Installation Manual for PV-Modules
IEC Version Rev. 11

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CONTENT

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1. Disclaimer of Liability

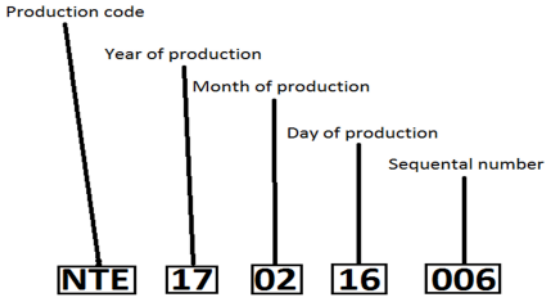
The installation, handling and use of New-Tek crystalline PV modules NTE 245 – NTE 255 are beyond company control. Accordingly, New-Tek does not assume responsibility for loss, damage, injury or expense resulting from improper installation, handling, use or maintenance. New-Tek assumes no responsibility for any infringement of patents or other rights of third parties that may result from use of the module. No license is granted by implication or under any patent or patent rights. Specifications included in this manual are subject to change without prior notice.

2. Product Identification

Each individual module has a unique serial number. A front side label with the serial number is permanently laminated inside the PV module and visible from the front side. A power label with the serial number of the PV module is attached to the backside of the PV module and a label with the serial number is attached to the PV module frame.

a) Serial Number:

Each PV module has a unique serial number accompanied by a bar code. The serial number labels are permanently embedded into the module visible from the front side, the rear side of the module and onto the frame. The serial number contains information about the product code, year, month and day of production and a unique continuous number of modules produced during a day.



b) Nameplate / Power Label:

The Power Label is located on the rear side of the PV modules. It contains information about the main parameters of the PV module such as product type, dimensions, weight, maximum system voltage and the electrical parameters as measured under Standard Test Conditions (AM1.5, 1000W/m², (25 2)°C): Maximum power point (Pmax), current at maximum power point (Ipmax), voltage at maximum power point (Vpmax), open circuit voltage (Voc), and short circuit current (Isc).

Figure X: Example of Power label

3. Safety Precautions

- New-Tek PV modules have passed all the required safety tests according to the IEC61730 Standard. They are certified as Class II devices for protection against electrical shock according to IEC61140 Directives.
- When designing the module system, please always take into consideration the variation of the voltage under different temperatures (please check the respective temperature coefficients of the modules, the Voc of the modules will rise when the temperature drops);
- For example: with NTE 245 modules (maximum system voltage is 1000V) the maximum number of modules connected in series should NEVER exceed N= 25 (1000V/40V=25), taking into consideration that the possible variation of the voltage due to the lowest temperature in winter at specified location can reach -40°C.
- We require that every string of PV module connected in series should be fused before being connected to other strings. For the maximum fuse rate, please refer to the detailed specification sheet (Datasheet for PV Modules).
- Connectors are only to be mated with connectors of the same series and from the same manufacturer. New-Tek PV modules have PV4-S connectors.
- Solar photovoltaic modules generate electricity when exposed to light. An array of modules may cause lethal shocks and/or burn hazards. Only authorized and trained personnel should have access to the PV modules.
- Use properly insulated tools and appropriate protective equipment to reduce risk of electrical shock.
- Do not stand or step on the PV module.
- Do not damage or scratch the front or backside surfaces of the PV module.

- Never use a PV module with broken glass or torn substrate. Broken modules cannot be repaired and contact with any module surface or frame can lead to electrical shock.
- Do not disassemble or remove any part of the PV module.
- Protect connectors against soiling; do not use soiled connectors.
- Do not install or handle PV modules when they are wet or during periods of high wind.
- Do not short circuit the positive and the negative connectors of a PV module.
- Do not disconnect when the PV module is under load.
- Make sure connectors have no gap between insulators. A gap can cause fire hazard and/or risk of an electrical shock.
- Make sure that the polarity of each PV module or string is not reversed relative to the rest of the PV modules or strings
- External or otherwise artificially concentrated sunlight shall not be directed onto the front or back face of the PV module.
- Maximum system voltage must not exceed 1000V DC.
- Under normal conditions, a solar photovoltaic module is likely to produce more current and/or voltage as reported under standard test conditions (STC). Accordingly, the value of Isc marked on this module should be multiplied by a factor of 1.25 when determining the conductor current ratings, fuse sizes and size of controls connected to the module output. Refer to Section 690-8 of the National Electric Code for an additional multiplying factor of 1.25 which maybe applicable.
- Installation in Canada shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code Part 1.

