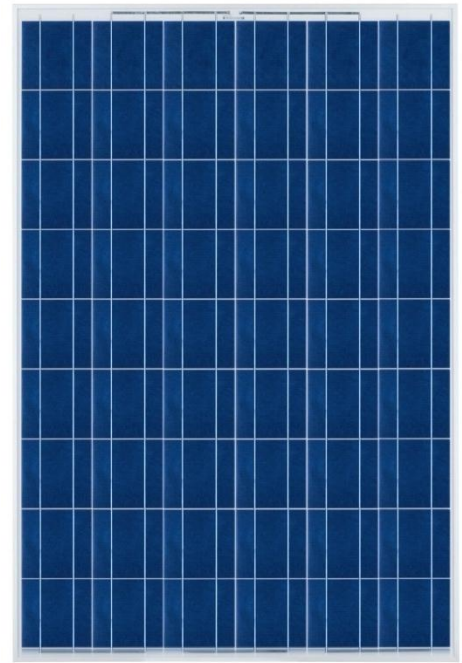


## FEATURES

- A range of PV modules (200-220W) using square poly-crystalline silicon solar cells with 16.0% module conversion efficiency.
- Photovoltaic module with bypass diode minimize the power drop caused by shade.
- Textured cell surface to reduce the reflection of sunlight and BSF (Back Surface Field) structure to improve cell conversion efficiency.
- White tempered glass, EVA resin and a weatherproof film, plus aluminum frames for extended outdoor use.
- Output terminal: Lead wire with waterproof connector.
- Certification: IEC 61215/61730



### **POLY-CRYSTALLINE SILICON PHOTOVOLTAIC (PV) MODULES**

These poly-crystalline module features 16.0% encapsulated cell efficiency and 15.4% module efficiency. The STF-200P6/210P6/220P6 module allows for maximum usable power per square meter of solar array.

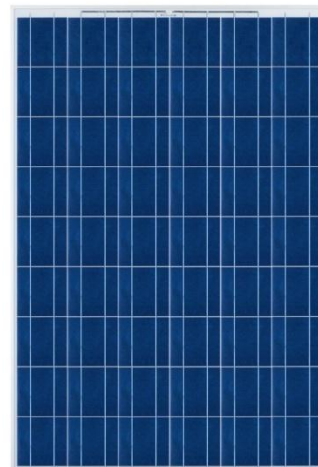
A safe, clean, reliable source of energy, SolarTIF's STF-200P6/210P6/220P6 photovoltaic module is designed for medium to large electrical power requirements. Based on the technology of crystal silicon solar cells developed over 5 years, this module has superb durability to withstand rigorous operating conditions and is suitable for grid connected systems.

Common applications for the STF-200P6/210P6/220P6 include residence, office building, solar power stations and solar suburb. As the world's leading manufacturer of photovoltaic modules, SolarTIF produces extensive line of high power modules for every electrical power requirement.



### Specification

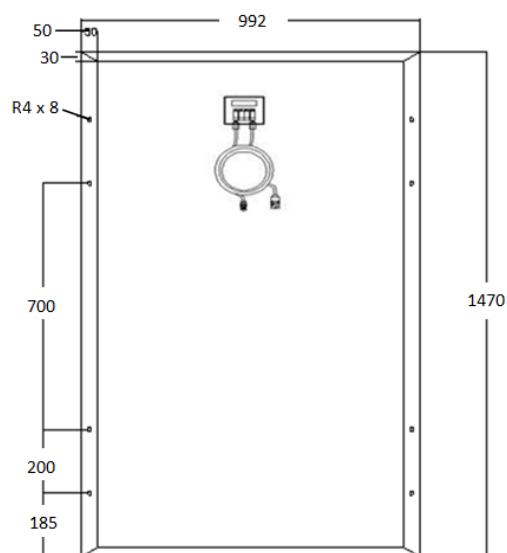
|                             |                 |
|-----------------------------|-----------------|
| Cell                        | 156mm x 156mm   |
| No. of cell and connections | 54 (6x9)        |
| Dimension of module (mm)    | 1470 x 992 x 47 |
| Weight (kg)                 | 20.0            |



