

# Vertex S<sup>+</sup> Shield

DUAL GLASS N type i-TOPCon Ultra MODULE

PRODUCT: TSM-NED9R.28

POWER RANGE: 450-475 W

## 475 W

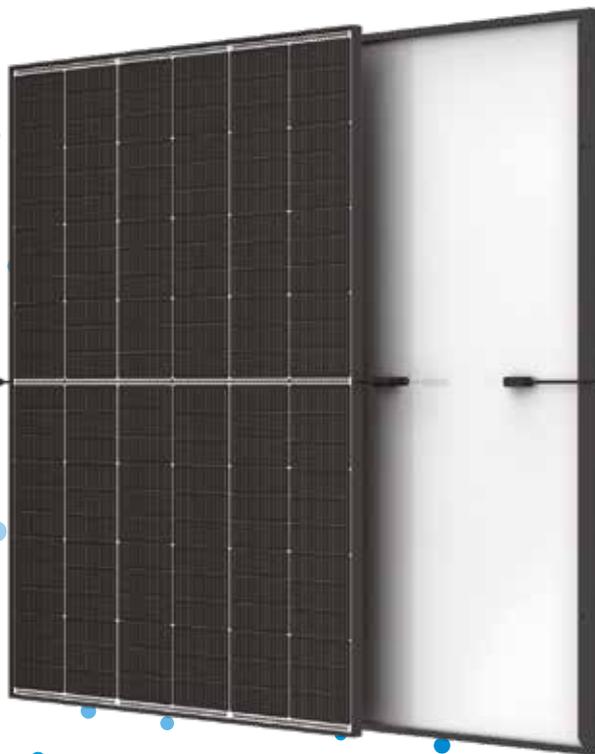
MAXIMUM POWER OUTPUT

## 0/+5 W

POSITIVE POWER TOLERANCE

## 23.8 %

MAXIMUM EFFICIENCY



### Small in size, bigger on power

- High module power: Up to 475 W, 23.8 % module efficiency with n type i-TOPCon technology
- Reduces installation cost with higher power bin and efficiency



### Dual-glass Design, High Reliability

- Excellent fire rating and resistance to harsh environmental conditions



### Key Features

- VKF HW4 Hail Test
- Standard load capacity: +7000/-5000 Pa,
- Fire rating (IEC 61730-2): Class A+A



### Maximize Energy Harvest

- Up to 25 years product warranty and 30 years power warranty
- 1 % first-year degradation and 0.4 % annual degradation enabled by N-type technology



### Universal solution for residential and C&I rooftops

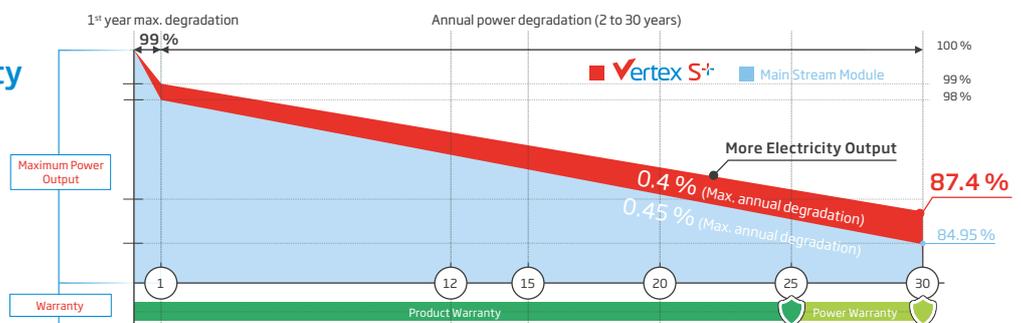
- Designed for compatibility with existing mainstream inverters, optimizers and mounting systems
- Flexible installation solutions for system deployment