4. Unpacking and Storage

- Before installation, keep all modules and electrical contacts clean and dry.
- If it is necessary to store modules temporarily, a dry, ventilated room should be used.
- When unpacking, carry modules with both hands. Do not place modules on top of each other.

5. Environmental Conditions and Site Selection

5.1 Climate Condition

Install New-Tek crystalline series modules in the following conditions:

Ambient temperature:	-40°C to +40°C
Operating temperature:	-40°C to +85°C
Storage temperature:	-20°C to +40°C
Humidity:	<85RH %
Max. design load (front/rear):	1600 Pa
With safety factor:	≥1.5
Operating altitude [m.asL]:	≤2000
Worst case mounting inclination:	≥45°

Note:
Mechanical load bearing (include wind and snow loads) of the module is based on mounting methods. Professional system installers are responsible for mechanical load calculation according to the system design.

5.2 Site Selection

- In most applications, New-Tek PV modules should be installed at a location where maximum irradiance of sunlight during the course of a year is to be expected.
- PV Modules should not be shaded by buildings, trees, chimneys, etc. at any time of the day
- Do not install PV modules in corrosive environments, such as corrosive salt areas within proximity of the ocean or sulfurous areas, etc.
- Do not install modules in a location where the PV module would be immersed in water or continually exposed to water from a sprinkler or fountain, etc.
- PV modules should be mounted over a fire resistant covering, with adequate ventilation between the module back sheet and the mounting surface. Clearance between the module frames and surface of the wall or roof is required to prevent wiring damage and to allow air circulation. The required minimal standoff height is 115mm. For all slopes, less than 5in/ft. (127mm/305mm) a fire class rating is required.
- Do not mount PV modules in such way that the drain holes in the PV module frame are blocked.

5.3 Module Arrangement

New-Tek PV modules connected in series should be installed at the same orientation and tilting angle. Different orientations or tilting angles may cause loss of output power due to the different irradiance seen by the PV modules. Typically, the optimum tilting angle of a PV module is almost the same as the degree of latitude of the location of installation. Provide adequate ventilation under a module for cooling. A minimum of 10cm air spacing between module and mounting surface is recommended.

6. Mounting Instruction

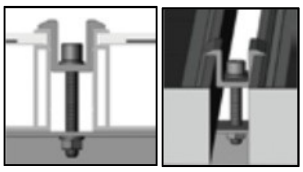
6.1 Mounting Methods

PV modules can be mounted to the substructure using the following method:

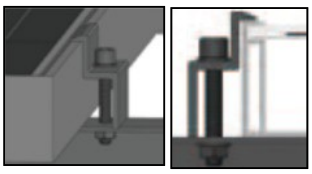
- The recommended fixing system is the Fischer Solar-fix.
- Clamp fitting: Using suitable module clamps on the side of the PV module frame to mount the modules (including “portrait orientation” and “landscape orientation”). PV module clamps should not get in contact with the front glass due to potential glass breakage. They must not deform the frame. Be sure to avoid shadowing effects from the module clamps. The PV module frame is not to be modified under any circumstances. When choosing this type of clamp-mounting method, please be sure to use at least four

clamps on each module, two clamps should be attached to each of the long sides of the module for portrait orientation and two on each short side of the PV module for landscape orientation. Depending on local wind and snow load conditions, additional clamps may be required. The applied torque should be 8Nm. Please find detailed mounting information in the below illustration:

Fringe modules installation



Middle modules installation



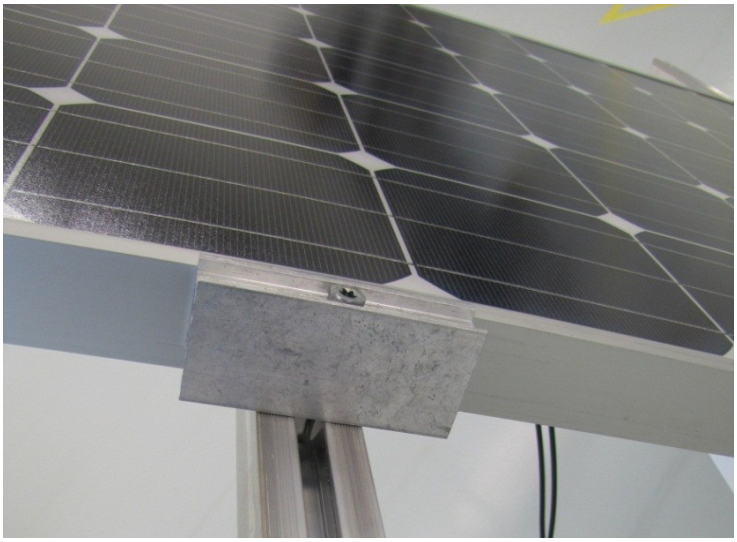
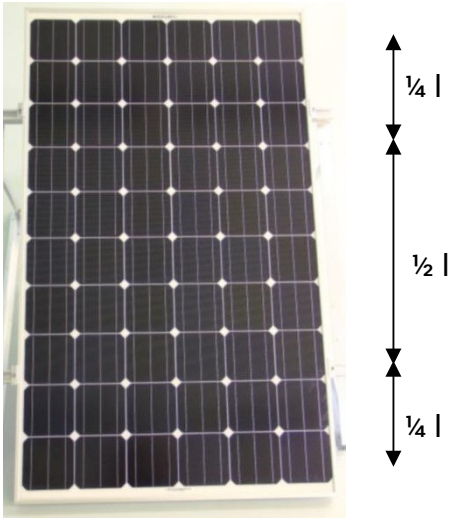