### Temperature and coefficient

|  |             |
|--|-------------|
| NOCT                                   | 43.6°C      |
| Short-circuit current temp coefficient | 6.928mA/ °C |
| Open-circuit voltage temp coefficient  | -0.068V/ °C |
| Peak power temp coefficient            | -0.391W/ °C |
| Power tolerance                        | 0 > ±3%     |

### Back view



### Electrical Characteristic

| Model                           | STF – 200P6 | STF – 210P6 | STF – 220P6 |
|---------------------------------|-------------|-------------|-------------|
| Rated Power (Pmax)              | 200W ± 3%   | 210 ± 3%    | 220 ± 3%    |
| Open- circuit voltage (Voc)     | 33.2 V      | 33.2 V      | 33.2 V      |
| Short – circuit current ( Isc ) | 8.14 A      | 9.14 A      | 9.9 A       |
| Voltage at Pmax (Vmp)           | 26.4 V      | 26.4 V      | 26.4 V      |
| Current at Pmax( Imp )          | 7.57 A      | 7.95 A      | 8.35 A      |



# SolarTIF Sdn Bhd

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## SCOPE

This document describes the specification of solar module STF - 200P6 / 210P6 / 220P6.

### 1. APPLICATION STANDARD

This module is designed to meet the requirement of the following standards.

- IEC61215 Ed.2                      Crystalline silicon terrestrial photovoltaic (PV) modules Design qualification and type approval.
- EN61730 – 1                      Photovoltaic (PV) module Safety qualification Part 1: Requirement for construction

### 2. SPECIFICATION

#### 2.1. Application class

This module is applied to application class A in accordance with EN61730

#### 2.2. Material

The material used for the module shall comply with this specification and unless otherwise specified, the ones that fully meet requirement of this specification shall be used in any case.

##### 3.2.1 Solar cells

Solar cells shall be produced from poly – crystalline silicon.

##### 3.2.2 Interconnectors

Interconnector shall be solder coated copper or solder coated clad metal with copper.

##### 3.2.3 Filling materials

Filling material shall be transparent EVA (Ethylene Vinyl Acetate) resin.

##### 3.2.4 Front cover

Front cover shall be low iron tempered glasses whose thickness is not less than 3mm.

##### 3.2.5 Frames

Frames shall be aluminum alloy.

##### 3.2.6 Back cover

Back cover shall be resistant films for weather. (TPT sheet)

##### 3.2.7 Terminal Box

The termination shall be lead wire system. The main material of the terminal box shall be PPO resin.

##### 3.2.8 Bypass diode

The bypass diode shall be installed in the terminal box.

#### 3.3 Mechanical Design

##### 3.3.1 General

The design of module is suitable for long-term operation in general open air climates.

##### 3.3.2 Interconnection of solar cells

The solar cells shall be interconnected in series using the interconnectors described in 3.2.2.

### 3.3.3 Termination

The termination shall be lead wire type with 4.0 mm<sup>2</sup>. Connector is Multi Contact connector (Model No.PV-GZX-0601-1).

### 3.3.4 Mass

The typical mass of module is shown in the appended data sheet.

## 3.4 Appearance

The following shall be considered to be major visual defects:

1. Broken, cracked, or torn external surfaces, including front cover, frames and terminal box;
2. Bent or misaligned external surfaces, including front cover, frames and terminal box to the extent that the installation and/or operation of the module would be impaired.
3. A crack in a cell the propagation of which could remove more than 10% of the cell's area from the electrical circuit of the module;
4. Bubbles or delimitations forming a continuous path between any part of the electrical circuit and the edge of the module;
5. Loss of mechanical integrity, to the extent that the installation and / or operation of the module would be impaired.

## 3.5 Performance characteristic

### 3.5.1 Environmental requirement

#### 3.5.1.1 Storage temperature

The storage temperature of the modules shall be from -40 °C to + 90°C

#### 3.5.1.2 Operating temperature of solar cells

The operating temperature of solar cells shall be from -40 °C to + 90°C

#### 3.5.1.3 Storage humidity

The storage humidity of the module shall be less than 90% of relative humidity.

