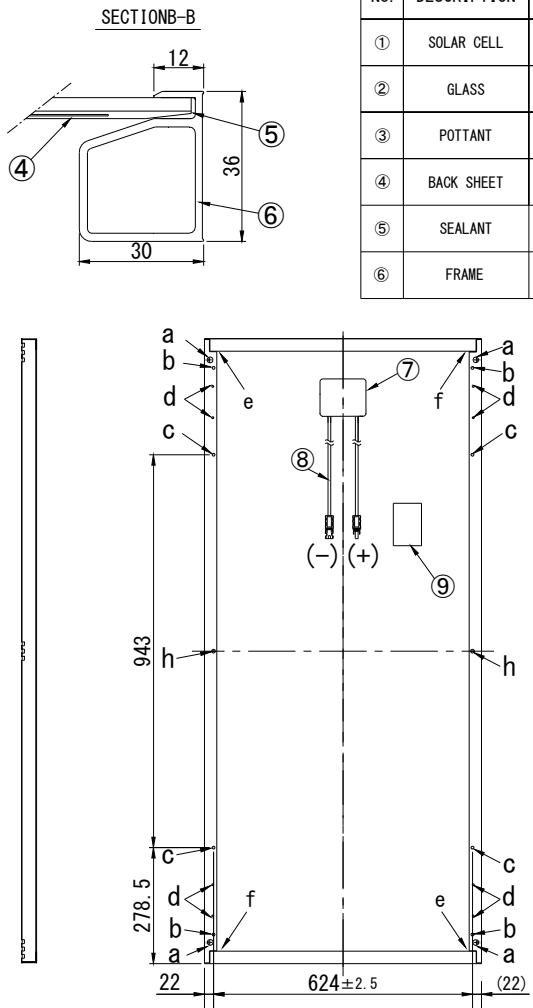
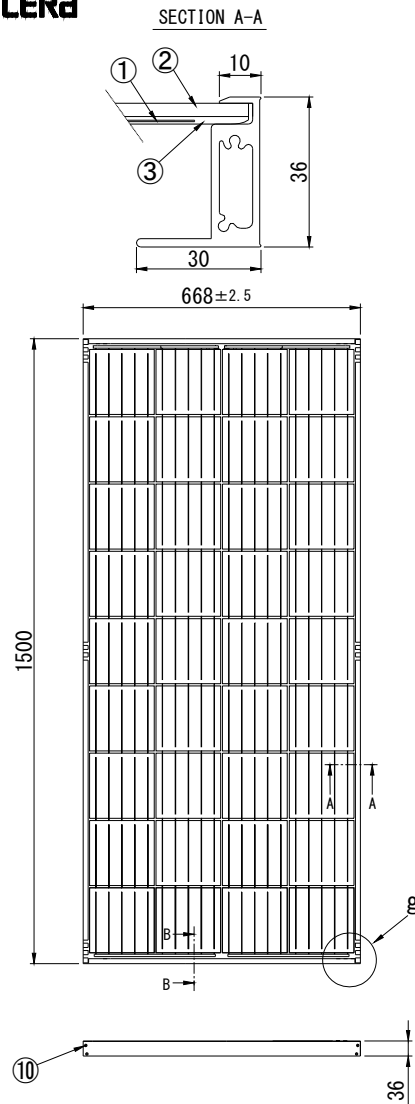
Fig.3 Packing PV module



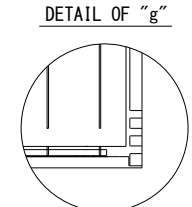
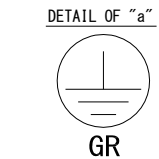
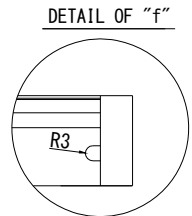
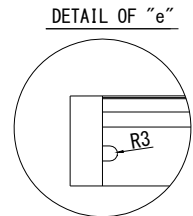
- (3) Do not load more than 20 modules high. Be sure to keep the above condition at all times, including transportation and storage.