Figure 2: NewTek PV module installed with clamp fitting method

Note:

Clearance between two module frames and the surface of the wall or roof is required to prevent wiring damage and to allow air circulation. The recommended standoff height is 115 mm. Do not mount modules in a way that the drain holes of the module frame are blocked. We recommend using the landscape and portrait orientation to install the PV module. Distances of clamps are indicated below: (¼ l ± 10%).



6.2 Grounding

All PV module frames and mounting racks must be properly grounded in accordance with appropriate respective national electrical code. Proper grounding is achieved by connecting the module frame(s) and all metallic structural components to form a continuous grounding conductor. The grounding conductor material may be copper, copper alloy, or other material acceptable for use as an electrical conductor per respective National Electrical Codes. The grounding must be connected to earth using a suitable earth grounding electrode. For proper grounding, we recommend to use the following methods:

- Make electrical contact by penetrating the anodized coating of the aluminum frame. Tighten the mounting hex nut to the proper torque (25 in lb.). The star washer must go through the anodized surface to create a conductive connection.
- Install the grounding system in the predrilled holes with the M5x16 screw and a M5 hex nut. Grounding system from Weitkowitz Number 16021/22 -UL Number ZMVV-E 318299
- Screw (M5x16), flat washer, cable clip, star washer, hex nut
- Select grounding wire size: (10 AWG solid bare copper) and install with a cable eye between the washer and the hex nut.
- The grounding bolt is only UL listed for use with 10 AWG bare solid copper wires.
- Grounding is achieved through securement to the array frame. The array frame shall be grounded in accordance with NEC Article 250

6.3 Module Wiring

Each PV module has two standard 90°C sunlight resistant output cables each with plug & play connectors. The wire type and gauge of the output cables are 1000V rated PV wire cables and are 12AWG/4 mm² in size. This cable is suitable for applications where wiring is exposed to the direct sunlight. We require that all wiring and electrical connections comply with the national electrical code (NEC). For field connections, use the minimum 12AWG / 4mm² copper wires insulated for a minimum of 90°C and sunlight resistance with insulation designated as PV wire.

6.4 Bypass Diodes

When a module is connected in series with other modules, partial shading can cause a reverse

voltage across the shaded area of the module. The current generated is therefore forced through the shaded area by the other module.
When a bypass diode is wired in parallel with the PV cell strings, such a forced current will flow through the diode and bypass the current generated by the non-shaded cells, thereby minimizing module heating, current losses, and damage to the module.
New-Tek PV modules are fitted with internal bypass diodes wired inside the junction box to reduce the effects of partial shadings.
Do not open the junction box to change the diodes even if they are affected. This should be done only by qualified personnel.

