SCHEDE TECNICHE ULICA SOLAR 2
SCHEDE TECNICHE HORAY 37

ULICA SOLAR 2
UL-1762-108BDGNHH-30-EN-V2.0 425-450 3
UL-1762-108BDGNTH-30-EN-V2.0 430-455 5
UL-1952-120BDGNTH-30-EN-V2.0 480-505 7
UL-1762-108BHVNBH-30-EN-V2.0 430-455 9
UL-2278-144ADGNBB-30-EN-V2.0 570-595 11
UL-2278-144ADGNYB-30-EN-V3.0 570-595 13
UL-2382-132DDGNYB-30-EN-V3.0 600-625 15
UL-2384-132DGNBB-33-EN-V2.0 700-725 17
UL-2384-132DGNYB-33-EN-V3.0 700-725 19
UL-2279-144HVBBC-35-EN-V1.2 545-555 21
UL-2384-132DGBBC-33-EN-V1.2 660-670 23
UL-2384-132HVBBC-35-EN-V1.2 660-670 25
QIN-UL-2382-144CDGNYB-30-EN-V2.0 27
UL-1762-108BDGNBB-30-EN-V2.0 430-455 29
UL-1762-108BDGNBBC-30-EN-V1.2 445-455 31
UL-2278-144ADGNBBC-30-EN-V1.2 33
Scheda tecnica Zavorra 35



LEADING IN TECHNOLOGY

Established in August 2005, Ningbo Ulica Solar Co., Ltd. is an integrated PV manufacturer dedicated to the R&D, production, and sales of solar wafers, cells, and modules.

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ulica solar
LEADING IN TECHNOLOGY

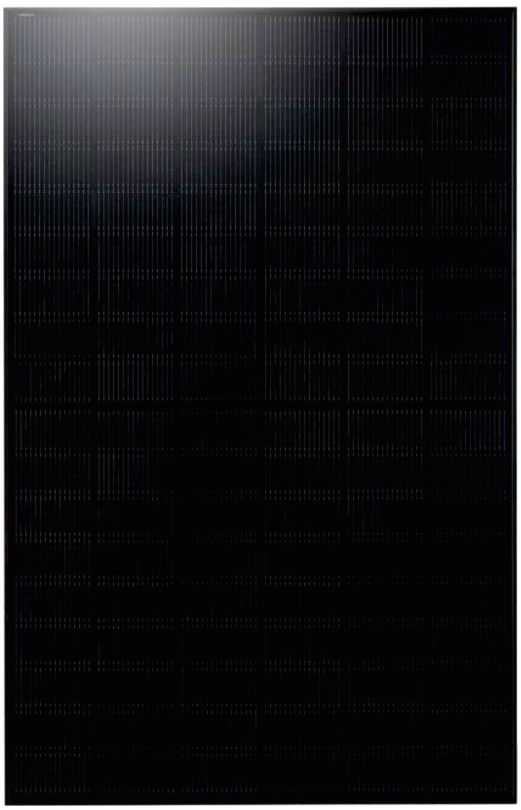
Black Jade series

Double Glass BiFacial N-Type TOPCon Solar Module

425~450 Watt

Model: UL-***M-108BDGN

Maximum Efficiency: 22.52%



Cutting Free Technology

The half cells are made directly from half silicon wafer, reducing power losses and hidden cracks

Bifacial Mono Module

Capable of generating power at back side,
80±5% efficiency of the front side

Outstanding Mechanical load Resistance

2400 Pa wind load, 5400 Pa snow load

Anti-PID(potential induced degradation)

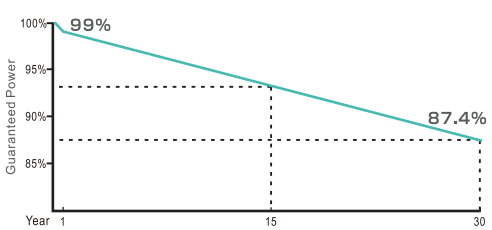
Passed anti-PID test under 85°C damp heat 85%
relative humidity for 192 hours

Lower LCOE

Lower shading and resistive loss Lower temperature coefficient

Widely Applied To Various Scenarios

Flexibly applied to roofs, ground surfaces, water surfaces, mountainous areas, and other diverse environments



15 Year Product Warranty **1%** Power Degradation In The First Year

30 Year Linear Power Warranty **0.4%** Linear Power Degradation

IEC 61215, IEC 61730
ISO 9001: 2015(Quality management systems)
ISO 14001: 2015 (Environmental management systems)
ISO45001: 2018 (Occupational health and safety)
UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Ulica Official Website
Add:No.238 Yunlin Middle Road,Ningbo China
TEL:+86-574-28828999
Email: sales@ulsolar.com.cn

DOUBLE GLASS BIFACIAL 425~450Watt

ELECTRICAL SPECIFICATIONS

Module Type		UL-425M-108BDGN		UL-430M-108BDGN		UL-435M-108BDGN		UL-440M-108BDGN		UL-445M-108BDGN		UL-450M-108BDGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	425	322	430	326	435	330	440	333	445	337	450	341
Maximum Power Voltage(Vmp)	V	32.64	30.03	32.72	30.10	32.87	30.24	32.91	30.28	33.02	30.38	33.22	30.56
Maximum Power Current(Imp)	A	13.02	10.73	13.14	10.82	13.24	10.90	13.37	11.01	13.48	11.10	13.55	11.16
Open-circuit Current(Voc)	V	38.72	35.24	38.97	35.46	39.18	35.65	39.38	35.84	39.58	36.02	39.78	36.20
Short-circuit Current(Isc)	A	14.05	11.33	14.10	11.37	14.15	11.41	14.22	11.47	14.30	11.53	14.38	11.60
Module Efficiency STC	%	21.27		21.52		21.77		22.02		22.27		22.52	

*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

OPERATING PARAMETERS

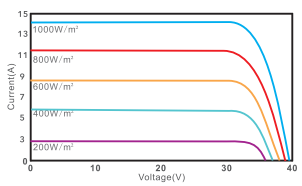
Operating Temperature	-40℃~85℃
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	30A
Nominal operating cell temperature	43±2℃
Power tolerance	0~+5Watt

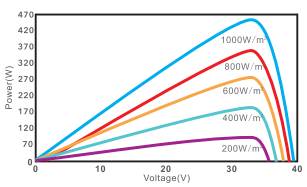
TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/℃
Temperature coefficients of Voc	-0.25%/℃
Temperature coefficients of Isc	0.046%/℃

I-V CURVE

I-V characteristics at different irradiations (reference to 450 W)



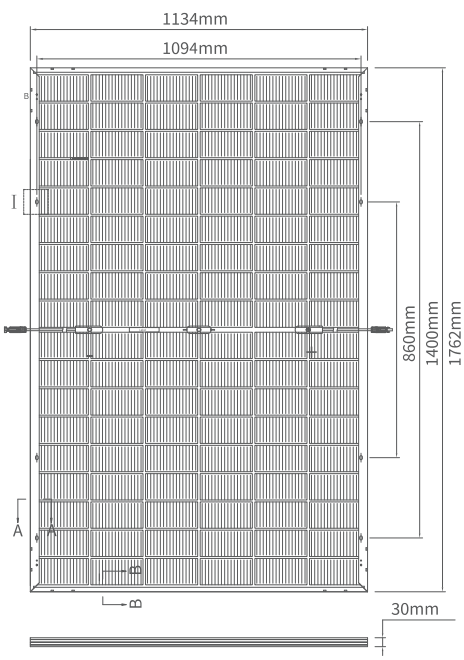


REAR SIDE POWER GAIN(REFERENCE TO 450W FRONT SIDE)

Pmax/W	450	473	495	518	540	563	585
Pmax gain	0%	5%	10%	15%	20%	25%	30%
Voc/V	39.78	39.78	39.78	39.78	39.78	39.78	39.78
Isc/A	14.38	15.10	15.82	16.54	17.26	17.98	18.69
Vmp/V	33.22	33.22	33.22	33.22	33.22	33.22	33.22
Imp/A	13.55	14.22	14.90	15.58	16.26	16.93	17.61

SPECIFICATIONS

Cell Type	N-type TOPCon Mono Half Cell
No.of cells	108(6×9×2)
Dimensions	1762*1134*30mm
Weight	23.7kg
Front Glass	2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Back Glass	2.0mm,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others _____
Cable Length (Including Connector)	◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1200/(-)1200mm (4mm²) or ◯ Customized Length _____



PACKAGING INFORMATION


36 Pcs/Pallet


72 Pcs/Stack


Length:1775mm


Width:1130mm

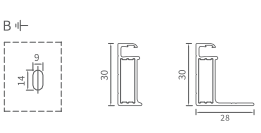

Height:2540mm



Weight:1770kg/Stack



13 Stack/40HQ
936 Pcs/40HQ



Length:±2mm
Width:±2mm
Height:±1mm
Row Pitch:±2mm

Specifications included in this datasheet are subject to change without noctice.

Ulica Solar reserves the right of final interpretation.

Version number: UL-1762-108BDGNHH-30-EN-V2.0

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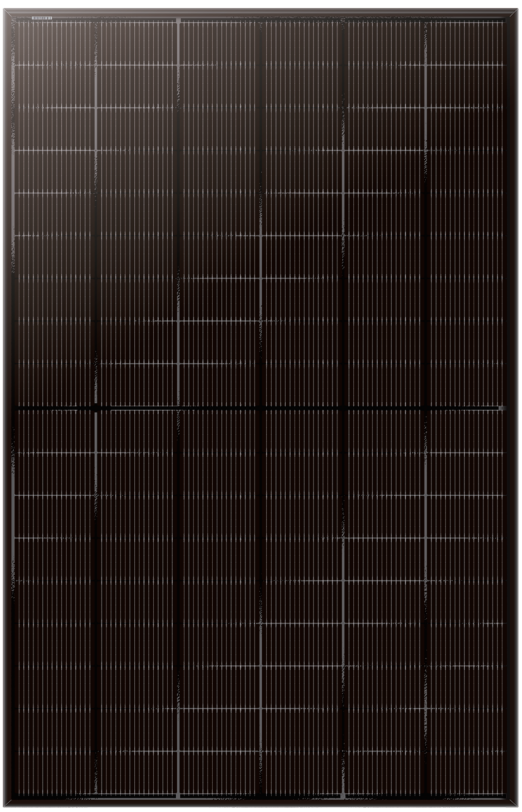
Black Jade Flow series

Double Glass BiFacial N-Type TOPCon Solar Module

430~455 Watt

Model: UL-***M-108BDGN

Maximum Efficiency: 22.77%



Cutting Free Technology

The half cells are made directly from half silicon wafer, reducing power losses and hidden cracks

Bifacial Mono Module

Capable of generating power at back side, 80±5% efficiency of the front side

Outstanding Mechanical load Resistance

2400 Pa wind load, 5400 Pa snow load

Anti-PID(potential induced degradation)

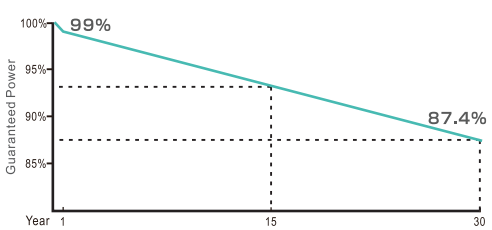
Passed anti-PID test under 85°C damp heat 85% relative humidity for 192 hours

Lower LCOE

Lower shading and resistive loss Lower temperature coefficient

Widely Applied To Various Scenarios

Flexibly applied to roofs, ground surfaces, water surfaces, mountainous areas, and other diverse environments



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30 Year Linear Power Warranty 0.4% Linear Power Degradation

IEC 61215, IEC 61730
ISO 9001: 2015(Quality management systems)
ISO 14001: 2015 (Environmental management systems)
ISO45001: 2018 (Occupational health and safety)
UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Ulica Official Website
Add:No.238 Yunlin Middle Road,Ningbo China
TEL:+86-574-28828999
Email: sales@ulsolar.com.cn

DOUBLE GLASS BIFACIAL 430~455Watt

ELECTRICAL SPECIFICATIONS

Module Type		UL-430M-108BDGN		UL-435M-108BDGN		UL-440M-108BDGN		UL-445M-108BDGN		UL-450M-108BDGN		UL-455M-108BDGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	430	326	435	330	440	333	445	337	450	341	455	345
Maximum Power Voltage(Vmp)	V	32.72	30.10	32.87	30.24	32.91	30.28	33.02	30.38	33.22	30.56	33.42	30.75
Maximum Power Current(Imp)	A	13.14	10.82	13.24	10.90	13.37	11.01	13.48	11.10	13.55	11.16	13.61	11.21
Open-circuit Current(Voc)	V	38.97	35.46	39.18	35.65	39.38	35.84	39.58	36.02	39.78	36.20	39.98	36.38
Short-circuit Current(Isc)	A	14.10	11.37	14.15	11.41	14.22	11.47	14.30	11.53	14.38	11.60	14.45	11.66
Module Efficiency STC	%	21.52		21.77		22.02		22.27		22.52		22.77	

*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

OPERATING PARAMETERS

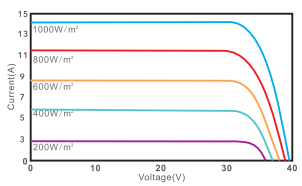
Operating Temperature	-40℃~85℃
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	30A
Nominal operating cell temperature	43±2℃
Power tolerance	0~+5Watt

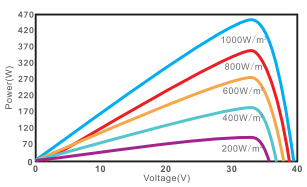
TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/℃
Temperature coefficients of Voc	-0.25%/℃
Temperature coefficients of Isc	0.046%/℃

I-V CURVE

I-V characteristics at different irradiations (reference to 450 W)



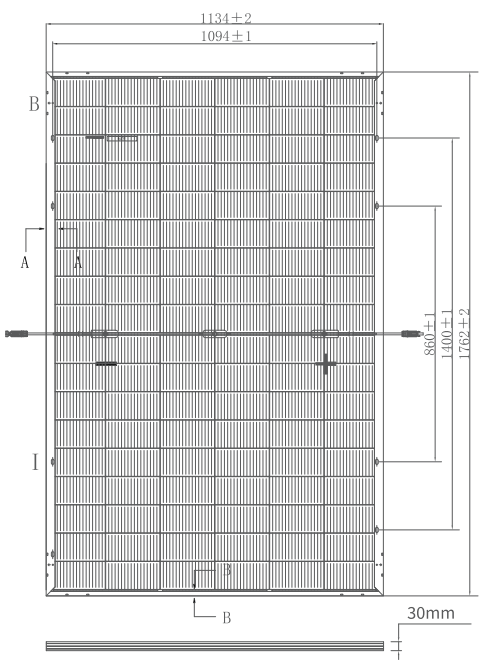


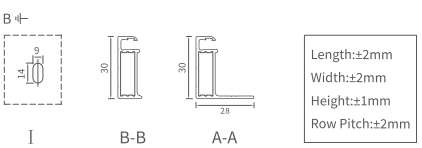
REAR SIDE POWER GAIN(REFERENCE TO 450W FRONT SIDE)

Pmax/W	450	473	495	518	540	563	585
Pmax gain	0%	5%	10%	15%	20%	25%	30%
Voc/V	39.78	39.78	39.78	39.78	39.78	39.78	39.78
Isc/A	14.38	15.10	15.82	16.54	17.26	17.98	18.69
Vmp/V	33.22	33.22	33.22	33.22	33.22	33.22	33.22
Imp/A	13.55	14.22	14.90	15.58	16.26	16.93	17.61

SPECIFICATIONS

Cell Type	N-type TOPCon Mono Half Cell
No.of cells	108(6×9×2)
Dimensions	1762*1134*30mm
Weight	23.7kg
Front Glass	2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Back Glass	2.0mm,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others _____
Cable Length (Including Connector)	4mm² ◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1200/(-)1200mm or ◯ Customized Length _____





Length:±2mm
Width:±2mm
Height:±1mm
Row Pitch:±2mm

PACKAGING INFORMATION


36 Pcs/Pallet


72 Pcs/Stack


Length:1775mm


Width:1130mm


Height:2540mm



Weight:1770kg/Stack



13 Stack/40HQ
936 Pcs/40HQ

Specifications included in this datasheet are subject to change without noctice.

Ulica Solar reserves the right of final interpretation.

Version number: UL-1762-108BDGNTH-30-EN-V2.0

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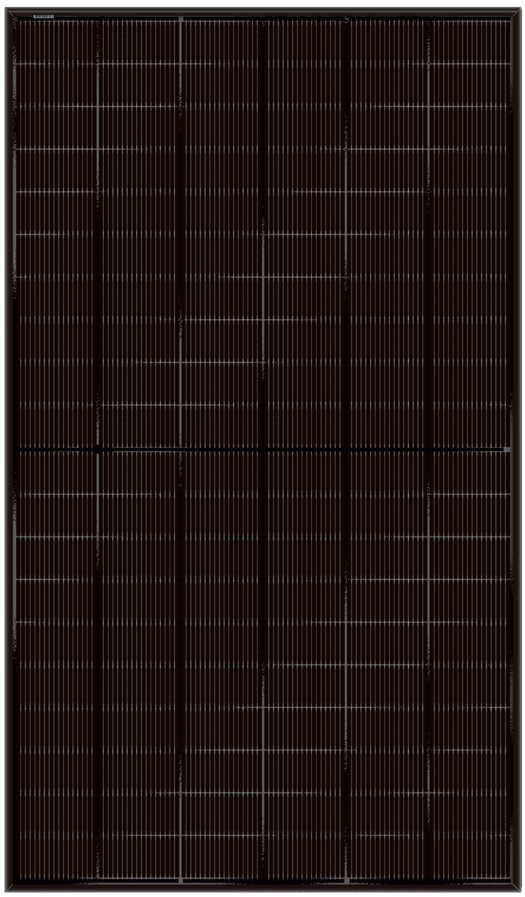
Black Jade Flow series

Double Glass BiFacial N-Type TOPCon Solar Module

480~505 Watt

Model: UL-***M-120BDGN

Maximum Efficiency: 22.81%



Cutting Free Technology

The half cells are made directly from half silicon wafer, reducing power losses and hidden cracks

Bifacial Mono Module

Capable of generating power at back side, 80±5% efficiency of the front side

Outstanding Mechanical load Resistance

2400 Pa wind load, 5400 Pa snow load

Anti-PID(potential induced degradation)

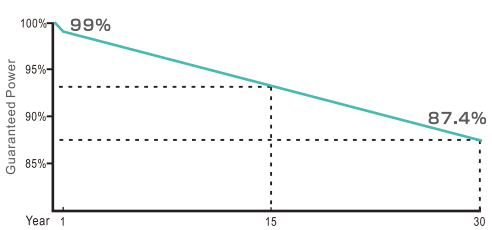
Passed anti-PID test under 85°C damp heat 85% relative humidity for 192 hours

Lower LCOE

Lower shading and resistive loss Lower temperature coefficient

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Flexibly applied to roofs, ground surfaces, water surfaces, mountainous areas, and other diverse environments



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30 Year Linear Power Warranty 0.4% Linear Power Degradation

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ISO45001: 2018 (Occupational health and safety)
UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Ulica Official Website
Add:No.238 Yunlin Middle Road,Ningbo China
TEL:+86-574-28828999
Email: sales@ulsolar.com.cn

DOUBLE GLASS BIFACIAL 480~505Watt

ELECTRICAL SPECIFICATIONS

Module Type		UL-480M-120BDGN		UL-485M-120BDGN		UL-490M-120BDGN		UL-495M-120BDGN		UL-500M-120BDGN		UL-505M-120BDGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	480	364	485	368	490	371	495	375	500	379	505	383
Maximum Power Voltage(Vmp)	V	36.35	33.44	36.52	33.60	36.68	33.75	36.85	33.90	37.02	34.06	37.18	34.21
Maximum Power Current(Imp)	A	13.20	10.88	13.28	10.94	13.36	11.00	13.43	11.06	13.51	11.13	13.58	11.19
Open-circuit Current(Voc)	V	43.02	39.15	43.18	39.29	43.35	39.45	43.52	39.60	43.78	39.84	43.98	40.02
Short-circuit Current(Isc)	A	14.25	11.49	14.30	11.53	14.35	11.58	14.43	11.64	14.48	11.68	14.54	11.73
Module Efficiency STC	%	21.68		21.91		22.14		22.36		22.59		22.81	

*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

OPERATING PARAMETERS

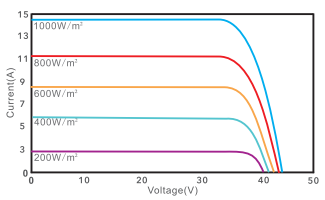
Operating Temperature	-40℃~85℃
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	30A
Nominal operating cell temperature	43±2℃
Power tolerance	0~+5Watt

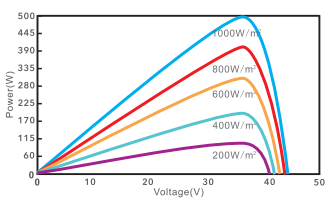
TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/℃
Temperature coefficients of Voc	-0.25%/℃
Temperature coefficients of Isc	0.046%/℃

I-V CURVE

I-V characteristics at different irradiations (reference to 500 W)



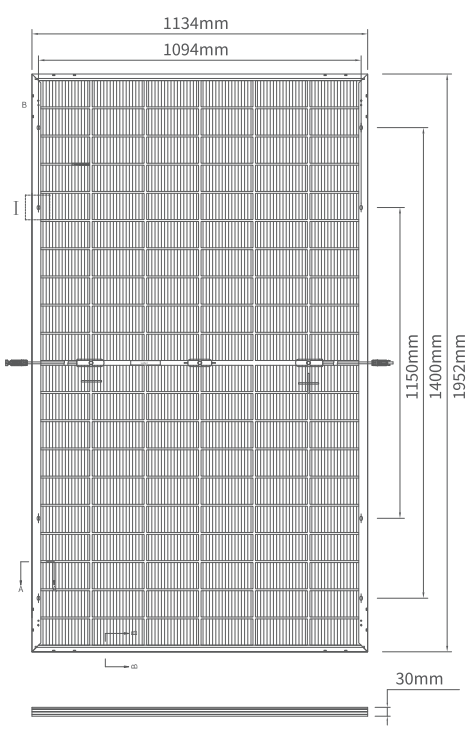


REAR SIDE POWER GAIN(REFERENCE TO 500W FRONT SIDE)

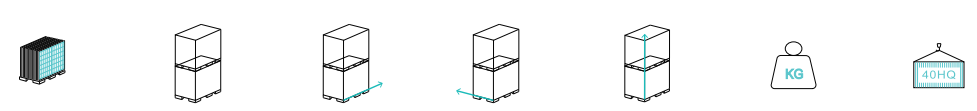
Pmax/W	500	525	550	575	600	625	650
Pmax gain	0%	5%	10%	15%	20%	25%	30%
Voc/V	43.78	43.78	43.78	43.78	43.78	43.78	43.78
Isc/A	14.48	15.20	15.93	16.65	17.38	18.10	18.82
Vmp/V	37.02	37.02	37.02	37.02	37.02	37.02	37.02
Imp/A	13.51	14.18	14.86	15.53	16.21	16.88	17.56

SPECIFICATIONS

Cell Type	N-type TOPCon Mono Half Cell
No.of cells	120(6×10×2)
Dimensions	1952*1134*30mm
Weight	26.2kg
Front Glass	2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Back Glass	2.0mm,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others _____
Cable Length (Including Connector)	◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1200/(-)1200mm or ◯ Customized Length _____ 4mm²



PACKAGING INFORMATION



36 Pcs/Pallet | 72 Pcs/Stack | Length:1965mm | Width:1130mm | Height:2540mm | Weight:1954kg/Stack | 12 Stack/40HQ 864Pcs/40HQ

Specifications included in this datasheet are subject to change without noctice.

Ulica Solar reserves the right of final interpretation.

