

PHANTOM

swiss solar

48-TCA BIFACIAL DOUBLEGLASS

470W | UP TO 26.09%

► TOPCon ADVANCE TECHNOLOGY

Next-generation cell architecture with enhanced passivation for higher output, reduced LID & PID, and stable performance under high temperatures and low light.

► DuraGlassX™

Ultra-strong tempered glass with advanced anti-reflective coating ensures maximum transparency, impact resistance, and long-term durability in extreme climates.

► Phantom Design

Deep black cells with an elegant black frame deliver a modern, premium look that blends seamlessly into architectural projects.

► AluForce™ Black Frames

Equivalent to up to +32% higher frame strength under front and side load tests.



COMPLETE SYSTEM AND PRODUCT CERTIFICATIONS



PHANTOM

48-TCA BIFACIAL DUAL GLASS 500-520

up to
26.09%
maximum efficiency

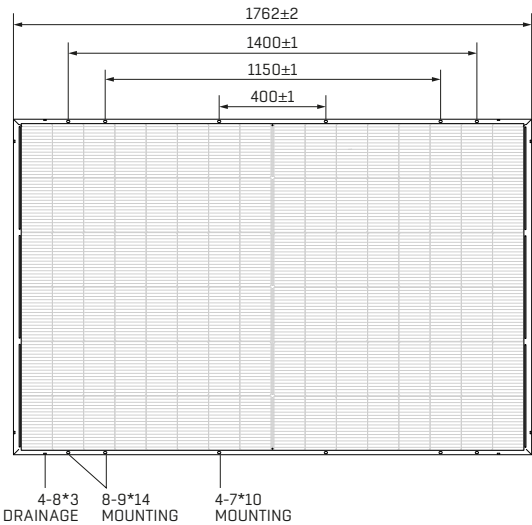
0~3
power
tolerance

<1%
first year
power degradation

0.35%
year 2-30
power degradation

N-TYPE CELL
lower operating
teperature

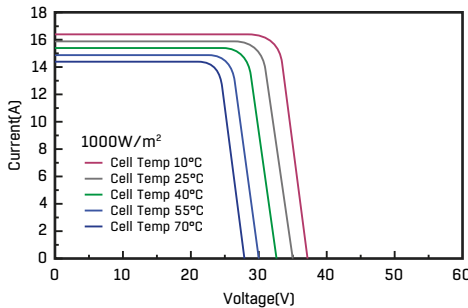
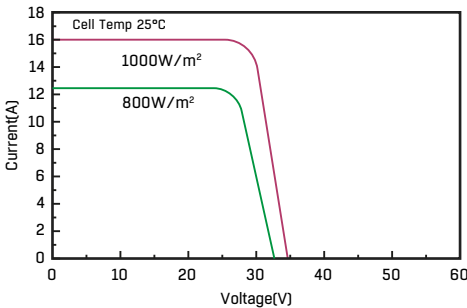
MECHANICAL CHARACTERISTICS	
Solar Cells	N-type Mono
No. of Cells	96 (12x8)
Dimensions	1762x 1134 x 30mm
Weight	24.7kg
Front / Back Glass	2.0mm coated semi-tempered glass
Frame	Anodized aluminium alloy
Junction Box	Ip68 rated (3 by pass diodes)
Output Cables	4.0mm², 250mm (+) / 350mm (-) Length can be customized
Connectors	Mc4 compatible
Mechanical load test	Front 6200Pa / Rear 4200Pa



POWER CLASS	PH48-TCA-450		PH48-TCA-455		PH48-TCA-460		PH48-TCA-465		PH48-TCA-470	
	STC	BNPI	STC	BNPI	STC	BNPI	STC	BNPI	STC	BNPI
Maximum Power (Pmax)	450W	499W	455W	504W	460W	510W	465W	515W	470W	521W
Open Circuit Voltage (Voc)	34.57±3%	34.67±3%	34.62±3%	34.72±3%	34.67±3%	34.77±3%	34.72±3%	34.82±3%	34.77±3%	34.87±3%
Short Circuit Current (Isc)	16.27±3%	17.98±3%	16.43±3%	18.16±3%	16.58±3%	18.32±3%	16.74±3%	18.50±3%	16.90±3%	18.67±3%
Voltage at Maximum Power (Vmpp)	29.38V	29.47V	29.43V	29.52V	29.47V	29.56V	29.51V	29.60V	29.55V	29.64V
Current Maximum Power (Impp)	15.31A	16.92A	15.46A	17.09A	15.60A	17.24A	15.76A	17.41A	15.91A	17.58A
MODULE EFFICIENCY (%)	22.52%	24.97%	22.77%	25.25%	23.01%	25.53%	23.27%	25.81%	23.53%	26.09%

STC: Irradiance 1000W/m², cell temperature 25°C, AM1.5G | NOCT: Irradiance 800W/m², ambient temperature 20°C, wind speed 1m/s, AM1.5G m²

PACKING CONFIGURATION	
Container	40'HQ
Pieces per pallet	36
Pallets per container	26
Pieces per container	936



OPERATING CHARACTERISTICS	
Operating Module Temperature	-40°C to +85°C
Maximum System Voltage	1500 DC (IEC)
Maximum Series Fuse Rating	28A
Power Tolerance	0/+5W

TEMPERATURE CHARACTERISTICS	
Nominal Operating Cell Temperature	45±2°C
Temperature Coefficient of Pmax	-0.29%/°C
Temperature Coefficient of Voc	-0.25%/°C
Temperature Coefficient of Isc	+0.045%/°C