

# 450 W

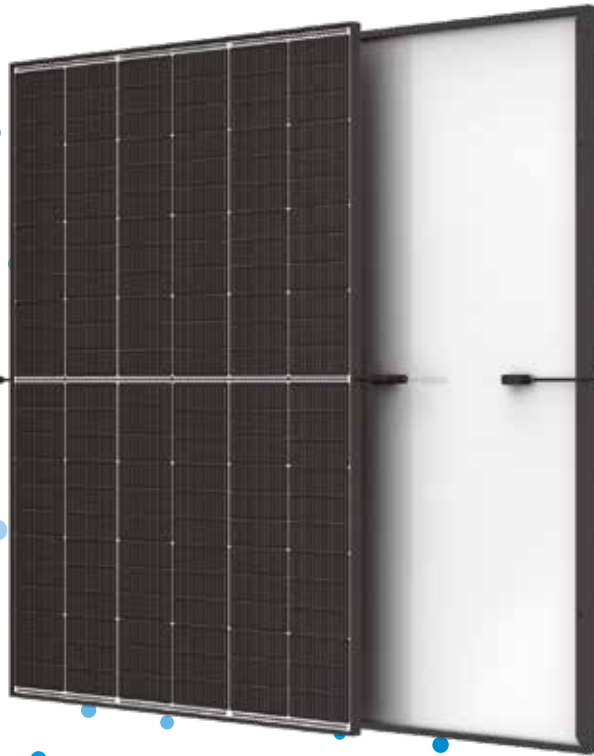
MAXIMUM POWER OUTPUT

# 0/+5 W

POSITIVE POWER TOLERANCE

# 22.5 %

MAXIMUM EFFICIENCY



### Small in size, bigger on power

- Generates up to 450 W, 22.5 % module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping, lower series resistance, improved current collection and enhanced reliability
- Reduces installation cost with higher power bin and efficiency



### Dual-glass Design, High Reliability

- Excellent fire rating and resistance to harsh environmental conditions
- 5,400 Pa snow load and 4,000 Pa wind load (test loads)



### 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

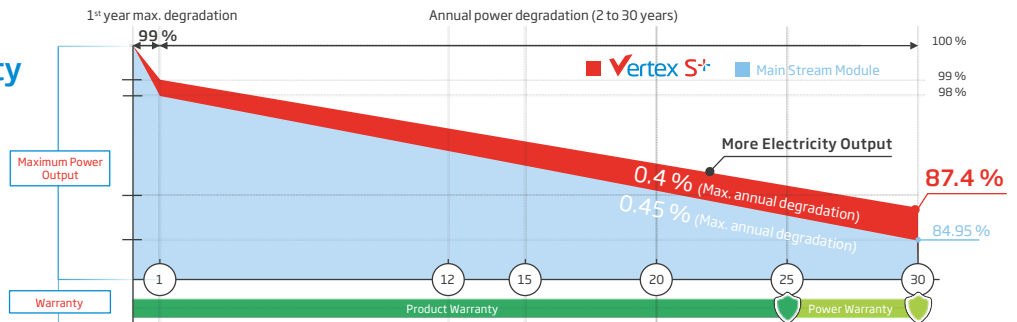
- Designed for compatibility with existing mainstream inverters, optimizers and mounting systems
- Perfect size and low weight for easy handling. Optimized transportation cost
- Flexible installation solutions for system deployment

