



High Power Output
Low LCOE



Maximum Power
465W



TWMNH

N-type Half-cell
Bifacial Black Frame Module (48)

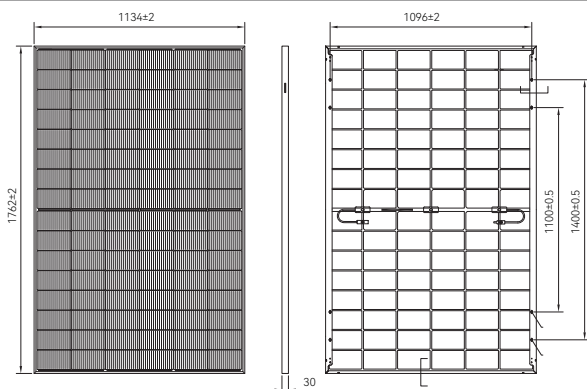
48HD440-465W

Tongwei Co.,Ltd.
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Drawings (Unit: mm)



Electrical characteristics (STC)

Model type:	TWMNH-48 HD440	TWMNH-48 HD445	TWMNH-48 HD450	TWMNH-48 HD455	TWMNH-48 HD460	TWMNH-48 HD465
Maximum Power: Pmax [W]	440	445	450	455	460	465
Open Circuit Voltage: Voc [V]	35.35	35.55	35.75	35.95	36.15	36.35
Short Circuit Current: Isc [A]	15.89	15.92	15.95	15.98	16.05	16.12
Voltage at Maximum Power: Vmp [V]	29.67	29.93	30.19	30.44	30.69	30.94
Current at Maximum Power: Imp [A]	14.83	14.87	14.91	14.95	14.99	15.03
Module Efficiency: η [%]	22.0	22.3	22.5	22.8	23.0	23.3

* STC: Irradiance 1000W/m², Cell Temperature 25°C, AM=1.5, Power measurement tolerance: ±3%

Electrical characteristics (BNPI)

Maximum Power: Pmax [W]	485.7	491.5	496.9	502.3	507.9	513.3
Open Circuit Voltage: Voc [V]	35.35	35.55	35.75	35.95	36.15	36.35
Short Circuit Current: Isc [A]	17.54	17.57	17.61	17.64	17.72	17.80
Voltage at Maximum Power: Vmp [V]	29.67	29.93	30.19	30.44	30.69	30.94
Current at Maximum Power: Imp [A]	16.37	16.42	16.46	16.50	16.55	16.59

* BNPI: Front side irradiance 1000W/m², Rear side irradiance 135W/m², Cell Temperature=25°C, AM=1.5, Power measurement tolerance: ±3%

Electrical characteristics with different rear side power gain

Maximum Power: Pmax[W]	462	467	472	477	483	488
Module Efficiency: η [%]	23.1	23.4	23.6	23.9	24.2	24.4
Maximum Power: Pmax[W]	506	511	517	523	529	534
Module Efficiency: η [%]	25.3	25.6	25.9	26.2	26.5	26.7
Maximum Power: Pmax[W]	550	556	562	568	575	581
Module Efficiency: η [%]	27.5	27.8	28.1	28.4	28.8	29.1

Temperature rating

Temperature Coefficient of Pmax	-0.28%/°C
Temperature Coefficient of Voc	-0.24%/°C
Temperature Coefficient of Isc	+0.046%/°C

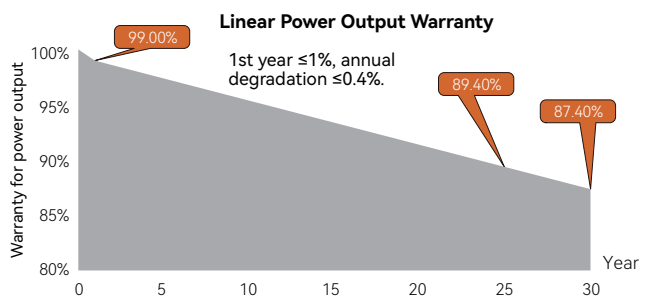
Operating parameters

Operating Temperature	-40°C~+70°C
Module [T98] max	70°C
Maximum System Voltage	1500V DC
Maximum Series Fuse Rating	30A
Power Selection Tolerance	0~+3%
Bifaciality coefficient of Pmax	80±10%
Bifaciality coefficient of Voc	98±5%
Bifaciality coefficient of Isc	80±10%
Fire Class Rating	Class C

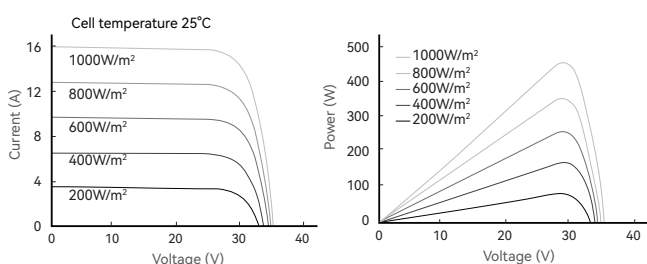
Mechanical parameters

Cell Type	TNC (N Type Monocrystalline Cell)
Cell Orientation	96[6×16]
Dimensions	1762±2×1134±2×30mm
Weight	21.9kg
Front Glass	1.6mm AR coating semi tempered glass
Rear Glass	1.6mm semi tempered glass
Frame	Anodized aluminum alloy black frame
Junction Box	IP68, 3diodes
Cable	4.0mm ²
Cable length	+1200mm, -1200mm, length can be customized
Connector	TW-PVCON-01(Tongwei Solar) PV-KST4-EVO2/xy_UR, PV-KBT4-EVO2/xy_UR(Staubli) PV-KST4-EVO2A/xy, PV-KBT4-EVO2A/xy(Staubli) PV-ZH202B(Zhejiang Zhonghuan Sunter)
Max static test load	Front side 5400Pa,Rear side 2400Pa
Per pallet	36pcs
Packaging	936pcs per 40'HC

Warranty



I-V Curve



Certifications

Quality Management System and Product Certification

ISO 9001: 2015 / Quality management systems
 ISO 14001: 2015 / Environmental management systems
 ISO 45001: 2018 / Occupational health and safety management systems
 ISO 50001: 2018 / Energy management systems
 IEC 62941: 2019 / Quality system for PV module manufacturing
 IEC 61215(2021) / IEC 61730(2023)



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