

Photovoltaic Module HIT™ VBHNxxxSJ53, SJ54, KJ01, KJ02 series

Model No.

VBHN335SJ53, VBHN330SJ53, VBHN325SJ53, VBHN320SJ53

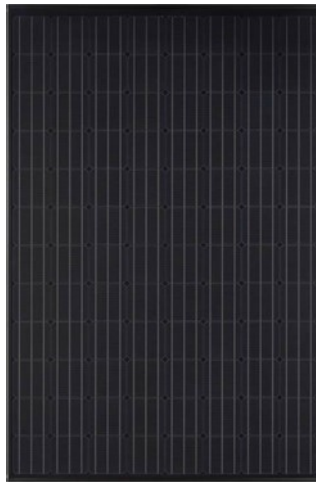
VBHN330SJ54, VBHN325SJ54, VBHN320SJ54

VBHN330KJ01, VBHN325KJ01, VBHN320KJ01

VBHN325KJ02, VBHN320KJ02



VBHNxxxSJ53/54 series



VBHNxxxKJ01/02 series

Thank you for choosing Panasonic photovoltaic module HIT™. Please read this manual completely before you install or use HIT™. With proper operation and maintenance, HIT™ will provide you with clean, renewable solar electricity for many years. This manual contains important installation, maintenance and safety information. The word “module” as used in this manual refers to one or more PV modules. Retain this manual for future reference.

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SAFETY PRECAUTIONS

- All instructions should be read and understood before attempting to install, wire, operate, and maintain the module.
- The installation of modules requires a great degree of skill and should only be performed by qualified licensed professionals, including, without limitation, licensed contractors and licensed electricians.
- The installer assumes the risk of all injury that might occur during installation, including, without limitation, the risk of electric shock.
- Before installing modules, contact the appropriate authorities to determine permissions, installation and inspection requirements, which should be followed.
- Be sure that the construction or structure (roof, etc.) where the modules are being installed has enough strength.
- Both roof construction and module installation design have an effect on the fire resistance of a building. Improper installation may contribute to fire hazards. Additional devices such as ground fault, fuses, and disconnects may be required.
- For a non-integrated module, the assembly is to be mounted over a fire resistant roof covering rated for the application.
- For modules mounted on roofs, special construction or structures may be required to help provide proper installation support.
- **Do not install** the module where flammable gases or vapors are present.
- **Do not use** modules of different specifications in the same system.
- Follow all safety precautions of other system components used.
- In some areas, local electrical codes may govern the installation and use of modules.


WARNING

To avoid the hazard of **electric shock, sparks, fire and injury**

- The modules generate DC electrical energy when exposed to sunlight or other light sources, so cover the entire front surface of the modules with a dense, opaque material such as a cardboard box, during installation and handling of the modules.
- The shock hazard increases as modules are connected in parallel, producing higher current, and as modules are connected in series, producing higher voltages.
 -  The shock hazard increases as modules with nominal open-circuit voltage (Voc) in excess of 45 V, and/or modules rated for maximum system voltage in excess of 45 V.
- Wear suitable clothing, gloves and guards to prevent from direct contact with 30 VDC or greater.
- Work only in dry conditions, with dry modules and dry tools.
- Children and unauthorized persons should not be allowed near the installation of modules.
- **Do not puncture or damage** the back sheet of a module. In case of a scratch on the back sheet, please replace the module and discard the scratched one. A scratch on the back sheet poses a risk of exposing conductive parts.
- **Do not disassemble** the module, or remove any parts installed by the manufacturer.
- **Do not open** a junction box's lid.
- **Do not touch** the junction box terminals.
- **Do not change** the wiring of bypass diodes.
- **Do not connect or disconnect** terminals while modules generate electricity and connect electrical load.
- **Never leave** a module unsupported or unsecured.

