HD HYUNDAI ENERGY SOLUTIONS

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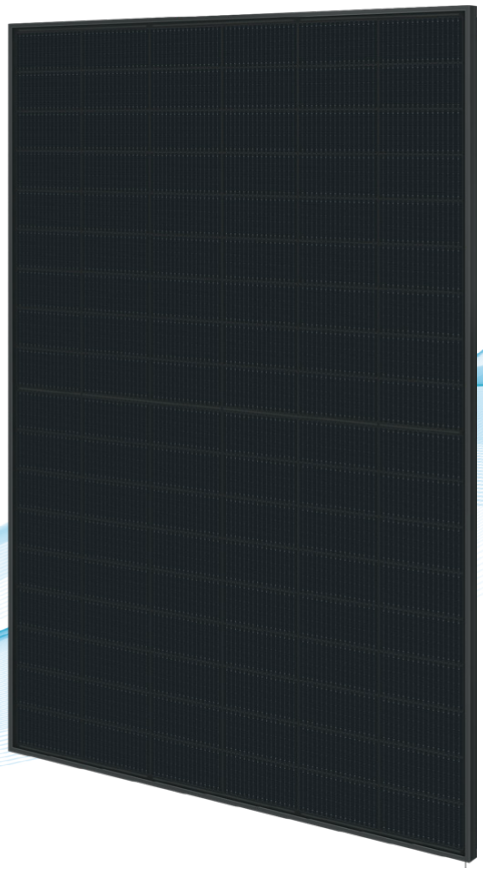
HD HYUNDAI SOLAR MODULE

NF(BK) Series

Premium N-Type TOPCon Module

HiN-T435NF(BK) | HiN-T440NF(BK) | HiN-T445NF(BK)



22.79%
22.79% High Efficiency

TOPCon
High-End TOPCon Technology

Higher Bifaciality

Long-Term Reliability

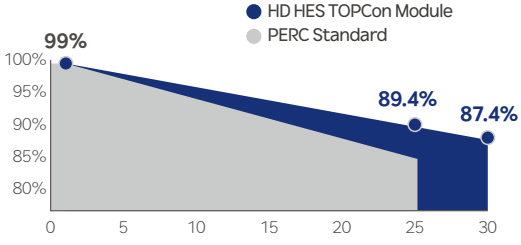
Compatible with Carport Applications

For Residential (Full Black Design)

HD Hyundai's Warranty Provisions

25 YEARS
- 25-Year Product Warranty
  - Materials and workmanship

30 YEARS
- 30-Year Performance Warranty
  - First year degradation: 1%
  - Linear warranty after initial year: with 0.4%p annual degradation, 87.4% is guaranteed up to 30years



*Refer to HD HES standard warranty for details.

Certification

ISO SA kiwa PVEL

- ISO 9001 : Quality management systems
- ISO 14001 : Environmental management systems
- ISO 45001 : Occupational health and safety management systems
- UL 61730: Photovoltaic (PV) module safety qualification (CSA)
- IEC 61701: Salt mist corrosion testing
- IEC 62716: Ammonia corrosion testing
- IEC 62804: Potential Induced Degradation (PID) testing
- IEC 60068-2-68: Sand and dust testing for environmental durability

Electrical Characteristics

HiN-TxxxNF(BK)		HiN-T435NF		HiN-T440NF		HiN-T445NF	
Item	Unit		BNPI		BNPI		BNPI
Nominal output (Pmax)	W	435	482	440	488	445	493
Open circuit voltage (Voc)	V	38.6	38.6	38.8	38.8	39.0	39.0
Short circuit current (Isc)	A	14.32	15.87	14.39	15.94	14.46	16.02
Voltage at Pmax (Vmpp)	V	32.1	32.1	32.3	32.3	32.5	32.5
Current at Pmax (Impp)	A	13.56	15.01	13.63	15.10	13.70	15.18
Module efficiency	%	22.28	24.68	22.53	25.00	22.79	25.25
Power Class Sorting	W	0 ~ +5					
Temperature coefficient of Pmax	%/K	-0.30					
Temperature coefficient of Voc	%/K	-0.25					
Temperature coefficient of Isc	%/K	0.046					
Bifaciality	%	80%±10%					

*STC : Irradiance 1,000 W/m², cell temperature 25℃, AM=1.5 / Test uncertainty for Pmax ±3%; Voc ±3%; Isc ±3%
**The electrical properties of BNPI are measured under the irradiance corresponding to 1000 W/m² on the module front and 135 W/m² on the module rear.