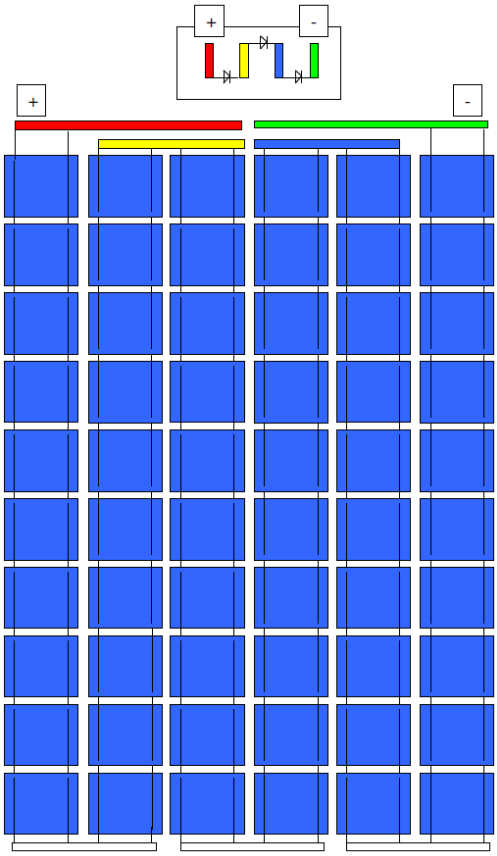


Figure X: Bypass diodes and cells electrical circuit

6.5 Electrical Ratings

- The electrical characteristics have tolerances I_{sc} ± 4%, V_{oc} ± 3%, and P_{max} ± 5% under standard test conditions (irradiance of 1000 W/m^2, AM 1.5 spectrum, and a cell temperature of 25°C (77°F))
- Type of overcurrent protection: 13A fuse.
- The electrical characteristics are printed on the module power label on the backsheet.

7. Array Wiring

New-Tek modules are fitted with two pre-assembled sunlight resistant cable leads, which are

terminated with PV fast connectors (type PV4-S). The positive (+) terminal has a female connector while the negative (-) terminal has a male connector. These cable leads and connectors must not be removed or cut off.

Several modules are connected in series and then in parallel to form a PV array, especially for applications with high operating voltage. When modules are connected in series, the total voltage of the resulting string is the sum of the individual voltages of the modules. Do not use different types of modules in the same circuit, as this will cause mismatch, power loss and/or damage to the PV system.

When selecting the size of the cables that connect the module strings to the solar inverter, it is recommended to refer to the nameplate electrical parameters of the related module type.

Under normal conditions, a photovoltaic module is likely to experience conditions that produce higher current and/or voltage than reported at standard test conditions. Accordingly, the values of Isc and Voc marked on this PV module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current ratings, and size of controls (e.g. inverter) connected to the PV output.

Make sure that connections are safe and tight. Plug connector should not be subjected to stress from the exterior. Connectors should only be used to connect the circuit. They should never be used to turn the circuit on and off.

Connectors are not waterproof when unmated. When installing modules, connectors should be connected to each other as soon as possible or appropriate measures should be taken to avoid moisture penetration.

7.1 Serial Connection

The maximum number of PV modules that can be connected in a series string must be calculated in accordance with applicable regulations in such a way that the specified maximum system voltage of the PV module and all other electrical DC components will not be exceeded in open-circuit operation at the lowest temperature expected at the PV system location. The maximum system voltage for all module types used is 1000V. By connecting the modules in series, the maximum system voltage of 1000V must not be exceeded.

7.2 Parallel Connection

By connecting more than two PV module strings in parallel you have to use string fuses (13A). The maximum series fuse rating has been rated to 13A, if more than two strings are connected in parallel, this value might be exceeded if there is a fault.

8. Maintenance and Care

- Under most weather conditions, normal rainfall is sufficient to keep the PV module glass

surface clean. If dust or soiling becomes excessive use a soft cloth in combination with a mild detergent and water to clean the glass surface.

- Do not clean the modules with cold water during the warmer hours of the day in order to avoid creating any thermal shock that may damage the PV module.
- Be cautious when cleaning the back surface of the PV module. PV modules which are mounted flat (0° tilt angle) should be cleaned more often.
- At least once a year, it is recommended to check the torque of the terminal screws and the general condition of wiring. Also, check that mounting hardware is properly torqued. Loose connections will result in damage of the array.
- If PV modules need to be replaced use PV modules of the same type. Do not touch live parts of cables and connectors. Use appropriate safety equipment (insulated tools, insulating gloves, etc.) when handling modules.
- When repairing PV modules cover their front surface with an opaque material. PV modules generate high voltage when exposed to sunlight and can be dangerous.
- New-Tek PV modules are equipped with bypass diodes in the junction box. This minimizes module heating and current losses.
- Do not try to open the junction box to replace the diodes even if it malfunctions.
- In a system that uses a battery, blocking diodes are typically placed between the battery and the module output to prevent battery discharge at night.

9. Module Specifications

New-Tek PV modules were tested and qualified according to IEC directives IEC61215-1:2016, IEC61215-2:2016 and IEC61730-1:2016, IEC61730-2:2016. New-Tek solar modules have been qualified for Application Class A (equivalent to Protection Class II requirements). Modules rated under this class should be used in systems operating at voltage above 50 V or power above 240 W, where general contact access is anticipated.