CAUTIONS

To avoid the hazard of **injury, burn and damage to the module**

- Use a module for its intended purpose only.
- Be sure that all other system components are compatible, and they do not subject the module to mechanical or electrical hazards.
- **Do not artificially concentrate** sunlight on a module.
- **Do not stand or step** on a module.
- When carrying a module, **two or more people** should carry it by its frame and **wear non-slip gloves**.
- **Do not carry** a module by its wires or junction box.
- **Do not drop** a module.
- **Do not drop** anything on the surface of a module.
- **Do not hit** the back sheet of a module by the connector or other things.
 -  **Do not disassemble** a module, attempt any repair, open the junction box cover, nor remove any parts installed by Panasonic. There are no user serviceable parts within the module or junction box.
- **Do not treat** the back sheet or front surface with paint or adhesives.
- **Do not use or install** broken modules. If you find a defect e.g. a glass breakage, please contact a professional PV installer to replace the module right away.
- **Do not touch** a module unnecessarily. The glass surface and frames get hot.

MODULE SPECIFICATIONS

- Module specifications are shown in Table 1 and Figure 1. (Electrical specifications, mechanical specifications, module dimensions)

1) Rated electrical characteristics are within the range of +10% to -5% of the values measured at Standard Test Conditions (STC). Irradiance of 1000W/m², 25 ± 2° cell temperature, AM1.5 and solar spectral irradiance according to IEC 60904-3.

- 2) Under normal conditions, a module may experience conditions that produce more current and/or voltage than reported at standard component test conditions. Accordingly, the values of Isc and Voc should be multiplied by a factor of 1.25 when determining voltage ratings, conductor capacities, fuse sizes, and size of controls connected to the module output.
- 3) The current output for the modules shown in the Specifications is measured at Standard Test

Conditions. These conditions may not be frequently observed in actual practice.

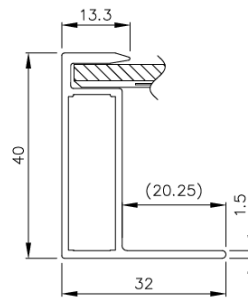
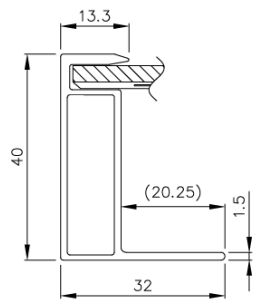
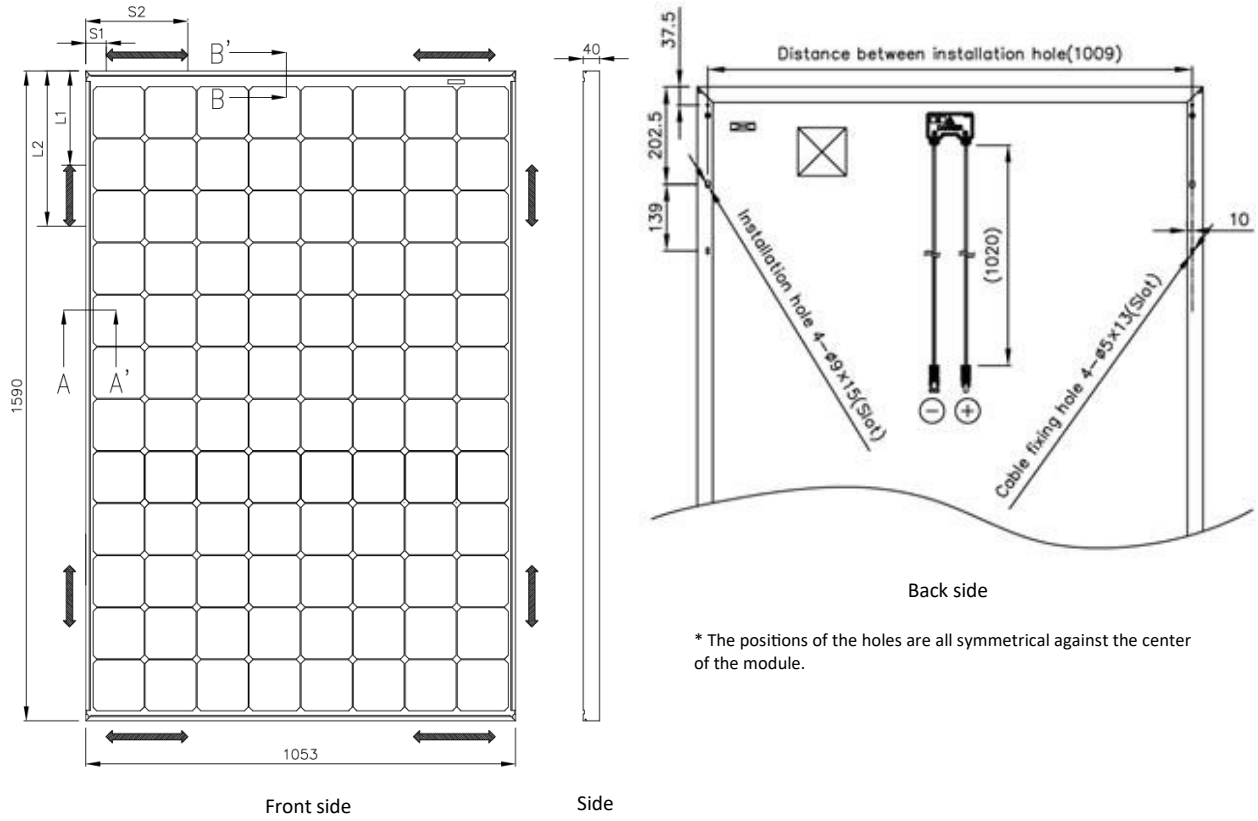
Table 1. Model specifications