Fig.4 Palletized PV modules





No.	DESCRIPTION	QT.	MTL.	REMARKS	No.	DESCRIPTION	QT.	MTL.	REMARKS
①	SOLAR CELL	36	Si	MULTICRYSTAL SILICON	⑦	JUNCTION BOX	1Set	-	111mm*90mm*15.9mm
②	GLASS	1	-	LOW-IRON TEMPERED	⑧	CABLE WITH CONNECTOR	1Set	-	4.0mm <sup>2</sup> (+)1010mm (-)840mm
③	POTTANT	1Set	-	-	⑨	LABEL	1	-	-
④	BACK SHEET	1	-	COLOR-WHITE	⑩	SCREW	8	SUS	-
⑤	SEALANT	1Set	-	-					
⑥	FRAME	1Set	AL	COLOR-SILVER					



TOLERANCE LIST (mm)		
DIMENSION	TOLERANCE (±)	
~ 6	0.3	
6 ~ 30	0.5	
30 ~ 120	0.8	
120 ~ 315	1.2	
315 ~ 1000	2.0	
1000 ~	2.5	

- a: GROUND MARK
- b: GROUNDING HOLE (4-φ7)
- c: INSTALLATION HOLE (4-φ7)
- d: CABLE CLAMP HOLE (8-φ4.7)
- e: DRAINAGE HOLE (2 PLACES)
- f: DRAINAGE HOLE (2 PLACES)
- h: CABLE CLAMP HOLE (2-φ7)

When the PV modules are mounted, do not seal or block drainage holes.

TOLERANCE REFER TO TOLERANCE LIST	NAME
SCALE	PHOTOVOLTAIC MODULE
DATE	TYPE
Oct. 16, 2018	KG160GX-LFE-S
	DWG. No.
	AC-568509

Fig. 5 Drawing of the module.



KSS-700-3083 (8/9)

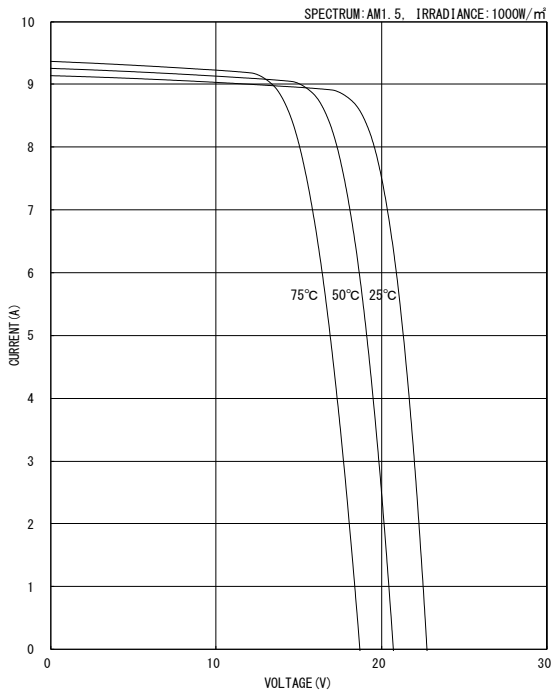


Fig. 6 I-V characteristics of KG160GX-LFE-S at various cell temperatures.

