

Strong
Wind Protection

Severe
Hail Protection

Heavy
Snow Protection

Superior
Fire Protection

Vertex S*

— *i-TOPCon Ultra* —

Shield TSM-NED9R.28
445-470W

Key Features



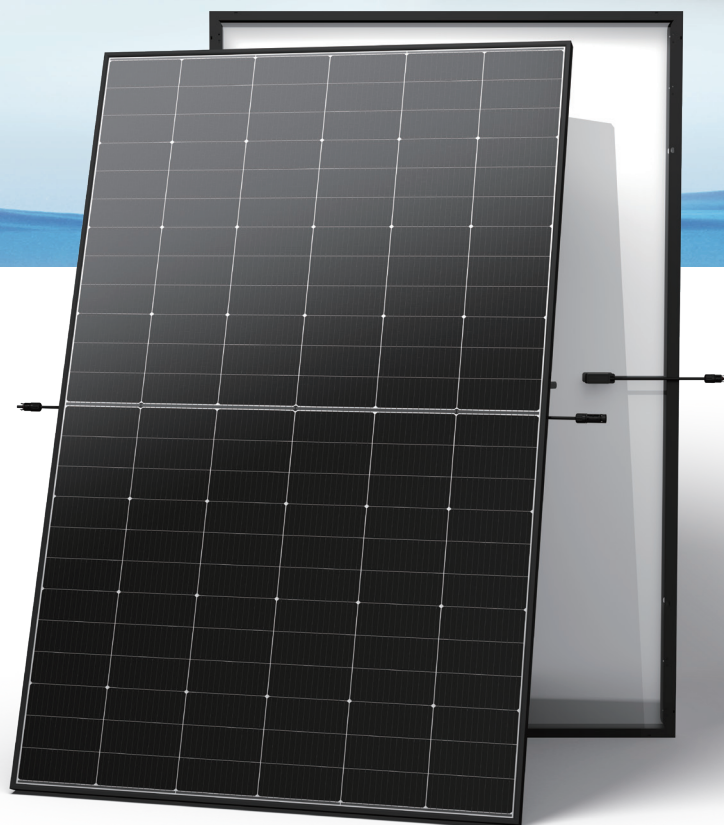
VKF HW4 Hail Test



Standard load capacity: +7000/-5000 Pa



Fire rating (IEC 61730-2): Class A+A



High customer value

- Suitable for residential and C&I rooftop
- Perfect size for handling and installation
- Compatible with mainstream inverters and diverse mounting systems



High power up to 470W

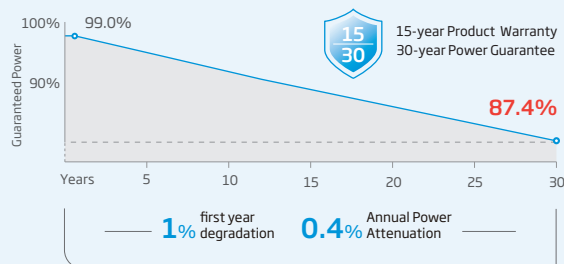
- Up to 23.5% module efficiency, on 210 innovative platform
- Patented i-TOPCon technology with continuous efficiency improvement, including contact resistance reduction, rear recombination enhancement and edge quality repairment



High reliability with double glass

- Less prone to micro-cracks and scratches on the back side
- Excellent fire rating, weather resistance, sustainable in harsh environments and extreme weather conditions
- Up to 25 years product warranty and 30 years power warranty

Performance Warranty



* Please refer to product warranty for details

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



ELECTRICAL DATA (STC)

Peak Power Watts- $P_{MAX}(W_p)^*$	445	450	455	460	465	470
Power Selection (W)**	0 ~ +5					
Maximum Power Voltage- V_{MPP} (V)	44.30	44.60	45.00	45.40	45.80	46.10
Maximum Power Current- I_{MPP} (A)	10.05	10.09	10.11	10.14	10.16	10.20
Open Circuit Voltage- V_{oc} (V)	52.60	52.90	53.40	53.80	54.20	54.60
Short Circuit Current- I_{sc} (A)	10.71	10.74	10.77	10.81	10.85	10.89
Module Efficiency η_m (%)	22.3	22.5	22.8	23.0	23.3	23.5

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5. *Measuring tolerance: ±3%. **Power selection up to: +3%.

