

# 440 W

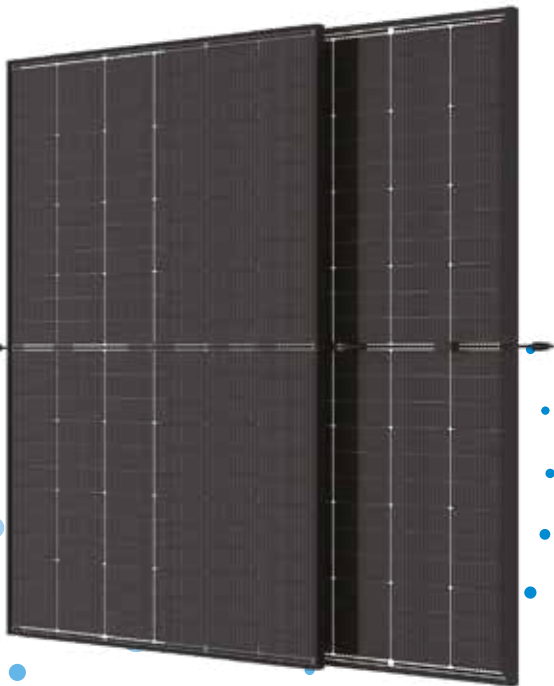
MAXIMUM POWER OUTPUT

# 0/+5 W

POSITIVE POWER TOLERANCE

# 22.0 %

MAXIMUM EFFICIENCY



### Small in size, bigger on power

- Generates up to 440 W, 22.0 % module efficiency with high density interconnect technology
- Boost performance at high temperature environments with better thermal behavior



### Transparent Dual-glass Design

- Designed with aesthetics in mind
- 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

- Higher bifaciality up to 85 %
- 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

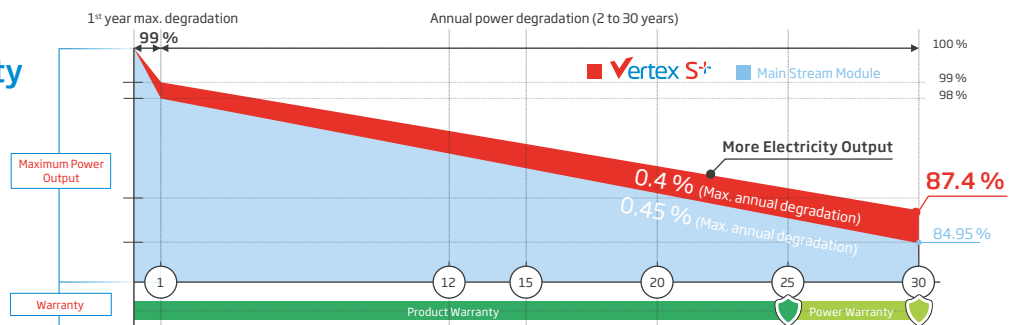
- Designed for compatibility with existing mainstream inverters, optimizers and mounting systems
- Perfect size and low weight for easy handling

## 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/UL61730

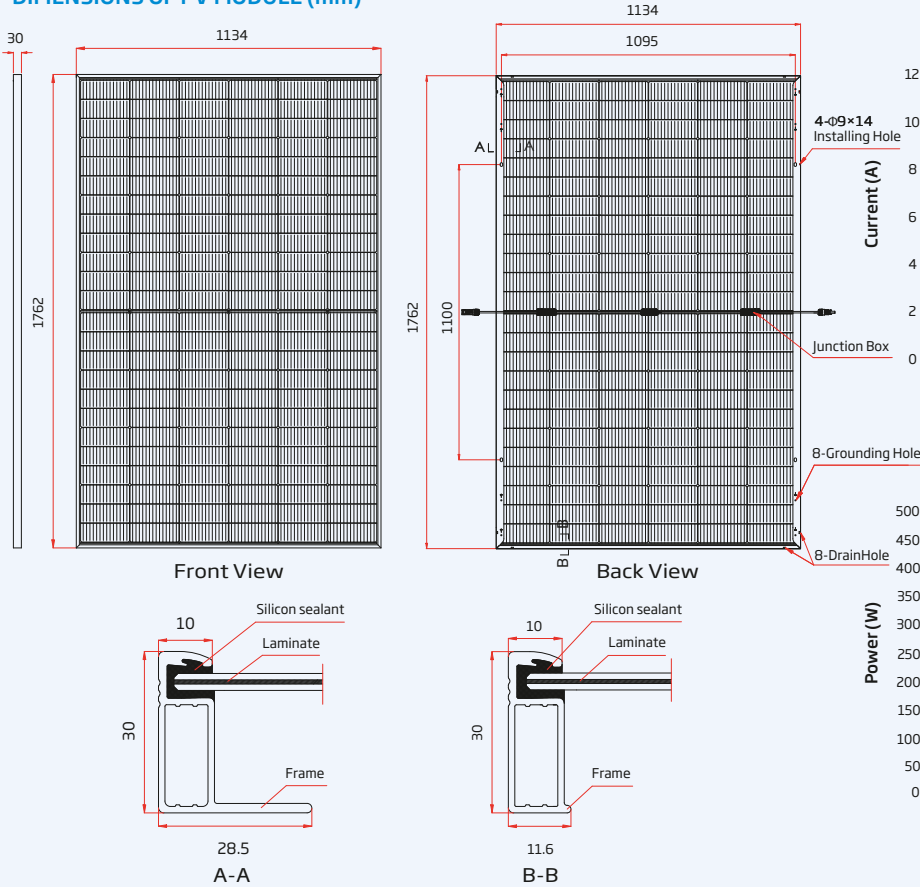
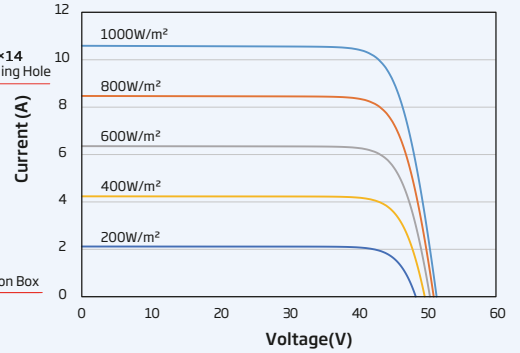
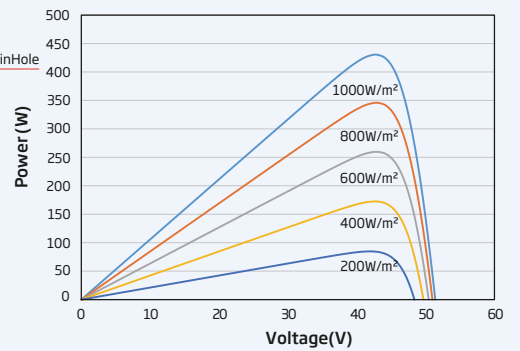
ISO 9001: Quality Management System