| Model | | | VBHN325SJ53 / SJ54 | VBHN330SJ53 / SJ54 | VBHN335SJ53 |
|--|----------|------|--------------------------|--------------------|-------------|
| Maximum Power (Pmax) | +10/-5 % | W | 325 | 330 | 335 |
| Open Circuit Voltage (Voc) | ± 10 % | V | 69.6 | 69.7 | 71.0 |
| Short Circuit Voltage (Isc) | ≥ 90 % | A | 6.03 | 6.07 | 6.08 |
| Maximum Power Voltage (Vpm) | | V | 57.6 | 58.0 | 59.4 |
| Maximum Power Current (Ipm) | | A | 5.65 | 5.70 | 5.65 |
| Temperature coefficient for Pmax | | %/°C | | -0.258 | |
| Temperature coefficient for Voc | | %/°C | | -0.235 | |
| Temperature coefficient for Isc | | %/°C | | 0.055 | |
| Cell Number in Series | | pcs | | 96 | |
| Cell Type | | | Silicon hetero-junction* | | |
| Maximum System Voltage (Vsys) | | V | | 1000 | |
| Maximum over-current protection rating | | A | | 15 | |
| Factory Installed Bypass Diode | | pcs | | 4 | |
| Length x Width x Height | | mm | 1590 x 1053 x 40 | | |
| Weight | | kg | 19 | | |

| Model | | | VBHN320KJ01 / KJ02 | VBHN325KJ01 / KJ02 | VBHN330KJ01 |
|--|----------|------|--------------------------|--------------------|-------------|
| Maximum Power (Pmax) | +10/-5 % | W | 320 | 325 | 330 |
| Open Circuit Voltage (Voc) | ± 10 % | V | 70.5 | 70.9 | 71.2 |
| Short Circuit Voltage (Isc) | ≥ 90 % | A | 5.89 | 5.94 | 5.99 |
| Maximum Power Voltage (Vpm) | | V | 58.7 | 59.2 | 59.5 |
| Maximum Power Current (Ipm) | | A | 5.46 | 5.50 | 5.55 |
| Temperature coefficient for Pmax | | %/°C | | -0.258 | |
| Temperature coefficient for Voc | | %/°C | | -0.235 | |
| Temperature coefficient for Isc | | %/°C | | 0.055 | |
| Cell Number in Series | | pcs | | 96 | |
| Cell Type | | | Silicon hetero-junction* | | |
| Maximum System Voltage (Vsys) | | V | | 1000 | |
| Maximum over-current protection rating | | A | | 15 | |
| Factory Installed Bypass Diode | | pcs | | 4 | |
| Length x Width x Height | | mm | 1590 x 1053 x 40 | | |
| Weight | | kg | 19 | | |

Silicon hetero-junction*: Mono-crystalline Silicon/amorphous silicon hetero-junction

Dimensions in mm



Note) A module is installed using 4 points, symmetrical mounting within setting range (shaded).
Setting range parameters are shown in "Mount Locations and Load Resistance" table.

