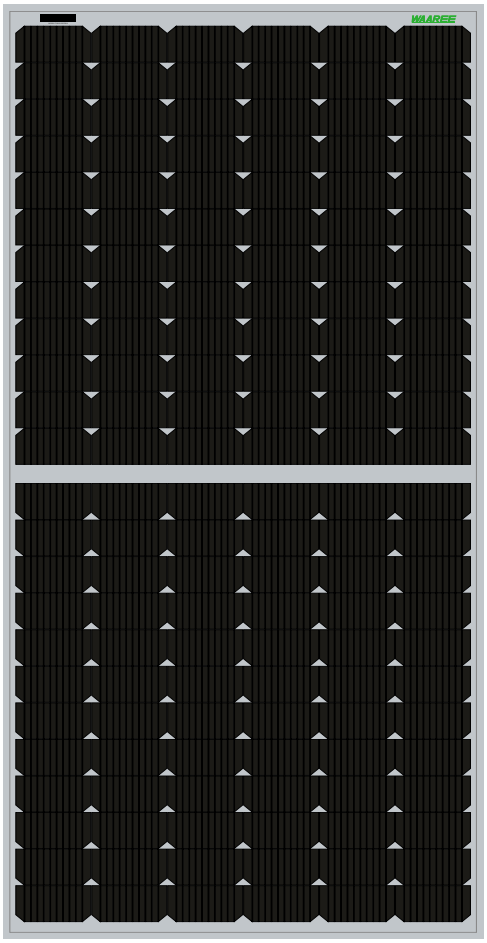
AHNAY SERIES

Bi-55-515 to Bi-55-545

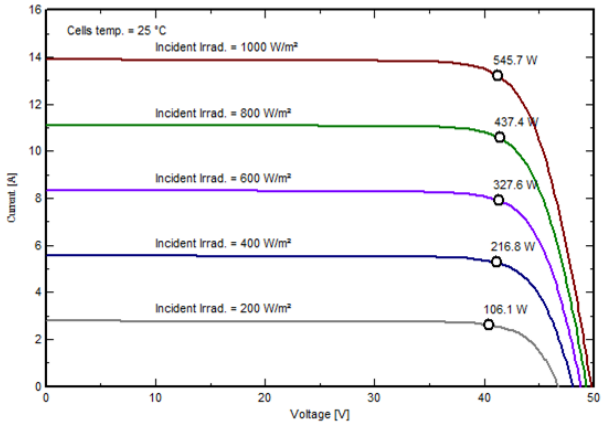
Framed dual glass bifacial module

WAAREE®
One *with the* Sun

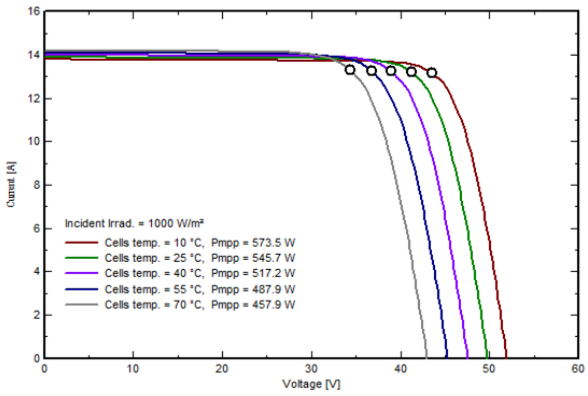
- Highest reliability & enhanced crack tolerant 10BB module
- Module utilizing Half cut cell for optimum performance
- Highly efficient Mono PERC M10 cells
- Best in class thermal coefficients
- Highest commercial gains, lower LCOE
- Split junction box improve heat dissipation
- Increase shade tolerance



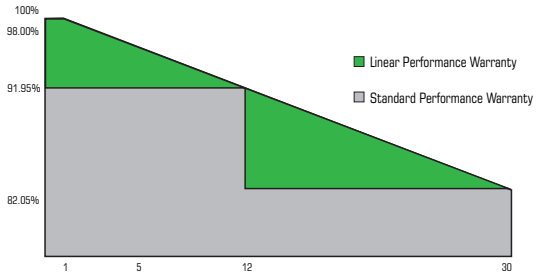
I-V VARIATION WITH IRRADIANCE



I-V VARIATION WITH TEMPERATURE



The Graphs are for reference purpose only. Please consult Waaree technical team for further clarifications.