Version number: UL-1952-120BDGNTH-30-EN-V2.0

www.ulicasolar.com

Heron series

Singe Glass Mono-Facial N-Type TOPCon Solar Module

430~455Watt

Model: UL-***M-108BHVN

Maximum Efficiency: 22.77%



Cutting Free Technology

The half cells are made directly from half silicon wafer, reducing power losses and hidden cracks

Outstanding Mechanical load Resistance

2400 Pa wind load, 5400 Pa snow load

Longer Term Reliability

Successfully passed TUV IEC test

Lower LCOE

Lower shading and resistive loss Lower temperature coefficient

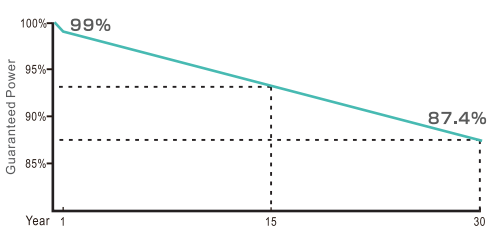
Anti-PID(potential induced degradation)

PID FREE

Passed anti-PID test under 85°C damp heat 85% relative humidity for 96 hours

Widely Applied To Various Scenarios

Flexibly applied to roofs, ground surfaces, water surfaces, mountainous areas, and other diverse environments



15 Year Product Warranty

1% Power Degradation In The First Year

30 Year Linear Power Warranty

0.4% Linear Power Degradation

IEC 61215, IEC 61730

ISO 9001: 2015(Quality management systems)

ISO 14001: 2015 (Environmental management systems)

ISO45001: 2018 (Occupational health and safety)

UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Ulica Official Website

Add:No.238 Yunlin Middle Road,Ningbo China

TEL:+86-574-28828999

Email: sales@ulsolar.com.cn

MONO-FACIAL MODULE 430~455Watt

ELECTRICAL SPECIFICATIONS

Module Type		UL-430M-108BHVN		UL-435M-108BHVN		UL-440M-108BHVN		UL-445M-108BHVN		UL-450M-108BHVN		UL-455M-108BHVN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	430	326	435	330	440	333	445	337	450	341	455	345
Maximum Power Voltage(Vmp)	V	32.72	30.10	32.87	30.24	32.91	30.28	33.02	30.38	33.22	30.56	33.42	30.75
Maximum Power Current(Imp)	A	13.14	10.82	13.24	10.90	13.37	11.01	13.48	11.10	13.55	11.16	13.61	11.21
Open-circuit Current(Voc)	V	38.97	35.46	39.18	35.65	39.38	35.84	39.58	36.02	39.78	36.20	39.98	36.38
Short-circuit Current(Isc)	A	14.10	11.37	14.15	11.41	14.22	11.47	14.30	11.53	14.38	11.60	14.45	11.66
Module Efficiency STC	%	21.52		21.77		22.02		22.27		22.52		22.77	

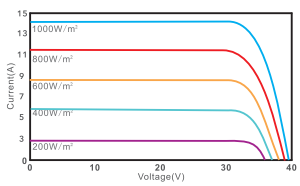
*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

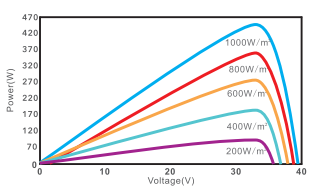
OPERATING PARAMETERS

Operating Temperature	-40°C~85°C
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	25A
Nominal operating cell temperature	43±2°C
Power tolerance	0~+5Watt

I-V CURVE

I-V characteristics at different irradiations (reference to 450 W)



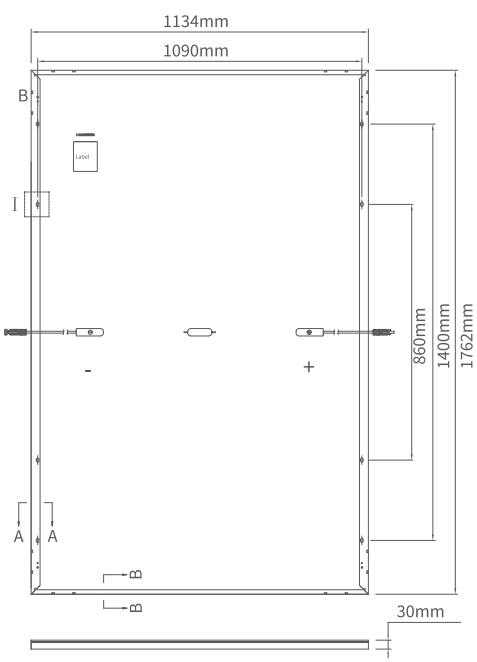


TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/°C
Temperature coefficients of Voc	-0.25%/°C
Temperature coefficients of Isc	0.046%/°C

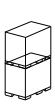
SPECIFICATIONS

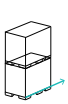
Cell Type	N-type TOPCon Mono Half Cell
No.of cells	108(6×9×2)
Dimensions	1762*1134*30mm
Weight	21.0kg
Front Glass	3.2mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others _____
Cable Length (Including Connector)	4mm² ◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1200/(-)1200mm or ◯ Customized Length _____

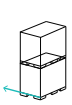


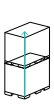
PACKAGING INFORMATION


36 Pcs/Pallet


72 Pcs/Stack


Length:1775mm


Width:1130mm


Height:2540mm



Weight:1576kg/Stack



13 Stack/40HQ
936 Pcs/40HQ



I



B-B



A-A

Length:±2mm
Width:±2mm
Height:±1mm
Row Pitch:±2mm

Specifications included in this datasheet are subject to change without noctice.

Ulica Solar reserves the right of final interpretation.

Version number: UL-1762-108BHVNBH-30-EN-V2.0

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LEADING IN TECHNOLOGY

Mate series

Double Glass BiFacial N-Type TOPCon Solar Module

570~595Watt

Model: UL-***M-144ADGN

Maximum Efficiency: 23.03%



Bifacial Mono Module

Capable of generating power at back side,
80±5% efficiency of the front side

Longer Term Reliability

Passed the IEC63209-1:2021 standard test
(With testing standards 2 to 3 times stricter than regular IEC requirements)

Outstanding Mechanical load Resistance

2400 Pa wind load, 5400 Pa snow load

Anti-PID(potential induced degradation)

PID FREE

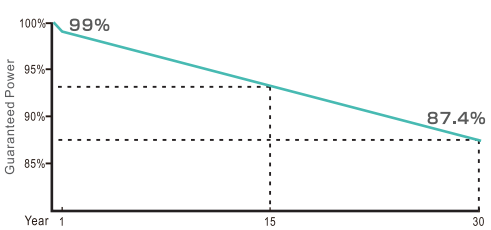
Passed anti-PID test under 85°C damp heat 85%
relative humidity for 192 hours

Lower LCOE

Lower shading and resistive loss Lower temperature coefficient

Widely Applied To Various Scenarios

Flexibly applied to roofs, ground surfaces, water surfaces, mountainous areas, and other diverse environments



15 Year Product Warranty 1% Power Degradation In The First Year

30 Year Linear Power Warranty 0.4% Linear Power Degradation

IEC 61215, IEC 61730
ISO 9001: 2015(Quality management systems)
ISO 14001: 2015 (Environmental management systems)
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TEL:+86-574-28828999
Email: sales@ulsolar.com.cn

DOUBLE GLASS BIFACIAL 570~595Watt

ELECTRICAL SPECIFICATIONS

Module Type		UL-570M-144ADGN		UL-575M-144ADGN		UL-580M-144ADGN		UL-585M-144ADGN		UL-590M-144ADGN		UL-595M-144ADGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	570	432	575	436	580	440	585	443	590	447	595	451
Maximum Power Voltage(Vmp)	V	43.70	40.20	43.85	40.34	44.02	40.50	44.17	40.64	44.35	40.80	44.55	40.99
Maximum Power Current(Imp)	A	13.04	10.74	13.11	10.80	13.18	10.85	13.24	10.91	13.30	10.96	13.36	11.00
Open-circuit Current(Voc)	V	52.12	47.43	52.32	47.61	52.52	47.79	52.72	47.98	52.82	48.07	52.92	48.16
Short-circuit Current(Isc)	A	13.83	11.16	13.89	11.20	13.95	11.25	14.01	11.30	14.02	11.31	14.06	11.34
Module Efficiency STC	%	22.07		22.26		22.45		22.65		22.84		23.03	

*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

OPERATING PARAMETERS

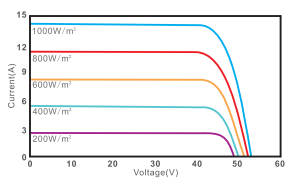
Operating Temperature	-40℃~85℃
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	30A
Nominal operating cell temperature	43±2℃
Power tolerance	0~+5Watt

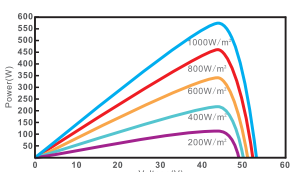
TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/℃
Temperature coefficients of Voc	-0.25%/℃
Temperature coefficients of Isc	0.046%/℃

I-V CURVE

I-V characteristics at different irradiations (reference to 580 W)



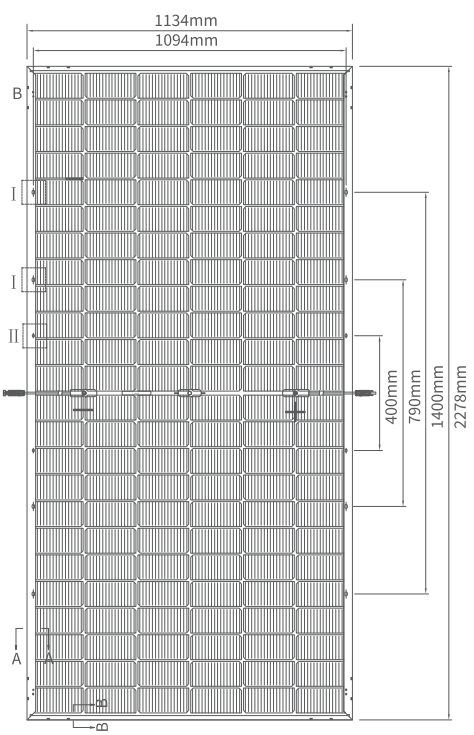


REAR SIDE POWER GAIN(REFERENCE TO 580W FRONT SIDE)

Pmax/W	580	609	638	667	696	725	754
Pmax gain	0%	5%	10%	15%	20%	25%	30%
Voc/V	52.52	52.52	52.53	52.52	52.52	52.52	52.52
Isc/A	13.95	14.65	15.35	16.04	16.74	17.44	18.14
Vmp/V	44.02	44.02	44.02	44.02	44.02	44.02	44.02
Imp/A	13.18	13.83	14.49	15.15	15.81	16.47	17.13

SPECIFICATIONS

Cell Type	N-type TOPCon Mono Half Cell
No.of cells	144(6×12×2)
Dimensions	2278*1134*30mm
Weight	30.3kg
Front Glass	2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Back Glass	2.0mm,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others_____
Cable Length (Including Connector)	◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1400/(-)1400mm (4mm²) or ◯ Customized Length_____



PACKAGING INFORMATION


36 Pcs/Pallet


72 Pcs/Stack


Length:2295mm


Width:1130mm

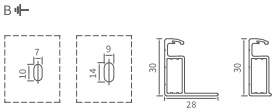

Height:2540mm



Weight:2262kg/Stack



10 Stack/40HQ
720Pcs/40HQ



Length:±2mm
Width:±2mm
Height:±1mm
Row Pitch:±2mm

Specifications included in this datasheet are subject to change without noctice.

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Version number: UL-2278-144ADGNBB-30-EN-V2.0

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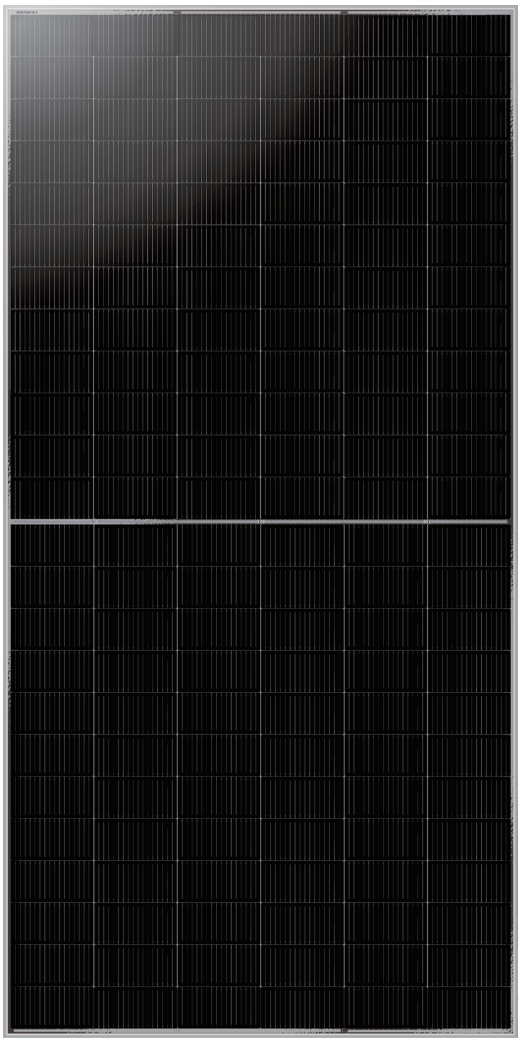
Mate Veil series

Double Glass BiFacial N-Type TOPCon Solar Module

570~595 Watt

Model: UL-***M-144ADGN

Maximum Efficiency: 23.03%



Bifacial Mono Module

Capable of generating power at back side,
80±5% efficiency of the front side

Longer Term Reliability

Passed the IEC63209-1:2021 standard test
(With testing standards 2 to 3 times stricter than regular IEC requirements)

Outstanding Mechanical load Resistance

2400 Pa wind load, 5400 Pa snow load

Anti-PID(potential induced degradation)

PID FREE

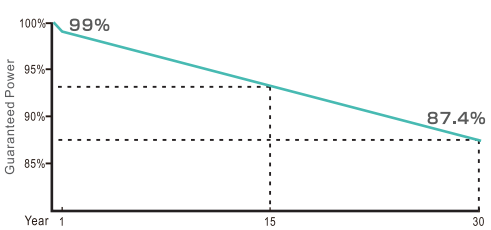
Passed anti-PID test under 85°C damp heat 85%
relative humidity for 192 hours

Lower LCOE

Lower shading and resistive loss Lower temperature coefficient

Widely Applied To Various Scenarios

Flexibly applied to roofs, ground surfaces, water surfaces, mountainous areas, and other diverse environments



15 Year Product Warranty 1% Power Degradation In The First Year

30 Year Linear Power Warranty 0.4% Linear Power Degradation

IEC 61215, IEC 61730
ISO 9001: 2015(Quality management systems)
ISO 14001: 2015 (Environmental management systems)
ISO45001: 2018 (Occupational health and safety)
UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

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Email: sales@ulsolar.com.cn

DOUBLE GLASS BIFACIAL 570~595Watt

ELECTRICAL SPECIFICATIONS

Module Type		UL-570M-144ADGN		UL-575M-144ADGN		UL-580M-144ADGN		UL-585M-144ADGN		UL-590M-144ADGN		UL-595M-144ADGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	570	432	575	436	580	440	585	443	590	447	595	451
Maximum Power Voltage(Vmp)	V	43.70	40.20	43.85	40.34	44.02	40.50	44.17	40.64	44.35	40.80	44.55	40.99
Maximum Power Current(Imp)	A	13.04	10.74	13.11	10.80	13.18	10.85	13.24	10.91	13.30	10.96	13.36	11.00
Open-circuit Current(Voc)	V	52.12	47.43	52.32	47.61	52.52	47.79	52.72	47.98	52.82	48.07	52.92	48.16
Short-circuit Current(Isc)	A	13.83	11.16	13.89	11.20	13.95	11.25	14.01	11.30	14.02	11.31	14.06	11.34
Module Efficiency STC	%	22.07		22.26		22.45		22.65		22.84		23.03	

*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

OPERATING PARAMETERS

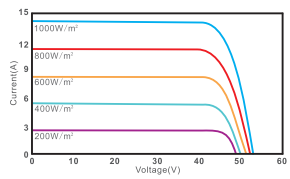
Operating Temperature	-40℃~85℃
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	30A
Nominal operating cell temperature	43±2℃
Power tolerance	0~+5Watt

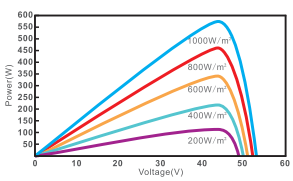
TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/℃
Temperature coefficients of Voc	-0.25%/℃
Temperature coefficients of Isc	0.046%/℃

I-V CURVE

I-V characteristics at different irradiations (reference to 580 W)



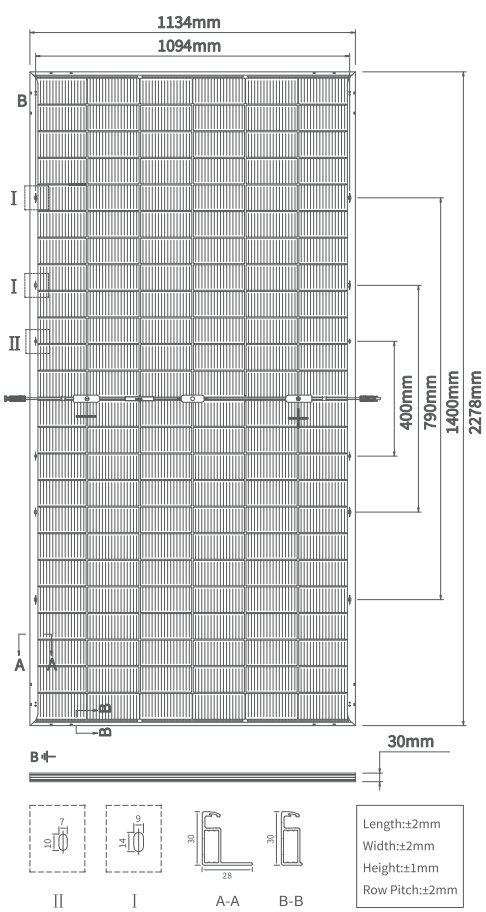


REAR SIDE POWER GAIN(REFERENCE TO 580W FRONT SIDE)

Pmax/W	580	609	638	667	696	725	754
Pmax gain	0%	5%	10%	15%	20%	25%	30%
Voc/V	52.52	52.52	52.53	52.52	52.52	52.52	52.52
Isc/A	13.95	14.65	15.35	16.04	16.74	17.44	18.14
Vmp/V	44.02	44.02	44.02	44.02	44.02	44.02	44.02
Imp/A	13.18	13.83	14.49	15.15	15.81	16.47	17.13

SPECIFICATIONS

Cell Type	N-type TOPCon Mono Half Cell
No.of cells	144(6×12×2)
Dimensions	2278*1134*30mm
Weight	30.3kg
Front Glass	2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Back Glass	2.0mm,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others _____
Cable Length (Including Connector)	◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1400/(-)1400mm (4mm²) or ◯ Customized Length _____



Length:±2mm
Width:±2mm
Height:±1mm
Row Pitch:±2mm

PACKAGING INFORMATION


36 Pcs/Pallet


72 Pcs/Stack


Length:2295mm


Width:1130mm


Height:2540mm



Weight:2262kg/Stack



10 Stack/40HQ
720Pcs/40HQ

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Version number: UL-2278-144ADGNYB-30-EN-V3.0

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LEADING IN TECHNOLOGY

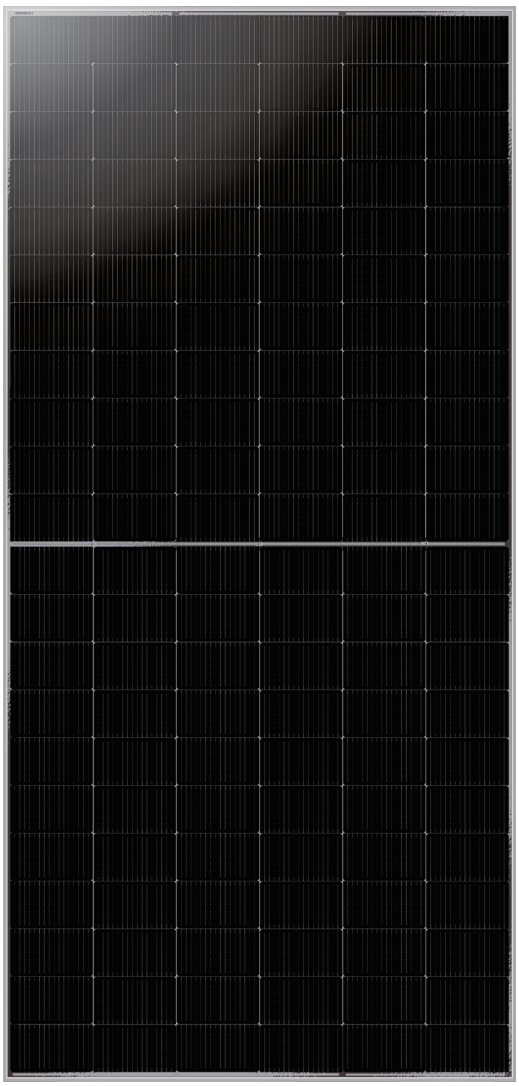
Mate Pro Veil series

Double Glass BiFacial N-Type TOPCon Solar Module

600~625 Watt

Model: UL-***M-132DDGN

Maximum Efficiency: 23.14%



Bifacial Mono Module

Capable of generating power at back side,
80±5% efficiency of the front side

Longer Term Reliability

Passed the IEC63209-1:2021 standard test
(With testing standards 2 to 3 times stricter than regular IEC requirements)

Outstanding Mechanical load Resistance

2400 Pa wind load, 5400 Pa snow load

Anti-PID(potential induced degradation)

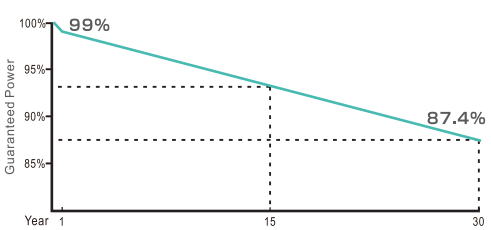
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Email: sales@ulsolar.com.cn

DOUBLE GLASS BIFACIAL 600~625Watt

ELECTRICAL SPECIFICATIONS

Module Type		UL-600M-132DDGN		UL-605M-132DDGN		UL-610M-132DDGN		UL-615M-132DDGN		UL-620M-132DDGN		UL-625M-132DDGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	600	455	605	458	610	462	615	466	620	470	625	474
Maximum Power Voltage(Vmp)	V	40.17	36.96	40.35	37.12	40.54	37.29	40.72	37.46	40.90	37.63	40.98	37.70
Maximum Power Current(Imp)	A	14.94	12.30	14.99	12.35	15.05	12.40	15.10	12.44	15.16	12.49	15.25	12.56
Open-circuit Current(Voc)	V	48.28	43.93	48.48	44.12	48.68	44.30	48.88	44.48	49.08	44.66	49.12	44.70
Short-circuit Current(Isc)	A	15.84	12.78	15.90	12.83	15.96	12.87	16.02	12.92	16.08	12.97	16.10	12.99
Module Efficiency STC	%	22.21		22.40		22.58		22.77		22.95		23.14	

*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

OPERATING PARAMETERS

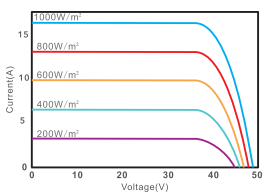
Operating Temperature	-40℃~85℃
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	30A
Nominal operating cell temperature	43±2℃
Power tolerance	0~+5Watt

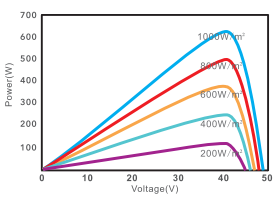
TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/℃
Temperature coefficients of Voc	-0.25%/℃
Temperature coefficients of Isc	0.046%/℃

I-V CURVE

I-V characteristics at different irradiations (reference to 615 W)



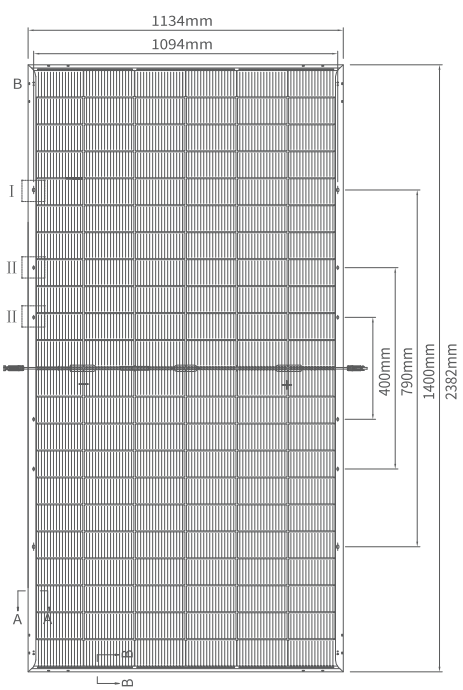


REAR SIDE POWER GAIN(REFERENCE TO 615W FRONT SIDE)

Pmax/W	615	646	677	707	738	769	800
Pmax gain	0%	5%	10%	15%	20%	25%	30%
Voc/V	48.88	48.88	48.88	48.88	48.88	48.88	48.88
Isc/A	16.02	16.82	17.62	18.42	19.22	20.03	20.83
Vmp/V	40.72	40.72	40.72	40.72	40.72	40.72	40.72
Imp/A	15.10	15.86	16.61	17.37	18.12	18.88	19.63

SPECIFICATIONS

Cell Type	N-type TOPCon Mono Half Cell
No.of cells	132(6×11×2)
Dimensions	2382*1134*30mm
Weight	31.7kg
Front Glass	2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Back Glass	2.0mm,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others _____
Cable Length (Including Connector)	4mm² ◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1400/(-)1400mm or ◯ Customized Length _____



PACKAGING INFORMATION


36 Pcs/Pallet


72 Pcs/Stack


Length:2390mm


Width:1130mm

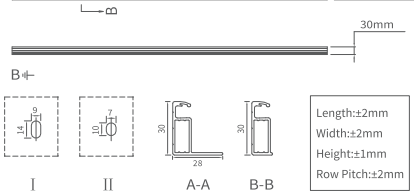

Height:2540mm



Weight:2365kg/Stack



10 Stack/40HQ
720Pcs/40HQ



Specifications included in this datasheet are subject to change without noctice.

Ulica Solar reserves the right of final interpretation.

