

# Vertex S

BACKSHEET MONOCRYSTALLINE MODULE

PRODUCT: TSM-DE09R.05W  
POWER RANGE: 405-425 W

## 425 W+

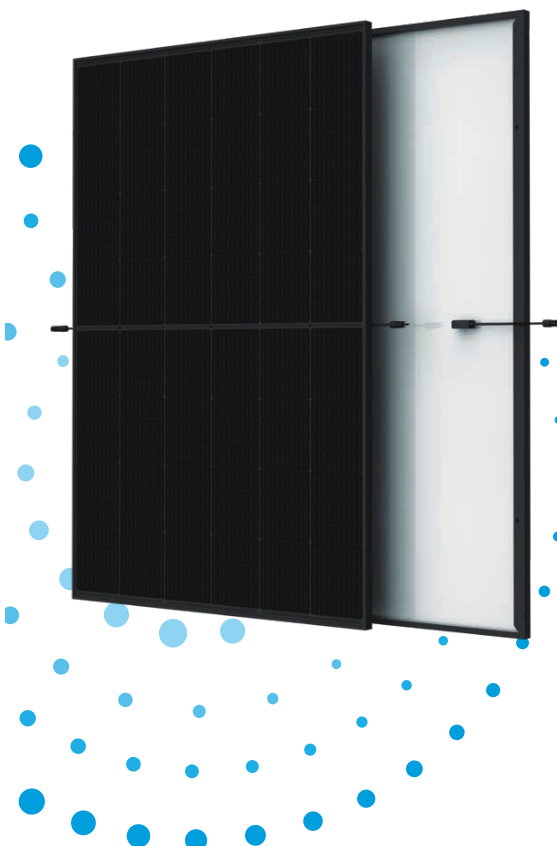
MAXIMUM POWER OUTPUT

## 0/+5 W

POSITIVE POWER TOLERANCE

## 21.3 %

MAXIMUM EFFICIENCY



### Outstanding Visual Appearance

- Designed with aesthetics in mind
- Ultra-thin, virtually invisible busbars
- Excellent cell color control by machine selection



### Small in size, big on power

- Generates up to 425 W, 21.3 % module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping, lower series resistance, improved current collection and enhanced reliability
- Excellent low light performance (IAM) with cell process and module material optimization



### Optimal solution for residential rooftops

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



### High Reliability

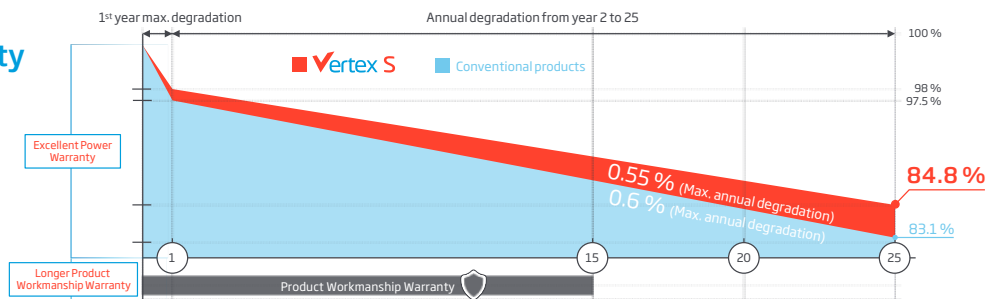
- Positive load up to 6,000 Pa (snow)
- Negative load up to 4,000 Pa (wind)

## Extended Vertex S Warranty

**2 %**  
1<sup>st</sup> year max. degradation

**0.55 %**  
Max. annual degradation from year 2 to 25

**15 Years**  
Product Workmanship Warranty



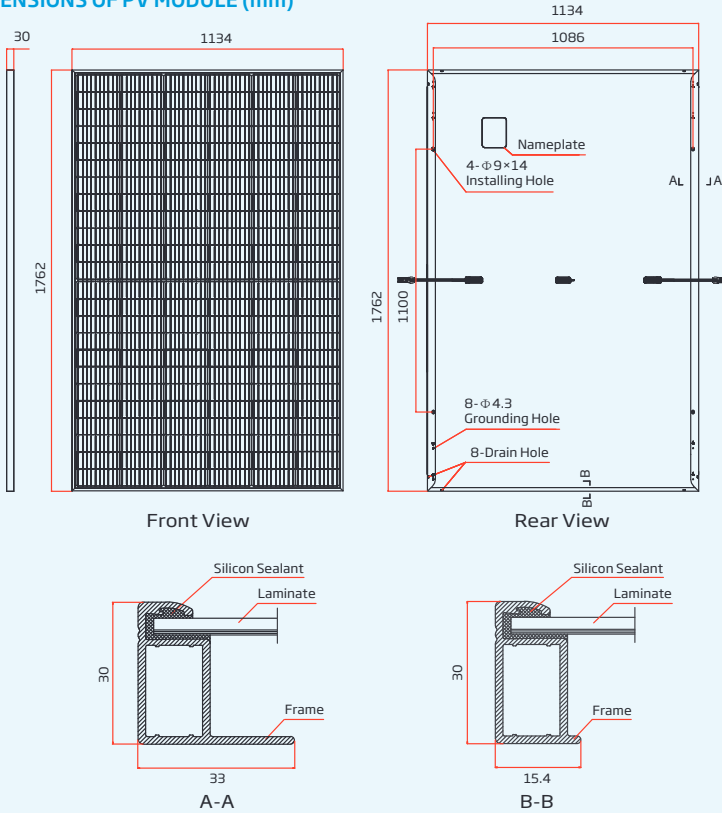
## Comprehensive Product and System Certificates