Module locations and load resistance

| | | | | | |
|---------------------------------|----|---------|----------|---------|---------|
| Mounting location range | L1 | 0 | 230 | 230 | - |
| | L2 | 450 | 380 | 345 | - |
| | S1 | - | - | - | 0 |
| | S2 | - | - | - | 250 |
| Load resistance (Positive load) | | 2400 Pa | 5400 Pa | 5400 Pa | 2400 Pa |
| Load resistance (Negative load) | | 2400 Pa | 4400 Pa* | 5400 Pa | 2400 Pa |

* Depending on internal standard

Figure 1: Module dimensions

STANDARDS

VBHNxxxSJ and VBHNxxxKJ series comply with the requirements of IEC61215, IEC61730-1, IEC61730-2 and the CE mark.

APPLICATION CLASS OF PRODUCT

HIT™ are applied to application **class A** and **safety class II**. It may be applied in systems operating at greater than 50 VDC or 240 W, where general contact access is anticipated.

FIRE CLASS OF PRODUCT

The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.

HIT™ fill **fire class C** that provides to IEC61730-2. Class C roof coverings are effective against light fire test exposures. Under such exposures, roof coverings of this class afford a light degree of fire protection to the roof deck, do not slip from position, and are not expected to produce flying brands.

JUNCTION BOX AND TERMINALS

- Modules equipped with one junction box contain terminals for both positive and negative polarity, and bypass diodes.

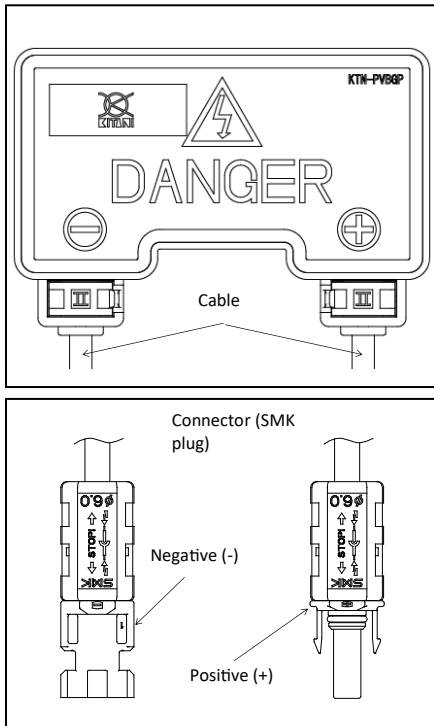


Figure 2. Configuration of Junction Box

- One terminal is dedicated to each polarity (with the polarity symbols engraved onto the body of the junction box) (see Figure 2).

BYPASS DIODE

- When the modules in series strings are shaded partially, it may cause reverse voltage across cells or modules, because the current from other cells in the same series is forced to flow through the shaded area. This may cause undesirable heating to occur.
- The use of a diode to bypass the shaded area can minimize both heating and array current reduction.
- All modules are equipped with factory installed bypass diodes. The factory installed diodes provide proper circuit protection for the systems within the specified system voltage, so that you do not need any other additional bypass diodes.
- Specifications of bypass diodes for the VBHNxxxSJ modules are as follows:
Number of bypass diode: 4 diodes
Number of series cells per bypass diode: 24 cells / diode (See Figure 3).

MECHANICAL LOADING

The method offers a maximum load as shown in the table "Mount location and load resistance" in Figure 1 and Figure 5 is a static state on the module surface.

