



TWMNH

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

48HD440-460W

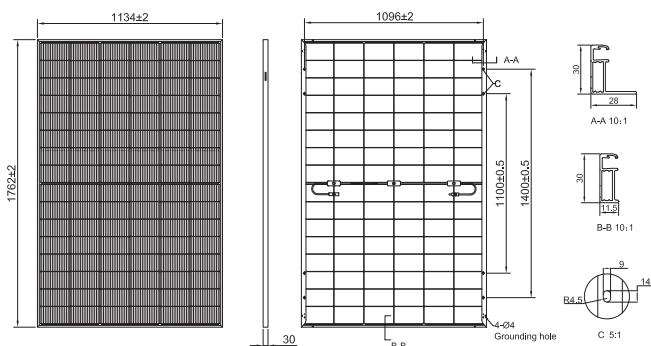


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Drawings (Unit: mm)



Electrical Characteristics (STC)

Module type: TWMNH-48HDXXX

Maximum Power: P _{max} [W]	440	445	450	455	460
Open Circuit Voltage: V _{oc} [V]	35.35	35.55	35.75	35.95	36.15
Short Circuit Current: I _{sc} [A]	15.89	15.92	15.95	15.98	16.05
Voltage at Maximum Power: V _{mp} [V]	29.67	29.93	30.19	30.44	30.69
Current at Maximum Power: I _{mp} [A]	14.83	14.87	14.91	14.95	14.99
Module Efficiency: η [%]	22.0	22.3	22.5	22.8	23.0

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

Electrical Characteristics (BNPI)

Maximum Power: P _{max} [W]	485.7	491.5	496.9	502.3	507.9
Open Circuit Voltage: V _{oc} [V]	35.35	35.55	35.75	35.95	36.15
Short Circuit Current: I _{sc} [A]	17.54	17.57	17.61	17.64	17.72
Voltage at Maximum Power: V _{mp} [V]	29.67	29.93	30.19	30.44	30.69
Current at Maximum Power: I _{mp} [A]	16.37	16.42	16.46	16.50	16.55

* 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

5%	Maximum Power: P _{max} [W]	462	467	472	477	483
	Module Efficiency: η [%]	23.1	23.4	23.6	23.9	24.2
15%	Maximum Power: P _{max} [W]	506	511	517	523	529
	Module Efficiency: η [%]	25.3	25.6	25.9	26.2	26.5
25%	Maximum Power: P _{max} [W]	550	556	562	568	575
	Module Efficiency: η [%]	27.5	27.8	28.1	28.4	28.8

Temperature Rating

Temperature Coefficient of P _{max}	-0.28%/°C
Temperature Coefficient of V _{oc}	-0.24%/°C
Temperature Coefficient of I _{sc}	+0.046%/°C

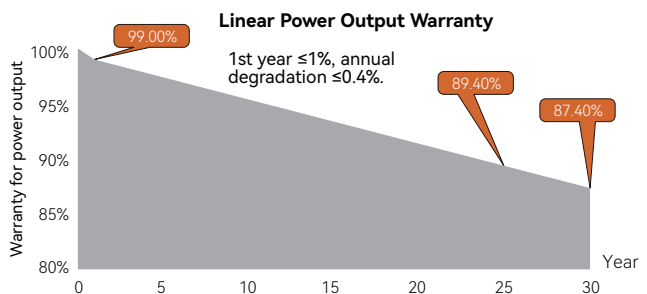
Operating Parameters

Operating Temperature	-40°C~+70°C
Maximum System Voltage	1500V DC
Maximum Series Fuse Rating	30A
Power Output Tolerance	0~+3%
Bifaciality coefficient of P _{max}	80±10%
Bifaciality coefficient of V _{oc}	98±5%
Bifaciality coefficient of I _{sc}	80±10%

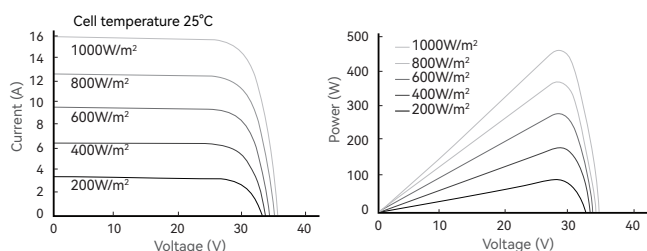
Mechanical Parameters

Cell Type	TNC (N Type Monocrystalline Cell)
Cell Orientation	96[6×16]
Dimensions	1762±2×1134±2×30mm
Weight	22.8kg
Front Glass	2.0mm AR coating semi tempered glass
Rear Glass	2.0mm semi tempered glass
Frame	Anodized aluminum alloy black frame
Junction Box	IP68, 3 diodes
Cable	4.0mm ²
Cable length	+1200mm, -1200mm, length can be customized
Wind/Snow load	2400Pa/5400Pa
Per pallet	36 pcs
Packaging	936 pcs per 40'HC

Linear 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/Occupation 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), IEC 62804(PID),
IEC 61701(Salt), IEC 62716 (Ammonia), IEC 60068-2-68(Sand)

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Statement: With technological process and product update, there maybe deviation between the technical parameters of Tongwei's module products and the technical parameters contained in the specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar. (AUS-TP Glass-Preview-20250429)