ISO 9001:2015 I ISO 14001:2015 I ISO 45001:2018
Independent assessment of factories by BLACK & VEATCH

AHNAY SERIES

Bi-55-515 to Bi-55-545

Framed dual glass bifacial module

WAAREE®
One with the Sun

ELECTRICAL CHARACTERISTICS

Models	Pmax (W)		Vmp (V)		Imp (A)		Isc (A)		Voc (V)		Module Eff. (%)
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	
Bi-55-515	515	388.3	40.99	37.70	12.57	10.29	13.49	10.89	48.86	45.80	20.01
Bi-55-520	520	391.9	41.14	37.90	12.65	10.34	13.55	10.94	49.01	46.00	20.20
Bi-55-525	525	395.6	41.29	38.00	12.73	10.40	13.63	11.00	49.16	46.10	20.39
Bi-55-530	530	399.2	41.45	38.20	12.80	10.45	13.69	11.05	49.31	46.20	20.59
Bi-55-535	535	403.1	41.60	38.40	12.88	10.51	13.76	11.11	49.46	46.40	20.78
Bi-55-540	540	406.7	41.75	38.50	12.95	10.56	13.83	11.16	49.61	46.50	20.98
Bi-55-545	545	410.4	41.90	38.70	13.02	10.62	13.90	11.22	49.76	46.70	21.17

*Standard Test Conditions (STC) - 1000 W/m2 irradiance, Air Mass 1.5 and 25°C cell temperature. Nominal Operating Cell Temperature (NOCT) - 800 W/m2 irradiance, Air Mass 1.5, Ambient temperature 20°C and Wind speed 1 m/s. Average power reduction of 4.5% at 200 W/m2 as per IEC 60904-1. Measuring Uncertainty ± 3%.

System Voltage	1500 V

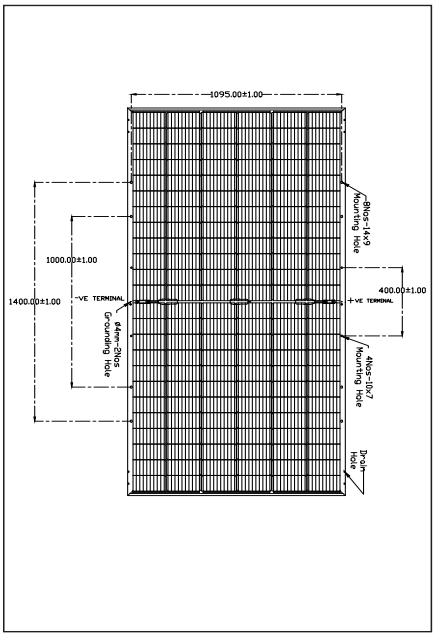
Series Fuse Rating	25 A

BI-FACIAL OUTPUT - BACKSIDE POWER GAIN*

		Bi-55-515	Bi-55-520	Bi-55-525	Bi-55-530	Bi-55-535	Bi-55-540	Bi-55-545
15%	Power Output (W)	592	598	604	610	615	621	627
	Module Efficiency (%)	23.01%	23.23%	23.45%	23.68%	23.90%	24.12%	24.35%
20%	Power Output (W)	618	624	630	636	642	648	654
	Module Efficiency (%)	24.01%	24.24%	24.47%	24.71%	24.94%	25.17%	25.41%
25%	Power Output (W)	644	650	656	663	669	675	681
	Module Efficiency (%)	25.01%	25.25%	25.49%	25.74%	25.98%	26.22%	26.46%
30%	Power Output (W)	670	676	683	689	696	702	709
	Module Efficiency (%)	26.01%	26.26%	26.51%	26.77%	27.02%	27.27%	27.52%

*The bifacial gains are dependant on the power plant design and location

DESIGN SPECIFICATIONS



THERMAL CHARACTERISTICS

Temperature coefficient of Current (Isc), α (%/°C)	0.05
Temperature coefficient of Voltage (Voc), ß (%/°C)	-0.27
Temperature coefficient of Power (Pm), γ (%/°C)	-0.35
NOCT (°C)	43 ± 2
Operating temperature range (°C)	-40 to 85