### 3.5.2 Electrical performance

#### 3.5.2.1 Electrical output

The electrical output characteristics of the module under standard test conditions (irradiance of 1000W/m<sup>2</sup> with IEC60904-3 reference solar spectral irradiance distribution, AM 1.5 spectrum and cell temperature of 25°C) in accordance with IEC60904-1 shall be compliance with the following table.

#### 3.5.2.2 Insulation

When the module shall be applied 6000 V- DC (maximum system voltage: 1000 – DC) by the tester during 1 min, the module shall not be break down regarding the insulation.

#### 3.5.3 Mechanical performance

##### 3.5.3.1 Withstanding mechanical load

After the module shall be load with 2400Pa (mounting methods are shown in the appended data sheet and installation manual), there shall be no major visual defects of the module described in 4.5.

##### 3.5.3.2 Withstanding the impact of hailstone

After hail test, there shall be no major visual defect of the module

##### 3.5.3.3 Robustness of termination

The termination of the module has enough strength against external forces and satisfied wet leakage current test.

#### 4. SHIPPING TEST

Each shipping lot shall successfully pass the shipping test below.

##### 4.1 Total inspection

###### 4.1.1 Sampling way

All shipping lot is inspected.

###### 4.1.2 Inspection items

The maximum power (Pm) is measured in the production line process.

##### 4.2 Sampling inspection

###### 4.2.1 Sampling way

Sampling shall be done by extracting at random 8 sets from 500 sets of production articles.

###### 4.2.2 Inspection items

Inspection items shall be the dimension, the appearance and the Insulation tests.

#### 5. PREPARATION FOR DELIVERY

##### 5.1 The shipping carton box specification.

Shipping packages shall be in compliance with international shipping standard. Every 2 pieces panels will be packed together and stackable for 10 pieces only.

##### 5.2 Identification of serial number

The label that described serial number is stuck on front glass and on carton box.

6. WARNING

The items regarding the warning are shown in the appended data sheet, installation manual.

7. OTHERS

Any doubt as to this specification shall be determined in good faith upon mutual consultation of the both parties

I-1 SCOPE

This data sheet describes the standard information (not items guaranteed) except specification for detail design and work. User shall consider the other information.

I-2 MECHANICAL CHARACTERISTICS

|                        |  |
|------------------------|--|
| Cell type              | 156mm square (Typ.), Poly crystalline silicon  |
| Frame material         | Anodized aluminum alloy (Color: Silver)  |
| Front cover material   | Low iron tempered glasses  |
| Encapsulation material | EVA (Ethylene Vinyl Acetate) resin   |
| Back film material     | Resistant films for weather  |
| Weight (Typical)       | 20.0kg   |
| Solar cell strings     | 54in series ( 6 strings)   |
| Terminal box           | Length: 130mm Width: 105mm Depth: 30mm<br>Material: PPO resin<br>IP rating 65 (at live parts with the silicon potting) |
| Bypass diode           | The bypass diode shall be installed in terminal box.   |
| Cable                  | CE cable 4.0mm sq. / Length 900mm (Typ.)<br>DC 1000V, 40°C~85°C  |
| Connector              | Multi-Connect PV – KBT3 / KST3 II<br>IP- rating 65/67 (plugged)  |

I-3 ELECTRICAL OUTPUT AND THERMAL CHARACTERISTICS

Rated electrical characteristics are within  $\pm 10\%$  of the indicated values of  $I_C$ ,  $V_{oc}$ , and  $+10/-5$  percent of  $P_{max}$  under STC (standard test condition) (irradiance of  $1000W/m^2$ , AM 1.5 spectrum, and a cell temperature of  $25^\circ C$  ( $77^\circ F$ )). The warranty conditions are specified elsewhere in this manual.

