

APPENDIX J

REPRESENTATIVE EQUIPMENT STANDARDS

PANELS

- Hi-MO5 LR5-72HBD 520 ~ 545M
- Trina Solar TSM-DEG19C 20 530-550W
- CanadianSolar HiKu6 Mono 570 W ~ 590 W

Hi-MO 5

LR5-72HBD 520~545M

- Based on M10-182mm wafer, best choice for ultra-large power plants
- Advanced module technology delivers superior module efficiency
 - M10 Gallium-doped Wafer
 - Smart Soldering
 - 9-busbar Half-cut Cell
- Globally validated bifacial energy yield
- High module quality ensures long-term reliability

12

12-year Warranty for
Materials and Processing

30

30-year Warranty for Extra
Linear Power Output

Complete System and Product Certifications

IEC 61215, IEC 61730, UL 61730

ISO 9001:2008: ISO Quality Management System

ISO 14001: 2004: ISO Environment Management System

TS62941: Guideline for module design qualification and type approval

OHSAS 18001: 2007 Occupational Health and Safety

LONGi



21.3%
MAX MODULE
EFFICIENCY

0~+5W
POWER
TOLERANCE

<2%
FIRST YEAR
POWER DEGRADATION

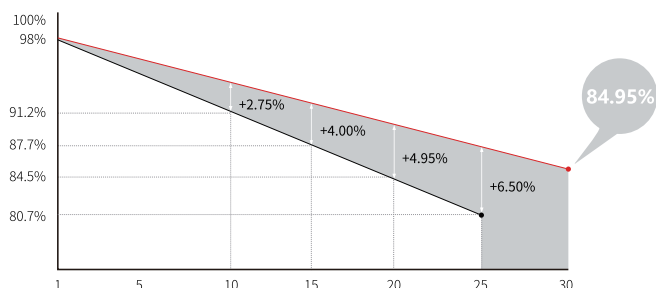
0.45%
YEAR 2-30
POWER DEGRADATION

HALF-CELL

Lower operating temperature

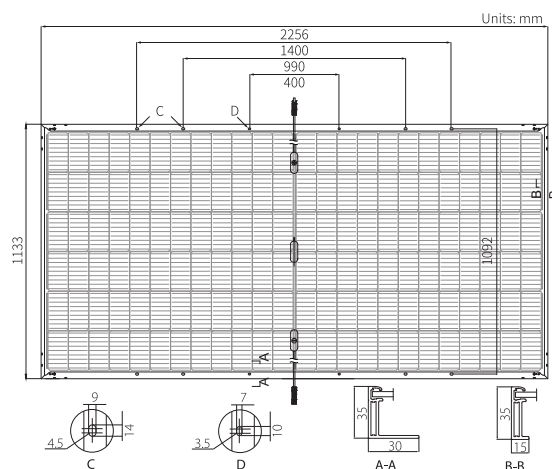
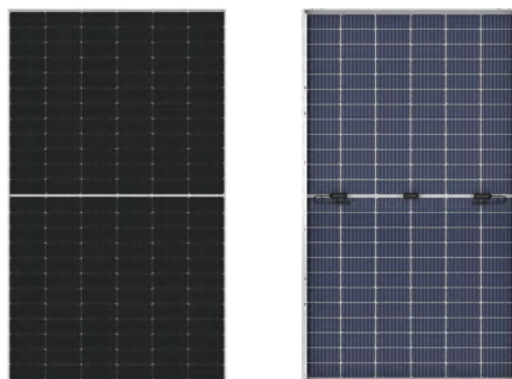
Additional Value

30-Year Power Warranty



Mechanical Parameters

Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm², positive 400 / negative 200mm length can be customized
Glass	Dual glass, 2.0mm coated tempered glass
Frame	Anodized aluminum alloy frame
Weight	32.3kg
Dimension	2256×1133×35mm
Packaging	31pcs per pallet / 155pcs per 20' GP / 620pcs per 40' HC



Electrical Characteristics STC: AM1.5 1000W/m² 25°C Test uncertainty for P_{max}: ±3%

Power Class	520	525	530	535	540	545
Maximum Power (Pmax/W)	520	525	530	535	540	545
Open Circuit Voltage (Voc/V)	48.90	49.05	49.20	49.35	49.50	49.65
Short Circuit Current (Isc/A)	13.57	13.65	13.71	13.78	13.85	13.92
Voltage at Maximum Power (Vmp/V)	41.05	41.20	41.35	41.50	41.65	41.80
Current at Maximum Power (Imp/A)	12.67	12.75	12.82	12.90	12.97	13.04
Module Efficiency(%)	20.3	20.5	20.7	20.9	21.1	21.3

Operating Parameters

Operational Temperature	-40°C ~ +85°C
Power Output Tolerance	0 ~ +5 W
Voc and Isc Tolerance	±3%
Maximum System Voltage	DC1500V (IEC/UL)
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	UL type 29
Bifaciality	70±5%

Mechanical Loading

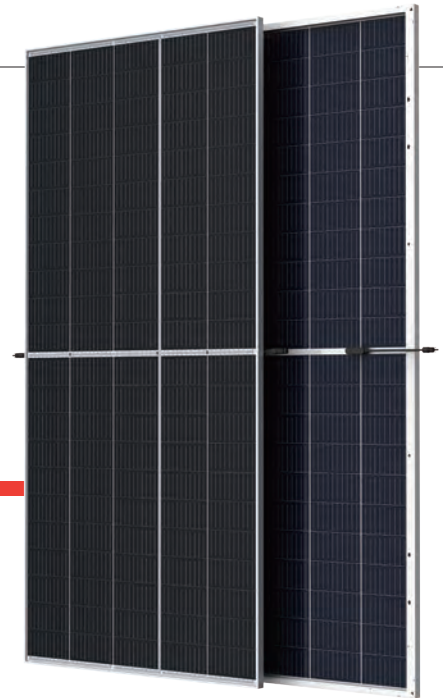
Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

Temperature Ratings (STC)

Temperature Coefficient of Isc	+0.050%/°C
Temperature Coefficient of Voc	-0.284%/°C
Temperature Coefficient of Pmax	-0.350%/°C

THE Vertex

BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE



550W

MAXIMUM POWER OUTPUT

21.0%

MAXIMUM EFFICIENCY

0~+5W

POSITIVE POWER TOLERANCE

Founded in 1997, Trina Solar is the world's leading total solution provider for solar energy. With local presence around the globe, Trina Solar is able to provide exceptional service to each customer in each market and deliver our innovative, reliable products with the backing of Trina as a strong, bankable brand. Trina Solar now distributes its PV products to over 100 countries all over the world. We are committed to building strategic, mutually beneficial collaborations with installers, developers, distributors and other partners in driving smart energy together.