MECHANICAL CHARACTERISTICS

Length x Width x Thickness (L x W x T)	2272 mm (L) x 1133 mm (W) x 35 mm (T)
Weight	32.5 kgs
Solar Cells per Module (Units) / Arrangement	144 cells / (12x6 || 12x6)
Solar Cell Type & Size	Mono PERC Bifacial, 91 x 182 mm
Front / Back Glass (Material / Thickness)	2.0 mm Low Iron glass
Encapsulate	PID Free & UV Resistant
Junction Box (Protection degree / Material)	IP68 / Weatherproof PPO
Cable & Connector (Protection degree / Type)	IP68 rated / MC4 compatible
Cable cross - section & Length	4 mm^2 & 250 mm (Cable + Connector)

Waaree Energies Ltd. is amongst the top Solar Energy Companies and has the country's largest Solar PV Module manufacturing capacity of 5 GW. In addition, it is committed to provide top notch EPC services, project development, rooftop solutions, solar water pumps and also in an Independent Power Producer. Waaree has its presence in over 325+ locations nationally and 68 countries globally.

12 Years Product Warranty • 30 Years Power Output Warranty

- The electrical data given here is for reference purpose only.
- Please confirm your exact requirements with the sales representative while placing your order.
- Refer installation Manual instructions & Waaree warranty statement for terms & conditions.
- Waaree Reserves the right to change the specifications without prior notice.z

WEL/E&PD/515-545/144/MPB/HC/07/17.11.2021

HEM

The turn-key solution, simplifies the task of designing the installation, and reduces connection costs.

HEM

REFERENCES		FS4200M
OUTPUT	AC Output Power (kVA/kW) @40°C[1]	4200
	AC Output Power (kVA/kW) @50°C[1]	3900
	Operating Grid Voltage (kV)[2]	34.5kV ±10%
	Operating Grid Frequency (Hz)	60Hz
	Current Harmonic Distortion (THDi)	< 3% per IEEE519
	Power Factor (cosine phi)[3]	0.5 leading … 0.5 lagging adjustable / Reactive power injection at night
INPUT	DC Voltage Range[4]	934V - 1500V
	Maximum DC Voltage	1500V
	Number of Inputs	Up to 40
	Max. DC Continuous Current (A)[5]	4590
	Max. DC Short Circuit Current (A)[5]	6940
	Number of Freemaq DC/DC[5]	Up to 2 (Bus Plus Basic) or 4 (Bus Plus Advanced)
EFFICIENCY	Efficiency (Max) (η)	97.8% including MV transformer
	Euroeta (η)	97.51% including MV transformer
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2
	Weight (lbs)	30865
	Weight (kg)	14000
	Type of Ventilation	Forced air cooling
ENVIROMENT	Degree of Protection	NEMA 3R
	Permissible Ambient Temperature [6]	-25°C to +60°C, >50°C / Active power derating
	Relative Humidity	4% to 100% non-condensing
	Max. Altitude (above sea level)[7]	2000m
CONTROL INTERFACE	Communication Protocol	Modbus TCP
	Power Plant Controller	Optional
	Keyed ON/OFF Switch	Standard
PROTECTIONS	Ground Fault Protection	GFDI and isolation monitoring device
	Humidity Control	Active heating
	General AC Protection & Disconn.	MV switchgear (20 or 25 kA)
	General DC Protection & Disconn.	Fuses, DC switch-disconnectors
	Overvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)
CERTIFICATIONS & STANDARDS	Safety	UL 1741 / CSA 22.2 No.107.1-16
	Installation	NEC 2020
	Utility Interconnect	IEEE 1547:2018 / UL 1741 SB

NOTES

[1] Values at 1.00 Vac nom and cosφ=1.
Consult Power Electronics for derating curves.
[2] Consult Power Electronics for other configurations.
[3] Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).
[4] Consult Power Electronics for derating curves.
[5] Consult Power Electronics for Freemaq DC/DC connection configurations.
[6] Consult Power Electronics for temperatures below -25ºC
[7] Consult Power Electronics for altitudes above 1000m.