Table I-1 Electrical Characteristics (at STC: STF-200P6)

|  |        |    |               |
|--|--------|----|---------------|
| Maximum Power Tolerance ( $P_{max}$ )            | 200.0  |    | W             |
|  | +10    | -5 | %             |
| Open –Circuit Voltage ( $V_{oc}$ )               | 33.2   |    | V             |
| Short – circuit Current ( $I_{sc}$ )             | 8.14   |    | A             |
| Voltage at Points of maximum Power ( $V_{mpp}$ ) | 26.4   |    | V             |
| Current at point of maximum Power ( $I_{mpp}$ )  | 7.57   |    | A             |
| Maximum System Voltage                           | 1000   |    | V             |
| Over- Current Protection                         | 15     |    | A             |
| Application Class                                | A      |    |               |
| Temperature Coefficient of $P_{max}$             | -0.39  |    | %             |
| Temperature Coefficient of $V_{oc}$              | -0.068 |    | $V/^\circ C$  |
| Temperature Coefficient of $I_{sc}$              | 6.93   |    | $\%/^\circ C$ |

The above electrical characteristics (Pmax, Voc, Isc, Vmp, Imp) are based on the result of the production line test. These electrical characteristics are different from the rated electrical characteristics described in the name plate label. These electrical characteristics is shown in the following.

1. Fig. I -1: Characteristics regarding Open circuit voltage and short circuit current versus Irradiance
2. Fig. I-2: Characteristics regarding Current and Power versus voltage per Irradiance
3. Fig.I-3: Normalized characteristics regarding Open circuit voltage, Short circuit current and Maximum power versus Cell temperature.

**NOTE: 1**

Under normal condition, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at Standard Test Condition. Accordingly, the values is Isc and Voc marked on this module should be multiplied by a factor of 1.25 when determining component voltage rating, conductor capacities, fused and size of controls connected to the output.

|   |       |    |
|---|-------|----|
| Maximum Power (Pmax)                      | 76.8  | W  |
| Open-Circuit Voltage (Voc)                | 20.69 | V  |
| Short-Circuit Current (Isc)               | 5.24  | A  |
| Voltage at Point of Maximum Power (Vmpp)  | 16.05 | V  |
| Nominal Operating Cell Temperature (NOCT) | 43.6  | °C |

**I-4 WARNING**

Please obey the instruction mentioned below for actual use of this module.

**I-4.1 Use**

1. Main application of the modules as follows.
  - Grid Connected PV system on house roofs or large scale PV – installation
  - Telemeter system (Terminal)
  - Village electrification
  - etc
2. Please take proper steps in order to maintain reliability and safety, in case this module is used or uses or in areas mentioned below which required high reliability.
  - Fallen snow area
  - Over water
  - Salt water damage area



- units concerning control and safety of a vehicle ( airplane, train, automobile etc)
- extremely cold area
- always poured water area
- small island
- road sign
- other safety system
- strong wind area
- desert area
- etc

3. Please don't use for the uses mentioned below which require extremely high reliability.

- Space equipment
- Nuclear control system
- Telecommunication system (Trunk)
- Medical system (relating to any fatal element)

4. Please do not connect the modules directly to the loads such as motor since the variation of the output power depending on the solar irradiation cause the damage for the connected motor.