9.1 General Characteristics

Dimensions:	1665 x 1001 x 42 mm / 1665 x 1001 x 35 mm
Weight:	18.5 kg (± 0.5 kg)

9.2 Electrical Data

Standard Test conditions	NTE245	NTE250	NTE255	NTE260	NTE265
Maximum Power (Pmax)	245W	250W	255W	260W	265W
Optimum Operating Voltage (Vmp)	30.10V	30.50V	30.70V	31.00V	31.10V
Optimum Operating Current (Imp)	8.20A	8.20A	8.30A	8.40A	8.50A
Open Circuit Voltage (Voc)	37.50V	37.80V	38.10V	38.40V	38.50V
Short Circuit Current (Isc)	8.70A	8.70A	8.80A	8.90A	9.00A

Electrical characteristics at STC (AM 1.5g, 1000 W/m², 25°C)
Tolerances at STC: Pmax ±5%, Voc ±3%, Isc ±4%.

Low irradiance	NTE245	NTE250	NTE255	NTE260	NTE265
Maximum Power (Pmax)	49.0W	50.0W	51W	52W	53W
Optimum Operating Voltage (Vmp)	29.73V	30.13V	30.32V	30.63V	30.93V
Optimum Operating Current (Imp)	1.65A	1.65A	1.67A	1.69A	1.70A
Open Circuit Voltage (Voc)	34.96V	35.24V	35.52V	35.76V	36.04V
Short Circuit Current (Isc)	1.75A	1.75A	1.75A	1.76A	1.76A

Electrical characteristics at low irradiance (AM 1.5g, 200 W/m², 25°C)
Tolerances at STC: Pmax ±5%, Voc ±3%, Isc ±4%.

Normal Operating Cell Temperature	NTE245	NTE250	NTE255	NTE260	NTE265
Maximum Power at NOCT (Pmax)	179W	183W	186W	190W	193W
Optimum Operating Voltage (Vmp)	27.00V	27.20V	27.60V	27.80V	28.0 0V
Optimum Operating Current (Imp)	6.60A	6.60A	6.70A	6.80A	6.90A
Open Circuit Voltage (Voc)	34.70V	34.80V	34.90V	35.00V	35.10V
Short Circuit Current (Isc)	7.00A	7.10A	7.20A	7.30A	7.40A

Electrical characteristics at normal operating cell temperature (NOCT) conditions: NOCT=46±2°C: Irradiance: 800 W/m², ambient temperature: 20°C, AM 1.5, wind speed: 1 m/s

9.3 Module Layout

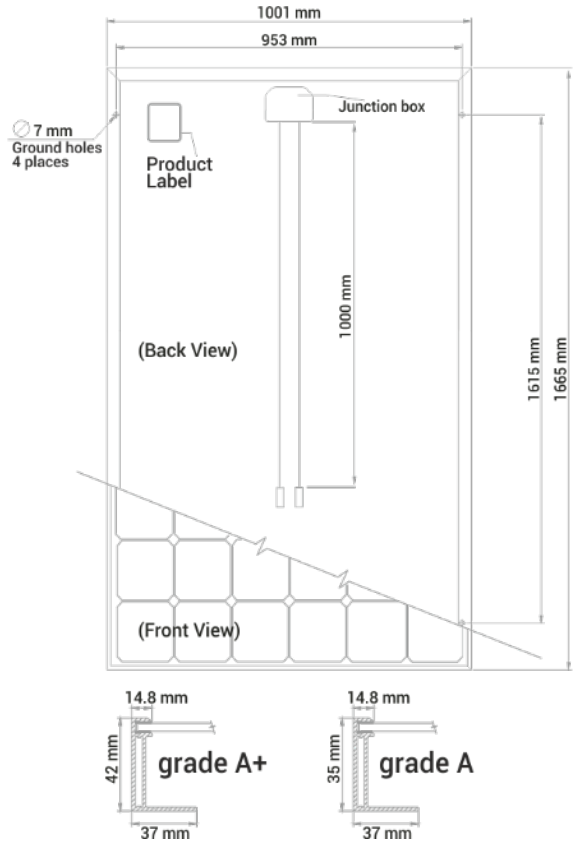


Figure X: module design drawing

9.4 Temperature Ratings

NOCT	46 2°C
NMOT	tbd
Temperature coefficient of Pmax	-0.43%/K
Temperature coefficient of Voc	-0.33%/K
Temperature coefficient of Isc	0.047%/K

9.5 Operative Conditions

Power sorting	0/+5W
Maximum System Voltage	1000V
Maximum Series Fuse Rating	13A
Operating Temperature Range	-40°C to 85°C
Design Load (front/rear)	1600 Pa
Safety factor	≥1.5

Resistance to external fire sources was not evaluated.
Maximum operating altitude of PV modules: 2000m above sea level

WARNING: For any electrical maintenance, the PV system must first be shut down. Improper maintenance can cause lethal electric shock and/or burns.

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