## Extended Vertex S<sup>+</sup> Warranty

**1 %**  
1<sup>st</sup> year max. degradation

**0.4 %**  
Max. annual degradation from year 2 to 30

**25 Years**  
Product Workmanship Warranty



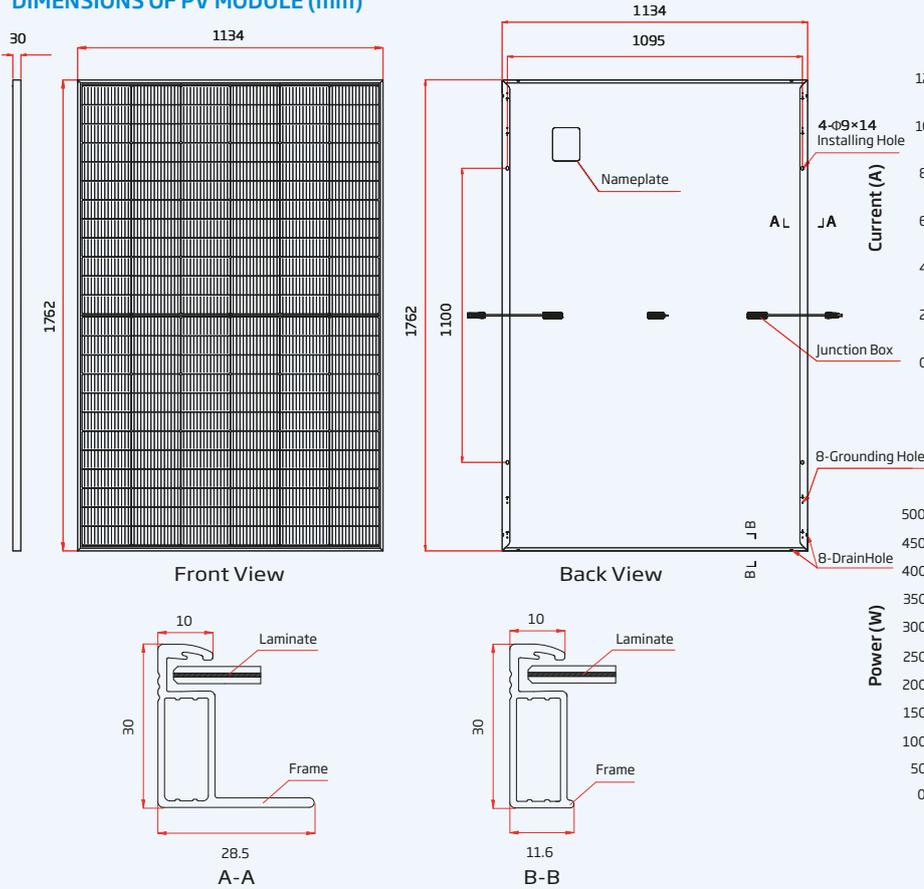
## Comprehensive Products and System Certificates



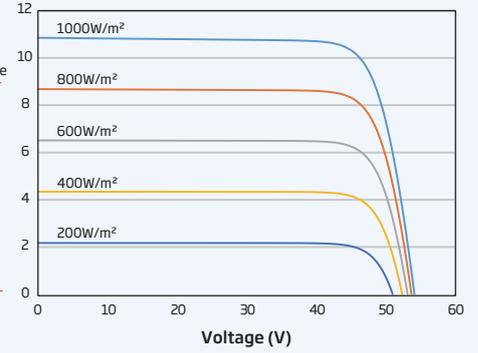
IEC61215/IEC61730/IEC61701/IEC62716  
ISO 9001: Quality Management System  
ISO 14001: Environmental Management System  
ISO14064: Greenhouse Gases Emissions Verification  
ISO45001: Occupational Health and Safety Management System