Version number: UL-2382-132DDGNYB-30-EN-V3.0

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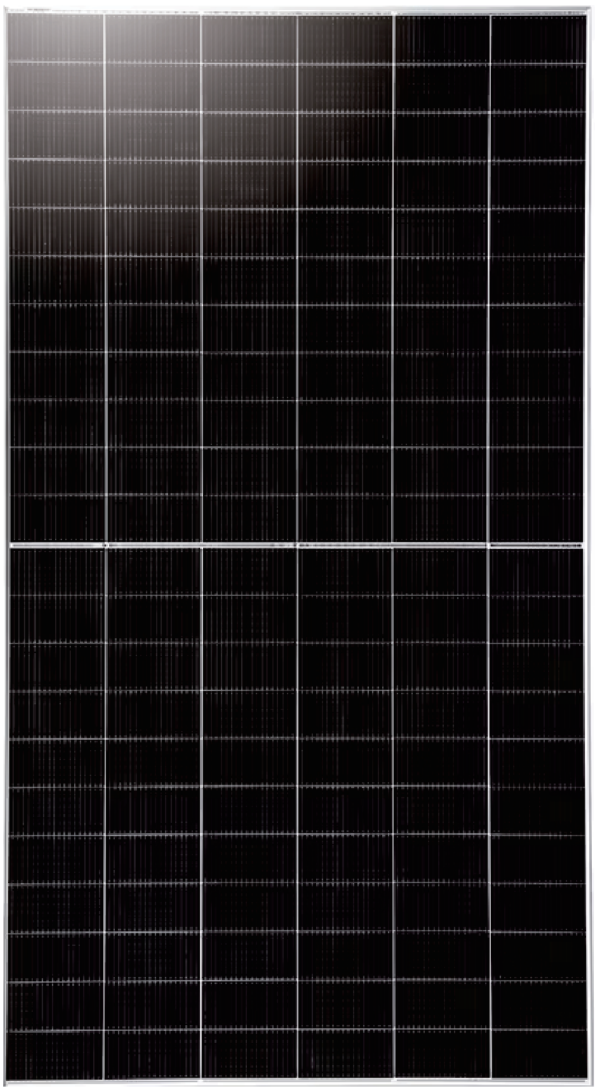
Mountain series

Double Glass BiFacial N-Type TOPCon Solar Module

700~725Watt

Model: UL-***M-132DGN

Maximum Efficiency: 23.34%



Cutting Free Technology

The half cells are made directly from half silicon wafer, reducing power losses and hidden cracks

Bifacial Mono Module

Capable of generating power at back side,
80±5% efficiency of the front side

Outstanding Mechanical load Resistance

2400 Pa wind load, 5400 Pa snow load

Anti-PID(potential induced degradation)

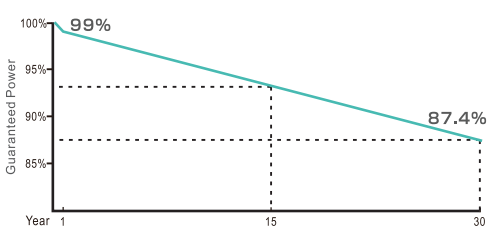
Passed anti-PID test under 85°C damp heat 85%
relative humidity for 192 hours

Lower LCOE

Lower shading and resistive loss Lower temperature coefficient

Widely Applied To Various Scenarios

Flexibly applied to roofs, ground surfaces, water surfaces, mountainous areas, and other diverse environments



15 Year Product Warranty 1% Power Degradation In The First Year

30 Year Linear Power Warranty 0.4% Linear Power Degradation

IEC 61215, IEC 61730
ISO 9001: 2015(Quality management systems)
ISO 14001: 2015 (Environmental management systems)
ISO45001: 2018 (Occupational health and safety)
UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Ulica Official Website
Add:No.238 Yunlin Middle Road,Ningbo China
TEL:+86-574-28828999
Email: sales@ulsolar.com.cn

DOUBLE GLASS BIFACIAL 700~725Watt

ELECTRICAL SPECIFICATIONS

Module Type		UL-700M-132DGN		UL-705M-132DGN		UL-710M-132DGN		UL-715M-132DGN		UL-720M-132DGN		UL-725M-132DGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	700	530	705	534	710	538	715	542	720	546	725	549
Maximum Power Voltage(Vmp)	V	40.54	37.29	40.69	37.43	40.84	37.57	40.99	37.71	41.20	37.90	41.30	38.00
Maximum Power Current(Imp)	A	17.27	14.22	17.33	14.27	17.38	14.32	17.44	14.37	17.48	14.39	17.55	14.46
Open-circuit Current(Voc)	V	48.62	44.24	48.72	44.34	48.82	44.43	48.93	44.53	48.98	44.57	49.03	44.62
Short-circuit Current(Isc)	A	18.32	14.78	18.36	14.81	18.40	14.84	18.42	14.86	18.44	14.87	18.50	14.92
Module Efficiency STC	%	22.53		22.70		22.86		23.02		23.18		23.34	

*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

OPERATING PARAMETERS

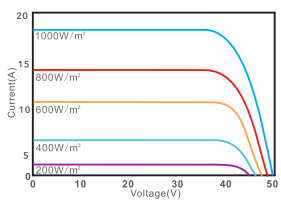
Operating Temperature	-40℃~85℃
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	35A
Nominal operating cell temperature	43±2℃
Power tolerance	0~+5Watt

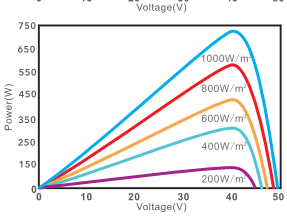
TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/℃
Temperature coefficients of Voc	-0.25%/℃
Temperature coefficients of Isc	0.046%/℃

I-V CURVE

I-V characteristics at different irradiations (reference to 720 W)



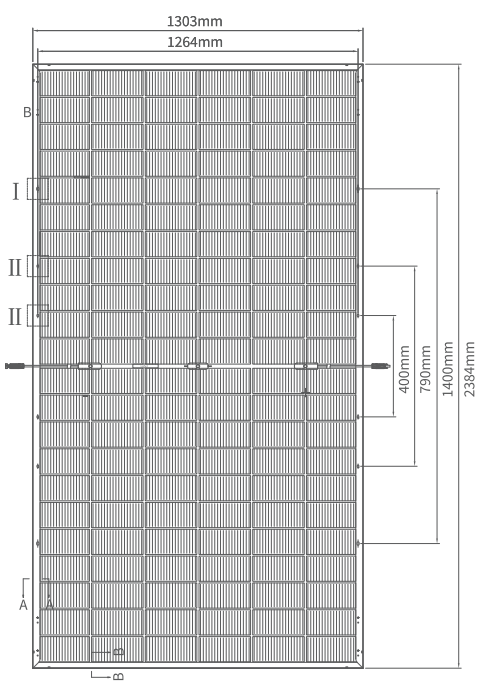


REAR SIDE POWER GAIN(REFERENCE TO 720W FRONT SIDE)

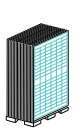
Pmax/W	720	756	792	828	864	900	936
Pmax gain	0%	5%	10%	15%	20%	25%	30%
Voc/V	48.98	48.98	48.98	48.98	48.98	48.98	48.98
Isc/A	18.44	19.36	20.28	21.21	22.13	23.05	23.97
Vmp/V	41.20	41.20	41.20	41.20	41.20	41.20	41.20
Imp/A	17.48	18.35	19.23	20.10	20.98	21.85	22.72

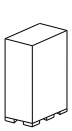
SPECIFICATIONS

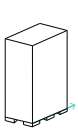
Cell Type	N-type TOPCon Mono Half Cell
No.of cells	132(6×11×2)
Dimensions	2384*1303*33mm
Weight	37.1kg
Front Glass	2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Back Glass	2.0mm,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others _____
Cable Length (Including Connector)	◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1400/(-)1400mm or ◯ Customized Length _____ 4mm²

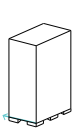


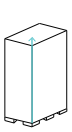
PACKAGING INFORMATION


33 Pcs/Pallet


33 Pcs/Stack


Length:1320mm


Width:1130mm


Height:2416mm



Weight:1260kg/Stack



18 Stack/40HQ
594Pcs/40HQ

Length:±2mm
Width:±2mm
Height:±1mm
Row Pitch:±2mm

Specifications included in this datasheet are subject to change without noctice.

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Version number: UL-2384-132DGNBB-33-EN-V2.0

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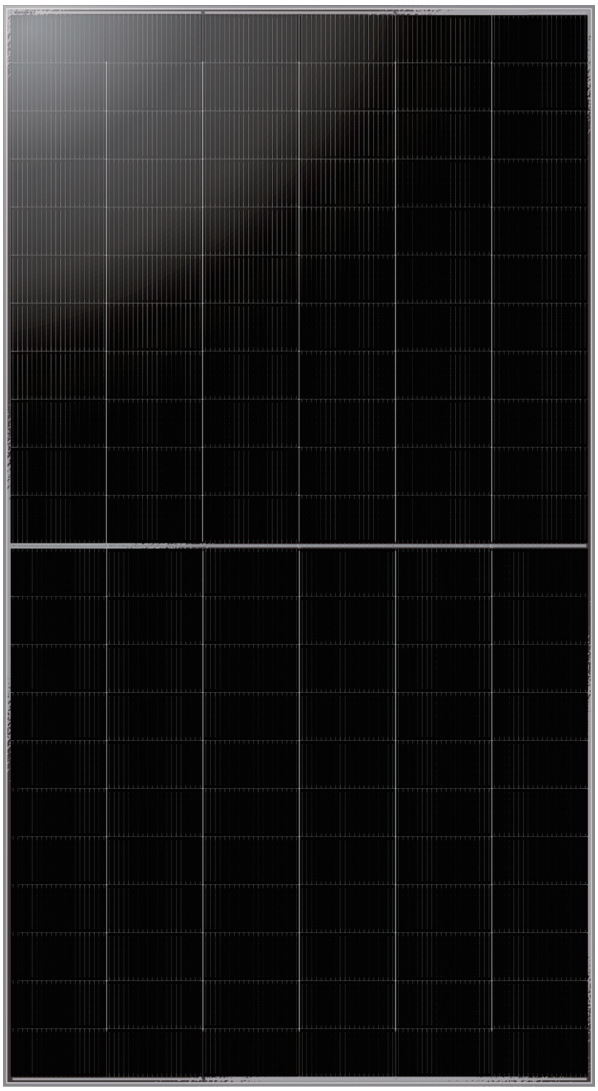
Mountain Veil series

Double Glass BiFacial N-Type TOPCon Solar Module

700~725 Watt

Model: UL-***M-132DGN

Maximum Efficiency: 23.34%



Cutting Free Technology

The half cells are made directly from half silicon wafer, reducing power losses and hidden cracks

Bifacial Mono Module

Capable of generating power at back side,
80±5% efficiency of the front side

Outstanding Mechanical load Resistance

2400 Pa wind load, 5400 Pa snow load

Anti-PID(potential induced degradation)

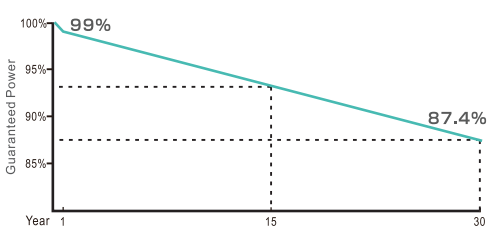
Passed anti-PID test under 85°C damp heat 85%
relative humidity for 192 hours

Lower LCOE

Lower shading and resistive loss Lower temperature coefficient

Widely Applied To Various Scenarios

Flexibly applied to roofs, ground surfaces, water surfaces, mountainous areas, and other diverse environments



15 Year Product Warranty 1% Power Degradation In The First Year

30 Year Linear Power Warranty 0.4% Linear Power Degradation

EUPD RESEARCH TOP BRAND PV MODULES POLAND 2023

Tier 1 Bloomberg NEW ENERGY FINANCE Q1 2020–Q1 2025

IEC 61215, IEC 61730
ISO 9001: 2015(Quality management systems)
ISO 14001: 2015 (Environmental management systems)
ISO45001: 2018 (Occupational health and safety)
UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Ulica Official Website

Add:No.238 Yunlin Middle Road,Ningbo China

TEL:+86-574-28828999

Email: sales@ulsolar.com.cn

DOUBLE GLASS BIFACIAL 700~725Watt

ELECTRICAL SPECIFICATIONS

Module Type		UL-700M-132DGN		UL-705M-132DGN		UL-710M-132DGN		UL-715M-132DGN		UL-720M-132DGN		UL-725M-132DGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	700	530	705	534	710	538	715	542	720	546	725	549
Maximum Power Voltage(Vmp)	V	40.54	37.29	40.69	37.43	40.84	37.57	40.99	37.71	41.20	37.90	41.30	38.00
Maximum Power Current(Imp)	A	17.27	14.22	17.33	14.27	17.38	14.32	17.44	14.37	17.48	14.39	17.55	14.46
Open-circuit Current(Voc)	V	48.62	44.24	48.72	44.34	48.82	44.43	48.93	44.53	48.98	44.57	49.03	44.62
Short-circuit Current(Isc)	A	18.32	14.78	18.36	14.81	18.40	14.84	18.42	14.86	18.44	14.87	18.50	14.92
Module Efficiency STC	%	22.53		22.70		22.86		23.02		23.18		23.34	

*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

OPERATING PARAMETERS

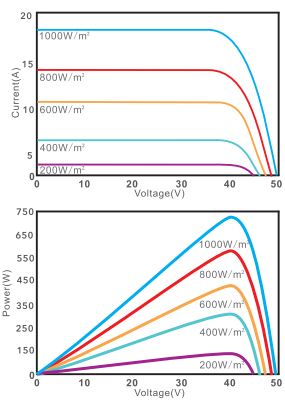
Operating Temperature	-40℃~85℃
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	35A
Nominal operating cell temperature	43±2℃
Power tolerance	0~+5Watt

TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/℃
Temperature coefficients of Voc	-0.25%/℃
Temperature coefficients of Isc	0.046%/℃

I-V CURVE

I-V characteristics at different irradiations (reference to 720 W)

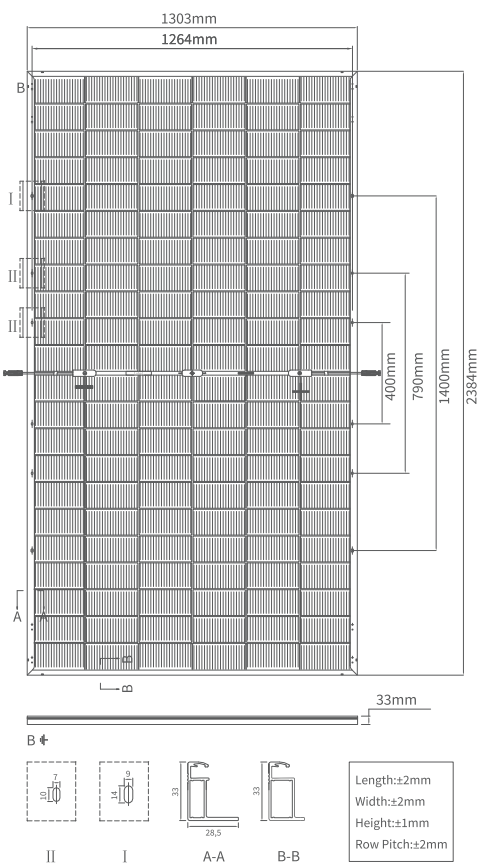


REAR SIDE POWER GAIN(REFERENCE TO 720W FRONT SIDE)

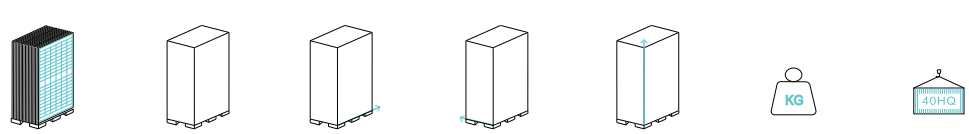
Pmax/W	720	756	792	828	864	900	936
Pmax gain	0%	5%	10%	15%	20%	25%	30%
Voc/V	48.98	48.98	48.98	48.98	48.98	48.98	48.98
Isc/A	18.44	19.36	20.28	21.21	22.13	23.05	23.97
Vmp/V	41.20	41.20	41.20	41.20	41.20	41.20	41.20
Imp/A	17.48	18.35	19.23	20.10	20.98	21.85	22.72

SPECIFICATIONS

Cell Type	N-type TOPCon Mono Half Cell
No.of cells	132(6×11×2)
Dimensions	2384*1303*33mm
Weight	37.1kg
Front Glass	2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Back Glass	2.0mm,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others _____
Cable Length (Including Connector)	◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1400/(-)1400mm (4mm²) or ◯ Customized Length _____



PACKAGING INFORMATION

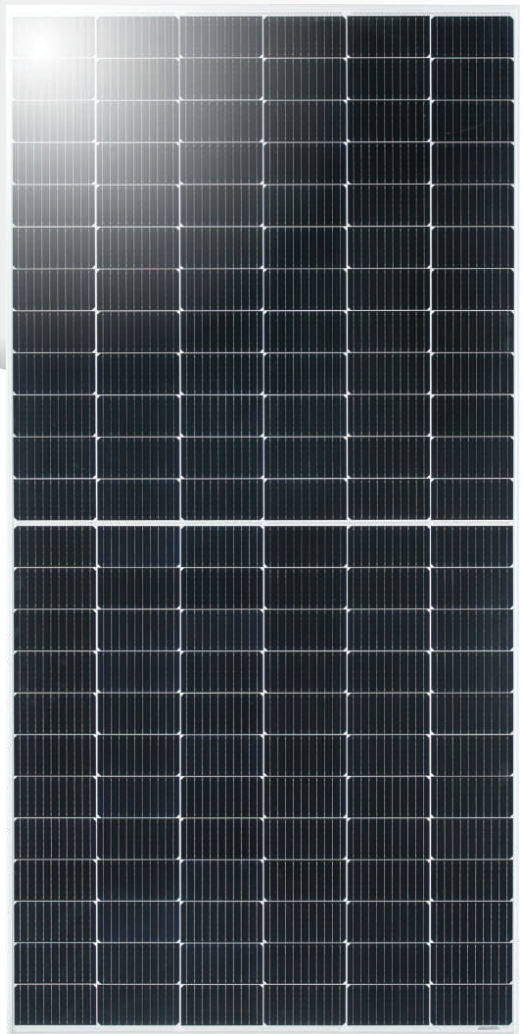


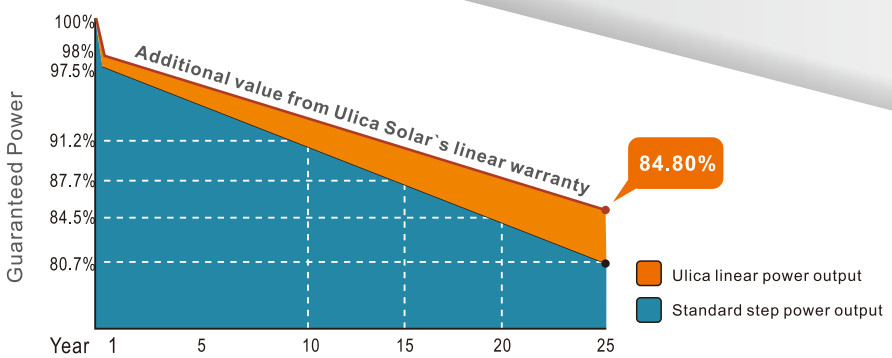
Specifications included in this datasheet are subject to change without noctice.

Ulica Solar reserves the right of final interpretation.

Version number: UL-2384-132DGNYB-33-EN-V3.0

MONO HALF-CUT MODULE
UL-545 | 550 | 555M-144HV





Anti-PID(potentialinduced degradation)
Passed anti-PID test under 85°C damp heat
85% relative humidity for 96 hours

Great Durability against extreme conditions
Passed salt mist corrosion test.ammonia corrosion test
dust & sand test,fire test,all certified by TUV

Lower LCOE
Lower shading and resistive loss
Lower temperature coefficient

Outstanding mechanical load resistance
2400 Pa wind load, 5400 Pa snow load

Tier 1 Bloomberg NEW ENERGY FINANCE Q1 2020~Q1 2025

12 year product warranty

25 year linear power warranty

- IEC 61215, IEC 61730
- ISO 9001: 2015(Quality management systems)
- ISO 14001: 2015 (Environmental management systems)
- ISO 45001: 2018 (Occupational health and safety)
- UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Add:No.238 Yunlin Middle Road, Wangchun Industrial District,Ningbo China
Tel:+86-574-28828939 Email:sales@ulsolar.com.cn
Fax:+86-574-28828997 Web:www.ulicasolar.com

MONO UL-545 | 550 | 555M-144HV

ELECTRICAL PERFORMANCE

Electrical Parameters Standard Test Conditions

Module Type			UL-545M-144HV	UL-550M-144HV	UL-555M-144HV
Power Output	Pmax	W	545	550	555
Power Tolerance	△Pmax	W		0/+5W	
Module Efficiency	η m	%	21.09	21.28	21.48
Voltage at Pmax	Vm	V	41.8	41.9	42.0
Current at Pmax	Im	A	13.04	13.13	13.21
Open-Circuit Voltage	Voc	V	49.9	50.0	50.1
Short-Circuit Current	Isc	A	13.65	13.75	13.83

STC:1000w/m² irradiance,25C module temperature,AM1.5

THERMAL CHARACTERISTICS

Nominal Operating Cell Temperature	NOCT	°C	43±2
Temperature Coefficient of Pmax	ɣ	%/°C	-0.340
Temperature Coefficient of Voc	β	%/°C	-0.265
Temperature Coefficient of Isc	α	%/°C	+0.049

OPERATING CONDITIONS

Max.System Voltage	DC1500V
Max.Series Fuse Rating	25A
Operating Temperature Range	−40℃～85℃
Max static snow load	5400Pa
Max static wind load	2400Pa
Application Class	A

CONSTRUCTION MATERIALS

Front Cover(material/type/thickness)	low-iron tempered glass/3.2mm
Cell(quantity/material/type/dimension)	144/monocrystalline/182X91mm
Encapsulant(material)	ethylene vinyl acetate(EVA)
Frame(material/anodization color)	anodized aluminum alloy/silver or black
Junction Box(protection degree)	IP68
Cable(length/cross-sectionalarea)	4mm² Landscape:(+)1400/(-)1400mm or Customized Length
Plug Connector	MC4 compatible

GENERAL CHARACTERISTICS

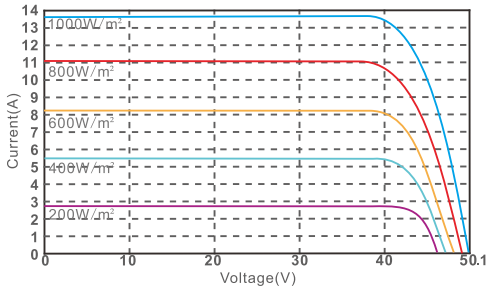
Dimension(L/W/H)	2279/1134/35mm
Weight	27.5kg

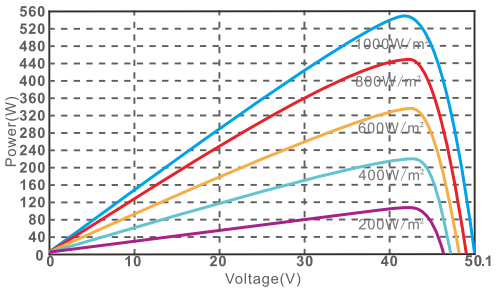
PACKING CONFIGURATION

Pallet Size(L/W/H)	2320/1130/2540mm
Pallet Weight	1790kg
Pieces per Pallet	62pcs
Pieces per Container	620pcs

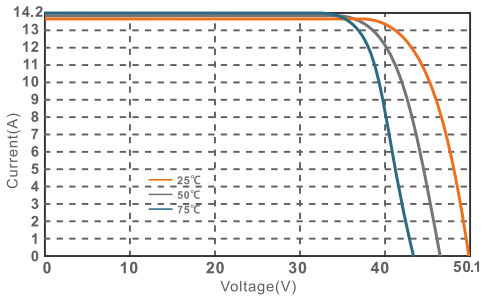
I-V CURVE

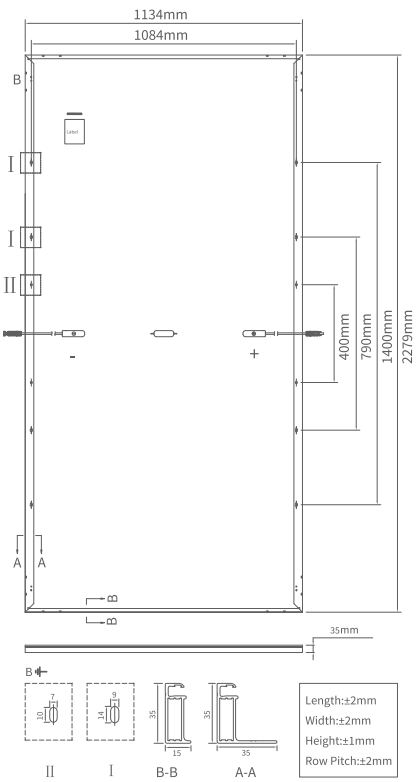
I-V characteristics at different irradiations (reference to 555 W)





I-V characteristics at different temperature





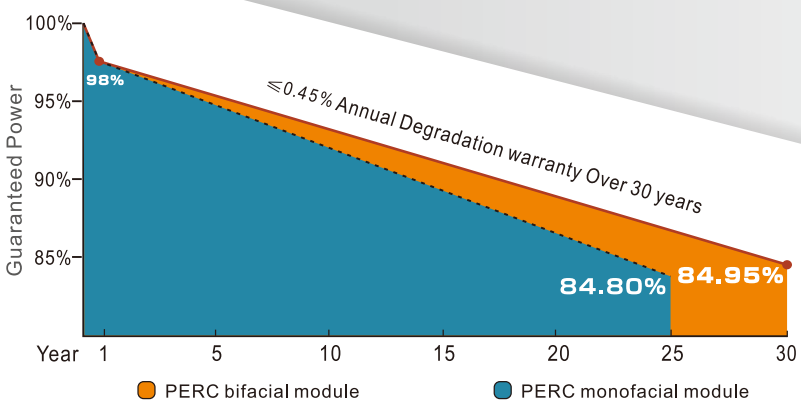
Specifications included in this datasheet are subject to change without noctice.

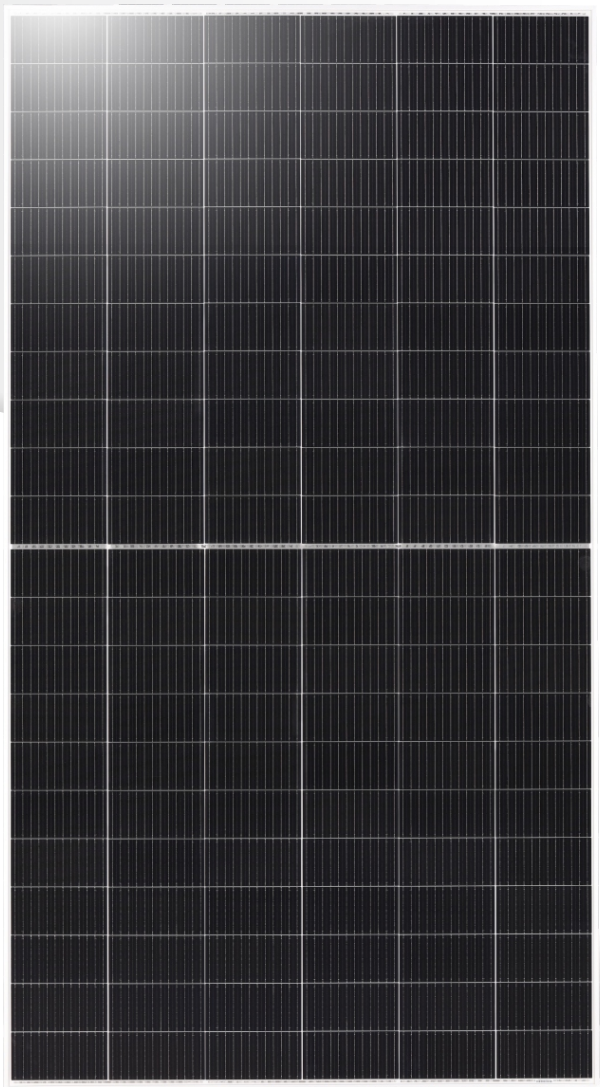
Ulica Solar reserves the right of final interpretation.