HEM

REFERENCES		FS4105M
OUTPUT	AC Output Power (kVA/kW)@40°C[1]	4105
	AC Output Power (kVA/kW)@50°C[1]	3810
	Operating Grid Voltage (kV)[2]	34.5kV ±10%
	Operating Grid Frequency (Hz)	60Hz
	Current Harmonic Distortion (THDi)	< 3% per IEEE519
	Power Factor (cosine phi)[3]	0.5 leading … 0.5 lagging adjustable / Reactive power injection at night
INPUT	DC Voltage Range[4]	913V - 1500V
	Maximum DC Voltage	1500V
	Number of Inputs	Up to 40
	Max. DC Continuous Current (A)[5]	4590
	Max. DC Short Circuit Current (A)[5]	6940
	Number of Freemaq DC/DC[5]	Up to 2 (Bus Plus Basic) or 4 (Bus Plus Advanced)
EFFICIENCY	Efficiency (Max) (η)	97.76% including MV transformer
	Euroeta (η)	97.50% including MV transformer
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2
	Weight (lbs)	30865
	Weight (kg)	14000
	Type of Ventilation	Forced air cooling
ENVIROMENT	Degree of Protection	NEMA 3R
	Permissible Ambient Temperature [6]	-25°C to +60°C, >50°C / Active power derating
	Relative Humidity	4% to 100% non-condensing
	Max. Altitude (above sea level)[7]	2000m
CONTROL INTERFACE	Communication Protocol	Modbus TCP
	Power Plant Controller	Optional
	Keyed ON/OFF Switch	Standard
PROTECTIONS	Ground Fault Protection	GFDI and isolation monitoring device
	Humidity Control	Active heating
	General AC Protection & Disconn.	MV switchgear (20 or 25 kA)
	General DC Protection & Disconn.	Fuses, DC switch-disconnectors
	Overvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)
CERTIFICATIONS & STANDARDS	Safety	UL 1741 / CSA 22.2 No.107.1-16
	Installation	NEC 2020
	Utility Interconnect	IEEE 1547:2018 / UL 1741 SB

NOTES

[1] Values at 1.00 Vac nom and cosφ=1.
Consult Power Electronics for derating curves.
[2] Consult Power Electronics for other configurations.
[3] Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).
[4] Consult Power Electronics for derating curves.
[5] Consult Power Electronics for Freemaq DC/DC connection configurations.
[6] Consult Power Electronics for temperatures below -25ºC
[7] Consult Power Electronics for altitudes above 1000m.

HEM

REFERENCES		FS4010M
OUTPUT	AC Output Power (kVA/kW)@40°C[1]	4010
	AC Output Power (kVA/kW)@50°C[1]	3720
	Operating Grid Voltage (kV)[2]	34.5kV ±10%
	Operating Grid Frequency (Hz)	60Hz
	Current Harmonic Distortion (THDi)	< 3% per IEEE519
	Power Factor (cosine phi)[3]	0.5 leading … 0.5 lagging adjustable / Reactive power injection at night
INPUT	DC Voltage Range[4]	891V - 1500V
	Maximum DC Voltage	1500V
	Number of Inputs	Up to 40
	Max. DC Continuous Current (A)[5]	4590
	Max. DC Short Circuit Current (A)[5]	6940
	Number of Freemaq DC/DC[5]	Up to 2 (Bus Plus Basic) or 4 (Bus Plus Advanced)
EFFICIENCY	Efficiency (Max) (η)	97.75% including MV transformer
	Euroeta (η)	97.48% including MV transformer
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2
	Weight (lbs)	30865
	Weight (kg)	14000
	Type of Ventilation	Forced air cooling
ENVIROMENT	Degree of Protection	NEMA 3R
	Permissible Ambient Temperature [6]	-25°C to +60°C, >50°C / Active power derating
	Relative Humidity	4% to 100% non-condensing
	Max. Altitude (above sea level)[7]	2000m
CONTROL INTERFACE	Communication Protocol	Modbus TCP
	Power Plant Controller	Optional
	Keyed ON/OFF Switch	Standard
PROTECTIONS	Ground Fault Protection	GFDI and isolation monitoring device
	Humidity Control	Active heating
	General AC Protection & Disconn.	MV switchgear (20 or 25 kA)
	General DC Protection & Disconn.	Fuses, DC switch-disconnectors
	Overvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)
CERTIFICATIONS & STANDARDS	Safety	UL 1741 / CSA 22.2 No.107.1-16
	Installation	NEC 2020
	Utility Interconnect	IEEE 1547:2018 / UL 1741 SB

NOTES

[1] Values at 1.00 Vac nom and cosφ=1.
Consult Power Electronics for derating curves.
[2] Consult Power Electronics for other configurations.
[3] Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).
[4] Consult Power Electronics for derating curves.
[5] Consult Power Electronics for Freemaq DC/DC connection configurations.
[6] Consult Power Electronics for temperatures below -25ºC
[7] Consult Power Electronics for altitudes above 1000m.