Comprehensive Products and System Certificates

IEC61215/IEC61730/IEC61701/IEC62716

ISO 9001: Quality Management System

ISO 14001: Environmental Management System

ISO14064: Greenhouse Gases Emissions Verification

ISO45001: Occupational Health and Safety Management System



Trina solar

PRODUCTS

TSM-DEG19C.20

POWER RANGE

530-550W



High customer value

- Lower LCOE (Levelized Cost Of Energy), reduced BOS (Balance of System) cost, shorter payback time
- Lowest guaranteed first year and annual degradation; extended 30-year warranty
- Designed for compatibility with existing mainstream system components
- Higher return on Investment



High power up to 550W

- Up to 21.0% module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection



High reliability

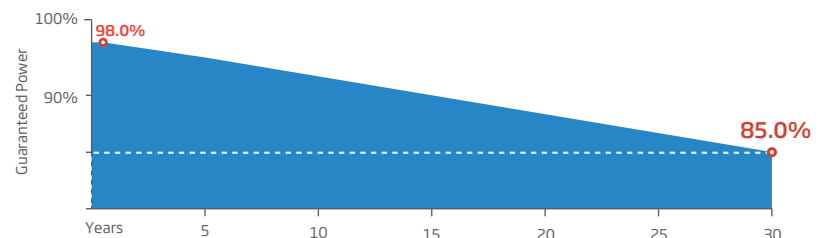
- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load
- Certificated to fire class A



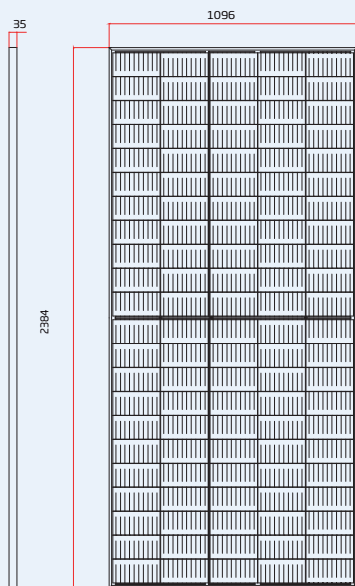
High energy yield

- Excellent IAM (Incident Angle Modifier) and low irradiation performance, validated by 3rd party certifications
- The unique design provides optimized energy production under inter-row shading conditions
- Lower temperature coefficient (-0.34%) and operating temperature
- Up to 25% additional power gain from back side depending on albedo

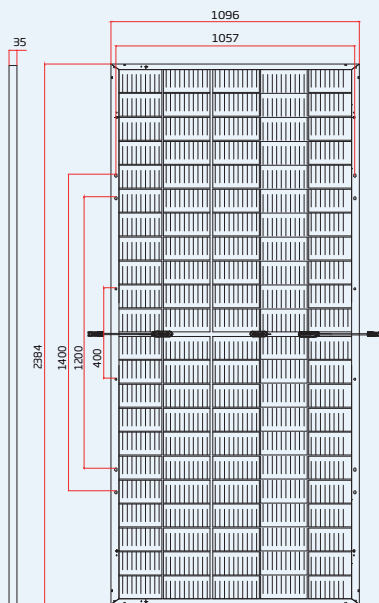
Trina Solar's Vertex Bifacial Dual Glass Performance Warranty



DIMENSIONS OF PV MODULE(mm)

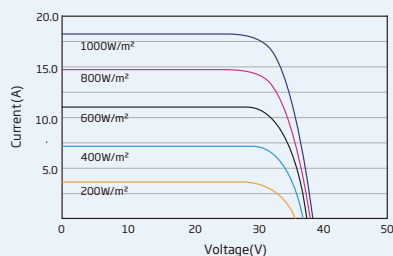


Front View

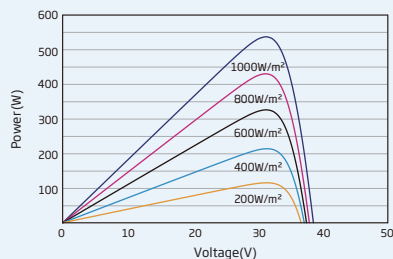


Back View

I-V CURVES OF PV MODULE(540W)



P-V CURVES OF PV MODULE(540W)



ELECTRICAL DATA (STC)

Peak Power Watts- P_{MAX} (Wp)*	530	535	540	545	550
Power Tolerance- P_{MAX} (W)	0 ~ +5				
Maximum Power Voltage- V_{MPP} (V)	31.0	31.2	31.4	31.6	31.8
Maximum Power Current- I_{MPP} (A)	17.11	17.16	17.21	17.24	17.29
Open Circuit Voltage- V_{OC} (V)	37.3	37.5	37.7	37.9	38.1
Short Circuit Current- I_{SC} (A)	18.19	18.24	18.30	18.35	18.39
Module Efficiency η_m (%)	20.3	20.5	20.7	20.9	21.0

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5.
*Measuring tolerance: $\pm 3\%$.

Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power - P_{MAX} (Wp)	567	573	578	583	589
Maximum Power Voltage- V_{MPP} (V)	31.0	31.2	31.4	31.6	31.8
Maximum Power Current- I_{MPP} (A)	18.31	18.36	18.41	18.45	18.50
Open Circuit Voltage- V_{OC} (V)	37.3	37.5	37.7	37.9	38.1
Short Circuit Current- I_{SC} (A)	19.46	19.52	19.58	19.63	19.68
Irradiance ratio (rear/front)	10%				

Power Bifaciality: 70 \pm 5%.

ELECTRICAL DATA (NOCT)

Maximum Power- P_{MAX} (Wp)	401	405	409	413	416
Maximum Power Voltage- V_{MPP} (V)	28.8	29.0	29.2	29.4	29.5
Maximum Power Current- I_{MPP} (A)	13.93	13.97	14.02	14.08	14.10
Open Circuit Voltage- V_{OC} (V)	35.1	35.3	35.5	35.7	35.9
Short Circuit Current- I_{SC} (A)	14.66	14.70	14.75	14.79	14.82

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	110 cells
Module Dimensions	2384 \times 1096 \times 35 mm (93.86 \times 43.15 \times 1.38 inches)
Weight	32.6 kg (71.9 lb)
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)
Frame	35mm(1.38 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm ² (0.006 inches ²), Portrait: 280/280 mm(11.02/11.02 inches) Landscape: 2050/2050 mm(80.71/80.71 inches)
Connector	MC4 EV02 / TS4*

*Please refer to regional datasheet for specified connector.

TEMPERATURE RATINGS

NOCT(Nominal Operating Cell Temperature)	43°C ($\pm 2^\circ$ C)
Temperature Coefficient of P_{MAX}	- 0.34%/°C
Temperature Coefficient of V_{OC}	- 0.25%/°C
Temperature Coefficient of I_{SC}	0.04%/°C

(Do not connect Fuse in Combiner Box with two or more strings in parallel connection)

WARRANTY

12 year Product Workmanship Warranty
30 year Power Warranty
2% first year degradation
0.45% Annual Power Attenuation

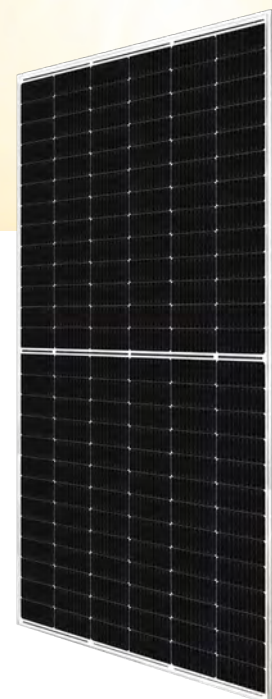
(Please refer to product warranty for details)

MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC)
Max Series Fuse Rating	35A

PACKAGING CONFIGURATION

Modules per box: 31 pieces
Modules per 40' container: 558 pieces



HiKu6 Mono

570 W ~ 590 W

CS6Y-570 | 575 | 580 | 585 | 590MS

MORE POWER



Module power up to 590 W
Module efficiency up to 21.3 %



Lower LCOE & BOS cost,
cost effective product for utility power plant



Comprehensive LID / LeTID mitigation
technology, up to 50% lower degradation



Compatible with mainstream trackers



Better shading tolerance

MORE RELIABLE



Minimizes micro-crack impacts



Heavy snow load up to 5400 Pa,
wind load up to 2400 Pa*



**Enhanced Product Warranty on Materials
and Workmanship***



Linear Power Performance Warranty*

1st year power degradation no more than 2%

Subsequent annual power degradation no more than 0.55%

*According to the applicable Canadian Solar Limited Warranty Statement.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2015 / Quality management system
ISO 14001:2015 / Standards for environmental management system
OHSAS 18001:2007 / International standards for occupational health & safety

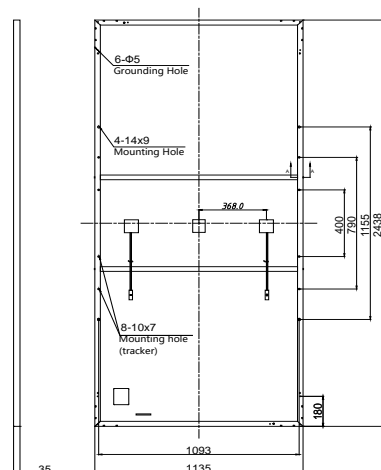
PRODUCT CERTIFICATES*

* As there are different certification requirements in different markets, please contact your local Canadian Solar sales representative for the specific certificates applicable to the products in the region in which the products are to be used.

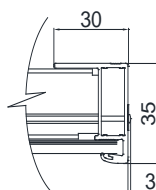
* For detailed information, please refer to the Installation Manual.

ENGINEERING DRAWING (mm)

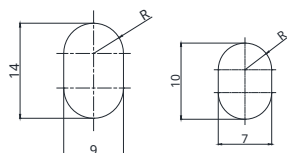
Rear View



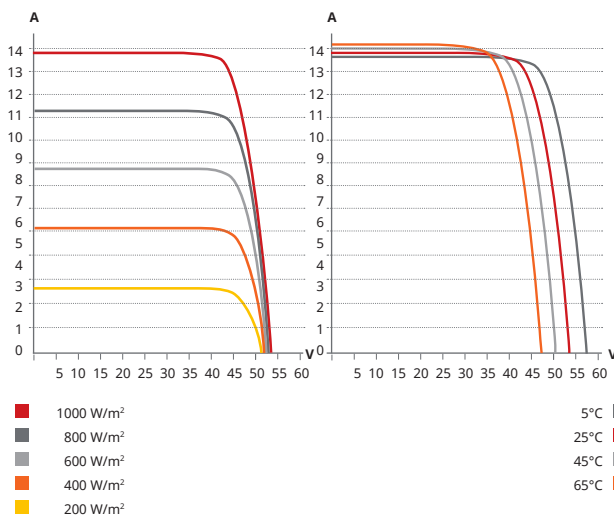
Frame Cross Section A-A



Mounting Hole



CS6Y-580MS / I-V CURVES



ELECTRICAL DATA | STC*

CS6Y	570MS	575MS	580MS	585MS	590MS
Nominal Max. Power (Pmax)	570 W	575 W	580 W	585 W	590 W
Opt. Operating Voltage (Vmp)	43.8 V	44.0 V	44.2 V	44.4 V	44.6 V
Opt. Operating Current (Imp)	13.02 A	13.07 A	13.13 A	13.18 A	13.23 A
Open Circuit Voltage (Voc)	52.8 V	53.0 V	53.2 V	53.4 V	53.6 V
Short Circuit Current (Isc)	13.77 A	13.82 A	13.87 A	13.92 A	13.97 A
Module Efficiency	20.6%	20.8%	21.0%	21.1%	21.3%
Operating Temperature	-40°C ~ +85°C				
Max. System Voltage	1500V (IEC/UL) or 1000V (IEC/UL)				
Module Fire Performance	TYPE 1 (UL 61730) or CLASS C (IEC 61730)				
Max. Series Fuse Rating	25 A				
Application Classification	Class A				
Power Tolerance	0 ~ + 10 W				

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

MECHANICAL DATA

Specification	Data
Cell Type	Mono-crystalline
Cell Arrangement	156 [2x (13 x 6)]
Dimensions	2438 x 1135 x 35 mm (96.0 x 44.7 x 1.38 in)
Weight	31.0 kg (68.3 lbs)
Front Cover	3.2 mm tempered glass
Frame	Anodized aluminium alloy, 2 crossbars enhanced
J-Box	IP68, 3 bypass diodes
Cable	4 mm² (IEC), 12 AWG (UL)
Cable Length (Including Connector)	400 mm (15.7 in) (+) / 280 mm (11.0 in) (-) or customized length*
Connector	T4 series or H4 UTX or MC4-EVO2
Per Pallet	30 pieces
Per Container (40' HQ)	540 pieces

* For detailed information, please contact your local Canadian Solar sales and technical representatives.

ELECTRICAL DATA | NMOT*

CS6Y	570MS	575MS	580MS	585MS	590MS
Nominal Max. Power (Pmax)	425 W	429 W	433 W	436 W	440 W
Opt. Operating Voltage (Vmp)	40.8 V	41.0 V	41.2 V	41.4 V	41.6 V
Opt. Operating Current (Imp)	10.42 A	10.47 A	10.51 A	10.54 A	10.58 A
Open Circuit Voltage (Voc)	49.7 V	49.9 V	50.1 V	50.2 V	50.4 V
Short Circuit Current (Isc)	11.11 A	11.15 A	11.19 A	11.23 A	11.27 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m²-spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.35 % / °C
Temperature Coefficient (Voc)	-0.27 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	42 ± 3°C

PARTNER SECTION



* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. Canadian Solar Inc. reserves the right to make necessary adjustment to the information described herein at any time without further notice.

Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

CANADIAN SOLAR INC.

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INVERTERS

- GE LV5⁺ Solar Power Station
- TMEiC Solar Ware Samurai Series
- Sungrown SG3425/360UD-MV



LV5⁺ Solar Power Station Data Sheet



The LV5⁺ Solar Power Station combines GE's LV5⁺ 1500V solar inverter, with medium voltage power transformer, optional MV switchgear, and various options for a reliable, plug & play, factory integrated power conversion solution for utility-scale solar installations.

The LV5⁺ Solar Inverter is one of the industry's leading 1500V developments and is GE's latest evolution in renewable power electronics. Building on expertise in the renewables industry, GE now offers its latest power conversion technology for efficient, cost effective and dispatchable solar power.