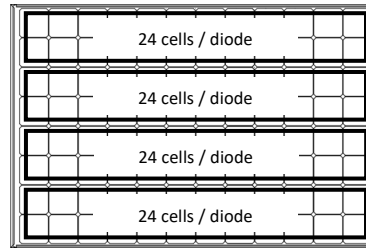


Figure 3. Number of series cells per bypass diode

MODULE INSTALLATION

- Install modules where they are not shaded by obstacles like buildings or trees. Especially pay attention to avoid partially shading the modules by objects during the daytime. If the PV module is always partly shaded, hot spots may occur which can destroy the PV module.
- Water stains might be caused when rain water remains on the glass surface for a long time. To avoid water stains, Panasonic recommends to install modules at a slope steeper than the water gradient.
- Modules should be firmly fixed in place in a manner suitable to withstand all expected loads, including wind and snow loads.
- The modules should be mounted basically at the four (4) quarter points by the means shown in Figure 1, and based on installation methods shown in Figure 4.
- Metals used in locations that are exposed to moisture shall not be employed alone or in combinations that could result in deterioration or corrosion.
- Clearance of 10cm between the roof surface and module frame is required to allow cooling air to circulate around the back of the module. This also allows any condensation or moisture to dissipate. Install modules so that air can circulate between the roof and the module.
- **Do not contact** a tip of a mounting bolt to the back sheet of the module when fixing the module to the mounting structure rail.
- Appropriate material should be used for mounting hardware (the module frame, mounting structure, and hardware) to prevent itself from corrosion.
- Please contact your Panasonic Authorized Representative with questions regarding mounting profiles for modules if needed.

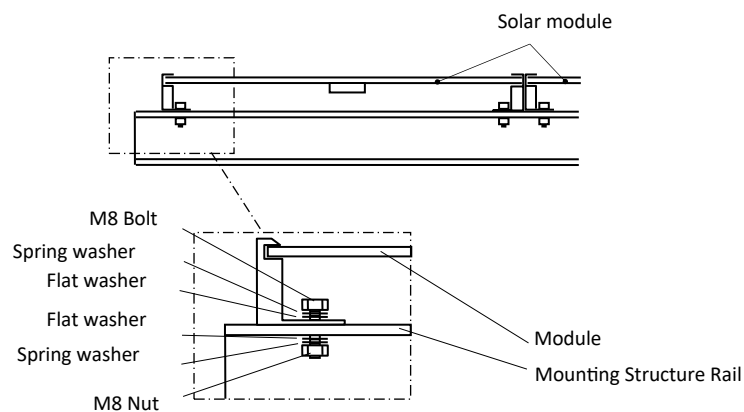
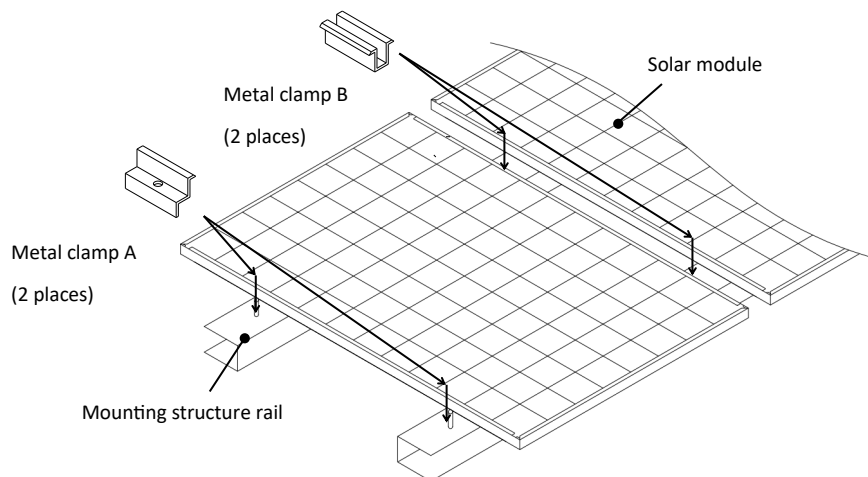