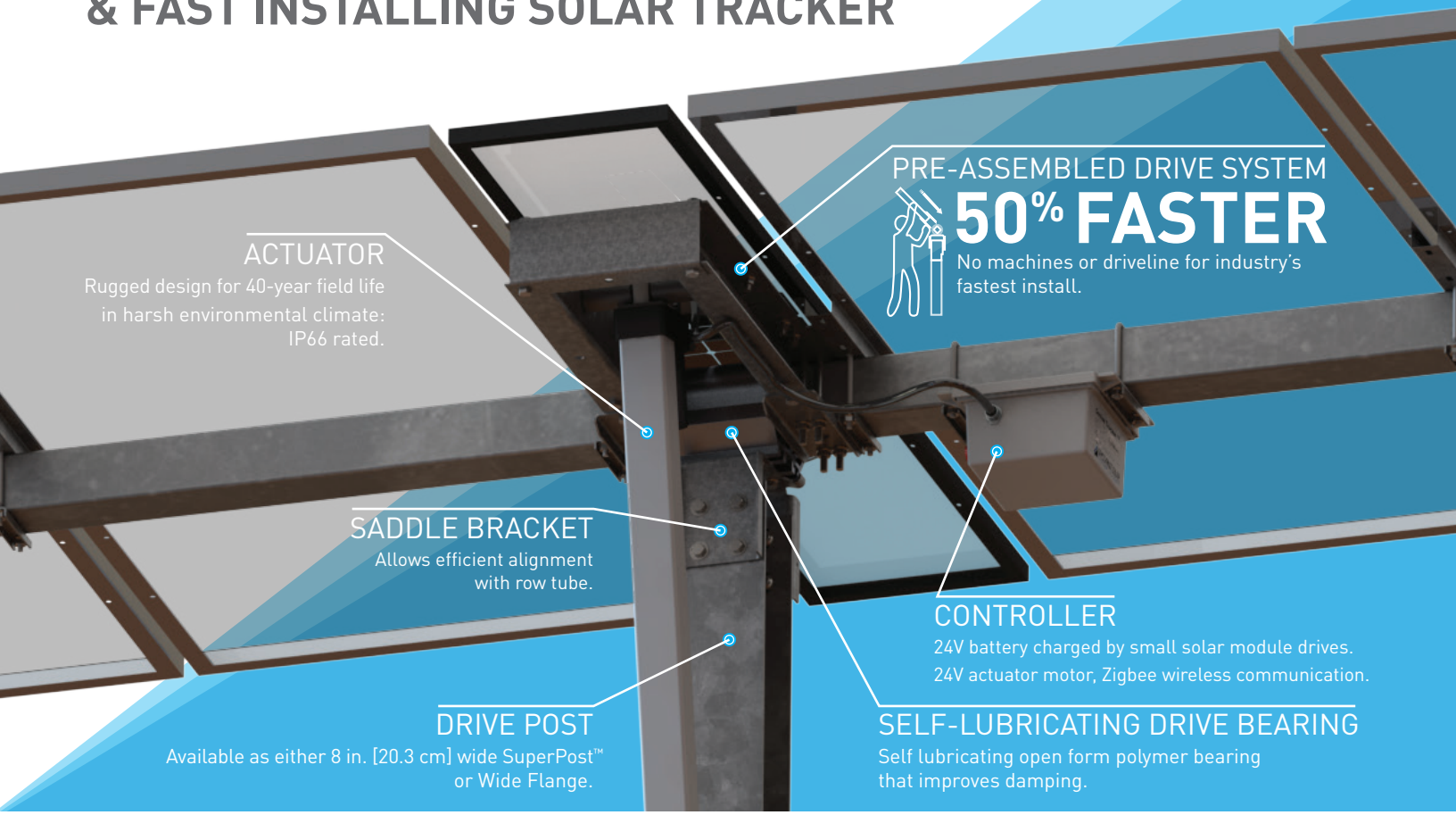
GAMECHANGE SOLAR
REPOWERING THE PLANET

OVER 29 GW SOLD
Global Innovation Leader for Trackers, Fixed Tilt & BOS

TECHNICAL DATASHEET

GENIUS TRACKER™ 1P

HIGH POWER PRODUCING & FAST INSTALLING SOLAR TRACKER



ACTUATOR
Rugged design for 40-year field life in harsh environmental climate: IP66 rated.