LV5⁺ Solar Power Station Features:

- UL or IEC compliant configurations
- 2.7 - 3.5 MW output power
- High efficiency
- Filter-less air-cooling system
- Plug & play
- Night time disconnect option
- Direct outdoor installation
- Standard 20ft ISO high cube container for optimized logistics and reduced on site installation and commissioning
- Fibre-optic SCADA interface
- Digital APM ready

1. LV5⁺ 1500V Solar Power Station Data

Specifications	Units	LV5+ 1560 Solar Power Station	LV5+ 1563 Solar Power Station	LV5+ 1566 Solar Power Station	LV5+ 1569 Solar Power Station
Input Data					
MPPT Range ¹	Vdc	853 - 1300	895 - 1300	938 - 1300	980 - 1300
Max Permissible DC Voltage	Vdc	1500			
Max Continuous DC Current (at 35°C / 50°C)	Adc	4000 / 3200			
Max DC Short Circuit Interrupt Rating	Adc	12000 ²			
Number of MPPT		1			
Number of DC Inputs		up to 24			
Output Data - Medium Voltage					
Transformer HV / LV Connection		Δ (Delta) / Y (Wye)			
Efficiency at 100% Load (Standard / High)	%	98.8 (Standard) / 99.1 (Option)			
Active AC Output Power (PF=1) ³ (at 35°C / 50°C)	MW	3.08 / 2.73	3.23 / 2.87	3.40 / 3.00	3.54 / 3.14
AC Output Voltage (+10% / -10%) ⁴	kVac	22 / 33 / 34.5			
Max AC Current (at 50°C)	Aac	72 / 48 / 46	76 / 51 / 48	80 / 53 / 51	83 / 56 / 53
Max AC Current (at 35°C)	Aac	82 / 55 / 52	86 / 57 / 55	90 / 60 / 57	94 / 63 / 60
Grid Frequency ±5%	Hz	50 / 60			
Power Factor (PF) Range		0-1 ⁴			
Current Harmonic Distortion (TDD)	%	<3			
Medium Voltage Cable		Designed for 630 mm ² / 1250 MCM max			
Efficiency & Auxiliary Power					
System Efficiency (Max / EU / CEC) ⁵	%	97.8 / 97.6 / 97.7			
Inverter Efficiency (Max / EU / CEC) ⁶	%	98.9 / 98.6 / 98.7			
System Nighttime Aux Power ⁷	W	≤700			
Interfaces					
Plant Control Interface / PLC		EtherNet IP / Modbus TCP, OPCUA, EGD			
Programming / Diagnostic Interface		EtherNet IP / Modbus TCP, OPCUA			
Extra Analog and Digital I/O		Option			
Features and Options					
Cooling		Air Cooled			
Emergency Shut Down		Included			
Mounting Options		Piers / Pad / Gravel			

Specifications	Units	LV5+ 1560 Solar Power Station	LV5+ 1563 Solar Power Station	LV5+ 1566 Solar Power Station	LV5+ 1569 Solar Power Station
Array Configurations Supported		Negative Pole Grounded or Floating			
Ground Fault Monitoring		Standard for Grounded Arrays, Option for Floating Arrays			
Nighttime Transformer Disconnect		Option			
Nighttime VAR Function		Option			
Insulation Monitoring		Option			
Power Disconnect AC Side		Motorized AC Circuit Breaker			
Switch-Disconnect DC Side		Motorized DC Switch			
Overvoltage Protection, DC and AC		Included – IEC 61643-1 Class II / UL 1449			
Main Power Transformer Oil Type		Mineral - ONAN (Standard) / Biodegradable - KNAN (Option)			
Oil Containment		Option			
Aux Power for Tracker / Customer Loads		Option (up to 100 kVA)			
Door Interlocking System		Option			
Weather Station		Option			
Noise (at 1m / 10m) ⁸	dBa	≤85 / ≤75			
Weight	kg / lbs	approx. 17000 / 37480			
Dimensions (L x W x H)	m / ft	6.1 x 2.4 x 2.9 / 20.0 x 8.0 x 8.5			
Protection Rating and Ambient Conditions					
Operating Temperature Range	°C	-25 to +50			
Storage Temperature Range	°C	-40 to +65			
Cold Weather Option ⁹	°C	-35 to +50			
Humidity	%	5-100 (rated for outdoor installation)			
Maximum Altitude without Derating ¹⁰	m / ft	2000 / 6562			
Seismic		Zone 2B ASCE 7 / IBC			
Maximum Wind Speed ¹¹	kph / mph	250 / 155			
Snow Load		ASCE 7			
NEMA Rating / IP Class		NEMA3 / IP54 (Inverter & RMU) NEMA3R / IP23 (Transformer)			
Standards					
Electromagnetic Compatibility (EMC)		EN 61000-6-2, 62920 / CISPR 11			
Certifications		IEC, CE, UL 1741 SA			

¹ At nominal voltage, ideal grid conditions, and PF=1 (at 50°C)

² Up to 5 times per lifetime

³ Implies active power reduction, Altitude ≤ 2000m, grid voltage ≥ nominal voltage

⁴ Derating will apply according to PQ curves

⁵ Preliminary, includes auxiliary power losses

⁶ Preliminary, excludes auxiliary power losses

⁷ No heating, no cooling, without environmental controls enabled, DC link de-energized and without main transformer no load losses, no customer loads, for inverter only auxiliary needs

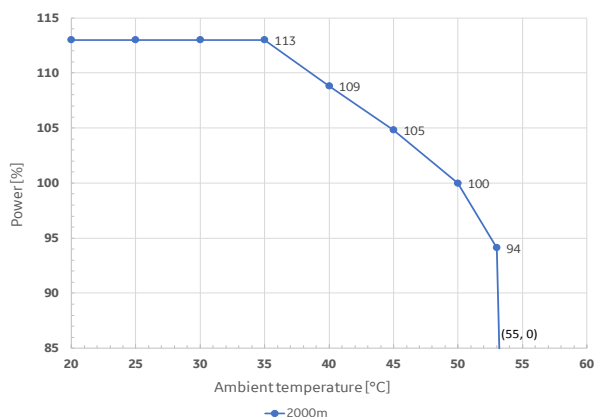
⁸ At 1m / 10m in front of enclosure and 1m up from the ground

⁹ Cold weather option on request

¹⁰ Higher altitudes (with derating) on request

¹¹ Maximum wind speed without derating 81 kph / 50 mph

2. Derating Curve (Altitude and Temperature)¹²



¹² Applicable for grid voltage ≥ nominal voltage, altitudes >2000m on request

www.ge.com/renewableenergy/hybrid

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GEA33501 09/19 - LV5* Solar Power Station Data Sheet

A partner you can trust.

Bankability. Reliability. Serviceability.

TMEIC, a multi-billion \$ joint venture between Toshiba & Mitsubishi-Electric, is a global leader for PV inverter technology innovation.

Bankability

The financial strength you need in an inverter partner. TMEIC is a diversified industrial systems company, serving steel, oil & gas, mining, container crane and a wide variety of power electronics applications.

- #1 market share leader in the Japanese market and #1 worldwide for inverters >99kW
- More than 13 GW of PV Inverters installed world-wide
- Over 35 years of PV inverter manufacturing and R&D experience

Reliability

A level above the competition. TMEIC was the first company to implement advanced 3-level NPS topology and an advanced hybrid cooling system for PV central inverters.