Version No.: UL-2279-144HVBBC-35-EN-V1.2

ulica solar
LEADING IN TECHNOLOGY

DOUBLE-GLASS BIFACIAL MODULE
UL-660 | 665 | 670 M-132DG





Bifacial Mono Module
Capable of generating power at back side,at least 70% efficiency of the front side

Anti-PID(potentialinduced degradation)
Passed anti-PID test under 85°C damp heat 85% relative humidity for 96 hours

Great Durability against extreme conditions
Passed salt mist corrosion test.ammonia corrosion test dust & sand test,fire test,all certified by TUV

Lower LCOE
Lower shading and resistive loss
Lower temperature coefficient

Outstanding mechanical load resistance
2400 Pa wind load, 5400 Pa snow load

Tier 1 Bloomberg NEW ENERGY FINANCE Q1 2020–Q1 2025

12 year product warranty

30 year linear power warranty

- IEC 61215, IEC 61730
- ISO 9001: 2015(Quality management systems)
- ISO 14001: 2015 (Environmental management systems)
- ISO 45001: 2018 (Occupational health and safety)
- UNI 9177 la CLASSE DI REAZIONE AL FUOCO:1

Add:No.238 Yunlin Middle Road, Wangchun Industrial District,Ningbo China
Tel:+86-574-28828939 Email:sales@ulsolar.com.cn
Fax:+86-574-28828997 Web:www.ulicasolar.com

mono 660~670Watt

ELECTRICAL SPECIFICATIONS

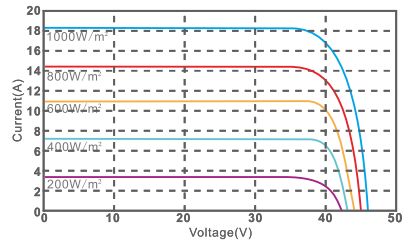
Module Type		UL-660M-132DG		UL-665M-132DG		UL-670M-132DG	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power (Pmax)	W	660	494	665	498	670	502
Maximum Power Voltage (Vmp)	V	38.22	35.16	38.30	35.24	38.41	35.34
Maximum Power Current (Imp)	A	17.27	14.06	17.36	14.13	17.44	14.20
Open-circuit Voltage (Voc)	V	46.01	41.87	46.12	41.97	46.21	42.05
Short-circuit Current (Isc)	A	18.44	14.88	18.53	14.95	18.62	15.03
Module Efficiency STC	%	21.25		21.41		21.57	
Operating Temperature		-40°C~85°C					
Maximum system voltage		DC1500V(IEC)					
Maximum series fuse rating		35A					
Power tolerance		0~+5Watt					
Temperature coefficients of Pmax		-0.34%/°C					
Temperature coefficients of Voc		-0.265%/°C					
Temperature coefficients of Isc		0.049%/°C					
Nominal operating cell temperature (NOCT)		43±2°C					

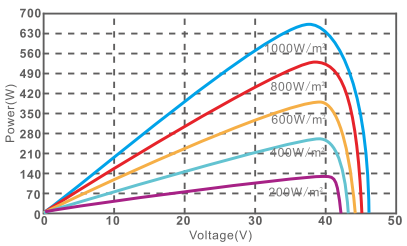
*STC : Cell temperature: 25°C, Irradiance: 1000 W/m², Air mass: 1.5G

*NOCT : Air temperature: 20°C, Irradiance: 800 W/m², Air mass:1.5G, Wind speed: 1 m/s

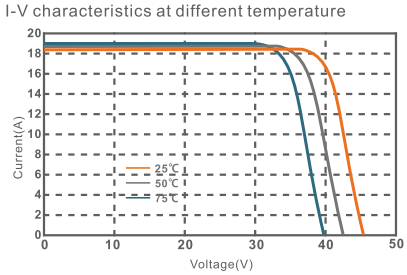
I-V CURVE

I-V characteristics at different irradiations (reference to 665 W)



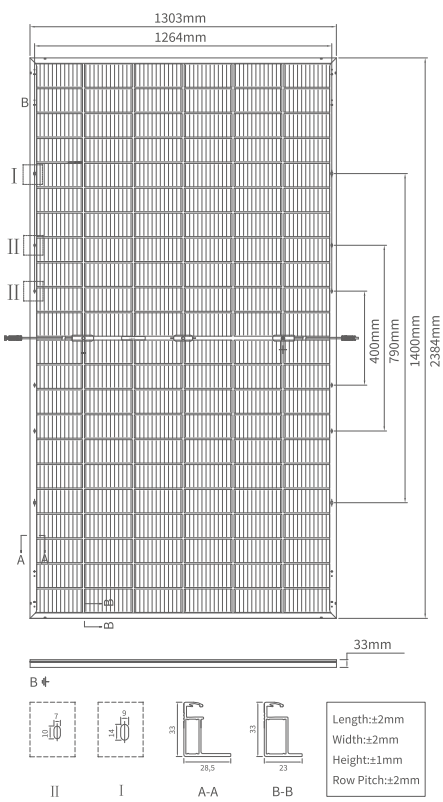


I-V characteristics at different temperature



SPECIFICATIONS

Cell Type	Mono-crystalline
No. of cells	132(6×11×2)
Dimensions	2384*1303*33mm
Weight	37.4kg
Glass	2.0mm+2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Junction Box	IP68,3diodes
Connector	MC4 Compatible
Cable Length (including Connector)	4mm² Landscape:(+)1400mm/(-)1400mm or Customized Length
Packaging Configuration	33pcs/Pallet,594pcs/40HQ Container



Electrical characteristics with different rear side power gain(reference to 665 W front)

Pmax/W	Voc/V	Isc/A	Vmp/V	Imp/A	Pmax gain
665	46.12	18.53	38.30	17.36	0%
698	46.12	19.46	38.30	18.23	5%
732	46.12	20.38	38.30	19.10	10%
765	46.12	21.31	38.30	19.96	15%
798	46.12	22.24	38.30	20.83	20%
831	46.12	23.16	38.30	21.70	25%
865	46.12	24.09	38.30	22.57	30%

Specifications included in this datasheet are subject to change without noctice.

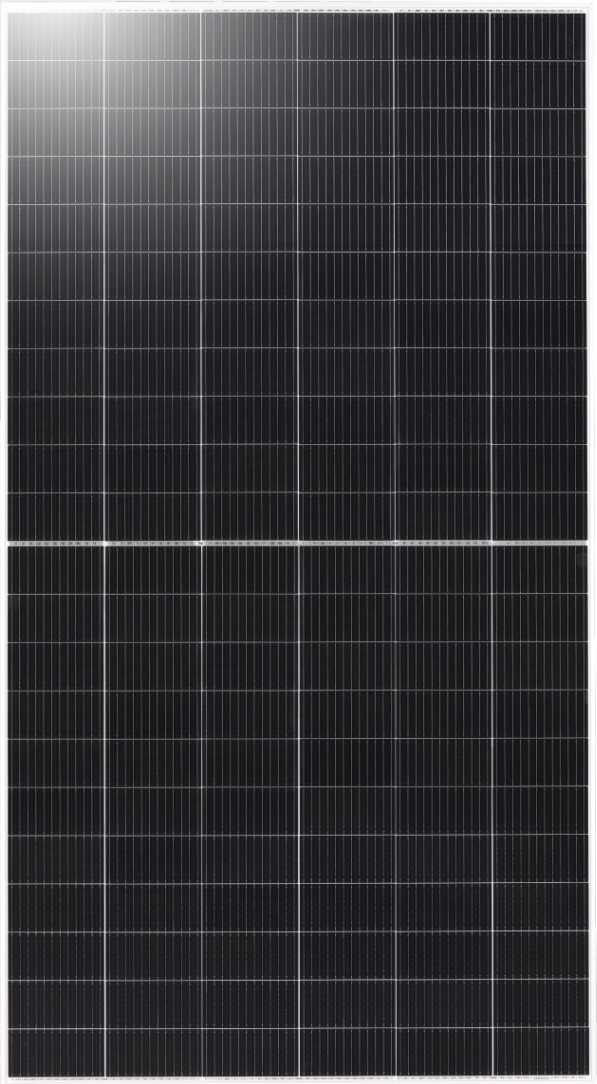
Ulica Solar reserves the right of final interpretation.

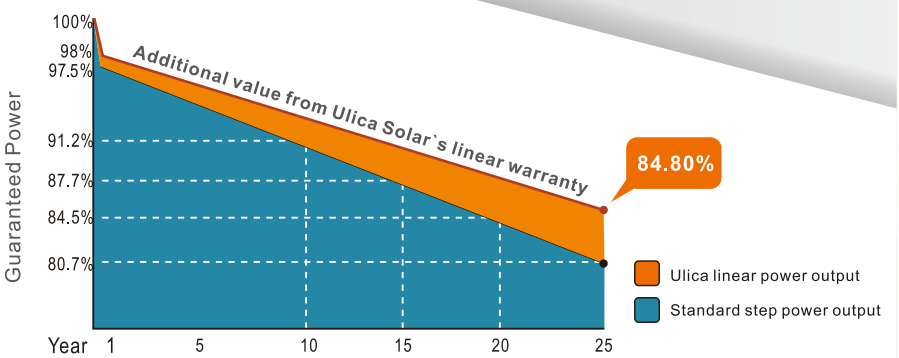
Version No.: UL-2384-132DGBBC-33-EN-V1.2

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LEADING IN TECHNOLOGY

MONO HALF-CUT MODULE

UL-660 | 665 | 670M-132HV





Anti-PID(potentialinduced degradation)
Passed anti-PID test under 85°C damp heat
85% relative humidity for 96 hours

Great Durability against extreme conditions
Passed salt mist corrosion test.ammonia corrosion test
dust & sand test,fire test,all certified by TUV

Lower LCOE
Lower shading and resistive loss
Lower temperature coefficient

Outstanding mechanical load resistance
2400 Pa wind load, 5400 Pa snow load

Tier 1 Bloomberg NEW ENERGY FINANCE Q1 2020~Q1 2025

12 year product warranty

25 year linear power warranty

- IEC 61215, IEC 61730
- ISO 9001: 2015(Quality management systems)
- ISO 14001: 2015 (Environmental management systems)
- ISO 45001: 2018 (Occupational health and safety)
- UNI 9177 la CLASSE DI REAZIONE AL FUOCO:1

Add:No.238 Yunlin Middle Road, Wangchun Industrial District,Ningbo China
Tel:+86-574-28828939 Email:sales@ulsolar.com.cn
Fax:+86-574-28828997 Web:www.ulicasolar.com

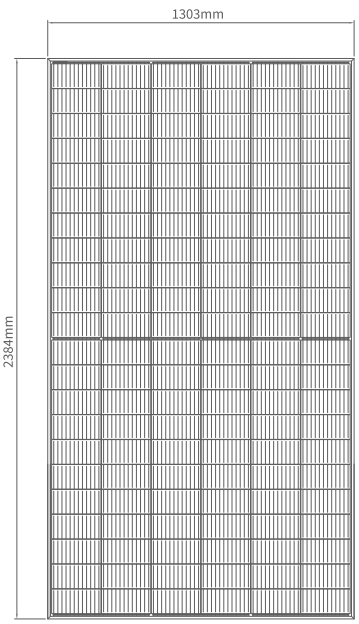
mono 660~670Watt

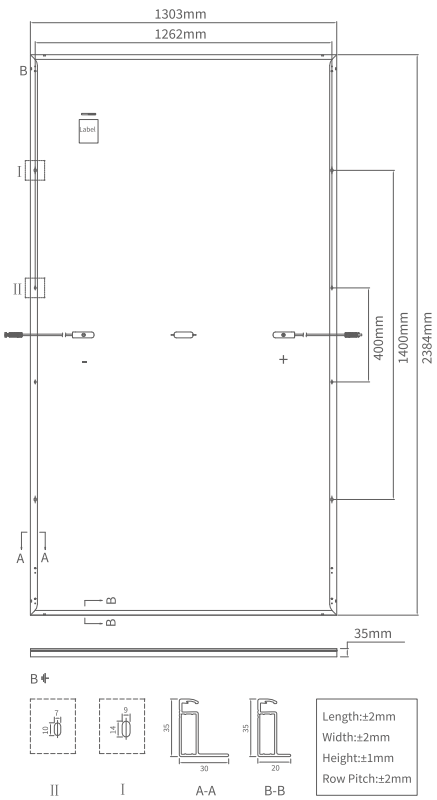
ELECTRICAL SPECIFICATIONS

Module Type		UL-660M-132HV		UL-665M-132HV		UL-670M-132HV	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power (Pmax)	W	660	500	665	504	670	508
Maximum Power Voltage (Vmp)	V	38.20	35.14	38.30	35.24	38.40	35.33
Maximum Power Current (Imp)	A	17.28	14.23	17.36	14.30	17.45	14.37
Open-circuit Voltage (Voc)	V	45.70	41.59	45.80	41.68	45.80	41.77
Short-circuit Current (Isc)	A	18.44	14.87	18.53	14.95	18.62	15.02
Module Efficiency STC	%	21.25		21.41		21.57	
Operating Temperature		-40℃~85℃					
Maximum system voltage		DC1500V(IEC)					
Maximum series fuse rating		30A					
Power tolerance		0~+5Watt					
Temperature coefficients of Pmax		-0.34%/℃					
Temperature coefficients of Voc		-0.265%/℃					
Temperature coefficients of Isc		0.049%/℃					
Nominal operating cell temperature (NOCT)		43±2℃					

*STC : Cell temperature: 25°C, Irradiance: 1000 W/m², Air mass: 1.5G

*NOCT : Air temperature: 20°C, Irradiance: 800 W/m², Air mass:1.5G, Wind speed: 1 m/s



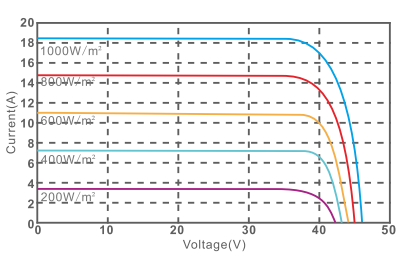


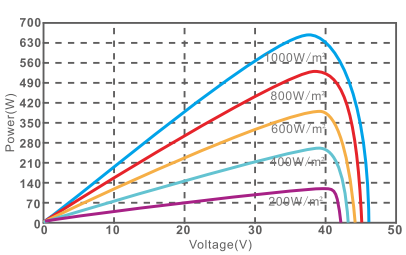
SPECIFICATIONS

Cell Type	Mono-crystalline
No. of cells	132(6×11×2)
Dimensions	2384*1303*35mm
Weight	33.6kg
Front Glass	3.2mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Junction Box	IP68,3diodes
Connector	MC4 Compatible
Cable Length (Including Connector)	4mm² Landscape:(+)1400mm/(-)1400mm or Customized Length
Packaging Configuration	31pcs/Pallet,558pcs/40HQ Container

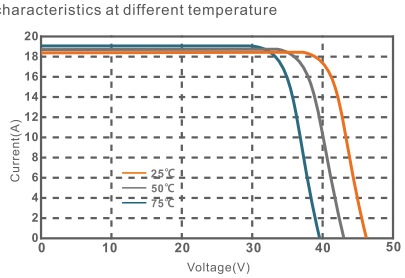
I-V CURVE

I-V characteristics at different irradiations (reference to 660 W)





I-V characteristics at different temperature



Specifications included in this datasheet are subject to change without noctice.

Ulica Solar reserves the right of final interpretation.

Version No.: UL-2384-132HVBBC-35-EN-V1.2

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LEADING IN TECHNOLOGY

Qin series (Preview Version)

Double Glass BiFacial N-Type TOPCon Solar Module

635~660 Watt

Model: QIN-UL-***M-144CDGN

Maximum Efficiency: 24.43%



Global Patent
Innovation Composite Finger Technology

Higher Output
Same dimension 40W higher,Module power up to 660W
Module efficiency up to 24.43%

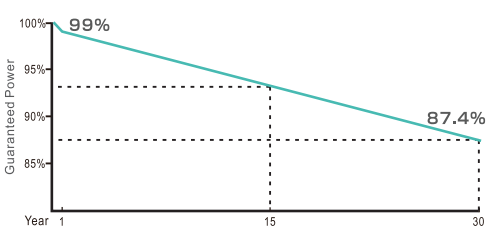
Bifacial Mono Module
Capable of generating power at back side,
80±5% efficiency of the front side

Outstanding Mechanical load Resistance
2400 Pa wind load, 5400 Pa snow load

Anti-PID(potential induced degradation)
PID FREE
Passed anti-PID test under 85°C damp heat 85%
relative humidity for 192 hours

Lower LCOE
Lower shading and resistive loss Lower temperature coefficient

Widely Applied To Various Scenarios
Flexibly applied to roofs, ground surfaces, water surfaces, mountainous areas, and other diverse environments



15 Year Product Warranty
1% Power Degradation In The First Year
30 Year Linear Power Warranty
0.4% Linear Power Degradation

IEC 61215, IEC 61730
ISO 9001: 2015(Quality management systems)
ISO 14001: 2015 (Environmental management systems)
ISO45001: 2018 (Occupational health and safety)
UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Ulica Official Website
Add:No.238 Yunlin Middle Road,Ningbo China
TEL:+86-574-28828999
Email: sales@ulsolar.com.cn

DOUBLE GLASS BIFACIAL 635~660Watt (Preview Version)

ELECTRICAL SPECIFICATIONS

Module Type		UL-635M-144CDGN		UL-640M-144CDGN		UL-645M-144CDGN		UL-650M-144CDGN		UL-655M-144CDGN		UL-660M-144CDGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	635	481	640	485	645	489	650	493	655	496	660	500
Maximum Power Voltage(Vmp)	V	44.88	41.29	44.98	41.38	45.08	41.47	45.18	41.57	45.28	41.66	45.38	41.75
Maximum Power Current(Imp)	A	14.15	11.65	14.23	11.72	14.31	11.79	14.39	11.85	14.47	11.92	14.54	11.98
Open-circuit Current(Voc)	V	53.38	48.58	53.48	48.67	53.58	48.76	53.68	48.85	53.78	48.94	53.88	49.03
Short-circuit Current(Isc)	A	14.87	11.99	14.96	12.07	15.04	12.14	15.12	12.20	15.20	12.27	15.28	12.33
Module Efficiency STC	%	23.51		23.69		23.88		24.06		24.25		24.43	

*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

OPERATING PARAMETERS

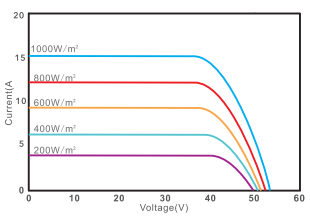
Operating Temperature	-40℃~85℃
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	30A
Nominal operating cell temperature	43±2℃
Power tolerance	0~+5Watt

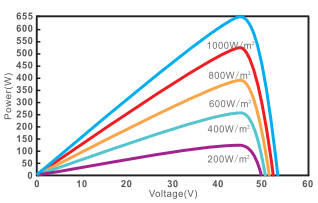
TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/℃
Temperature coefficients of Voc	-0.25%/℃
Temperature coefficients of Isc	0.046%/℃

I-V CURVE

I-V characteristics at different irradiations (reference to 655 W)



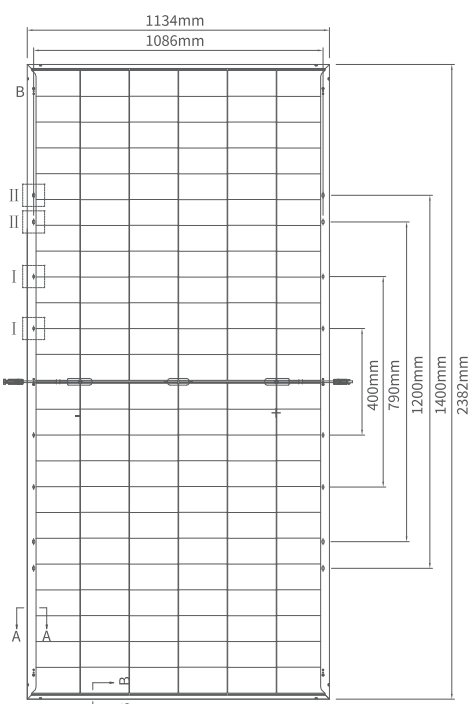


REAR SIDE POWER GAIN(REFERENCE TO 655W FRONT SIDE)

Pmax/W	655	688	721	753	786	819	852
Pmax gain	0%	5%	10%	15%	20%	25%	30%
Voc/V	53.78	53.78	53.78	53.78	53.78	53.78	53.78
Isc/A	15.20	15.96	16.72	17.48	18.24	19.00	19.76
Vmp/V	45.28	45.28	45.28	45.28	45.28	45.28	45.28
Imp/A	14.47	15.19	15.92	16.64	17.36	18.09	18.81

SPECIFICATIONS

Cell Type	N-type TOPCon Mono Half Cell
No.of cells	144(6×12×2)
Dimensions	2382*1134*30mm
Weight	32.0kg
Front Glass	2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Back Glass	2.0mm,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others _____
Cable Length (Including Connector)	◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1400/(-)1400mm (4mm²) or ◯ Customized Length _____



PACKAGING INFORMATION


36 Pcs/Pallet


72 Pcs/Stack


Length:2390mm


Width:1130mm

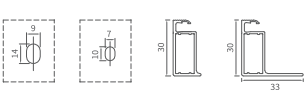

Height:2540mm



Weight:2387kg/Stack



10 Stack/40HQ
720Pcs/40HQ



Length:±2mm
Width:±2mm
Height:±1mm
Row Pitch:±2mm

Specifications included in this datasheet are subject to change without noctice.

Ulica Solar reserves the right of final interpretation.

Version number: QIN-UL-2382-144CDGNYB-30-EN-V2.0

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LEADING IN TECHNOLOGY

Swan series

Double Glass BiFacial N-Type TOPCon Solar Module

430~455Watt

Model: UL-***M-108BDGN

Maximum Efficiency: 22.77%



Cutting Free Technology

The half cells are made directly from half silicon wafer, reducing power losses and hidden cracks

Bifacial Mono Module

Capable of generating power at back side,
80±5% efficiency of the front side

Outstanding Mechanical load Resistance

2400 Pa wind load, 5400 Pa snow load

Anti-PID(potential induced degradation)

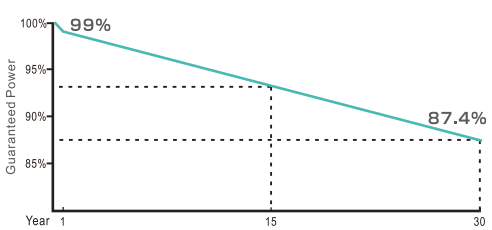
Passed anti-PID test under 85°C damp heat 85%
relative humidity for 192 hours

Lower LCOE

Lower shading and resistive loss Lower temperature coefficient

Widely Applied To Various Scenarios

Flexibly applied to roofs, ground surfaces, water surfaces, mountainous areas, and other diverse environments



15 Year Product Warranty 1% Power Degradation In The First Year

30 Year Linear Power Warranty 0.4% Linear Power Degradation

IEC 61215, IEC 61730
ISO 9001: 2015(Quality management systems)
ISO 14001: 2015 (Environmental management systems)
ISO45001: 2018 (Occupational health and safety)
UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Ulica Official Website
Add:No.238 Yunlin Middle Road,Ningbo China
TEL:+86-574-28828999
Email: sales@ulsolar.com.cn

DOUBLE GLASS BIFACIAL 430~455Watt

ELECTRICAL SPECIFICATIONS

Module Type		UL-430M-108BDGN		UL-435M-108BDGN		UL-440M-108BDGN		UL-445M-108BDGN		UL-450M-108BDGN		UL-455M-108BDGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power(Pmax)	W	430	326	435	330	440	333	445	337	450	341	455	345
Maximum Power Voltage(Vmp)	V	32.72	30.10	32.87	30.24	32.91	30.28	33.02	30.38	33.22	30.56	33.42	30.75
Maximum Power Current(Imp)	A	13.14	10.82	13.24	10.90	13.37	11.01	13.48	11.10	13.55	11.16	13.61	11.21
Open-circuit Current(Voc)	V	38.97	35.46	39.18	35.65	39.38	35.84	39.58	36.02	39.78	36.20	39.98	36.38
Short-circuit Current(Isc)	A	14.10	11.37	14.15	11.41	14.22	11.47	14.30	11.53	14.38	11.60	14.45	11.66
Module Efficiency STC	%	21.52		21.77		22.02		22.27		22.52		22.77	

*STC:Cell temperature:25°C,Irradiance:1000W/m²,Ari mass:1.5G,Power measurement tolerance: ±3%
*NOCT:Air temperature:20°C,Irradiance:1000W/m²,Ari mass:1.5G,Wind speed:1m/s

OPERATING PARAMETERS

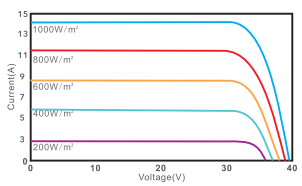
Operating Temperature	-40℃~85℃
Maximum system voltage	DC1500V(IEC)
Maximum series fuse rating	30A
Nominal operating cell temperature	43±2℃
Power tolerance	0~+5Watt

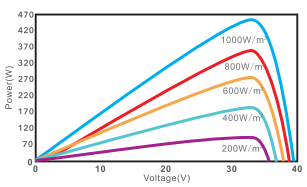
TEMPERATURE RATINGS

Temperature coefficients of Pmax	-0.29%/℃
Temperature coefficients of Voc	-0.25%/℃
Temperature coefficients of Isc	0.046%/℃

I-V CURVE

I-V characteristics at different irradiations (reference to 450 W)



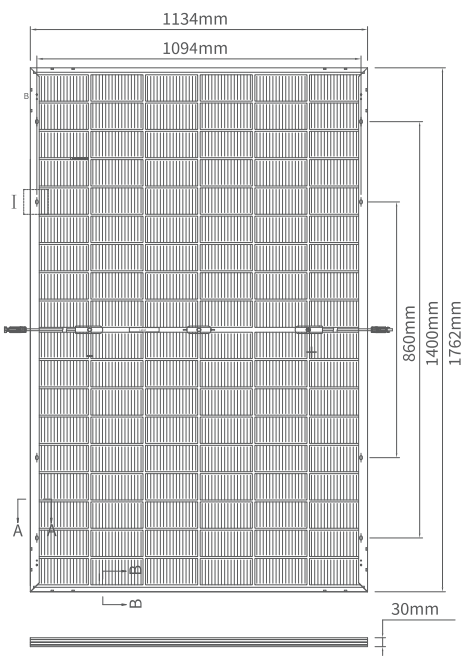


REAR SIDE POWER GAIN(REFERENCE TO 450W FRONT SIDE)

Pmax/W	450	473	495	518	540	563	585
Pmax gain	0%	5%	10%	15%	20%	25%	30%
Voc/V	39.78	39.78	39.78	39.78	39.78	39.78	39.78
Isc/A	14.38	15.10	15.82	16.54	17.26	17.98	18.69
Vmp/V	33.22	33.22	33.22	33.22	33.22	33.22	33.22
Imp/A	13.55	14.22	14.90	15.58	16.26	16.93	17.61

SPECIFICATIONS

Cell Type	N-type TOPCon Mono Half Cell
No.of cells	108(6×9×2)
Dimensions	1762*1134*30mm
Weight	23.7kg
Front Glass	2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Back Glass	2.0mm,High Transmission,Low Iron,Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68,3diodes
Connector	◯ MC4 Compatible:PV-UL608 or ◯ Original:MC4-EVO2 or ◯ others _____
Cable Length (Including Connector)	◯ Short Cable: (+)400/(-)200mm or ◯ Long Cable:(+)1200/(-)1200mm (4mm²) or ◯ Customized Length _____



PACKAGING INFORMATION


36 Pcs/Pallet


72 Pcs/Stack


Length:1775mm


Width:1130mm

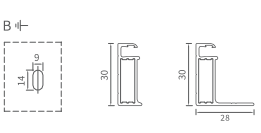

Height:2540mm



Weight:1770kg/Stack



13 Stack/40HQ
936 Pcs/40HQ



Length:±2mm
Width:±2mm
Height:±1mm
Row Pitch:±2mm

Specifications included in this datasheet are subject to change without noctice.