PRE-ASSEMBLED DRIVE SYSTEM
50% FASTER
No machines or driveline for industry's fastest install.

SADDLE BRACKET
Allows efficient alignment with row tube.

CONTROLLER
24V battery charged by small solar module drives.
24V actuator motor, Zigbee wireless communication.

DRIVE POST
Available as either 8 in. [20.3 cm] wide SuperPost™ or Wide Flange.

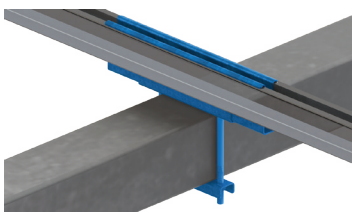
SELF-LUBRICATING DRIVE BEARING
Self lubricating open form polymer bearing that improves damping.

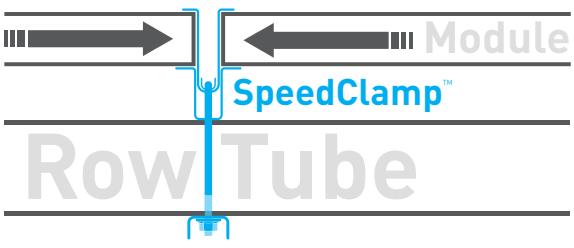
OWNER BENEFITS

UP TO 2% MORE POWER PRODUCTION
RESULTS IN **HIGHER** KWH OUTPUT
based on project specifics

INSTALLER BENEFITS

200% FASTER INSTALL SPEED WITH **SPEEDCLAMP**™ THAN ANY OTHER TRACKER





GAMECHANGE SOLAR
REPOWERING THE PLANET

OVER 29 GW SOLD

Global Innovation Leader for Trackers, Fixed Tilt & BOS

OWNER BENEFITS

UP TO 2% MORE POWER PRODUCTION
Results In higher kWh output.

HIGHER MODULE DENSITY
Increased row spacing means more time facing the sun and less time running from the shade. Adds up to 5% more power production than competitors.

WEATHERSMART™
Proprietary algorithm optimizes tilt angle based on weather data to maximize power production. Adds up to 1.25% additional power production.

LOWEST O&M COST
Lowest grass cutting & module washing cost.

ZERO MAINTENANCE DRIVE SYSTEM

INSTALLER BENEFITS

FASTEST INSTALLING SYSTEM
Advanced design innovations & pre-assembled components.

SPEEDCLAMP™
Mounts modules with no mounting hardware, speeds module installation up to 200%.

PRE-ASSEMBLED DRIVE ARM
Can be lifted by one worker. No machine required. 50% faster than most competing systems.

PE STAMPED DRAWINGS
Design loads according to local building codes: ASCE 7, NBC, Eurocode, AS1170, IS 875.

PROPRIETARY INTEGRATED-HARDWARE™
Proprietary hardware allows for faster structure assembly, module mounting, and reduced O&M cost. Oversized Serrated Flange Nyloc Nut and Oversized Flange Star Bolt with integrated star washer eliminates the need for washers and star washers.

GameChange Solar

HEADQUARTERS
230 East Ave, Suite 100
Norwalk, CT, USA
Phone: +1 (203) 769-3900
Fax: +1 (646) 607-2223
gamechangesolar.com
media@gamechangesolar.com

GLOBAL LOCATIONS
El Paso, TX
Florence, SC
Dublin, Ireland
Madrid, Spain
Wuxi, China
Bangalore, India
Dubai, UAE
Buenos Aires, Argentina
Johannesburg, South Africa
Newcastle, Australia

SERVICE SUPERCENTERS
Lakeland, FL, USA
Mesa, AZ, USA
Bogotá, Colombia
Santiago, Chile
Madrid, Spain