- First central inverter to achieve 99% maximum efficiency
- Heatpipe-based cooling minimizes particle entrance, increasing uptime & reducing O&M cost
- With over 10 GW installed, TMEIC has only had two IGBT field failures.

Serviceability

We're there when you need us! TMEIC's well proven technology is further enhanced with the industry's leading service structure.

- 24/7 US based phone support
- Comprehensive customer training system
- Extended warranty of up to 20 years
- Optional performance guarantee

Global Locations



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Contents subject to change without notice
The Samurai Series name is used by TMEIC exclusively in North America.
Cover photo courtesy of Signal Energy

TMEiC

P-1307-Z
Revised May 2018

SOLAR WARE Samurai Series

Utility-Scale Photovoltaic Inverters
Up to 3360kW, 1500V

TMEiC



Multiple Power Classes

- 2500kW to 3360 kW (1500 V)

1500Vdc Series

- UL 1741 Certified
- Reduces cable mass to minimize cost & enhance flexible plant design
- Reduces combiner box and number of inverters

Award Winning Central Inverters

- Advanced multilevel inverter - 56% of switching loss reduction
- Maximized and optimized efficiency at high load
- Wide MPPT range allowing for best in class DC/AC Ratios
- Flexible DC-input configuration to meet complex array configuration

Maximize Revenue & Improve ROI

- High-yield power generation – Maximum efficiency of 99%
- High-efficiency in any weather
- Realize large capacity with fewer inverters
- Reduce site work and BOS investment

Grid Connection Features

TMEIC developed the grid connection features working with Japanese power companies. All of TMEIC’s utility scale inverters include the latest interconnection technology. These features include:

- Power factor control
- Reactive/Active power control
- TMEIC’s proprietary anti-islanding technique utilizes a slip mode frequency shift method
- Advanced Fault Ride Through Features

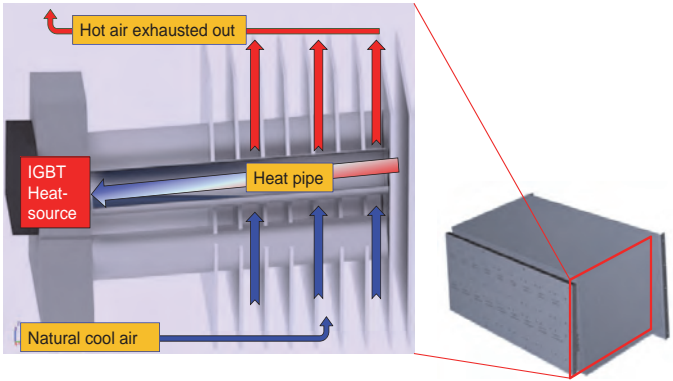
Advanced Hybrid Cooling System

The first heat pipe air-cooled PV inverter

Utilizing TMEIC heat pipe technology, the inverter runs without fan operation up to 50% load. Heat-pipe cooling significantly simplifies thermal management, because it uses fewer parts and only a slow-speed fan with a heat pipe heat sink. TMEIC’s advanced hybrid cooling solution:

- Simple & Robust
- High Reliability
- Significantly reduces O&M costs
- Small Footprint

The Fan-less mode runs when the inverter is below 50% load @ 50°C. Natural convection provides necessary cooling. Cool air enters from the bottom, flows through the heat pipe, and hot air is exhausted from the top.



SPECIFICATIONS

Type		PVH-L2500GR	PVH-L2700GR	PVH-L3200GR	PVH-L3360GR
Output side (AC)	Rated Power	2500 kW / 2500 kVA	2700 kW / 2700 kVA	3200 kW / 3200 kVA	3360 kW / 3360 kVA
	Rated Voltage (3-phase)	550V +10%*1	600V +10%*1	600V +10%*1	630V +10%*1
	Rated Frequency	60/50 Hz	60/50 Hz (+0.5Hz, -0.7Hz)	60/50 Hz (+0.5Hz, -0.7Hz)	60/50 Hz (+0.5Hz, -0.7Hz)
	Rated Power Factor	Over 0.99	Over 0.99	Over .99	Over .99
	Reactive Capability	+/-980 kVAR *4	+/-1020 kVAR*4	1394 kVAR	1464 kVAR*5
	Rated Current	2624 Arms	2598 Arms	3079 Arms	3079 Arms
	Maximum Current	2624 Arms	2598 Arms	3079 Arms	3079 Arms
	Maximum Efficiency	98.8%	98.8%	98.8%	98.9%*5
	CEC Efficiency	98.5%	98.5%	98.5%	98.5%*5
Input side (DC)	Maximum Voltage	1500 Vdc	1500 Vdc	1500 Vdc	1500 Vdc
	MPPT Operation Range	800 Vdc ~ 1300 Vdc	875 Vdc ~ 1300 Vdc	875 Vdc ~ 1300 Vdc	915 Vdc ~ 1300 Vdc
Environ. Conditions	Ingress Protection Ratings	NEMA3R			
	Installation	Outdoor			
	Ambient Temperature Range	-20°~40°C (-4°~104°F)*3		-25°~40°C (-13°~104°F)*3	
	Maximum Altitude	2000 m (contact TMEIC for ratings above 2000 m)			
Protective Functions	Input (DC) Side	Ground Fault, DC Reverse Current, Over Voltage, Over Current			
	Grid (AC) Side	Anti-islanding, Over/Under Voltage, Over/Under Frequency, Over Current			
	Grid Assistance	Reactive/Active Power Control, Power Factor Control, Fault Ride Through (optional)			
User Interface	User Interface	LCD (3.8 inch, QVGA) with Touch-Screen			
	Communication	Modbus/TCP			
Fault Analysis		Fault Event Log, Waveform Acquisition via memory card			
Compliance		UL1741/IEEE1547; UL1741 Supplement SA; NEC standard		UL1741/CSA C22.1 107.1/IEEE1547; UL1741 Supplement SA; NEC standard	
Cooling Method		Advanced Hybrid Cooling			
Number of Inputs		Up to 32			
Standard Control Power Supply		Control Power Supply from Inverter output and Capacitor backup circuit (3 sec. compensation)			
Weight		13,228 lbs (6000 kg)			13,228 lbs. (6,000 kg)*5
Dimensions (H x W x D)		92 x 197 x 46 inch (2286x5000x1150 mm)			
Floor Space		8,914 sq. in. (5.75 m²)			
Color		Cabinet: Sand White #Dic583, Roof: Gray #Munsel N4.5			

Notes:

- ^{*1} Full power available at and above nominal voltage. Derate will apply below nominal voltage.
- ^{*2} Transition from constant DC voltage mode to MPPT mode occurs between 595V and 605V.
- ^{*3} Contact a TMEIC Sales Manager for detailed temperature derates and operational ranges.
- ^{*4} Available reactive capability with reduction in active power.
- ^{*5} Preliminary testing.