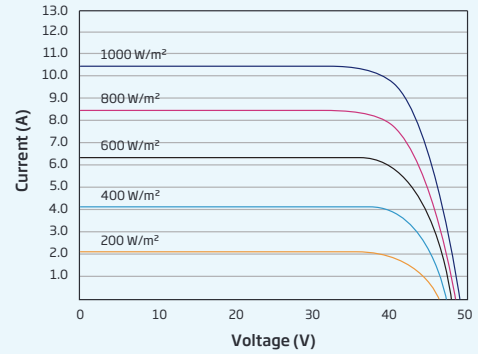
IEC61215/IEC61730/IEC61701/IEC62716  
ISO 9001: Quality Management System  
ISO 14001: Environmental Management System  
ISO14064: Greenhouse Gases Emissions Verification  
ISO45001: Occupational Health and Safety Management System



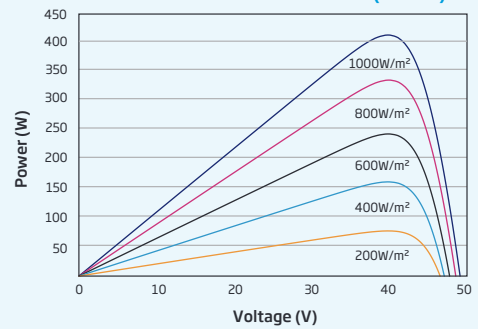
## DIMENSIONS OF PV MODULE (mm)



## I-V CURVES OF PV MODULE (415W)



## P-V CURVES OF PV MODULE (415W)



## ELECTRICAL DATA (STC)

	TSM-405 DE09R.05W	TSM-410 DE09R.05W	TSM-415 DE09R.05W	TSM-420 DE09R.05W	TSM-425 DE09R.05W
Peak Power Watts- $P_{MAX}$ (Wp)*	405	410	415	420	425
Power Tolerance- $P_{MAX}$ (W)	0/+5	0/+5	0/+5	0/+5	0/+5
Maximum Power Voltage- $V_{MPP}$ (V)	41.3	41.5	41.7	42.0	42.2
Maximum Power Current- $I_{MPP}$ (A)	9.82	9.87	9.94	10.01	10.08
Open Circuit Voltage- $V_{oc}$ (V)	49.7	49.8	50.0	50.1	50.2
Short Circuit Current- $I_{sc}$ (A)	10.50	10.53	10.55	10.58	10.61
Module Efficiency $\eta_m$ (%)	20.3	20.5	20.8	21.0	21.3

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

## MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	144 cells
Module Dimensions	1762×1134×30 mm
Weight	21.8 kg
Glass	3.2 mm, High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
Backsheet	Black-White
Frame	30 mm Anodized Aluminium Alloy
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 EV02*

\*Special order only

## ELECTRICAL DATA (NOCT)

	TSM-405 DE09R.05W	TSM-410 DE09R.05W	TSM-415 DE09R.05W	TSM-420 DE09R.05W	TSM-425 DE09R.05W
Maximum Power- $P_{MAX}$ (Wp)	306	309	312	317	321
Maximum Power Voltage- $V_{MPP}$ (V)	38.3	38.5	38.7	39.2	39.5
Maximum Power Current- $I_{MPP}$ (A)	7.99	8.03	8.07	8.10	8.13
Open Circuit Voltage- $V_{oc}$ (V)	46.8	46.9	47.1	47.1	47.2
Short Circuit Current- $I_{sc}$ (A)	8.46	8.49	8.50	8.53	8.55

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

## TEMPERATURE RATINGS

NOCT(Nominal Operating Cell Temperature)	43°C (±2 K)
Temperature Coefficient of $P_{MAX}$	-0.34 %/K
Temperature Coefficient of $V_{oc}$	-0.25 %/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

15 Year product workmanship warranty  
25 Year power warranty  
2% First year degradation  
0.55% Annual power degradation

(Please refer to the applicable limited warranty for details)

## PACKAGING CONFIGURATION

Modules per box	36 pieces
Modules per 40' container	936 pieces