Figure 5. Module Installation

WIRING

GENERAL

- All wiring should be done in accordance with applicable electrical codes.
- All wiring should be done by a qualified, licensed professional.
- Wiring should be protected to help ensure personal safety and to prevent its damage.
- Please connect each cable after confirming the polarity of it is correct.
- Connectors between modules must be inserted until they click.
- When connecting the connectors, please make sure that they are clean and not contaminated with water, sand etc. Please keep in mind that if you leave the connector in a non-connected state for a long period of time, contamination is likely to occur.
- If an extreme load is applied to the cable, the cable may come off the junction box or the connectors. Please be careful that there is no heavy load applied to the cable.
- When fixing the cable, make sure that the minimum bending radius of the cable is 30 mm or more.
- **Do not disconnect** terminals while modules generate electricity and connect electrical load to avoid the hazard of electrical shock.
- Cable conduits should be used in locations where the wiring is inaccessible to children or small animals.
- These modules contain factory installed bypass diodes. If these modules are connected to each other incorrectly, the bypass diodes, cables, or junction box may be damaged.
- Please contact your Panasonic Authorized Representative with questions regarding other electrical connections if needed.

MODULE WIRING

- All modules connected in series should be of the same model number and/or type.
- The number of VBHNxxxSJ and KJ modules, that can be wired in series, is recommended to be twelve (12) or fewer. If connecting thirteen (13) modules and more in series, check local temperature conditions to ensure compliance with maximum system voltage limitations.
- Do not connect modules in parallel without using connection devices that connect to appropriate FUSE for each series string or each module. For the installation of connection devices, refer to the installation manual of connection devices.
- Do not connect modules in parallel without maximum over current protection.

ARRAY WIRING

- The term “array” is used to describe the assembly of several modules on a support structure with associated wiring.
- When installing a PV array, the system design must be completed with reference to the module electrical specifications for proper selection of inverters, fuses, breakers, charging controllers, batteries and other storage devices.
- Modules are equipped with SMK connectors (P51-5H/R51-5) as a terminal enclosure. Use these SMK connectors for electrical connections.
- Use copper wire which is insulated to withstand the maximum possible system open circuit voltage. For applications where wire conduits are used, follow the applicable codes for outdoor installation of wires in conduits. Minimum diameter of wire conduit is 4 mm². The temperature rating of the conductor is -40—90 °C.
- In order to avoid submerging cables and connectors in the water, cables must be fixed either to the module frame using cable fixing holes or to the mounting structure. Also, if the cable is not secured, an external impact may affect the cable from the outside, and the module may be damaged.
- **Do not insert** a PV cable between back side and mounting structure rail. When snow weight is applied to the module, load may be applied to the cable.
- Verify that all fittings are properly installed to protect cables against damage and prevent moisture intrusion.
- We recommend installing a lightning rod and SPD (Surge protection device) to reduce damage or break-down to the PV module caused by lightning.
- Check your local codes for requirements.

EARTH GROUND WIRING

Completely ground all modules.

When grounding the modules, please use a hole near the ground mark displayed on the frame. For metal parts for grounding, consider a combination that does not cause corrosion due to dissimilar metal contact.

INSTALLATION

GENERAL

Please read this guide completely before installation or use of the modules.

OPERATING CONDITIONS

Panasonic recommends that modules be operated within the following Operating Conditions. An installation location with conditions beyond the Operating Conditions or with other Special Conditions (see below) should be avoided. Operating Conditions of Panasonic modules are as follows:

- 1) The modules should be operated only in terrestrial applications. No space or other special conditions.
- 2) The ambient temperature should be within **-20°C to 40°C**.
- 3) The relative humidity should be within 45% to 95%.
- 4) The wind pressure load of the installation site should be less than the load resistance shown in "Mount Locations and Load Resistance" table in Figure 1.

SPECIAL CONDITIONS

Panasonic doesn't recommend to install modules in areas such as below circumstance:

- 1) The ambient temperature and installation place are different from the recommended Operating Conditions.
- 2) Coastal areas where modules come in direct contact with salt water.
- 3) Heavy snow falls areas.
- 4) Sand and dust damage is excessive at the installation place. Heavy dirt areas by sand or dust (e.g.; desert, a quarry, etc.)
- 5) Installation in places where there is a concern about deterioration of modules such as heavy air pollution, chemically active vapors, acid rain, and/or soot, ammonia gas, etc.