SG3425/3600UD-MV

SUNGROW

Clean power for all

Turnkey Station for North America 1500 Vdc System - MV
Transformer Integrated



HIGH YIELD

- Advanced three-level technology, max. efficiency 98.9%
- Full power operation at 45 °C (113 °F)
- Effective cooling, wide operation temperature
- Max. DC/AC ratio up to 2.0

EASY O&M

- Integrated current, voltage and MV parameters monitoring function for online analysis and trouble shooting
- Modular design, easy for maintenance

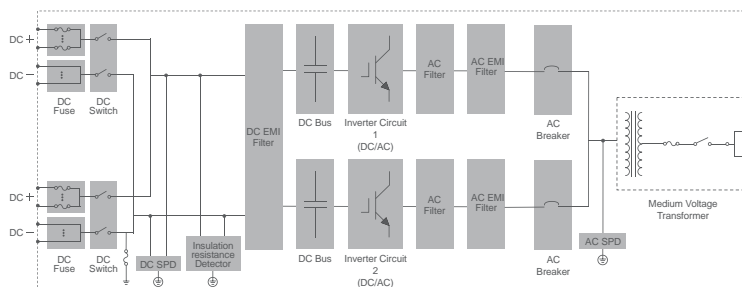
SAVED INVESTMENT

- Low transportation and installation cost due to 20-foot container size design
- DC 1500V system, low system cost
- Integrated MV transformer and LV auxiliary power supply
- Q at night optional

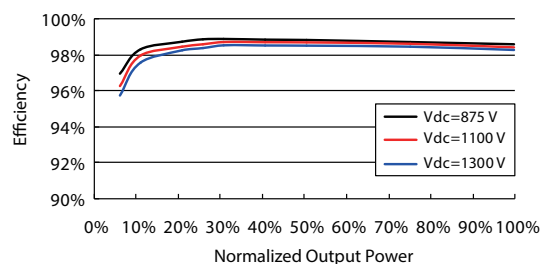
GRID SUPPORT

- Compliance with standards: UL 1741, UL 1741 SA, IEEE 1547, Rule 21 and NEC code
- Low / High voltage ride through (L/HVRT), L/HFRT, soft start / stop
- Active & reactive power control and power ramp rate control

CIRCUIT DIAGRAM



EFFICIENCY CURVE (SG3425UD)



Type designation	SG3425UD-MV	SG3600UD-MV
Input (DC)		
Max. PV input voltage	1500V	
Min. PV input voltage / Startup input voltage	875 V / 915 V	915 V / 955 V
Available DC fuse sizes	250A, 315A, 400A, 450A, 500A	
MPP voltage range for nominal power	875 – 1300 V	915 – 1300 V
No. of independent MPP inputs	1	
No. of DC inputs	20 (optional: 22 / 24 / 26 / 28)	
Max. DC short-circuit current	10000 A	
PV array configuration	Negative grounding or floating	
Output (AC)		
AC output power	3425 kVA @ 45 °C (113 °F), 3083 kVA @ 50 °C (122 °F)	3600 kVA @ 45 °C (113 °F), 3240 kVA @ 50 °C (122 °F)
Nominal grid frequency / Grid frequency range	50 Hz / 45 – 55 Hz, 60 Hz / 50 – 65 Hz	
THD	< 3 % (at nominal power)	
DC current injection	< 0.5 % In	
Efficiency		
Inverter Max. efficiency	98.9 %	
Inverter CEC efficiency	98.5 %	
Transformer		
Transformer rated power	3425 kVA	3600 kVA
Transformer max. power	3425 kVA	3600 kVA
LV / MV voltage	0.6 kV / (12 – 35) kV	0.63 kV / (12 – 35) kV
Transformer vector	Dy1 or Dy11	
Transformer cooling type	ONAN (Optional: KNAN)	
Protection		
DC input protection	Load break switch + fuse	
Inverter output protection	Circuit breaker	
AC MV output protection	Load break switch + fuse	
Overvoltage protection	DC Type II / AC Type II	
Grid monitoring / Ground fault monitoring	Yes / Yes	
Insulation monitoring	Yes	
Overheat protection	Yes	
General Data		
Dimensions (W * H * D)	6058 * 2896 * 2438 mm 238.5" * 114.0" * 96.0"	
Weight	18000 kg 39683.2 lbs	
Degree of protection	NEMA 4X (Electronic for Inverter) / NEMA 3R (Others)	
Auxiliary power supply	5kVA, 120Vac/240Vac; Optional: 30kVA, 480Vac/277Vac	
Operating ambient temperature range	-35 to 60 °C (> 45 °C derating) / optional: -40 to 60 °C (> 45 °C derating) -22 to 140 °F (> 113 °F derating) / optional: -40 to 140 °F (> 113 °F derating)	
Allowable relative humidity range	0 - 100 %	
Cooling method	Temperature controlled forced air cooling	
Max. operating altitude	1000 m (Standard) / > 1000 m (Customized) (3280.8 ft (standard) / > 3280.8 ft (Customized))	
DC-Coupled storage interface	Optional	
Charging power from the grid	Optional	
Communication	Standard: RS485, Ethernet; Optional: optical fiber	
Compliance	UL 1741, IEEE 1547, UL1741 SA, NEC 2017, CSA C22.2 No.107.1-01	
Grid support	Q at night function (optional), L/HVRT, L/HFRT, Active & reactive power control and power ramp rate control, Volt-var, Frequency-watt	

RACKING

- Nextracker NX Gemini™ two-in-portrait
- Array Technologies DuraTrack® HZ v3

NX Gemini

Two-in-Portrait Smart Solar Tracker

The NX Gemini™ two-in-portrait (2P) solar tracker optimizes lifetime value and performance, helping project developers and asset owners get the most from their power plant. Ideally suited for sites with challenging soils, high winds, and irregular boundaries, the ruggedized 2P tracker features a patent-pending distributed drive system for maximum stability in extreme weather, eliminating the need for dampers and producing virtually zero energy losses associated with stowing.

Capitalize with Highest Power Density Solar Tracker

NX Gemini's flexible 2P module configuration allows for the maximum number of modules per foundation, requiring only 60 meters and seven foundation posts to provide support for up to 120 modules on four 1500-volt strings. With the lowest number of foundations per megawatts on the solar tracker market today, NX Gemini helps reduce tracker installation costs on difficult sites.

Pair with TrueCapture and Bifacial for Maximum Performance

The 2P tracker can be equipped with either monofacial or bifacial PV modules and integrated with the entire Nextracker software ecosystem, including the TrueCapture™ advanced smart control and energy yield enhancement platform. Incorporated into the NX Gemini design is the field-proven innovations found in NX Horizon™, such as independent-row architecture, intelligent control systems and wireless communications.



The Nextracker team has always collaborated with us during their product development process, resulting in trackers that are faster to build, compatible for more sites and easier to maintain. NX Gemini is a strong tracker option for sites with challenging topography and geotechnical conditions.