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 (430 W)**

**P-V CURVES OF PV MODULE (430 W)**


ELECTRICAL DATA (STC)	TSM-415	TSM-420	TSM-425	TSM-430	TSM-435	TSM-440
	NEG9RC.27	NEG9RC.27	NEG9RC.27	NEG9RC.27	NEG9RC.27	NEG9RC.27
Peak Power Watts -P <sub>MAX</sub> (Wp)*	415	420	425	430	435	440
Power Tolerance -P <sub>MAX</sub> (W)	0/+5					
Maximum Power Voltage -V <sub>MPP</sub> (V)	42.1	42.5	42.9	43.2	43.6	44.0
Maximum Power Current -I <sub>MPP</sub> (A)	9.86	9.89	9.92	9.96	9.99	10.01
Open Circuit Voltage -V <sub>OC</sub> (V)	50.1	50.5	50.9	51.4	51.8	52.2
Short Circuit Current -I <sub>SC</sub> (A)	10.50	10.53	10.56	10.59	10.64	10.67
Module Efficiency $\eta_m$ (%)	20.8	21.0	21.3	21.5	21.8	22.0

STC: Irradiance 1000 W/m<sup>2</sup>, Cell Temperature 25°C, Air Mass AM1.5. \*Measuring tolerance: ±3%.

**Electrical characteristics with different power bin (reference to 10% Irradiance ratio)**

Total Equivalent power -P <sub>MAX</sub> (Wp)	448	454	459	464	470	475
Maximum Power Voltage -V <sub>MPP</sub> (V)	42.1	42.5	42.9	43.2	43.6	44.0
Maximum Power Current -I <sub>MPP</sub> (A)	10.65	10.68	10.71	10.76	10.79	10.81
Open Circuit Voltage -V <sub>OC</sub> (V)	50.1	50.5	50.9	51.4	51.8	52.2
Short Circuit Current -I <sub>SC</sub> (A)	11.34	11.37	11.40	11.44	11.49	11.52
Irradiance ratio (rear/front)	10 %					

Power Bifaciality: 80 ±5%.

ELECTRICAL DATA (NOCT)	TSM-415	TSM-420	TSM-425	TSM-430	TSM-435	TSM-440
	NEG9RC.27	NEG9RC.27	NEG9RC.27	NEG9RC.27	NEG9RC.27	NEG9RC.27
Maximum Power -P <sub>MAX</sub> (Wp)	316	320	324	328	332	335
Maximum Power Voltage -V <sub>MPP</sub> (V)	39.3	39.7	40.0	40.4	40.7	41.0
Maximum Power Current -I <sub>MPP</sub> (A)	8.03	8.07	8.09	8.11	8.15	8.17
Open Circuit Voltage -V <sub>OC</sub> (V)	47.5	47.8	48.2	48.7	49.1	49.4
Short Circuit Current -I <sub>SC</sub> (A)	8.46	8.49	8.51	8.53	8.57	8.60

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, High Transmission, 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 <sub>MAX</sub>	-0.30 %/ K
Temperature Coefficient of V <sub>OC</sub>	-0.24 %/ K
Temperature Coefficient of I <sub>SC</sub>	0.04 %/ K

**MAXIMUM RATINGS**

Operational Temperature	-40 to +85 °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:	936 pieces