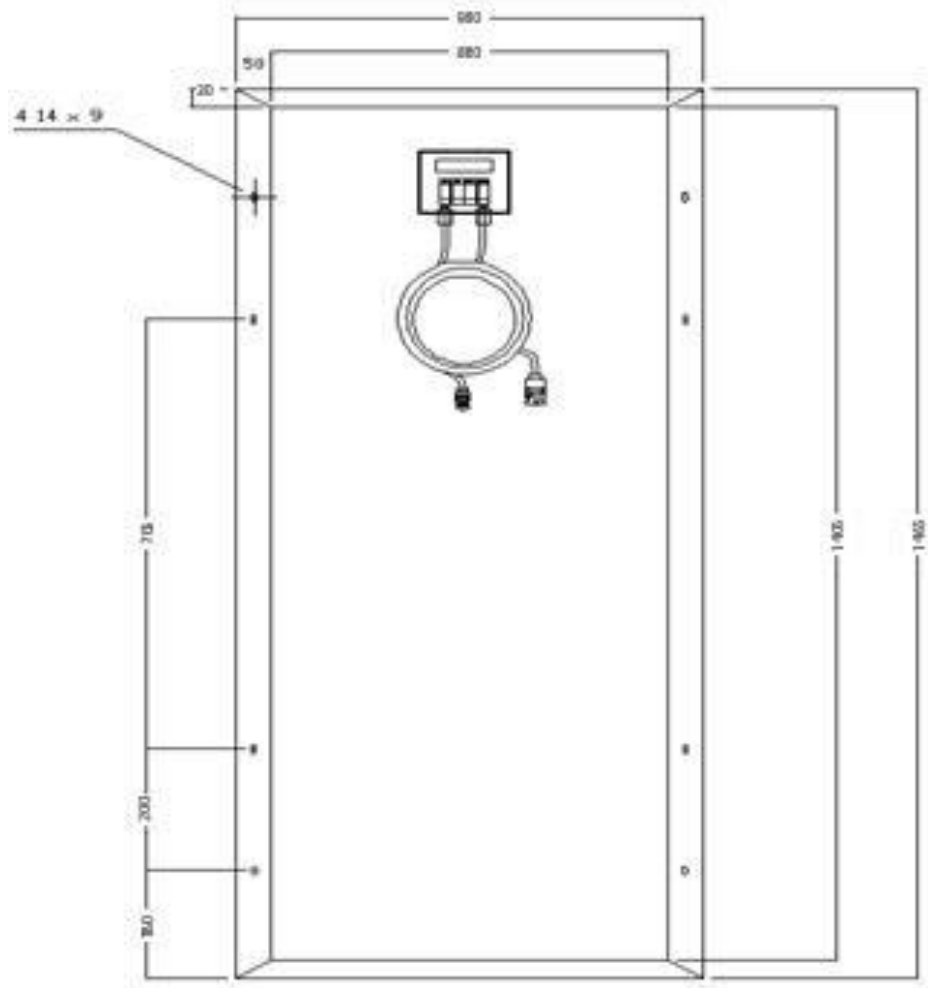
- I. In case of brush-less motor, the lock function gets active and the hall IC is most likely to the damaged.
- II. In case of the motor with brush, the coil is most likely to the damaged.

#### I-4.2 Handling

1. Never touch the output terminals with bare hand when the module is irradiated. Cover the surface of the module by sufficiently thick cloth of something suitable to prevent incident light, and handle the output terminals with rubber gloved hands not to receive the electric shock.
2. Do not drops tools or hard things on the front cover of the module. When broken the front cover of the module, never use the module.
3. Do not scratch the back cover by hard things. Do not wear a metallic jewelry which may become cause of the electric shock during installation.

### I-4.3 Installation

1. When mounting the modules on structure, keeps the displacement of the forth corner of the module smaller than 2mm for 1000mm of the diagonal of the module after other 3 corners are placed on structure.
2. Be careful in handling polarity of insulated output wires.
3. Install modules and ground frames (support structure) in accordance with applicable law of each country.
4. Consult the government office before the installation of the modules in case that the permission of the installation is required by law.
5. The modules shall be installed and maintained by qualification personnel.
6. Follow safety precautions of the battery manufactured if batteries are used with modules.
7. Consult manufactured for proper installation on special vehicles such as boats and campers.
8. Module shall be fastened with 4C-holes with M8-bolts for withstanding load 2400Pa.



#### I-4.4 Operation

1. When a part of the modules is shadowed, the hot spot may be causes. Therefore do not shadow cells.
2. The modules shall be maintained by qualified personnel.
3. The electrical characteristics degrade when the front cover of the module become dirty.
4. Do not pour solvent on the modules when cleaning.
5. Do not produce sparks near flammable vapors.
6. Do not expose the modules to sunlight concentrated with mirrors, lenses or similar means.
7. Keeps modules away from children.