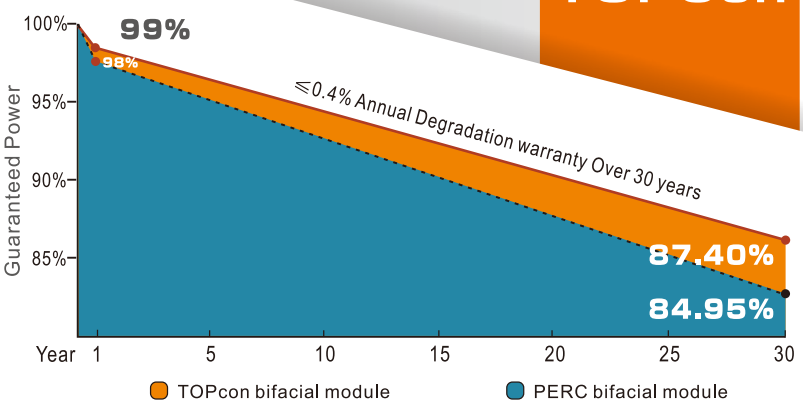
Ulica Solar reserves the right of final interpretation.

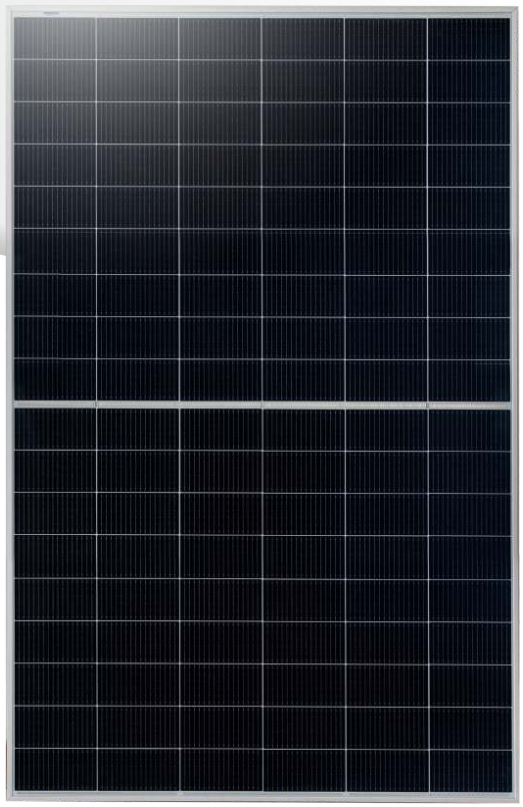
Version number: UL-1762-108BDGNBB-30-EN-V2.0

DOUBLE-GLASS BIFACIAL N-TYPE 445~455 Watt

ulica solar
LEADING IN TECHNOLOGY

TOPCon





Cutting Free Technology
Minimized micro-crack

Bifacial Mono Module
Capable of generating power at back side,at least 80% efficiency of the front side

PID FREE

Anti-PID(potentialinduced degradation)
Passed anti-PID test under 85°C damp heat 85% relative humidity for 192 hours

Lower LCOE
Lower shading and resistive loss
Lower temperature coefficient

Outstanding mechanical load resistance
2400 Pa wind load, 5400 Pa snow load

Tier 1
Bloomberg
NEW ENERGY FINANCE
Q1 2020~Q1 2025

15
30

15-year product warranty

30-year linear power output

CE TÜV SÜD MCS CERTIFIED CEC Listed INMETRO

IEC 61215, IEC 61730
ISO 9001: 2015(Quality management systems)
ISO 14001: 2015 (Environmental management systems)
ISO45001: 2018 (Occupational health and safety)
UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Add:No.238 Yunlin Middle Road, Wangchun Industrial District,Ningbo China
Tel:+86-574-28828939 Email:sales@ulsolar.com.cn
Fax:+86-574-28828997 Web:www.ulicasolar.com

TOPCon(N TYPE) 445~455Watt

ELECTRICAL SPECIFICATIONS

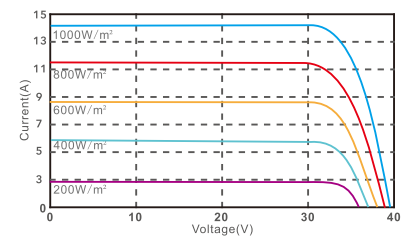
Module Type		UL-445M-108BDGN		UL-450M-108BDGN		UL-455M-108BDGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power (Pmax)	W	445	337	450	341	455	345
Maximum Power Voltage (Vmp)	V	33.02	30.38	33.22	30.56	33.42	30.75
Maximum Power Current (Imp)	A	13.48	11.10	13.55	11.16	13.61	11.21
Open-circuit Voltage (Voc)	V	39.58	36.02	39.78	36.20	39.98	36.38
Short-circuit Current (Isc)	A	14.30	11.53	14.38	11.60	14.45	11.66
Module Efficiency STC	%	22.27		22.52		22.77	
Operating Temperature		-40°C~85°C					
Maximum system voltage		DC1500V(IEC)					
Maximum series fuse rating		30A					
Power tolerance		0~+5Watt					
Temperature coefficients of Pmax		-0.29%/°C					
Temperature coefficients of Voc		-0.25%/°C					
Temperature coefficients of Isc		0.046%/°C					
Nominal operating cell temperature (NOCT)		43±2°C					

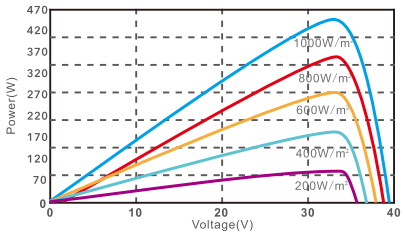
*STC : Cell temperature: 25°C, Irradiance: 1000 W/m², Air mass: 1.5G

*NOCT : Air temperature: 20°C, Irradiance: 800 W/m², Air mass:1.5G, Wind speed: 1 m/s

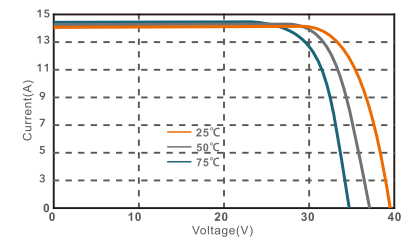
I-V CURVE

I-V characteristics at different irradiations (reference to 450W)



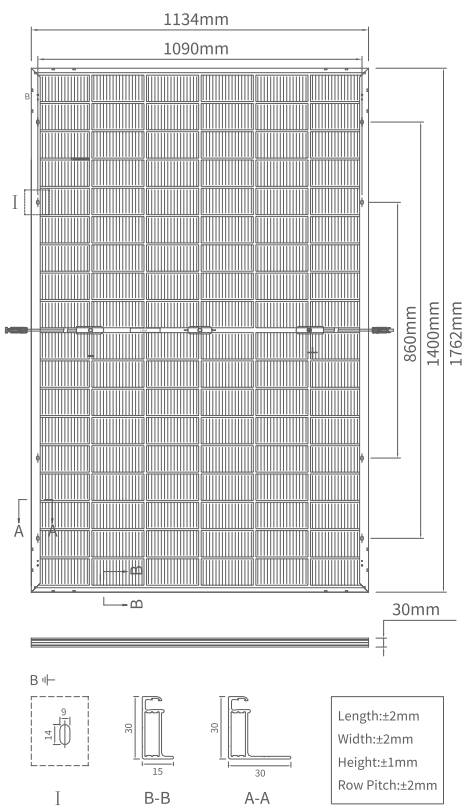


I-V characteristics at different temperature



SPECIFICATIONS

Cell Type	N type Mono-crystalline
No. of cells	108(6×9×2)
Dimensions	1762*1134*30mm
Weight	24.0kg
Glass	2.0mm+2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Junction Box	IP68,3diodes
Connector	MC4 Compatible
Cable Length (Including Connector)	4mm² Landscape:(+)1200mm/(-)1200mm or Customized Length
Packaging Configuration	Two Box=One Pallet 36pcs/Box,72pcs/Pallet,936pcs/40HQ Container



Electrical characteristics with different rear side power gain(reference to 450W front)

Pmax/W	Voc/V	Isc/A	Vmp/V	Imp/A	Pmax gain
450	39.78	14.38	33.22	13.55	0%
473	39.78	15.10	33.22	14.22	5%
495	39.78	15.82	33.22	14.90	10%
518	39.78	16.54	33.22	15.58	15%
540	39.78	17.26	33.22	16.26	20%
563	39.78	17.98	33.22	16.93	25%
585	39.78	18.69	33.22	17.61	30%

Specifications included in this datasheet are subject to change without noctice.

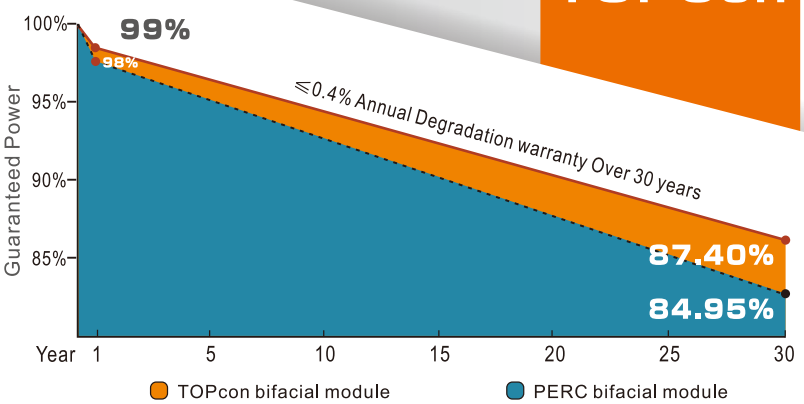
Ulica Solar reserves the right of final interpretation.

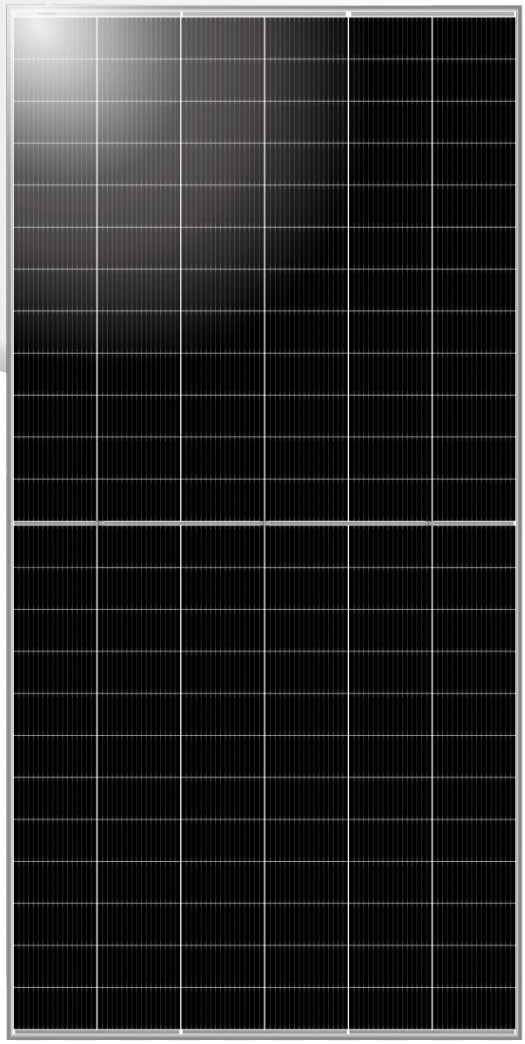
Version No.: UL-1762-108BDGNBBC-30-EN-V1.2

DOUBLE-GLASS BIFACIAL N-TYPE 575~590Watt

ulica solar
LEADING IN TECHNOLOGY

TOPCon





Bifacial Mono Module
Capable of generating power at back side,at least 80% efficiency of the front side

PID FREE

Anti-PID(potentialinduced degradation)
Passed anti-PID test under 85°C damp heat 85% relative humidity for 192 hours

TÜV

Great Durability against extreme conditions
Passed salt mist corrosion test.ammonia corrosion test dust & sand test,fire test,all certified by TUV

Lower LCOE
Lower shading and resistive loss
Lower temperature coefficient

Outstanding mechanical load resistance
2400 Pa wind load, 5400 Pa snow load

Tier 1 Bloomberg NEW ENERGY FINANCE Q1 2020~Q1 2025

15
30

15-year product warranty

30-year linear power output

CE TÜV SUD MCS CERTIFIED CEC Listed LAPI INMETRO

IEC 61215, IEC 61730
ISO 9001: 2015(Quality management systems)
ISO 14001: 2015 (Environmental management systems)
ISO45001: 2018 (Occupational health and safety)
UNI 9177 Ia CLASSE DI REAZIONE AL FUOCO:1

Add:No.238 Yunlin Middle Road, Wangchun Industrial District,Ningbo China
Tel:+86-574-28828939 Email:sales@ulsolar.com.cn
Fax:+86-574-28828997 Web:www.ulicasolar.com

TOPCon(N TYPE)575~590Watt

ELECTRICAL SPECIFICATIONS

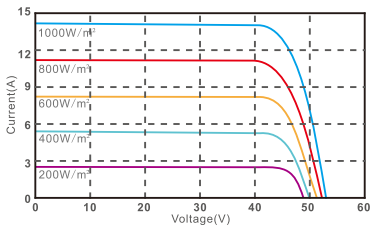
Module Type		UL-575M-144ADGN		UL-580M-144ADGN		UL-585M-144ADGN		UL-590M-144ADGN	
		STC*	NOCT*	STC*	NOCT*	STC*	NOCT*	STC*	NOCT*
Maximum Power (Pmax)	W	575	436	580	440	585	443	590	447
Maximum Power Voltage (Vmp)	V	43.85	40.34	44.02	40.50	44.17	40.64	44.35	40.80
Maximum Power Current (Imp)	A	13.11	10.80	13.18	10.85	13.24	10.91	13.30	10.96
Open-circuit Voltage (Voc)	V	52.32	47.61	52.52	47.79	52.72	47.98	52.82	48.07
Short-circuit Current (Isc)	A	13.89	11.20	13.95	11.25	14.01	11.30	14.02	11.31
Module Efficiency STC	%	22.26		22.45		22.65		22.84	
Operating Temperature		-40℃~85℃							
Maximum system voltage		DC1500V(IEC)							
Maximum series fuse rating		30A							
Power tolerance		0~+5Watt							
Temperature coefficients of Pmax		-0.29%/℃							
Temperature coefficients of Voc		-0.25%/℃							
Temperature coefficients of Isc		0.046%/℃							
Nominal operating cell temperature (NOCT)		43±2℃							

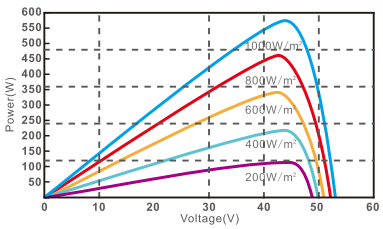
*STC : Cell temperature: 25°C, Irradiance: 1000 W/m², Air mass: 1.5G

*NOCT : Air temperature: 20°C, Irradiance: 800 W/m², Air mass: 1.5G, Wind speed: 1 m/s

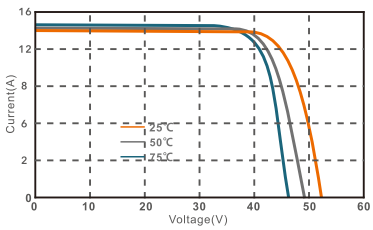
I-V CURVE

I-V characteristics at different irradiations (reference to 580 W)



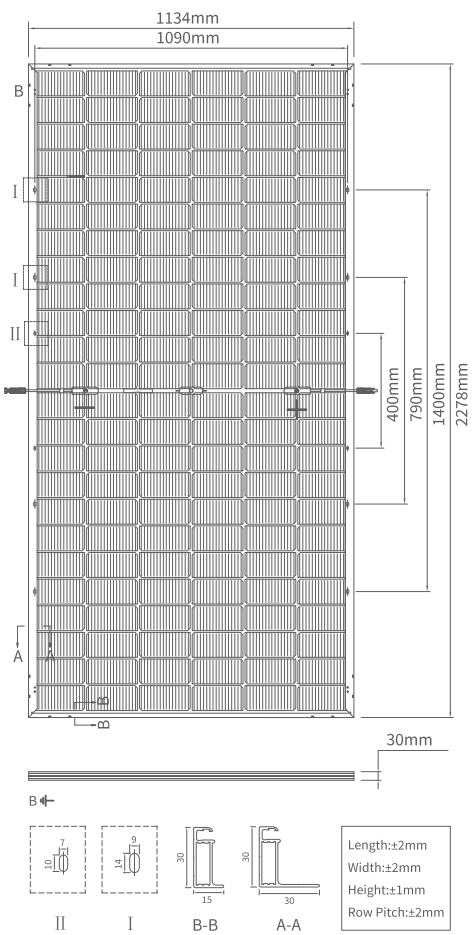


I-V characteristics at different temperature



SPECIFICATIONS

Cell Type	N type Mono-crystalline
No. of cells	144(6×12×2)
Dimensions	2278*1134*30mm
Weight	30.6kg
Glass	2.0mm+2.0mm,Anti-Reflection Coating,High Transmission,Low Iron,Tempered Glass
Junction Box	IP68,3diodes
Connector	MC4 Compatible
Cable Length (including Connector)	4mm² Landscape:(+)1400mm/(-)1400mm or Customized Length
Packaging Configuration	Two Box=One Pallet 36pcs/Box,72pcs/Pallet,720pcs/40HQ Container



Electrical characteristics with different rear side power gain(reference to 580 W front)

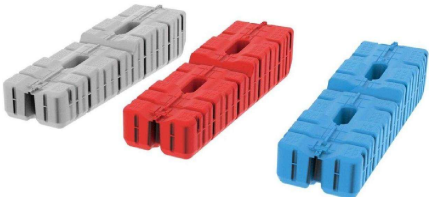
Pmax/W	Voc/V	Isc/A	Vmp/V	Imp/A	Pmax gain
580	52.52	13.95	44.02	13.18	0%
609	52.52	14.65	44.02	13.83	5%
638	52.52	15.35	44.02	14.49	10%
667	52.52	16.04	44.02	15.15	15%
696	52.52	16.74	44.02	15.81	20%
725	52.52	17.44	44.02	16.47	25%
754	52.52	18.14	44.02	17.13	30%

Specifications included in this datasheet are subject to change without noctice.

Ulica Solar reserves the right of final interpretation.

Version No.: UL-2278-144ADGNBBC-30-EN-V1.2

ACHYRA®
Soluzioni Energetiche Sostenibili
Achyra Holding srl
Milano - Nola - HongKong - Guangzhou





Tipo	**AZ-01**
Luogo di installazione	**Tetto piano in cemento / Terra**
Angolo di installazione	**5°**
Resistenza al vento	**40 m/s (Max. Categoria 13 Typhoon)**
Dimensione del modulo	**Universale**
Tipo di carico	**Riempibile ad acqua**
Materiali	**HDPE Polietilene ad alta densità +**
	Anti-UV e anti-usura
Dimensioni	**1470 x 415 x 300 (mm)**
Tempo di installazione	**<1 Minuto / Modulo**
Temperatura di esercizio	**-40°C to 85°C**
Installazione Modulo	**Verticale**
Peso	**< 6 kg / Unità**
Tipo di Modulo	**Universale**
Carico massimo d'acqua	**120 kg / Unità**
Materiale fissaggi	**ALLUMINIO AL6063-T5**
Volume	**36 Unità / 5,85 m³**
Quantità contenitore	**452 pz / 40 HQ**
Riciclabilità dei materiali	**Completamente riciclabile**
Garanzia	**Durabilità 25 anni**
	Garanzia di 10 anni

PANNELLI SOLARI HORAY 3
HS186R-108TC-Alpine-455W 4
HS186R-120TC-Alpine-510W 6
HS186R-132TC-Alpine-560W 8
HS186R-144TC-Alpine-610W 10
HS191R-108TC-Basin-475W 12
HS191R-120TC-Basin-520W 14
HS191R-132TC-Basin-570W 16
HS191R-144TC-Basin-620W 18
HS182-108TC-Ocean-430~450W 20
HS182-120TC-Ocean-480~500W 22
HS182-132TC-Ocean-530~550W 24
HS182-144TC-Ocean-585~605W 26
HS186R-108TC-D-Alpine-455W 28
HS186R-120TC-D-Alpine-510W 30
HS186R-132TC-D-Alpine-560W 32
HS186R-144TC-D-Alpine-610W 34
HS191R-108TC-D-Basin-475W 36
HS191R-120TC-D-Basin-520W 38
HS191R-132TC-D-Basin-570W 40
HS191R-144TC-D-Basin-620W 42
HS210R-096TC-D-Cosmos-445~465W 44
HS210R-108TC-D-Cosmos-500~520W 46
HS210R-108TC-D-Cosmos-515W 48
HS210R-120TC-D-Cosmos-560~580W 50
HS210R-132TC-D-Cosmos-620~640W 52
HS210R-132TC-D-Cosmos-630W 54
HS199R-108TC-D-Delta-485W 56
HS199R-120TC-D-Delta-540W 58
HS199R-132TC-D-Delta-590W 60

HS199R-144TC-D-Delta-650W 62
HS210-132TC-D-Galaxy-700~730W-33Frame with C 64
HS210-132TC-D-Galaxy-700~730W-33Frame without C 66
HS210-132TC-D-Galaxy-720W-33Frame 68
HS182-108TC-D-Ocean-430~450W 70
HS182-120TC-D-Ocean-480~500W 72
HS182-132TC-D-Ocean-530~550W 74
HS182-144TC-D-Ocean-585~605W 76
HS182-144TC-D-Ocean-590W 78
HS_(570-590)TC_MHO-D_EN-30-Without-C-frame 80
HS_(370-385)_MHL_EN 82
HS_(410-425)_MHL_EN 84
HS_(445-465)_MHL_EN 86
Horay-Solar-Global-Installation-Manual 88
InstallationManual_Horay-DG 116
InstallationManual_Horay-SG 139
Solar-Creek-Series 161
TUV-RHEINLAND-CERT-(DOUBLE-GLASS)-HORAY-SOLAR 173
TUV-RHEINLAND-CERT-HORAY-SOLAR 176
LIMITED-WARRANTY-FOR-PV-MODULES-OF-HORAY-SOLAR 179
Scheda tecnica Zavorra 186

HORAY



455W

HORAY | TIER1 BloombergNEF

HS 186R-108 TC *Alpine* *N-type Mono-facial Modules*

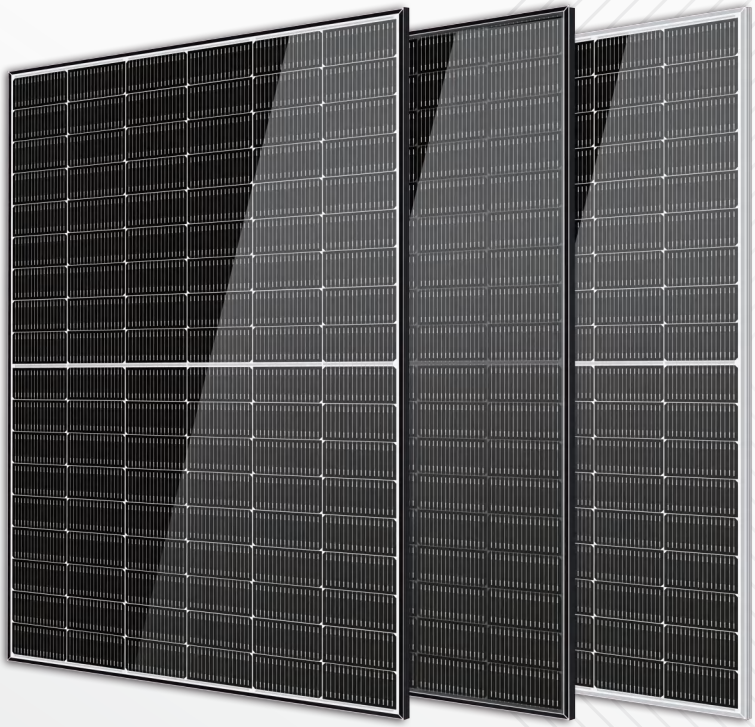
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 108 half-cells monocrystalline modules is up to 455W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