Additional Power Gain from rear side					
Pmpp gain	Pmpp[W]	Vmpp[V]	Impp[A]	Voc[V]	Isc[A]
5%	458	32.30	14.18	38.80	14.97
15%	493	32.30	15.27	38.80	16.12
25%	528	32.40	16.36	38.90	17.27

*Electrical characteristics with different rear power gain (reference to 440W)

Mechanical Characteristics

Dimensions	1,722mm (L) x 1,134mm (W) x 30mm (H) (67.8in x 44.6in x 1.2in)
Weight	24.5 kg (54.01lbs)
Solar Cells	N-Type TOPCon, 108 (6x18) monocrystalline 16BB half-cut bifacial cells
Output Cables	Cable : (+)1,200mm(47.2in), (-)1,200mm(47.2in) / Customized length available Connector : Stäubli MC4 genuine Connector / IP68
Junction Box	3-part, 3 bypass diodes, IP68 rated
Construction	Front : 2.0mm(0.08in) semi-tempered solar glass with high transmittance and anti-reflective coating Rear : 2.0mm(0.08in) semi-tempered solar glass
Frame	Anodized aluminum alloy

Installation Safety Guide

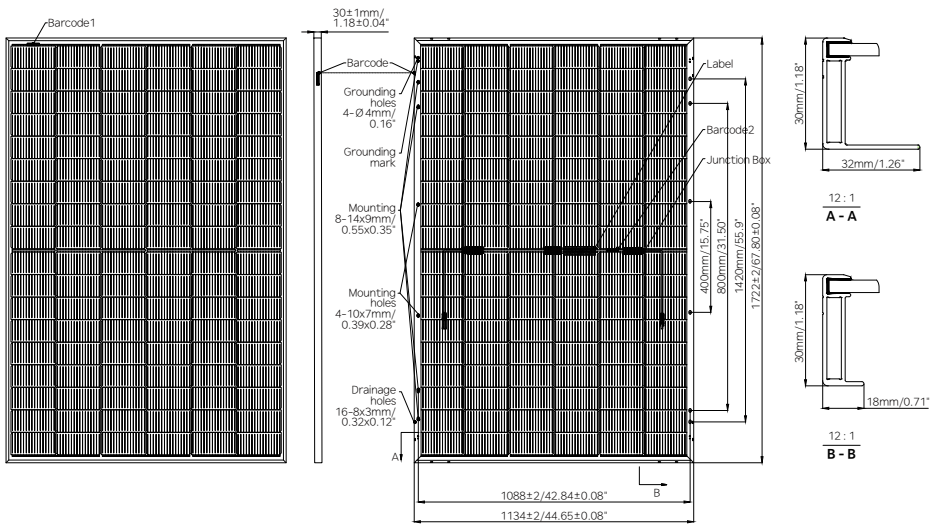
- Only qualified personnel should install or perform maintenance.
- Be aware of dangerous high DC voltage.
- Do not handle or install modules when they are wet.

Nominal Module Operation Temperature	44℃ ± 2℃
Operating Temperature	-40℃~+85℃
Maximum System Voltage	DC 1,500 V
Maximum Reverse Current	30A
Maximum Test Load *See Installation Manual	Front 5,400Pa *Rear 5,400Pa
Fire Performance	Type 29

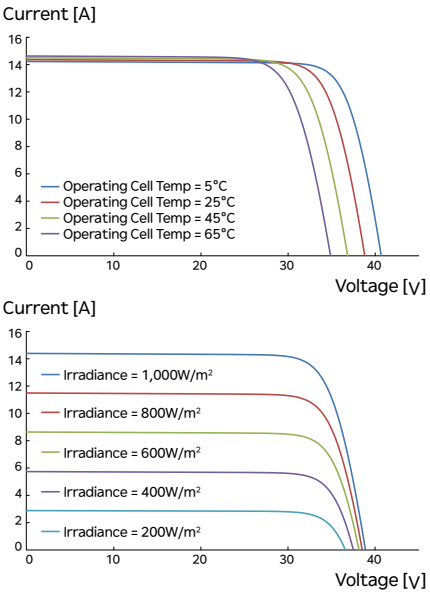
Shipping Configurations

Packing Direction	Vertical	Packing pallet weight (kg)	912
Container Size (HC)	40'	Modules Per Pallet (pcs)	36
Pallets Per Container	26	Modules Per Container (pcs)	936

Module Diagram (unit : mm)



I-V Curves (HiN-T440NF(BK))



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