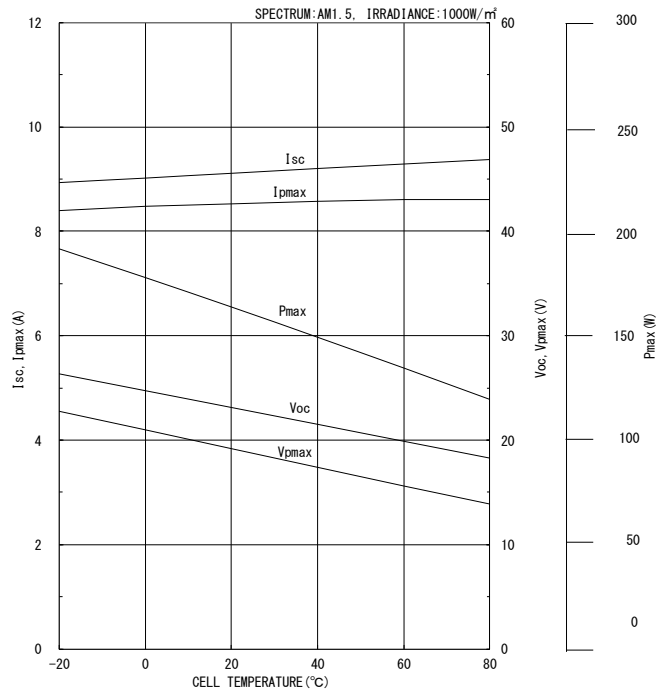


Fig. 7 Maximum power, open circuit voltage, and short circuit current of KG160GX-LFE-S at various cell temperatures.

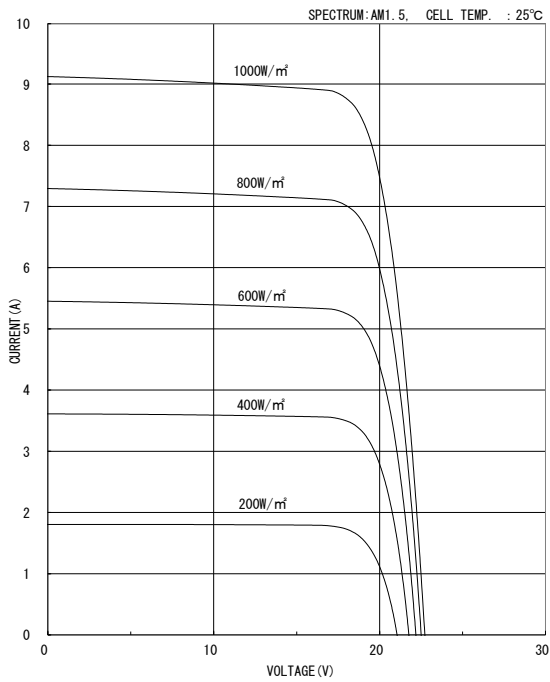


Fig. 8 I-V Characteristics of KG160GX-LFE-S at various irradiance levels.

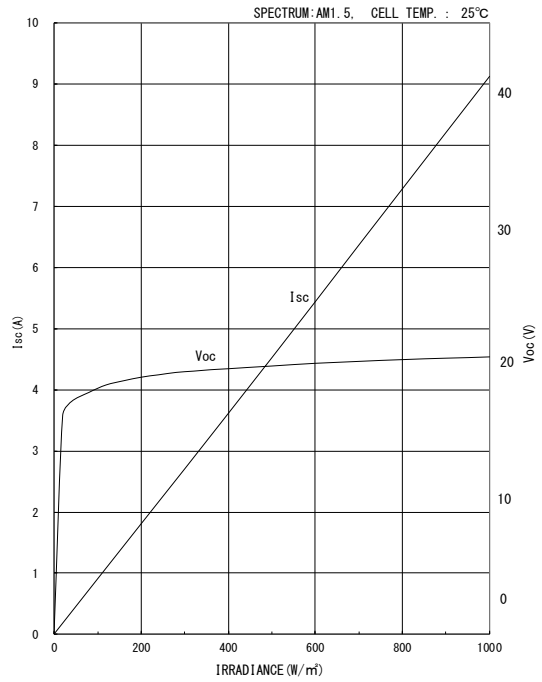


Fig. 9 Open circuit voltage and short circuit current of KG160GX-LFE-S at various irradiance levels.