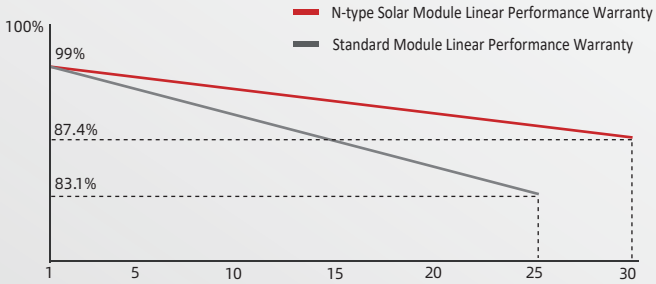
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

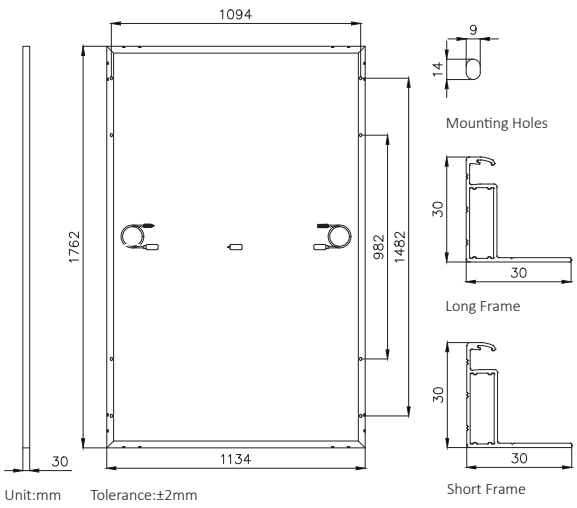
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 186R-108 TC

MECHANICAL DIAGRAMS



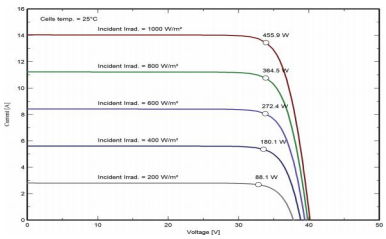
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

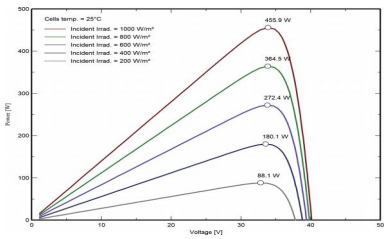
Weight	20.5kg
Dimension	1762×1134×30mm
Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/962pcs per 40'HC

MECHANICAL PARAMETERS

HS455TC-MHA



HS455TC-MHA



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS435TC-MHA	HS440TC-MHA	HS445TC-MHA	HS450TC-MHA	HS455TC-MHA
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	435	440	445	450	455
Open Circuit Voltage(Voc/V)	39.36	39.57	39.77	39.97	40.14
Short Circuit Current(Isc/A)	13.72	13.80	13.87	13.94	14.03
Maximum Power Voltage(Vmp/V)	32.78	32.99	33.19	33.39	33.53
Maximum Power Current(Imp/A)	13.27	13.34	13.41	13.48	13.57
Module Efficiency(%)	21.8	22.0	22.3	22.5	22.8

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS435TC-MHA	HS440TC-MHA	HS445TC-MHA	HS450TC-MHA	HS455TC-MHA
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	331	335	339	343	347
Open Circuit Voltage(Voc/V)	39.36	39.57	39.77	39.97	40.14
Short Circuit Current(Isc/A)	10.45	10.52	10.57	10.62	10.69
Maximum Power Voltage(Vmp/V)	32.78	32.99	33.19	33.39	33.53
Maximum Power Current(Imp/A)	10.11	10.17	10.22	10.27	10.34

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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510W

HORAY | TIER1 BloombergNEF

HS 186R-120 TC *Alpine* *N-type Mono-facial Modules*

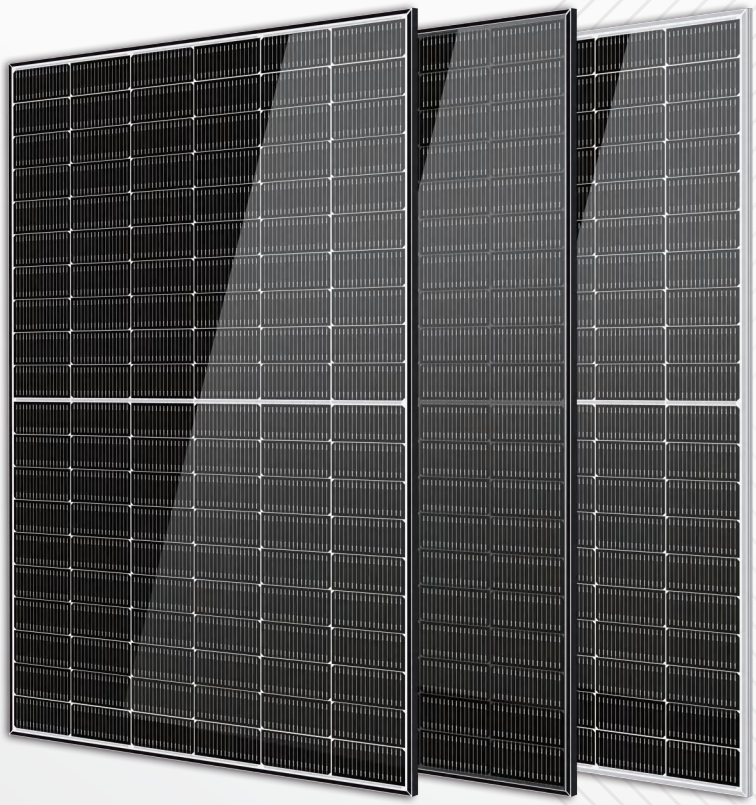
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 120 half-cells monocrystalline modules is up to 510W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

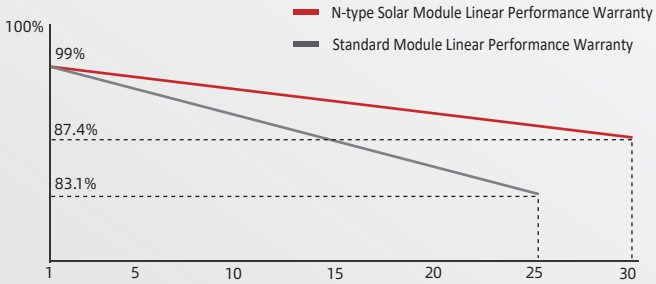
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

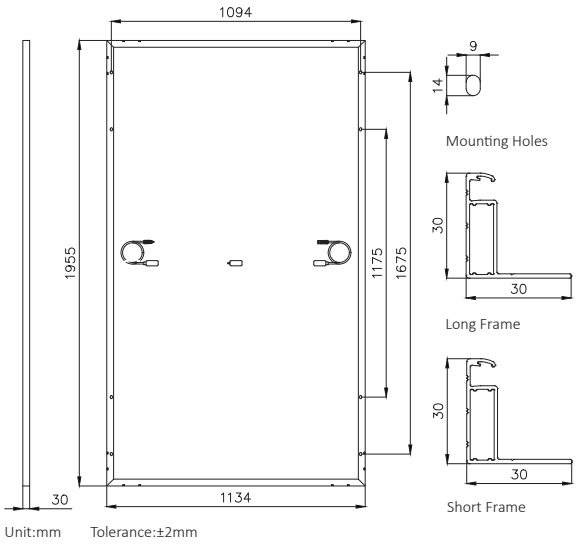
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 186R-120 TC

MECHANICAL DIAGRAMS



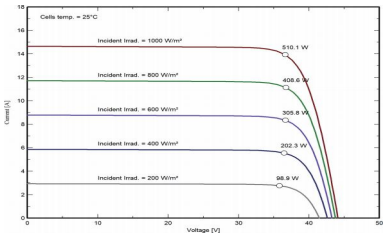
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

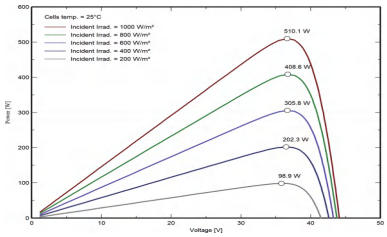
Weight	21.5kg
Dimension	1955×1134×30mm
Cell Orientation	120 (6×20)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/814pcs per 40'HC

MECHANICAL PARAMETERS

HS510TC-MHA



HS510TC-MHA



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS490TC-MHA	HS495TC-MHA	HS500TC-MHA	HS505TC-MHA	HS510TC-MHA
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	490	495	500	505	510
Open Circuit Voltage(Voc/V)	43.35	43.53	43.70	43.88	44.10
Short Circuit Current(Isc/A)	14.31	14.40	14.48	14.57	14.64
Maximum Power Voltage(Vmp/V)	36.17	36.32	36.47	36.62	36.80
Maximum Power Current(Imp/A)	13.55	13.63	13.71	13.79	13.86
Module Efficiency(%)	22.2	22.4	22.6	22.9	23.1

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS490TC-MHA	HS495TC-MHA	HS500TC-MHA	HS505TC-MHA	HS510TC-MHA
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	373	377	381	385	389
Open Circuit Voltage(Voc/V)	43.35	43.53	43.70	43.88	44.10
Short Circuit Current(Isc/A)	10.90	10.97	11.04	11.10	11.16
Maximum Power Voltage(Vmp/V)	36.17	36.32	36.47	36.62	36.80
Maximum Power Current(Imp/A)	10.32	10.38	10.45	10.51	10.56

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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560W

HORAY | TIER1 BloombergNEF

HS 186R-132 TC *Alpine* *N-type Mono-facial Modules*

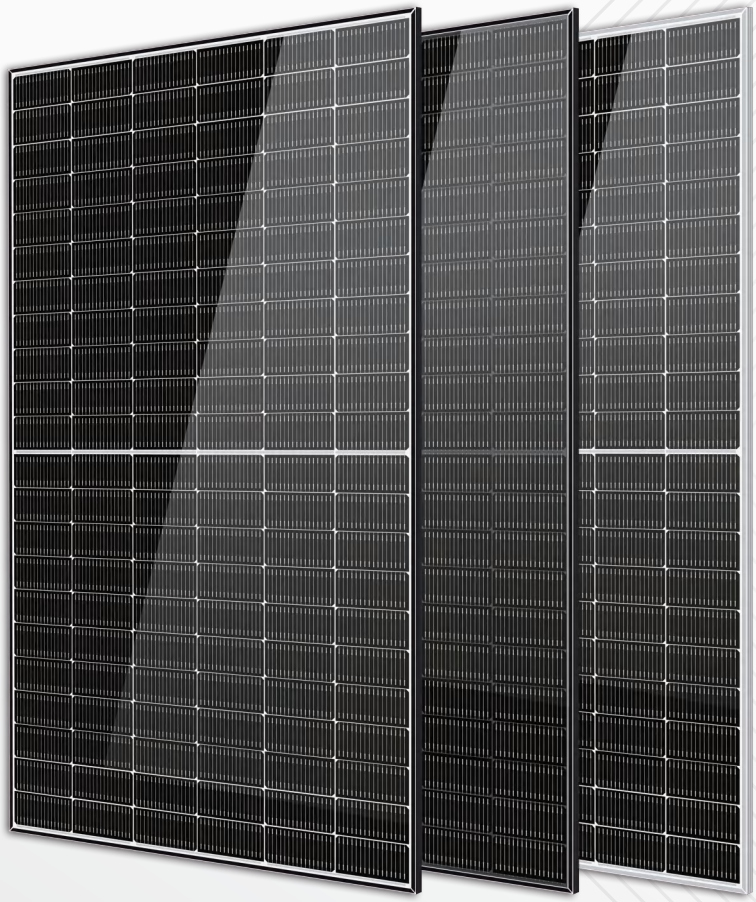
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 560W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

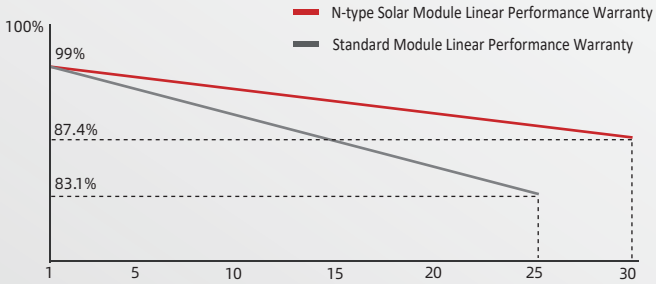
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

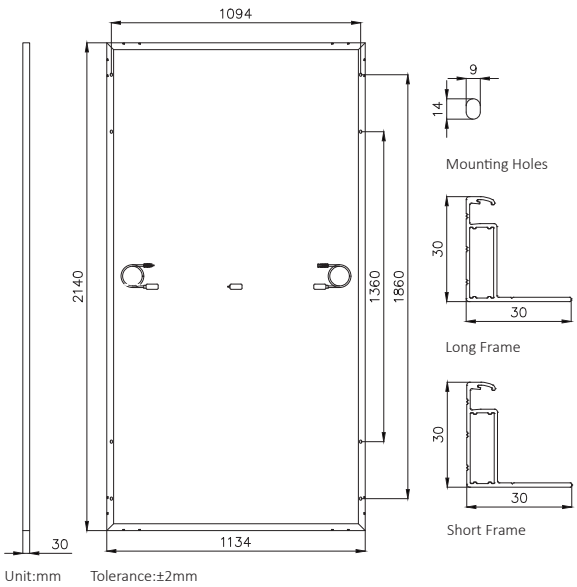
30 30-year linear power output warranty

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sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 186R-132 TC

MECHANICAL DIAGRAMS



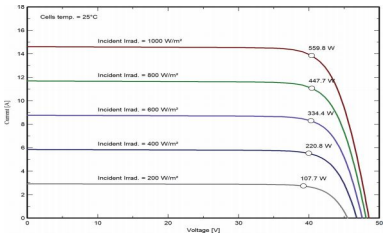
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MECHANICAL PARAMETERS

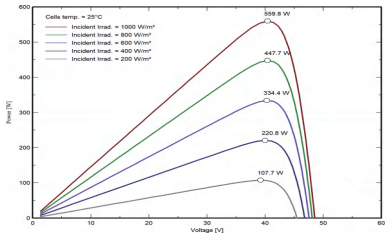
Weight	24.5kg
Dimension	2140×1134×30mm
Cell Orientation	132 (6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/740pcs per 40'HC

MECHANICAL PARAMETERS

HS560TC-MHA



HS560TC-MHA



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS540TC-MHA	HS545TC-MHA	HS550TC-MHA	HS555TC-MHA	HS560TC-MHA
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	540	545	550	555	560
Open Circuit Voltage(Voc/V)	47.68	47.88	48.07	48.27	48.51
Short Circuit Current(Isc/A)	14.34	14.41	14.48	14.56	14.61
Maximum Power Voltage(Vmp/V)	39.79	39.96	40.11	40.28	40.48
Maximum Power Current(Imp/A)	13.57	13.64	13.71	13.78	13.83
Module Efficiency(%)	22.3	22.5	22.7	22.9	23.1

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS540TC-MHA	HS545TC-MHA	HS550TC-MHA	HS555TC-MHA	HS560TC-MHA
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	411	415	419	423	427
Open Circuit Voltage(Voc/V)	47.68	47.88	48.07	48.27	48.51
Short Circuit Current(Isc/A)	10.92	10.98	11.04	11.09	11.14
Maximum Power Voltage(Vmp/V)	39.79	39.96	40.11	40.28	40.48
Maximum Power Current(Imp/A)	10.34	10.39	10.45	10.50	10.54

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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610W

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HS 186R-144 TC *Alpine* *N-type Mono-facial Modules*

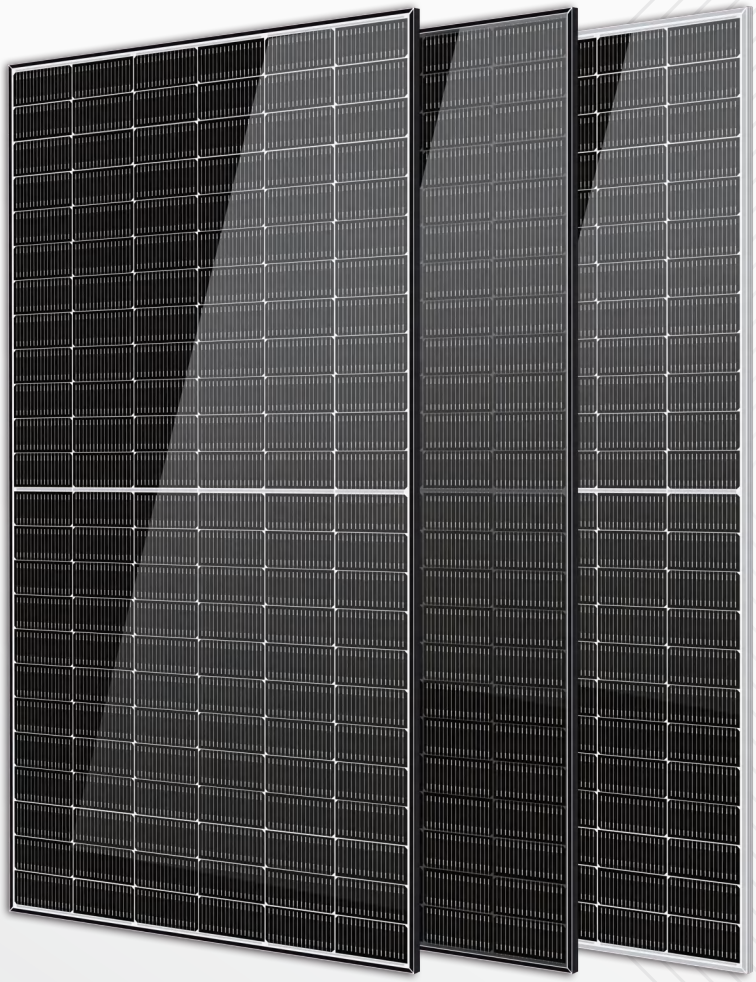
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 144 half-cells monocrystalline modules is up to 610W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

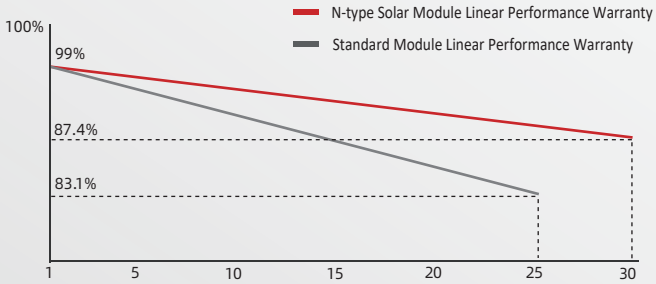
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

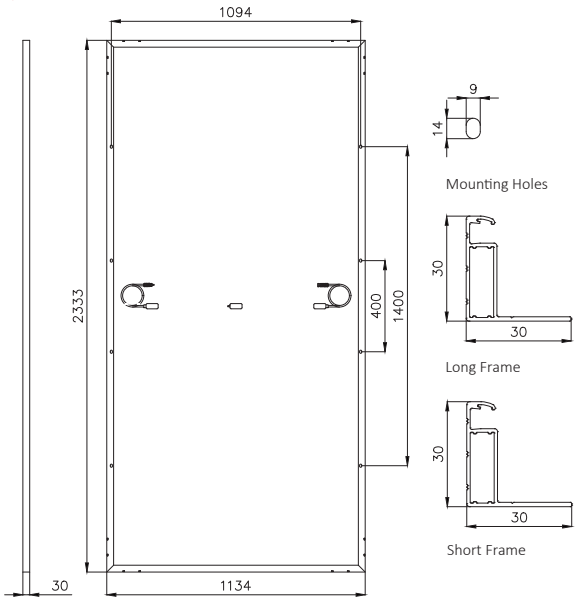
30 30-year linear power output warranty

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sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 186R-144 TC

MECHANICAL DIAGRAMS



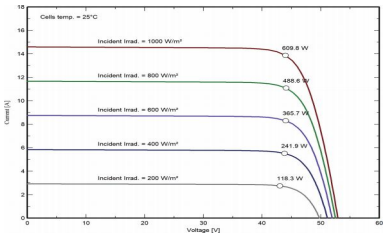
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MECHANICAL PARAMETERS

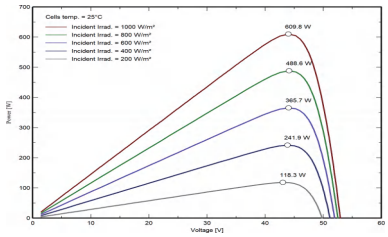
Weight	27.0kg
Dimension	2333×1134×30mm
Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	36pcs per pallet/720pcs per 40'HC

MECHANICAL PARAMETERS

HS610TC-MHA



HS610TC-MHA



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS590TC-MHA	HS595TC-MHA	HS600TC-MHA	HS605TC-MHA	HS610TC-MHA
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	590	595	600	605	610
Open Circuit Voltage(Voc/V)	52.02	52.24	52.44	52.65	52.92
Short Circuit Current(Isc/A)	14.36	14.42	14.48	14.55	14.59
Maximum Power Voltage(Vmp/V)	43.41	43.59	43.76	43.94	44.16
Maximum Power Current(Imp/A)	13.59	13.65	13.71	13.77	13.81
Module Efficiency(%)	22.3	22.5	22.7	22.9	23.1

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS590TC-MHA	HS595TC-MHA	HS600TC-MHA	HS605TC-MHA	HS610TC-MHA
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	450	453	457	461	465
Open Circuit Voltage(Voc/V)	52.02	52.24	52.44	52.65	52.92
Short Circuit Current(Isc/A)	10.94	10.99	11.04	11.08	11.12
Maximum Power Voltage(Vmp/V)	43.41	43.59	43.76	43.94	44.16
Maximum Power Current(Imp/A)	10.36	10.40	10.45	10.49	10.53

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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475W

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HS 191R-108 TC Basin *N-type Mono-facial Modules*

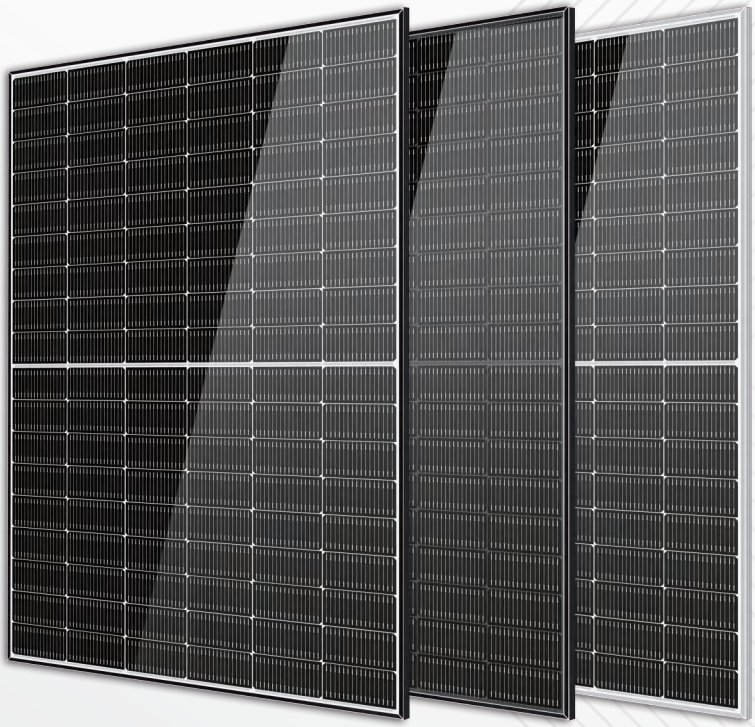
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 108 half-cells monocrystalline modules is up to 475W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

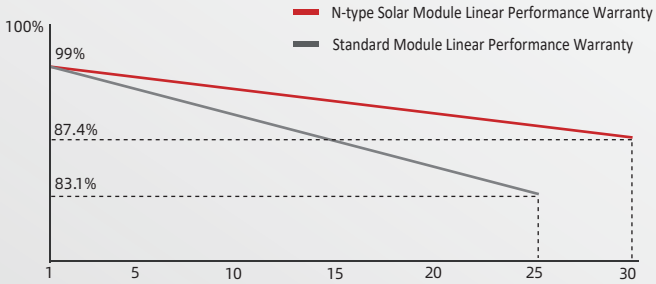
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

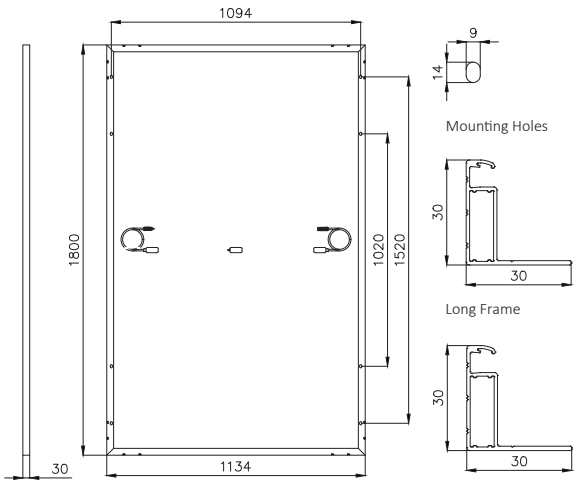
30 30-year linear power output warranty

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sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 191R-108 TC

MECHANICAL DIAGRAMS



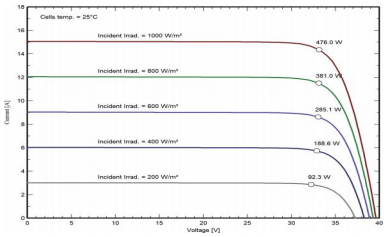
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