## Extended Vertex S+ Warranty

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

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

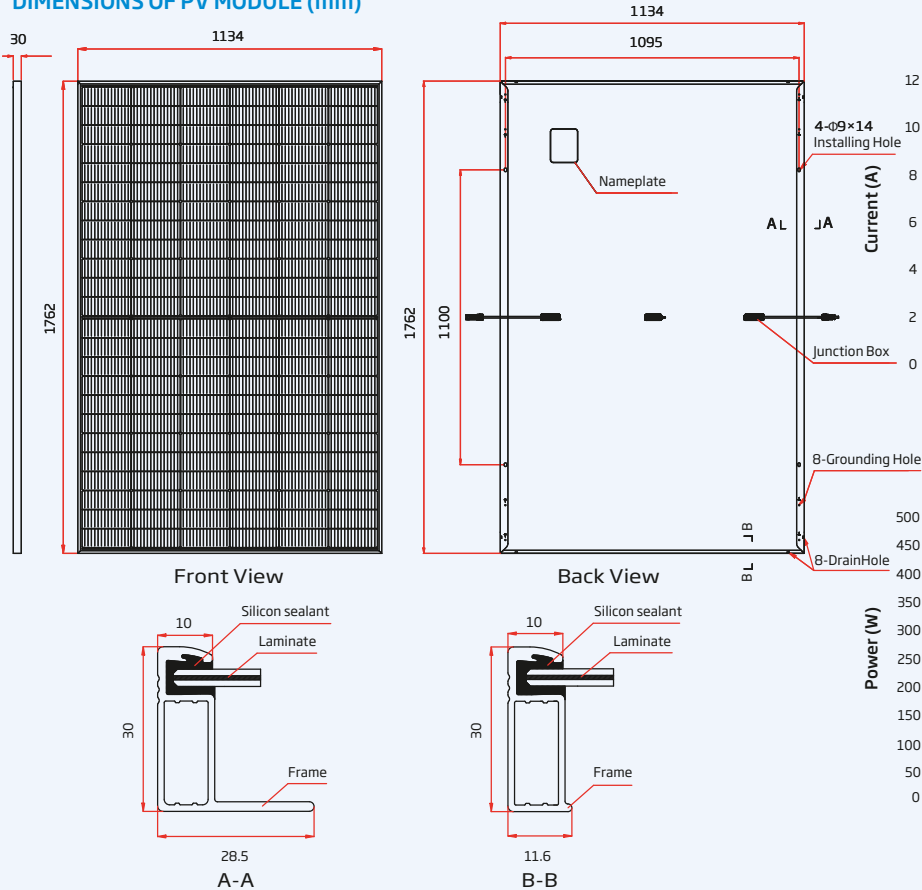
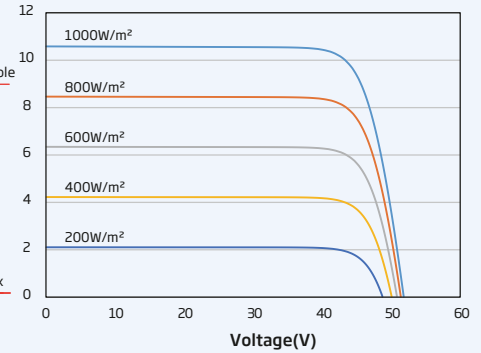
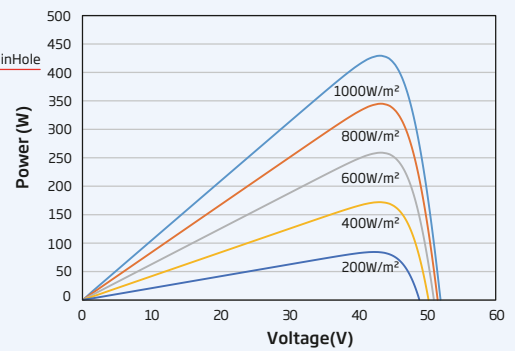
**25 Years**  
Product Workmanship Warranty



## 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

**DIMENSIONS OF PV MODULE (mm)**

**I-V CURVES OF PV MODULE (440 W)**

**P-V CURVES OF PV MODULE (440 W)**

**ELECTRICAL DATA (STC)**

	TSM-425 NEG9R.2B	TSM-430 NEG9R.2B	TSM-435 NEG9R.2B	TSM-440 NEG9R.2B	TSM-445 NEG9R.2B	TSM-450 NEG9R.2B
Peak Power Watts- $P_{MAX}$ (Wp)*	425	430	435	440	445	450
Power Tolerance- $P_{MAX}$ (W)	0/+5					
Maximum Power Voltage- $V_{MPP}$ (V)	42.9	43.2	43.6	44.0	44.3	44.6
Maximum Power Current- $I_{MPP}$ (A)	9.92	9.96	9.99	10.01	10.05	10.09
Open Circuit Voltage- $V_{oc}$ (V)	50.9	51.4	51.8	52.2	52.6	52.9
Short Circuit Current- $I_{sc}$ (A)	10.56	10.59	10.64	10.67	10.71	10.74
Module Efficiency $\eta_m$ (%)	21.3	21.5	21.8	22.0	22.3	22.5

STC: Irradiance 1000 W/m<sup>2</sup>, Cell Temperature 25 °C, Air Mass AM 1.5. \*Measuring tolerance: ±3%.

**ELECTRICAL DATA (NOCT)**

	TSM-425 NEG9R.2B	TSM-430 NEG9R.2B	TSM-435 NEG9R.2B	TSM-440 NEG9R.2B	TSM-445 NEG9R.2B	TSM-450 NEG9R.2B
Maximum Power- $P_{MAX}$ (Wp)	324	328	332	335	339	343
Maximum Power Voltage- $V_{MPP}$ (V)	40.0	40.4	40.7	41.0	41.3	41.6
Maximum Power Current- $I_{MPP}$ (A)	8.09	8.11	8.15	8.17	8.20	8.24
Open Circuit Voltage- $V_{oc}$ (V)	48.2	48.7	49.1	49.4	49.8	50.1
Short Circuit Current- $I_{sc}$ (A)	8.51	8.53	8.57	8.60	8.63	8.65

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

**MECHANICAL DATA**

Solar Cells	Monocrystalline
No. of cells	144 cells
Module Dimensions	1762×1134×30 mm
Weight	21.0 kg
Front Glass	1.6 mm, High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	1.6 mm, Heat Strengthened Glass
Frame	30 mm Anodized Aluminium Alloy, Black
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0 mm <sup>2</sup> Landscape: 1100/1100 mm Portrait: 280/350 mm*
Connector	TS4 / MC4 EVO2*

\*Special order only

**TEMPERATURE RATINGS**

NOCT (Nominal Operating Cell Temperature)	43 °C (±2 K)
Temperature Coefficient of $P_{MAX}$	-0.30 %/K
Temperature Coefficient of $V_{oc}$	-0.24 %/K
Temperature Coefficient of $I_{sc}$	0.04 %/K

**MAXIMUM RATINGS**

Operational Temperature	-40 to +85 °C
Maximum System Voltage	1500 V DC (IEC)
Max Series Fuse Rating	20 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:	936 pieces