— **George Hershman**, President,
Swinerton Renewable Energy

Features and Benefits

Industry-leading

2P design with 7 foundations points per 120 module row

Ideal

for challenging soils

Bifacial-optimized

for maximum performance

Patent-pending

distributed drive system for maximum stability in high winds

TrueCapture ready gain up to **6% more energy**

Special rotation

feature for high velocity module installation



Installer-friendly array height with construction rotation feature for faster, easier installation

GENERAL AND MECHANICAL

Tracking type	Horizontal single-axis, independent row
String voltage	1,500 V _{DC}
Typical row size	112 – 120 modules, depending on module string length
Drive type	NX patent-pending self-locking, distributed drive
Motor type	48 V brushless DC motor
Array height	Rotation axis elevation 1.9 to 2.5 m / 6'2" to 8'2"
Ground coverage ratio (GCR)	Typical range 28–50%
Modules supported	Mounting options available for most utility-scale crystalline modules
Bifacial features	Available with optimized central torque tube gap
Tracking range of motion	±50°
Operating temperature range	Array powered: -20°C to 55°C (-4°F to 131°F) AC powered: -40°C to 55°C (-40°F to 131°F)
Module configuration	2 in portrait. 4 x 1,500 strings per standard tracker. Partial length trackers available.
Module attachment	Self-grounding, electric tool-actuated fasteners standard. Clamping system optional.
Materials	Galvanized steel
Allowable wind speed	Configurable up to 235 kph (145 mph) 3-second gust
Wind protection	Intelligent wind stowing with self-locking, distributed drive system for maximum array stability in all wind conditions
Foundations	Standard W8 section foundation posts. Typically ~160 piers / MW.

ELECTRONICS AND CONTROLS

Solar tracking method	Astronomical algorithm with backtracking. TrueCapture™ upgrades available for terrain adaptive backtracking and diffuse tracking mode
Control electronics	NX tracker controller with inbuilt inclinometer and backup battery
Communications	Zigbee wireless communications to all tracker rows and weather stations via network control units (NCUs)
Nighttime stow	Yes
Power supply	ARRAY POWERED: NX Integrated DC pre-combiner & power supply AC POWERED: Customer-provided AC circuit

INSTALLATION, OPERATIONS AND SERVICE

PE stamped structural calculations and drawings	Included
Onsite training and system commissioning	Included
Installation requirements	Simple assembly using swaged fasteners and bolted connections. No field cutting, drilling or welding.
Monitoring	NX Data Hub™ centralized data aggregation and monitoring
Module cleaning compatibility	Compatible with virtually all standard cleaning systems
DC string monitoring	Available with array-powered option
Warranty	10-year structural, 5-year drive and control components
Codes and standards	UL 3703 / UL 2703 / IEC 62817

**99.996%
UPTIME.
ENGINEERED
SIMPLICITY.**

**7%
LOWER
LCOE**

**31%
LOWER
LIFETIME
O&M**

DuraTrack® HZ v3

Three decades of field-tested design improvements have resulted in the DuraTrack® HZ v3 — the most durable, reliable tracking system under the sun. While our single-bolt module clamp and forgiving tolerances streamline installation, and our flexibly linked architecture maximizes power density, it's our innovative use of fewer components and a failure-free wind management system that makes Array Technologies the best choice for solar trackers. **Better. Stronger. Smarter.**



HIGH POWER DENSITY.

Higher density means more power and more profit. DuraTrack HZ v3 offers the unique ability to maximize the power density of each site, boasting 100 modules per row and higher density than our closest competition.



LEADING TERRAIN ADAPTABILITY.

Our flexibly linked architecture, with articulating driveline joints and forgiving tolerances, creates the most adaptable system on the market for following natural land contours while creating the greatest power generation potential from every site.



FEWER COMPONENTS. GREATER RELIABILITY.

Array was founded on a philosophy of engineered simplicity. Minimizing potential failure points (167 times fewer components than competitors), DuraTrack HZ v3 consistently delivers higher reliability and superior uptime.



FAILURE-FREE WIND DESIGN.

DuraTrack HZ v3 was designed and field tested to withstand some of the harshest conditions on the planet. It is the only tracker on the market that reliably handles wind events with a fully integrated, fully mechanical, passive wind-load mitigation system without the need for complex communication systems, batteries, or power.



ZERO SCHEDULED MAINTENANCE.

Maintenance-free motors and gears, fewer moving parts, and industrial-grade components—what does this mean for our customers? No scheduled maintenance required. While our competitors average two unscheduled maintenance events per day, we average only one per year.

COST VERSUS VALUE

We believe value is more than the cost of a tracking system. It's about building with forgiving tolerances and fewer parts so construction crews can work efficiently. It means protecting your investment with a failure-free wind management system. It also includes increasing power density. But most of all, value is measured in operational uptime, or reliability.

THE GLOBAL LEADER IN RELIABILITY

Array has spent decades designing and perfecting the most reliable tracker on the planet. Fewer moving parts, stronger components and intelligent design that protects your investment in the harshest weather are but a few of the innovative differences that keep your system running flawlessly all day and you resting easy at night.

ARRAY TECHNOLOGIES, INC.

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arraytechinc.com

30 GW YEARS OF
OPERATION

167x FEWER COMPONENTS THAN
COMPETITIVE TRACKERS

STRUCTURAL & MECHANICAL FEATURES/SPECIFICATIONS

Tracking Type	Horizontal single axis
Less than 1 drive motor /MW	Up to 1.559 MW DC
String Voltage	Up to 1,500V DC
Maximum Linked Rows	32
Maximum Row Size	116 modules crystalline, and bifacial: 240 modules First Solar 4; 90 modules First Solar 6 and 6 Plus
Drive Type	Rotating gear drive
Motor Type	2 HP, 3 PH, 480V AC
East-West/North-South Dimensions	Site / module specific
Array Height	54" standard, adjustable (48" min height above grade)
Ground Coverage Ratio (GCR)	Flexible, 28–45% typical, others supported on request
Terrain Flexibility	N-S tolerance: 0-15% standard, 26% optional; Driveline: 40° in all directions
Modules Supported	Most commercially available, including framed and frameless thin film, crystalline silicon, hetero junction and bifacial.
Tracking Range of Motion	± 52° standard, ± 62° optional
Operating Temperature Range	-30°F to 140°F (-34°C to 60°C)
Module Configuration available.	Single-in-portrait standard, including bifacial. Four-in-landscape (thin film)
Module Attachment	Single fastener, high-speed mounting clamps with integrated grounding. Traditional rails for crystalline in landscape, custom racking for thin film and frameless crystalline and bifacial per manufacturer specs.
Materials	Pre-galv steel, HDG steel and aluminum structural members, as required
Allowable Wind Load (ASCE 7-10)	140 mph, 3-second gust exposure C
Wind Protection	Failure free passive mechanical system protects against wind damage without the use of complex communications systems, batteries — no power required

ELECTRONIC CONTROLLER FEATURES/SPECIFICATIONS

Solar Tracking Method	Algorithm with GPS input
Control Electronics	MCU plus Central Controller
Data Feed	MODBUS over Ethernet to SCADA system
Night-time Stow	Yes
Tracking Accuracy	± 2° standard, field adjustable
Backtracking	Yes

INSTALLATION, OPERATION & MAINTENANCE

Software	SmarTrack optimization available
PE Stamped Structural Calculations & Drawings	Yes
On-site Training and System Commissioning	Yes
Connection Type	Fully bolted connections, no welding
In-field Fabrication Required	No
Dry Slide Bearings and Articulating Driveline Connections	No lubrication required
Scheduled Maintenance	None required
Module Cleaning Compatibility	Robotic, Tractor, Manual

GENERAL

Annual Power Consumption (kWh per 1 MW)	400 kWh per MW per year, estimate
---	-----------------------------------

Step-Up Transformer

- Prolec Substation Transformers



Substation Transformers up to 69 kV



Powering reliable solutions for you



Prolec GE offers a complete line of liquid-filled distribution transformers that meet current applicable ANSI™ / IEEE™ standards.