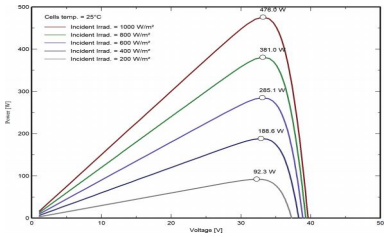
Weight	21.0kg
Dimension	1800×1134×30mm
Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/888pcs per 40'HC

MECHANICAL PARAMETERS

HS475TC-MHB



HS475TC-MHB



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS455TC-MHB	HS460TC-MHB	HS465TC-MHB	HS470TC-MHB	HS475TC-MHB
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	455	460	465	470	475
Open Circuit Voltage(Voc/V)	38.90	39.08	39.26	39.31	39.61
Short Circuit Current(Isc/A)	14.68	14.78	14.87	15.01	15.06
Maximum Power Voltage(Vmp/V)	33.00	33.15	33.30	33.35	33.60
Maximum Power Current(Imp/A)	13.79	13.88	13.96	14.10	14.14
Module Efficiency(%)	22.3	22.6	22.8	23.0	22.3

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS455TC-MHB	HS460TC-MHB	HS465TC-MHB	HS470TC-MHB	HS475TC-MHB
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	381	386	390	394	398
Open Circuit Voltage(Voc/V)	38.90	39.08	39.26	39.31	39.61
Short Circuit Current(Isc/A)	11.19	11.26	11.33	11.44	11.47
Maximum Power Voltage(Vmp/V)	33.00	33.15	33.30	33.35	33.60
Maximum Power Current(Imp/A)	10.51	10.57	10.64	10.74	10.77

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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Version number: HS191R-TC-2025-A0

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520W

HORAY | TIER1 BloombergNEF

HS 191R-120 TC *Basin* *N-type Mono-ifacial Modules*

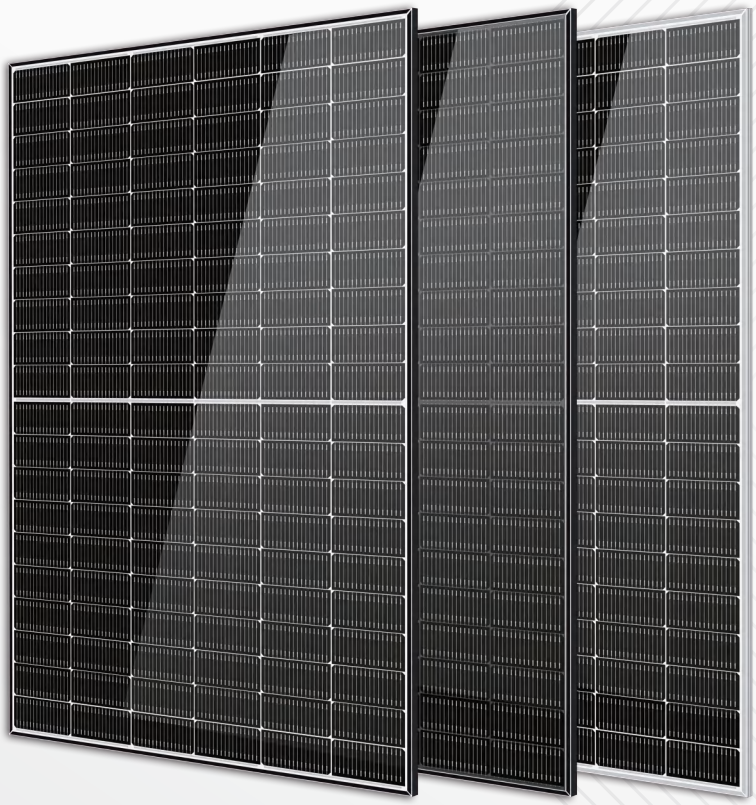
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 120 half-cells monocrystalline modules is up to 520W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

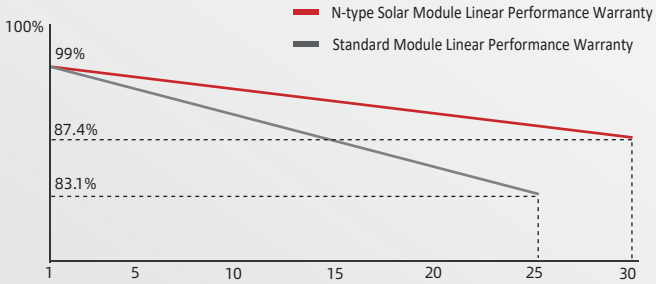
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

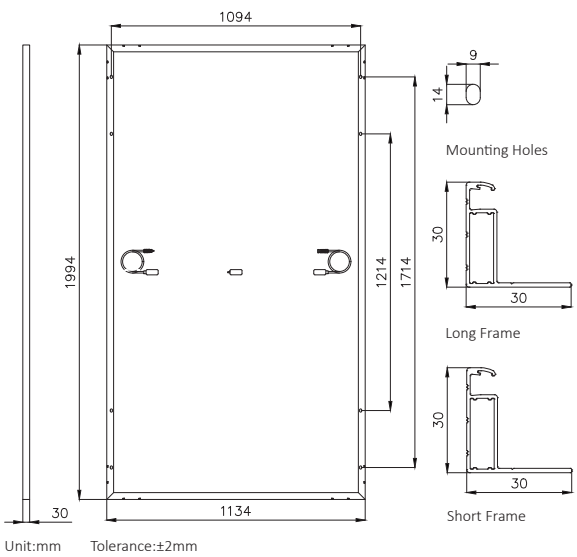
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 191R-120 TC-D

MECHANICAL DIAGRAMS

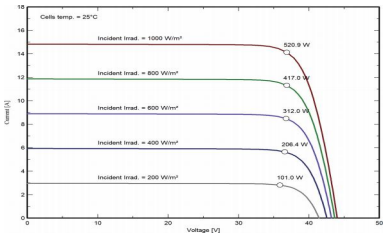


MECHANICAL PARAMETERS

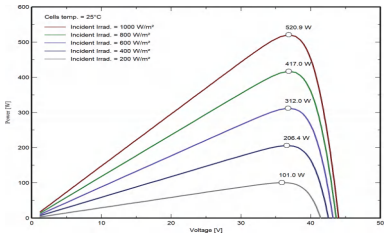
Weight	23.5kg
Dimension	1994×1134×30mm
Cell Orientation	120 (6×20)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/814pcs per 40'HC

MECHANICAL PARAMETERS

HS520TC-MHB



HS520TC-MHB



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS500TC-MHB	HS505TC-MHB	HS510TC-MHB	HS515TC-MHB	HS520TC-MHB
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	500	505	510	515	520
Open Circuit Voltage(Voc/V)	43.23	43.42	43.62	43.68	44.01
Short Circuit Current(Isc/A)	14.52	14.60	14.68	14.80	14.83
Maximum Power Voltage(Vmp/V)	36.67	36.83	37.00	37.05	37.33
Maximum Power Current(Imp/A)	13.64	13.71	13.78	13.90	13.93
Module Efficiency(%)	22.1	22.3	22.6	22.8	23.0

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS500TC-MHB	HS505TC-MHB	HS510TC-MHB	HS515TC-MHB	HS520TC-MHB
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	419	423	427	432	436
Open Circuit Voltage(Voc/V)	43.23	43.42	43.62	43.68	44.01
Short Circuit Current(Isc/A)	11.07	11.13	11.19	11.28	11.30
Maximum Power Voltage(Vmp/V)	36.67	36.83	37.00	37.05	37.33
Maximum Power Current(Imp/A)	10.39	10.45	10.50	10.59	10.61

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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Version number: HS191R-TC-2025-A0

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570W

HORAY | TIER1 BloombergNEF

HS 191R-132 TC Basin *N-type Mono-facial Modules*

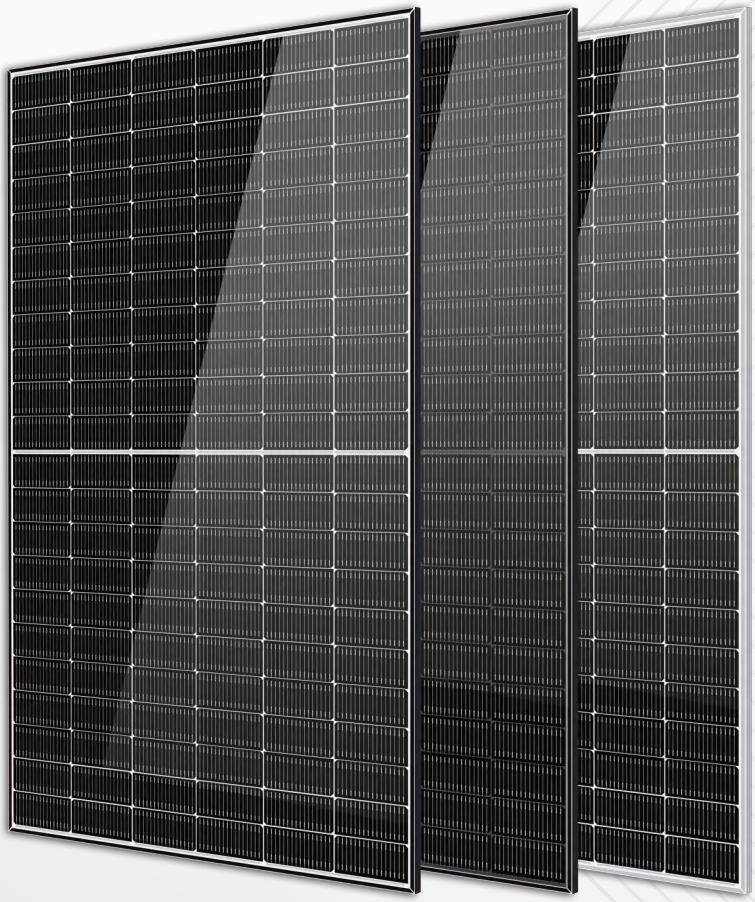
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 570W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

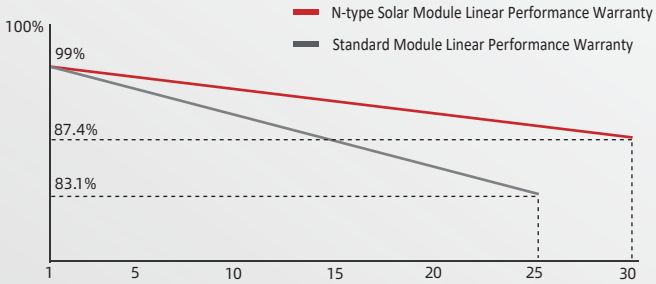
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

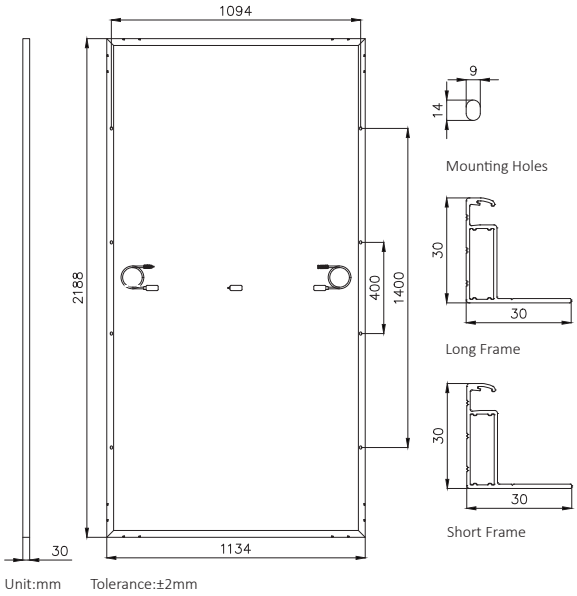
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 191R-132 TC

MECHANICAL DIAGRAMS



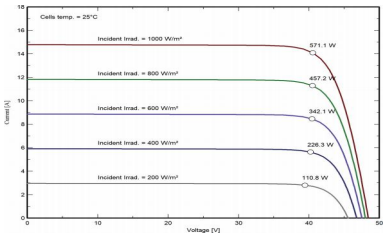
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

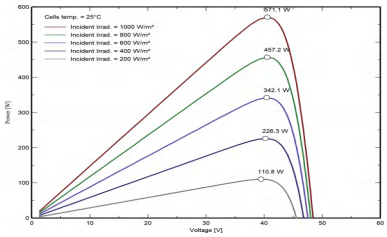
Weight	25.5kg
Dimension	2188×1134×30mm
Cell Orientation	132 (6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/740pcs per 40'HC

MECHANICAL PARAMETERS

HS570TC-MHB



HS570TC-MHB



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS550TC-MHB	HS555TC-MHB	HS560TC-MHB	HS565TC-MHB	HS570TC-MHB
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	550	555	560	565	570
Open Circuit Voltage(Voc/V)	47.55	47.76	47.98	48.05	48.41
Short Circuit Current(Isc/A)	14.52	14.59	14.65	14.76	14.78
Maximum Power Voltage(Vmp/V)	40.33	40.52	40.70	40.76	41.07
Maximum Power Current(Imp/A)	13.64	13.70	13.76	13.86	13.88
Module Efficiency(%)	22.2	22.4	22.6	22.8	23.0

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS550TC-MHB	HS555TC-MHB	HS560TC-MHB	HS565TC-MHB	HS570TC-MHB
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	461	465	469	474	478
Open Circuit Voltage(Voc/V)	47.55	47.76	47.98	48.05	48.41
Short Circuit Current(Isc/A)	11.07	11.12	11.17	11.25	11.26
Maximum Power Voltage(Vmp/V)	40.33	40.52	40.70	40.76	41.07
Maximum Power Current(Imp/A)	10.39	10.44	10.48	10.56	10.58

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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620W

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HS 191R-144 TC Basin *N-type Mono-facial Modules*

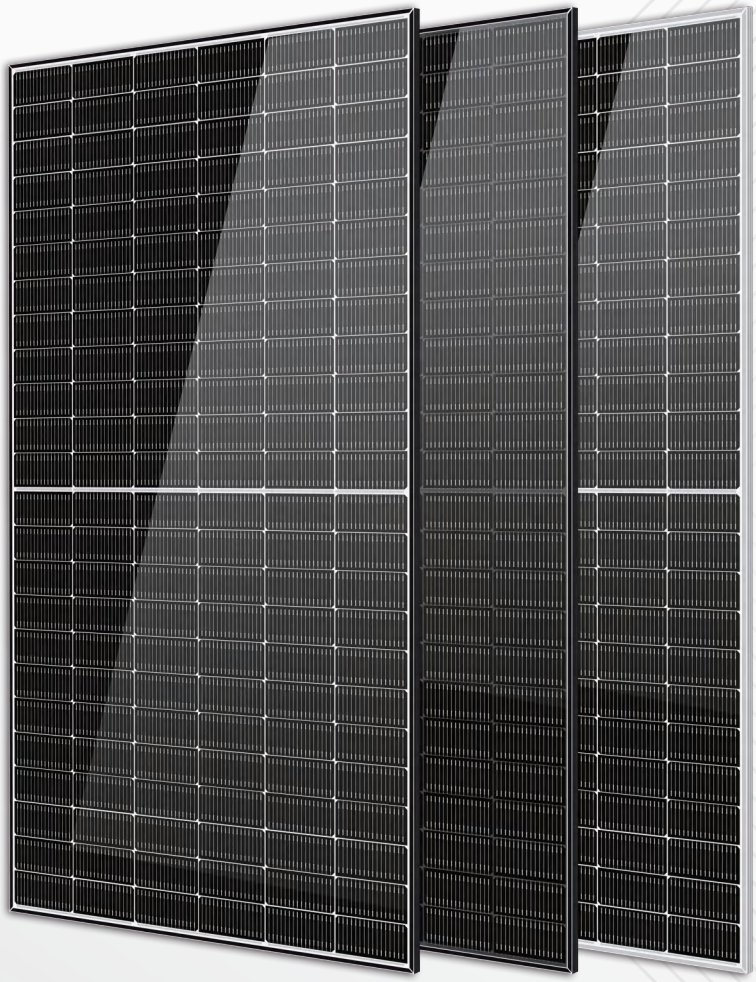
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 144 half-cells monocrystalline modules is up to 620W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

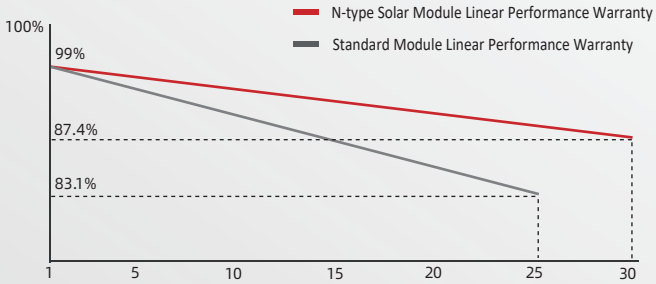
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

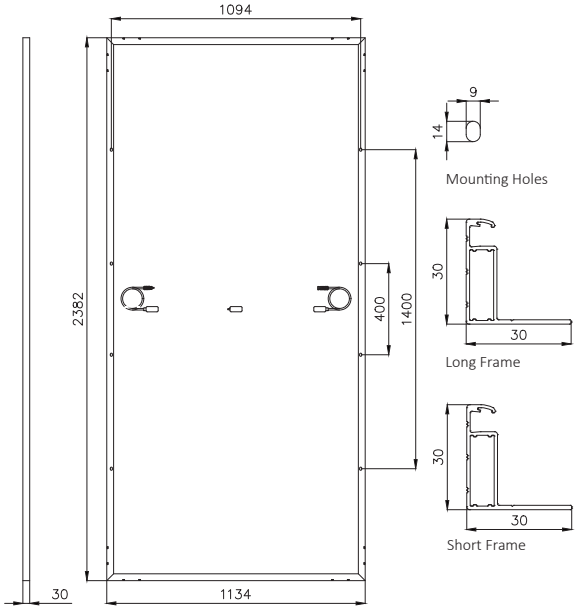
30 30-year linear power output warranty

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sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 182-144 TC

MECHANICAL DIAGRAMS



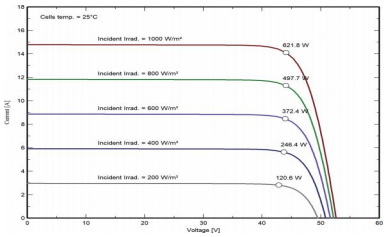
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

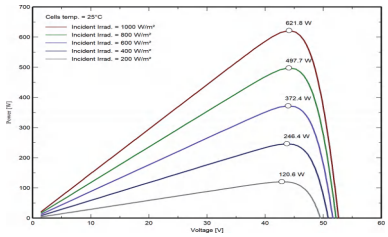
Weight	28.0kg
Dimension	2382×1134×30mm
Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	36pcs per pallet/720pcs per 40'HC

MECHANICAL PARAMETERS

HS620TC-MHB



HS620TC-MHB



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS600TC-MHB	HS605TC-MHB	HS610TC-MHB	HS615TC-MHB	HS620TC-MHB
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	600	605	610	615	620
Open Circuit Voltage(Voc/V)	51.80	52.00	52.20	52.40	52.60
Short Circuit Current(Isc/A)	14.54	14.60	14.66	14.72	14.78
Maximum Power Voltage(Vmp/V)	44.00	44.20	44.40	44.60	44.80
Maximum Power Current(Imp/A)	13.64	13.69	13.74	13.79	13.84
Module Efficiency(%)	22.2	22.4	22.6	22.8	23.0

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS600TC-MHB	HS605TC-MHB	HS610TC-MHB	HS615TC-MHB	HS620TC-MHB
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	503	507	511	515	520
Open Circuit Voltage(Voc/V)	51.80	52.00	52.20	52.40	52.60
Short Circuit Current(Isc/A)	11.08	11.13	11.17	11.22	11.26
Maximum Power Voltage(Vmp/V)	44.00	44.20	44.40	44.60	44.80
Maximum Power Current(Imp/A)	10.39	10.43	10.47	10.51	10.55

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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430~450 Watt

HORAY | TIER1 BloombergNEF

HS 182-108 TC Ocean *N-type Mono-facial Modules*

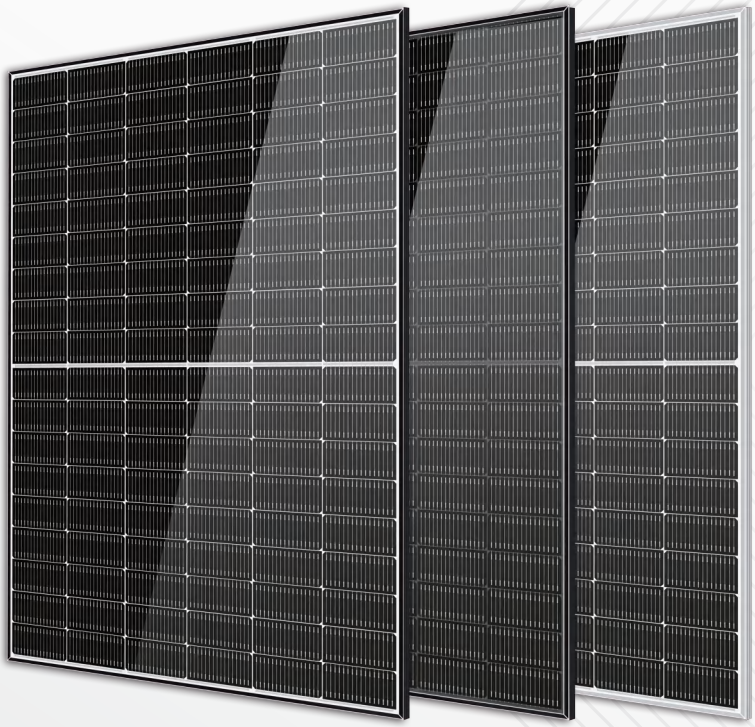
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 108 half-cells monocrystalline modules is up to 450W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

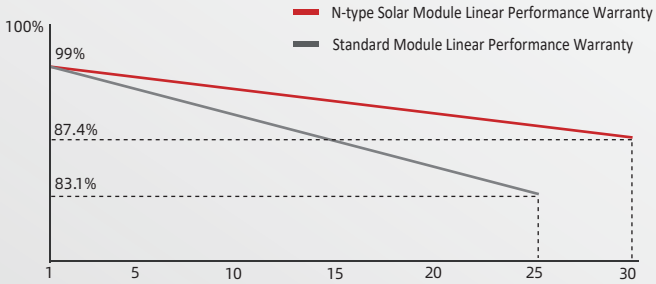
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ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

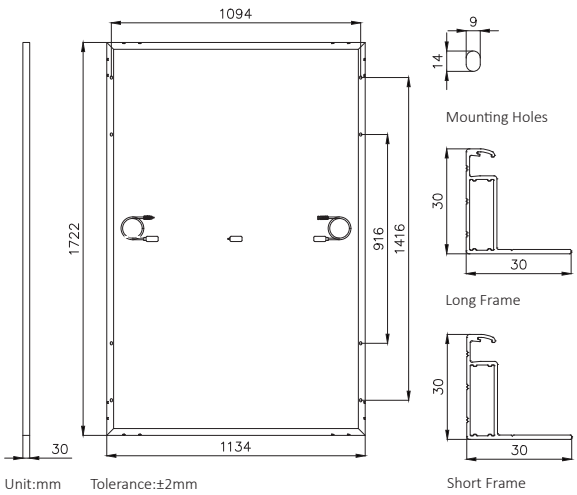
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 182-108 TC

MECHANICAL DIAGRAMS



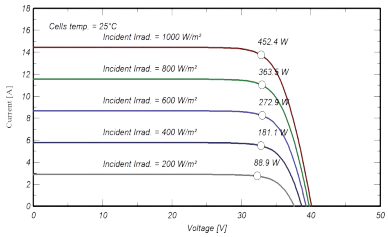
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

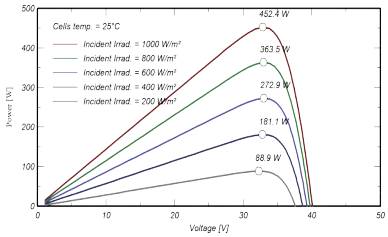
Weight	20.5kg
Dimension	1722×1134×30mm
Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm²,±1100mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/962pcs per 40'HC

MECHANICAL PARAMETERS

HS450TC-MHO



HS450TC-MHO



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS430TC-MHO	HS435TC-MHO	HS440TC-MHO	HS445C-MHO	HS450TC-MHO
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	430	435	440	445	450
Open Circuit Voltage(Voc/V)	39.30	39.50	39.70	39.90	40.10
Short Circuit Current(Isc/A)	14.15	14.22	14.30	14.37	14.45
Maximum Power Voltage(Vmp/V)	32.84	33.04	33.24	33.44	33.64
Maximum Power Current(Imp/A)	13.10	13.17	13.24	13.31	13.38
Module Efficiency(%)	22.0	22.3	22.5	22.8	23.0

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS430TC-MHO	HS435TC-MHO	HS440C-MHO	HS445TC-MHO	HS450TC-MHO
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	328	332	336	340	344
Open Circuit Voltage(Voc/V)	37.10	37.30	37.50	37.70	37.90
Short Circuit Current(Isc/A)	11.43	11.49	11.55	11.61	11.67
Maximum Power Voltage(Vmp/V)	30.50	30.70	30.90	31.10	31.30
Maximum Power Current(Imp/A)	10.74	10.80	10.86	10.93	10.99

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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Version number: HS182-TC-2025-A0