**Trinasolar**

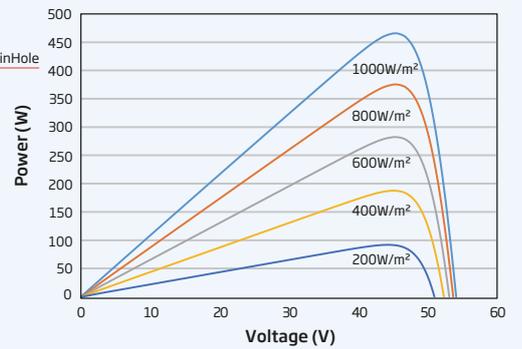
### DIMENSIONS OF PV MODULE (mm)



### I-V CURVES OF PV MODULE (465 W)



### P-V CURVES OF PV MODULE (465 W)



### ELECTRICAL DATA (STC)

	TSM-450 NED9R.2B	TSM-455 NED9R.2B	TSM-460 NED9R.2B	TSM-465 NED9R.2B	TSM-470 NED9R.2B	TSM-475 NED9R.2B
Peak Power Watts- $P_{MAX}$ (Wp)*	450	455	460	465	470	475
Power Selection (W)**	0/+5					
Maximum Power Voltage- $V_{MPP}$ (V)	44.6	45.0	45.4	45.7	46.1	46.4
Maximum Power Current- $I_{MPP}$ (A)	10.09	10.11	10.14	10.16	10.19	10.24
Open Circuit Voltage- $V_{OC}$ (V)	52.9	53.4	53.8	54.2	54.6	55.0
Short Circuit Current- $I_{SC}$ (A)	10.74	10.77	10.81	10.85	10.89	10.93
Module Efficiency $\eta_m$ (%)	22.5	22.8	23.0	23.3	23.5	23.8

STC: Irradiance 1000 W/m<sup>2</sup>, Cell Temperature 25 °C, Air Mass AM 1.5. \*Measuring tolerance:  $\pm 3\%$ . \*\*Power Selection up to: +3%

### ELECTRICAL DATA (NOCT)

	TSM-450 NED9R.2B	TSM-455 NED9R.2B	TSM-460 NED9R.2B	TSM-465 NED9R.2B	TSM-470 NED9R.2B	TSM-475 NED9R.2B
Maximum Power- $P_{MAX}$ (Wp)	344	348	352	355	359	362
Maximum Power Voltage- $V_{MPP}$ (V)	42.0	42.3	42.7	42.8	43.2	43.4
Maximum Power Current- $I_{MPP}$ (A)	8.19	8.22	8.25	8.28	8.31	8.35
Open Circuit Voltage- $V_{OC}$ (V)	50.2	50.6	51.0	51.4	51.7	52.1
Short Circuit Current- $I_{SC}$ (A)	8.66	8.68	8.71	8.74	8.78	8.79

NOCT: Irradiance at 800 W/m<sup>2</sup>, Ambient Temperature 20 °C, Wind Speed 1 m/s.

### MECHANICAL DATA

Solar Cells	N-type i-TOPCon Monocrystalline
No. of cells	144 cells
Module Dimensions	1762x1134x30 mm
Weight	27 kg
Front Glass	2.5 mm AR Coating Heat Strengthened Glass
Back Glass	2.0 mm Heat Strengthened Glass
Frame	30 mm Anodized Aluminium Alloy, Black
J-Box	IP 68 rated, 3 bypass diodes
Cables	Photovoltaic Technology Cable 4.0 mm <sup>2</sup> Landscape: 1100/1100 mm Portrait: 200/320 mm*
Connector	TS4 Plus / TS4 / MC4 EVO2*

\*Special order only

### TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43 °C ( $\pm 2$ °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

### MAXIMUM RATINGS

Operational Temperature	-40 to +70 °C
Maximum System Voltage	1500 V DC (IEC)
Max Series Fuse Rating	25 A

### WARRANTY

25 year Product Workmanship Warranty  
30 year Power Warranty  
1% first year degradation  
0.4% Annual Power Attenuation

(Please refer to product warranty for details)

### PACKAGING CONFIGURATION

Modules per box:	36 pieces
Modules per 40' container:	828 pieces

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

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