UNPACKING AND HANDLING

- **Do not hit** the back sheet of a module by the connector when unpacking and handling.
- Please do not expose the connector to rain water and dust.
- To avoid the damage of the back sheet by the connector, fix the cables to the frame with tape after unpacking. (refer to Figure 4)
- **Do not handle** modules by their cables or junction box. Handle them by the frame with both hands in any situation.
- The anti-reflection glass of the module is easy to be soiled, when it is grasped by hand or hand gloves. So it is recommended to hold cardboard or frames when carrying or installing the solar module. When cables and connectors touch the surface of the glass, it may soil the surface too. It is also recommended to avoid contact of cables and connectors with surface of the glass. (If the glass surface becomes dirty, see section of "anti-reflection glass surface cleaning".)

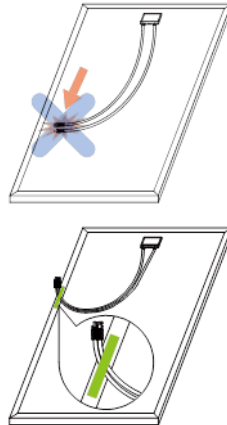


Figure 4. Fixing of cables and connectors

MAINTENANCE

- In order to maintain the optimum output of the module quality and safety, please conduct periodic inspection or cleaning.
- It is also recommended to inspect the electrical and mechanical connections annually.
- If you need electrical or mechanical inspection or maintenance, it is recommended to have a licensed authorized professional carry out the inspection or maintenance to avoid the hazards of electric shock or injury.

ANTI-REFLECTION GLASS SURFACE CLEANING

- Light dirt that does not shield light completely, does not significantly degrade power generation performance, but if the module surface becomes dirty, it may reduce output power. Malfunctions or hotspots may occur.
- It is recommended to clean the surface of the module with water and a soft cloth or sponge.
- When cleaning with neutral glass detergent or weak alkaline glass detergent, it is recommended to start with smallest area and from the edge of solar module in order to check no damage occurs to the glass.
- After that, clean surface of glass with wet and clean cloth.
- Recommended detergents: "Glass Magiclean"¹ or "Windex® Original"²

¹ Glass Magiclean is a trademark of Kao Corporation.

² Windex® is a trademark of SC Johnson & Son, Inc.

- It is recommended to read carefully the manuals of detergent and understand notes on usage and first-aid treatment.
- To remove persistent dirt, the module can be washed with a micro-fiber cloth and ethanol.
- Never use abrasive detergent, strong alkaline detergent, strong acid detergent or a detergent which forms a protective layer on the surface of the glass to clean any part of the module. The performance of a solar module may be reduced. Please be very careful since the guarantee will not cover damages caused by detergents.
- When cleaning the PV module, please do not put detergent on the junction box or connector. If detergents and chemical substances adhere, the junction box and connectors may be deteriorated or damaged.

DISPOSAL OF OLD EQUIPMENT

This symbol on the products, and/or accompanying documents means that used electrical and electronic products must not be mixed with general household waste.



For proper treatment, recovery and recycling of old products, please take them to applicable collection points in accordance with your national legislation.

For more information about collection and recycling, please contact your local municipality.

Penalties may be applicable for incorrect disposal of this waste, in accordance with national legislation.

DISCLAIMER OF LIABILITY

Panasonic does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of, or in any way connected with installation, operation, use, or maintenance by using this manual.

Panasonic assumes no responsibility for any infringement of patents or other rights of third parties, which may result from use of modules.

No license is granted by implication or under any patent or patent rights. The information in this manual is believed to be reliable, but does not constitute an expressed and/or implied guarantee.

As part of our policy of continuous improvement, Panasonic reserves the right to make changes to the product, specifications, or manual at any time without prior notice.

The return of any modules will not be accepted by Panasonic unless prior written authorization has been given by Panasonic.

CUSTOMER SERVICES

For further information, please visit eu-solar.panasonic.net or contact a Panasonic Authorized Representative.

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SANYO is part of the Panasonic Group and is in charge of the manufacturing process of HIT™.

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REVISION HISTORY

| Edition | Revision Date | Revised Item | Revised Content |
|----------------|----------------------|-----------------------------|------------------------------|
| TENTATIVE | 2017.12.15 | | |
| TENTATIVE 2 | 2017.12.20 | Appearance drawing (Fig. 1) | Change of Appearance drawing |
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