ELECTRICAL DATA (NOCT)

Peak Power Watts- $P_{MAX}(W_p)$	341	344	348	352	355	359
Maximum Power Voltage- V_{MPP} (V)	41.70	42.00	42.30	42.70	42.80	43.20
Maximum Power Current- I_{MPP} (A)	8.17	8.19	8.22	8.25	8.28	8.31
Open Circuit Voltage- V_{oc} (V)	49.90	50.20	50.60	51.00	51.40	51.70
Short Circuit Current- I_{sc} (A)	8.63	8.66	8.68	8.71	8.74	8.78

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

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature) 43°C (±2°C)

Temperature Coefficient of P_{MAX} -0.29% /°C

Temperature Coefficient of V_{oc} -0.24% /°C

Temperature Coefficient of I_{sc} 0.04% /°C

Due to different testing methods, the actual performances might differ from the declared specifications.

APPLICATION CONDITIONS

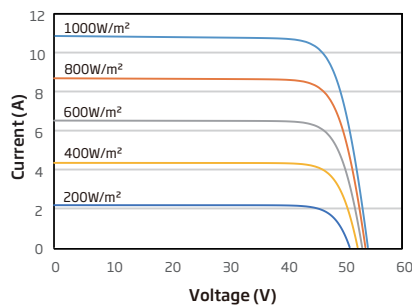
Operating Temperature -40~+70°C

Maximum System Voltage 1500V DC (IEC)

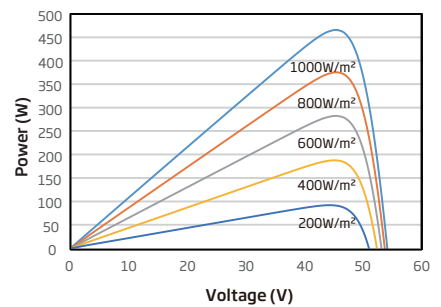
Max Series Fuse Rating 25A

CURVES OF PV MODULE

I-V CURVES OF PV MODULE (465W)



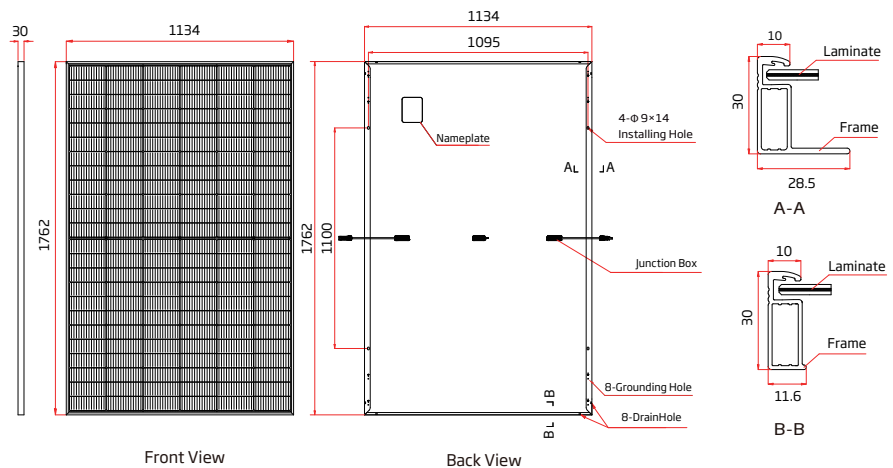
P-V CURVES OF PV MODULE (465W)



MECHANICAL DATA

Solar Cells	N-type i-TOPCon Monocrystalline
No. of cells	144 cells
Module Dimensions	1762×1134×30 mm (69.37×44.65×1.18 inches)
Weight	27 kg (59.52lb)
Front Glass	2.5mm (0.10inches), AR Coating Heat Strengthened Glass
Back Glass	2.0mm (0.08inches), Heat Strengthened Glass
Frame	30mm(1.18 inches) Anodized Aluminium Alloy, Black
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm ² (0.006 inches ²) Portrait: 200/320 mm(13.78/11.02 inches) Length can be customized
Connector	TS4 Plus / TS4 / MC4 EVO2*
Packaging	Modules per box: 36 pieces Modules per 40' container: 900pieces

*The connector names listed are general names; specific types are subject to the certification documents.



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CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.
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