In addition to the already existing Substation Transformers product line Prolec GE now offers its brand new transformers, with high voltages from 34.5 kV to 69 kV and ranging from 5 MVA to 12 MVA (ONAN). These type of transformers are used in a wide range of utility, and industrial applications. High-grade materials, combined with state of the art technology in our design and manufacturing systems, are key elements of a transformer that will deliver years of high reliability service.

Prolec GE Substation Transformers meet all of your industrial applications for electric distribution.

Standard features

- Insulating mineral oil
- Externally operated de-energized tap changer with (2) 2.5% full capacity taps above and below nominal
- High voltage cover-mounted bushings
- Low voltage cover and side-mounted bushings
- Pressure-vacuum gauge
- Top filter press valve provision
- Liquid level gauge
- Liquid temperature gauge
- Winding temperature device
- Pressure relief device
- Pressure test valve
- ANSI grounding pad
- Drain / filter valve with sampling device
- Tank lifting lugs

- Corrosion resistant nameplate
- ANSI 61 paint finish, 5 mils thickness
- ANSI 70 paint finish, 5 mils thickness
- Hydran Provision
- Removable radiators
- 60 Hertz operation
- 65° C average winding rise

Optional features & accessories

- Forced air cooling
- Future fan wiring and control
- Winding temperature device (additional)
- Sudden pressure relay with or without seal in
- Devices with alarm contacts
- Top filter press valve
- Low voltage flange connections
- Low Voltage air terminal compartments
- Current transformers (additional)
- Neutral grounding resistor
- Special impedances and low losses
- Special environment (i.e: classified areas)
- Special/Low sound level
- 50 Hertz
- Seismic zone III and IV and IBC
- Stainless and galvanized steel removable radiators
- Special paint for marine environment
- Special colors and paint thickness
- CSA compliance
- Other special features upon request
- 55° C, 55/65° C average winding rise

Tests

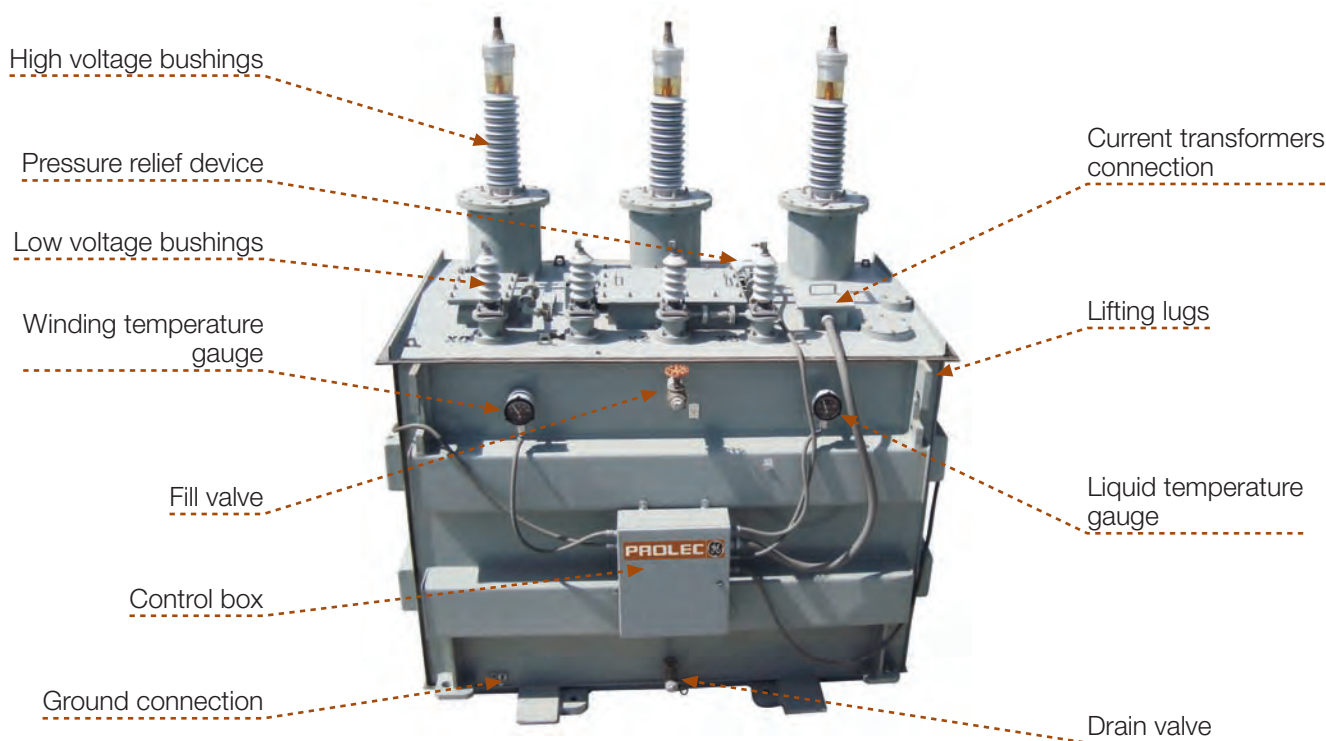
Each transformer receives all standard commercial tests in accordance with ANSI C57.12.90 (latest revision), with test reports available by serial number of the transformer.

Routine tests include:

- Resistance tests of all windings
- Ratio test on all tap positions
- Polarity and phase relation tests at rated voltage
- No load loss at rated voltage
- Exciting current at rated voltage
- Impedance and load losses
- Applied voltage test
- Induced voltage test
- Full wave impulse test

ANSI is a registered trademark of American National Standards Institute, Incorporated.

IEEE is a registered trademark of the Institute of Electrical Electronics Engineers, Inc.



Overall dimensions for reference

Weight (Lbs.) Volume (Gallons) and Dimensions (Inches)					
kVA	Height	Large	Depth	Oil	Weight
5000	154	180	150	2,400	48,000
7500	158	175	185	2,800	60,000
10000	167	263	157	3,200	74,000
12000	164	263	177	3,200	77,000

Standard Primary Voltage Ratings, kV
46
69

Standard Secondary Voltage Ratings
4160 Y / 2400 V
12470 Y / 7200 V
13200 Y / 7620 V
13800 Y / 7960 V
23000 Y / 13280 V

For kVAs not listed, contact factory.

Dimensions and weights are approximate and subject to change without notice and should not be used for construction purposes.

Standard kVA Ratings
5000
7500
10000
12000

Liquid filled impulse ratings	
Nominal System Voltage, kV	Standard BIL, kV
46	250
69	350

This foregoing document was electronically filed with the Public Utilities

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in

Case No(s). 21-0117-EL-BGN

Summary: Application Appendix J (Representative Equipment Standards) electronically filed by Mr. Michael J. Settineri on behalf of Kingwood Solar I LLC