RESEARCH & DEVELOPMENT CENTER
Brimfield, MA, USA

Modules	**Modules Supported**	Most commercially available modules, including frameless crystalline and thin film
Civil	**Slope Tolerance (N-S)**	7% standard, can go to 15% special order
	Slope Tolerance (E-W)	15%
	Tracker follows slope (Y/N)	Yes
Structural	**Drive Type**	Robust linear actuator stainless steel & aluminum
	Posts per MW	350-400/MW for 1 up portrait / 2 up landscape or 250-300/MW for 2 up portrait
	Design Wind Load	105 mph [46.9 m/s](Std) / 130 mph [58.1 m/s](Premium 1) / 150 mph [67 m/s](Premium 2)
	Snow Load	5 psf [.24 kPa](Std) / 20 psf [.96 kPa](Premium 1) / 40 psf [1.92 kPa](Premium 2) / 60 psf [2.87 kPa](Premium 3)
	Tracking Range (Std)	45°, 52°
	Tracking Range (Premium)	60°
	Post Sections	G235 [55 µm] galvanized steel (or HDG option) roll formed standard posts, HDG wide flange option also available
	Post Size (Interior) & (Exterior)	6 x 6 in. [15.24 x 15.24 cm] roll form shape or W6x7, W6x9, W6x12 or W6x15 wide flange
	Motor Foundation	6.5 x 8 in. [16.51 x 20.32 cm] roll form hat or W6x15 or larger wide flange
	Standard Embedment	5 - 7 ft. [1.52 - 2.13 m]
	Flood Plain Allowance	Up to 6 ft. [1.83 m]
Design	**Module Configuration**	1 or 2 up in portrait for crystalline & First Solar Series 6™, 2 up landscape or 1 or 2 up in portrait for Bifacial, 3 to 4 up landscape for First Solar Series 4™
	Length per Table	Up to 500 ft. [150 m]
	Module Attachment	SpeedClamp™ or bolts available for bottom mount frame modules or clamps for glass on glass modules
	Ground Coverage Ratio	0.25 to 0.65
	Rows per Drive	1 drive per tracker(table), distributed drive system
	Powering System	Onboard solar module with battery
	Ground Clearance To Module	18 - 48 in. [45.7 - 121.9 cm] typical
	Min / Max Ground to Top of Post	3'-8" [1.12 m] typical + 9 in. [22.86 cm] min. adjustment range
	Backtracking / Anti-shading	Yes, although can be turned off as requested (i.e. for FSLR modules)
	Temperature Range	-20° C (-40° C also available) + 48° C
	Electromagnetic Interference	Compliant with FCC guidelines/ Applicable sections EN 61000
Install	**Specialty Tools Required**	No
	Max Offload for Deliveries	As per customer requirement
Electrical	**Tracking Method**	Time and location based algorithm
	String Design	Compatible with any string size
	Cable Supports	Hole punching per customer requirement for nominal cost
	Linear Actuator Motor	24V DC UL Listed
	Parasitic Loss	0 amps
	Controller Box	Zigbee wireless communications, 24V solar module and battery
	Control System	Master to Node: Zigbee wireless communications Master to SCADA/DAS: Modbus TCP communications
	# of Motors	20 to 52 / MW depending on module wattage and loading conditions (35 for typical conditions)
	1000V System or 1500V System	Both
	Grounding Method	Tracker structure is part of grounding path per UL 2703
	UL Compliance	UL 2703 / UL 3703
	Ingress Protection	IP66 Actuator [NEMA 4 equivalent]
	# Anemometers	1 per 6 MW - 10 MW typical
	Monitoring System	Web portal interface available Compatible with all standard third party monitoring vendors
	Snow & Flood Sensors	Move modules to optimum location for weather events
	Backup Power	Solar module and battery providing integrated backup - 3 days
O&M	**Warranty**	5 year drive & control, 10 year structural standard, 10 /20 also available
Shipping	**Max load**	International - 18.5 to 22.5 metric tons per container USA - 45,000 lbs. [20,411 kg] per truckload, 5,000 lbs. [2,267 kg] maximum bundle size, 2,900 lbs. [1315.4 kg] or other maximum as requested by customers
	Shipping Containers or Flatbeds	Flat beds for structure, dry vans for hardware
	# Trucks or Containers per MWdc	4 typical for trucks, 5 typical for containers
Commissioning	**Backfeed required?**	No, generator for power as alternative

Rev. 1-26-2023