YouTube FaceBook Linkedin WeChat

480~500 Watt

HORAY | TIER1 BloombergNEF

HS 182-120 TC Ocean *N-type Mono-facial Modules*

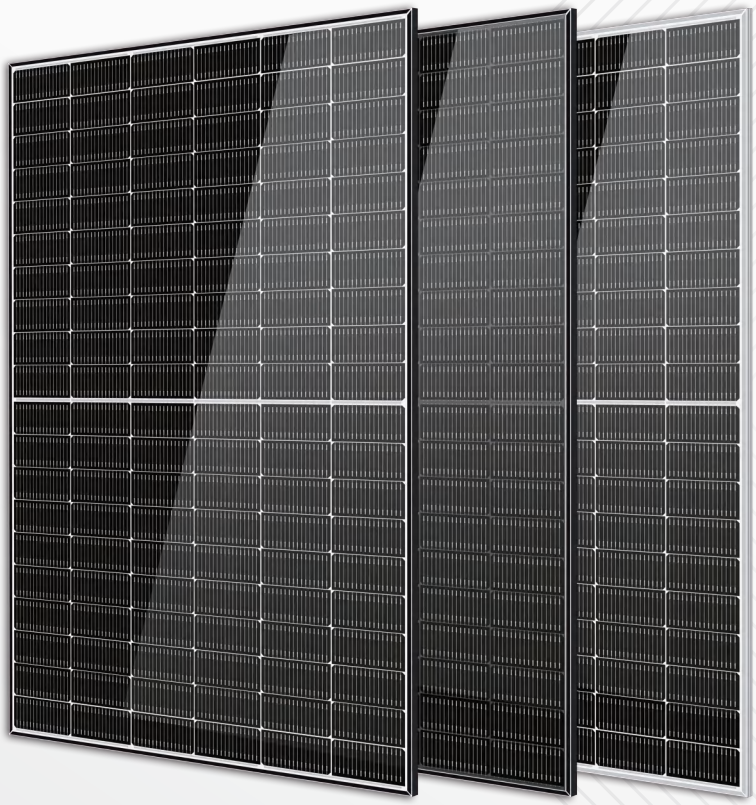
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 120 half-cells monocrystalline modules is up to 500W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

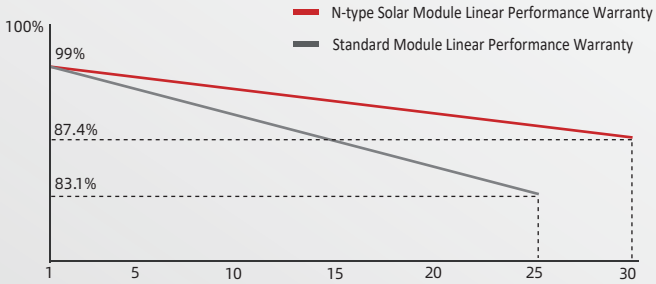
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

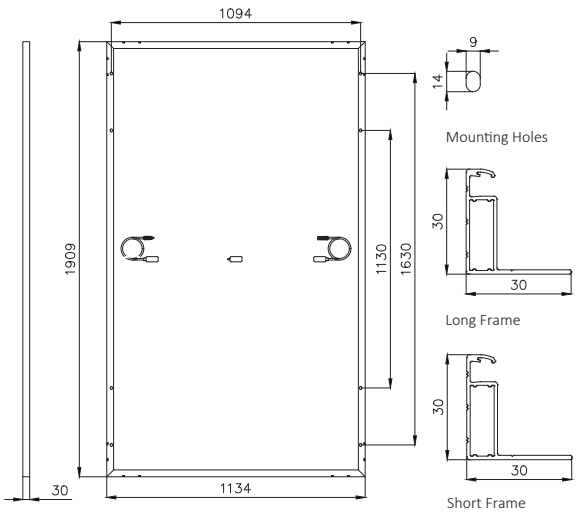
30 30-year linear power output warranty

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sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

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info@horaysolar.com www.horaysolar.com
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HS 182-120 TC

MECHANICAL DIAGRAMS



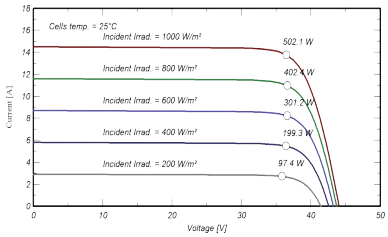
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

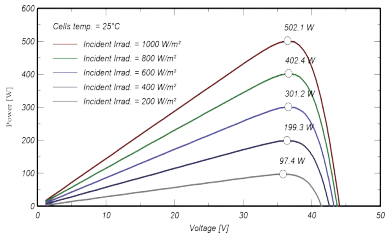
Weight	23.0kg
Dimension	1909×1134×30mm
Cell Orientation	120 (6×20)
Junction Box	IP68, three diodes
Output Cable	4mm²,±1100mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/888pcs per 40'HC

MECHANICAL PARAMETERS

HS500TC-MHO



HS500TC-MHO



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS480TC-MHO	HS485TC-MHO	HS490TC-MHO	HS495TC-MHO	HS500TC-MHO
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	480	485	490	495	500
Open Circuit Voltage(Voc/V)	43.26	43.46	43.66	43.86	44.06
Short Circuit Current(Isc/A)	14.22	14.30	14.37	14.43	14.50
Maximum Power Voltage(Vmp/V)	36.44	36.64	36.84	37.04	37.24
Maximum Power Current(Imp/A)	13.17	13.23	13.31	13.36	13.43
Module Efficiency(%)	22.2	22.4	22.6	22.9	23.1

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS480TC-MHO	HS485TC-MHO	HS490TC-MHO	HS495TC-MHO	HS500TC-MHO
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	365	369	374	378	382
Open Circuit Voltage(Voc/V)	41.00	41.20	41.40	41.60	41.80
Short Circuit Current(Isc/A)	11.49	11.55	11.61	11.66	11.72
Maximum Power Voltage(Vmp/V)	33.80	34.00	34.20	34.40	34.60
Maximum Power Current(Imp/A)	10.82	10.88	10.93	10.99	11.04

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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Version number: HS182-TC-2025-A0

YouTube FaceBook Linkedin WeChat

530~550 Watt

HORAY | TIER1 BloombergNEF

HS 182-132 TC Ocean *N-type Mono-facial Modules*

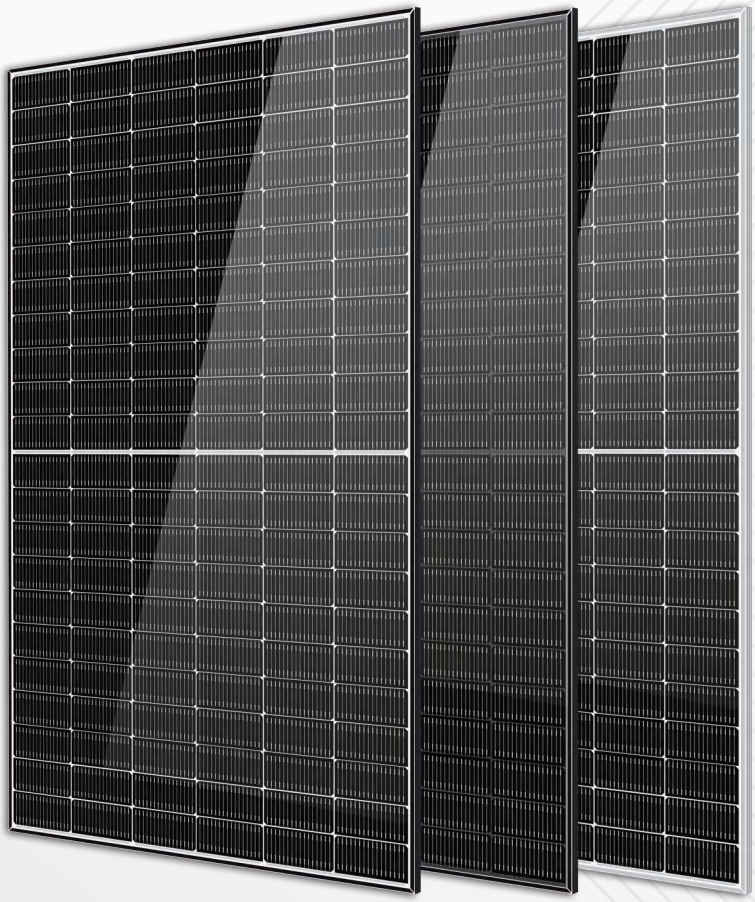
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 550W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

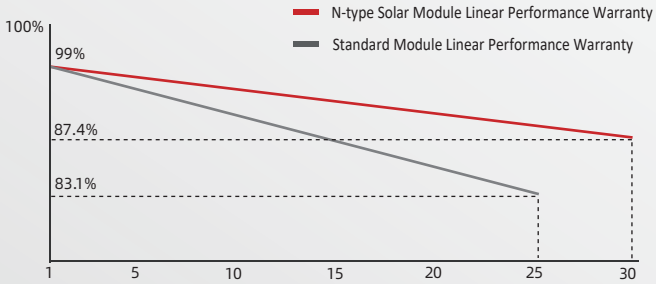
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

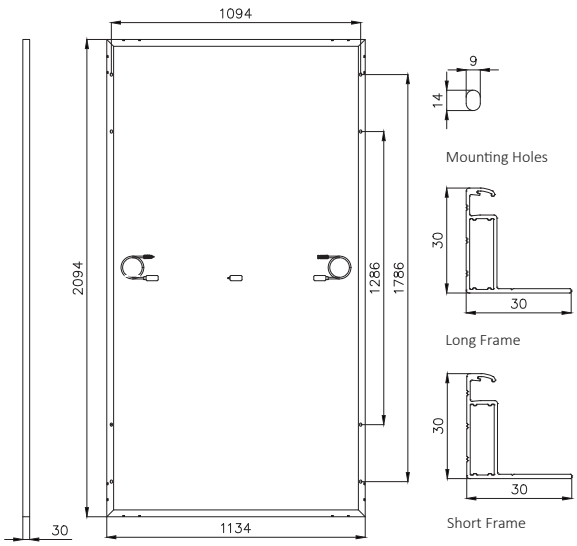
30 30-year linear power output warranty

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sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

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info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 182-132 TC

MECHANICAL DIAGRAMS



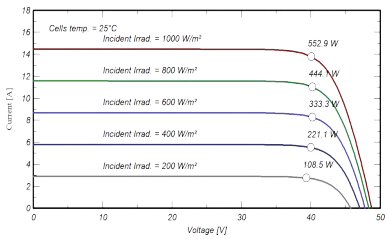
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MECHANICAL PARAMETERS

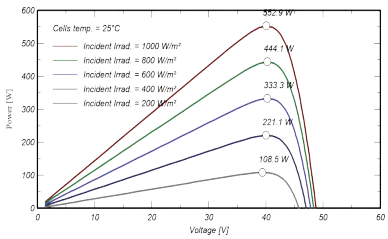
Weight	24.5kg
Dimension	2094×1134×30mm
Cell Orientation	132 (6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/814pcs per 40'HC

MECHANICAL PARAMETERS

HS550TC-MHO



HS550TC-MHO



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS530TC-MHO	HS535TC-MHO	HS540TC-MHO	HS545TC-MHO	HS550C-MHO
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	530	535	540	545	550
Open Circuit Voltage(Voc/V)	47.81	48.04	48.27	48.52	48.76
Short Circuit Current(Isc/A)	14.22	14.29	14.35	14.41	14.47
Maximum Power Voltage(Vmp/V)	40.24	40.44	40.64	40.84	41.04
Maximum Power Current(Imp/A)	13.17	13.23	13.29	13.34	13.40
Module Efficiency(%)	22.3	22.5	22.7	23.0	23.2

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS530TC-MHO	HS535TC-MHO	HS540TC-MHO	HS545TC-MHO	HS550TC-MHO
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	401	408	412	416	420
Open Circuit Voltage(Voc/V)	45.20	45.50	45.80	46.00	46.30
Short Circuit Current(Isc/A)	11.49	11.54	11.59	11.64	11.69
Maximum Power Voltage(Vmp/V)	37.30	37.60	37.70	37.90	38.10
Maximum Power Current(Imp/A)	10.81	10.86	10.92	10.98	11.02

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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585~605 Watt

HORAY | TIER1 BloombergNEF

HS 182-144 TC Ocean *N-type Mono-facial Modules*

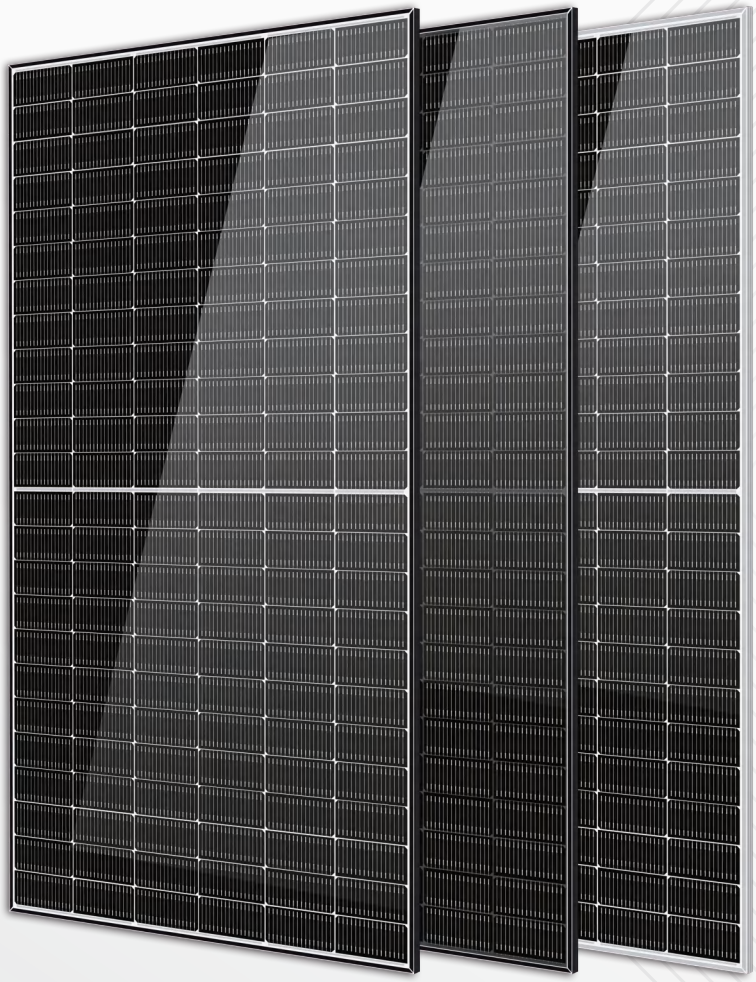
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 144 half-cells monocrystalline modules is up to 605W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

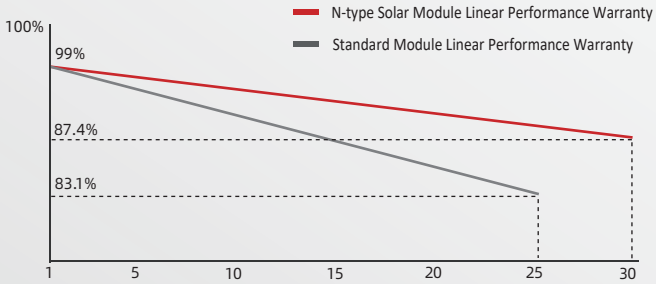
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



12 12-year product warranty

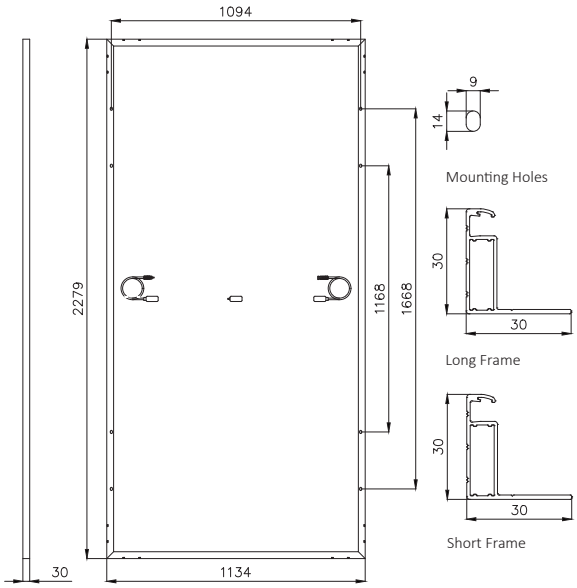
30 30-year linear power output warranty

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sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

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Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 182-144 TC

MECHANICAL DIAGRAMS



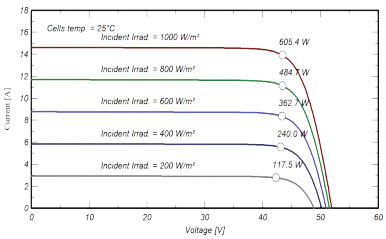
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MECHANICAL PARAMETERS

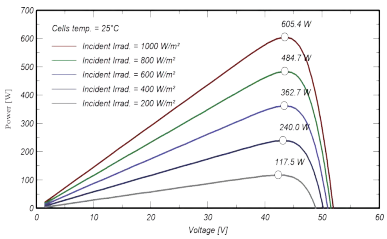
Weight	26.0kg
Dimension	2279×1134×30mm
Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	3.2mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/740pcs per 40'HC

MECHANICAL PARAMETERS

HS605TC-MHO



HS605TC-MHO



ELECTRICAL CHARACTERISTICS AT STC

Module Type	HS585TC-MHO	HS590TC-MHO	HS595TC-MHO	HS600TC-MHO	HS605TC-MHO
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	585	590	595	600	605
Open Circuit Voltage(Voc/V)	51.52	51.63	51.74	51.85	51.95
Short Circuit Current(Isc/A)	14.30	14.38	14.46	14.54	14.62
Maximum Power Voltage(Vmp/V)	43.33	43.44	43.55	43.66	43.76
Maximum Power Current(Imp/A)	13.51	13.59	13.66	13.74	13.83
Module Efficiency(%)	22.6	22.8	23.0	23.2	23.4

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL CHARACTERISTICS AT NMOT

Module Type	HS585TC-MHO	HS590TC-MHO	HS595TC-MHO	HS600TC-MHO	HS605TC-MHO
Testing Condition	NMOT	NMOT	NMOT	NMOT	NMOT
Maximum Power(Pmax/W)	444	448	451	455	459
Open Circuit Voltage(Voc/V)	48.70	48.90	49.00	49.10	49.20
Short Circuit Current(Isc/A)	11.55	11.62	11.68	11.74	11.81
Maximum Power Voltage(Vmp/V)	40.50	40.70	40.80	40.90	41.00
Maximum Power Current(Imp/A)	10.94	11.00	11.05	11.12	11.20

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	IEC Class C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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455W

HORAY | TIER1 BloombergNEF

HS 186R-108 TC-D *Alpine* *N-type Bifacial Modules*

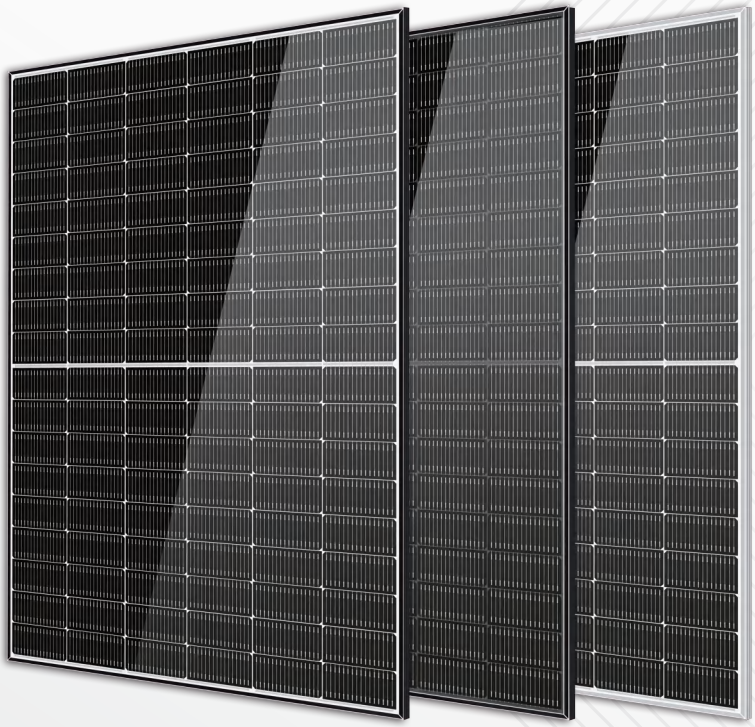
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 108 half-cells monocrystalline modules is up to 455W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

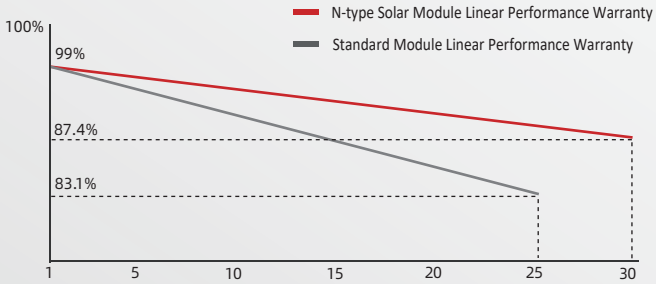
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CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

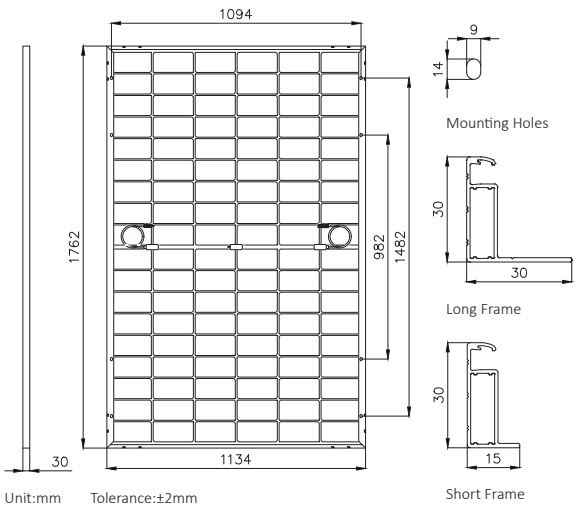
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 186R-108 TC-D

MECHANICAL DIAGRAMS



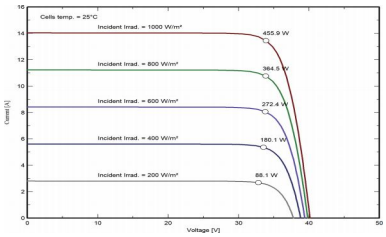
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MECHANICAL PARAMETERS

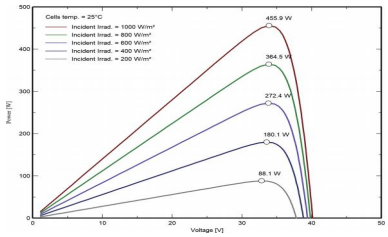
Weight	24.5kg
Dimension	1762×1134×30mm
Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/962pcs per 40'HC

CURVES OF PV MODULE

HS455TC-MHA-D



HS455TC-MHA-D



ELECTRICAL CHARACTERISTICS

Module Type	HS435TC-MHA-D		HS440TC-MHA-D		HS445TC-MHA-D		HS450TC-MHA-D		HS455TC-MHA-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	435	331	440	335	445	339	450	343	455	347
Open Circuit Voltage(Voc/V)	39.36	39.36	39.57	39.57	39.77	39.77	39.97	39.97	40.14	40.14
Short Circuit Current(Isc/A)	13.72	10.45	13.80	10.52	13.87	10.57	13.94	10.62	14.03	10.69
Maximum Power Voltage(Vmp/V)	32.78	32.78	32.99	32.99	33.19	33.19	33.39	33.39	33.53	33.53
Maximum Power Current(Imp/A)	13.27	10.11	13.34	10.17	13.41	10.22	13.48	10.27	13.57	10.34
Module Efficiency(%)	21.8		22.0		22.3		22.5		22.8	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	469	475	480	486	491
Open Circuit Voltage(Voc/V)	39.36	39.57	39.77	39.97	40.14
Short Circuit Current(Isc/A)	14.68	14.77	14.84	14.92	15.01
Maximum Power Voltage(Vmp/V)	32.78	32.99	33.19	33.39	33.53
Maximum Power Current(Imp/A)	14.32	14.40	14.47	14.55	14.64

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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Specifications included in this datasheet are subject to change without notice.
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510W

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HS 186R-120 TC-D *Alpine* *N-type Bifacial Modules*

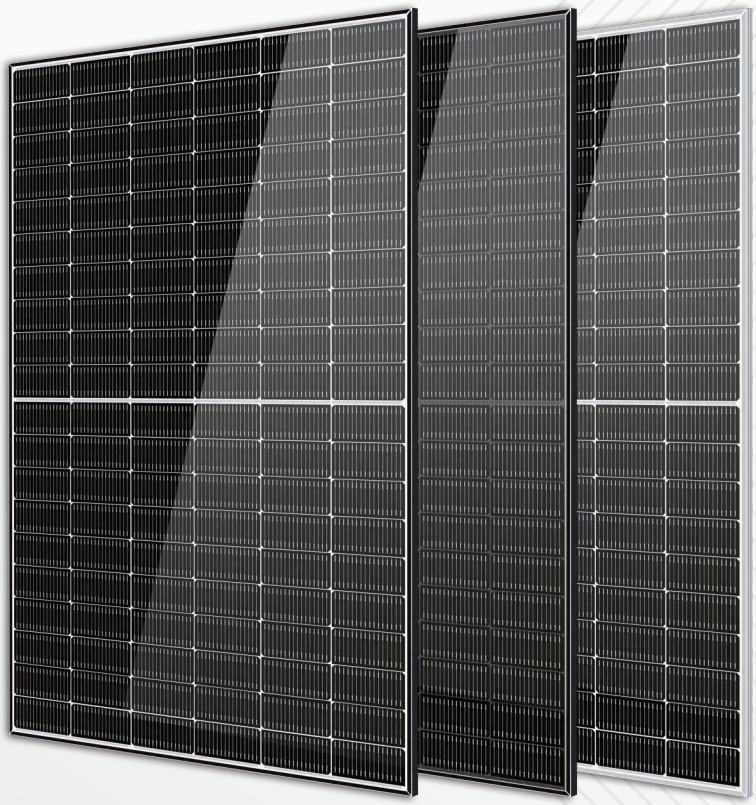
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 120 half-cells monocrystalline modules is up to 510W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

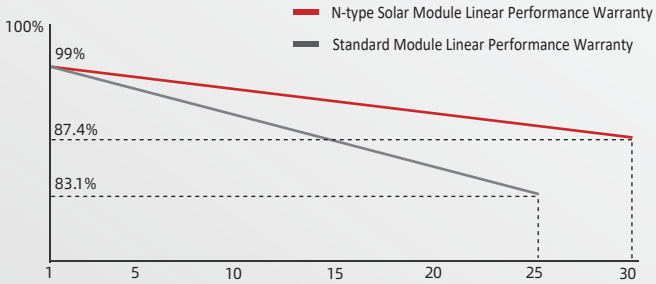
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

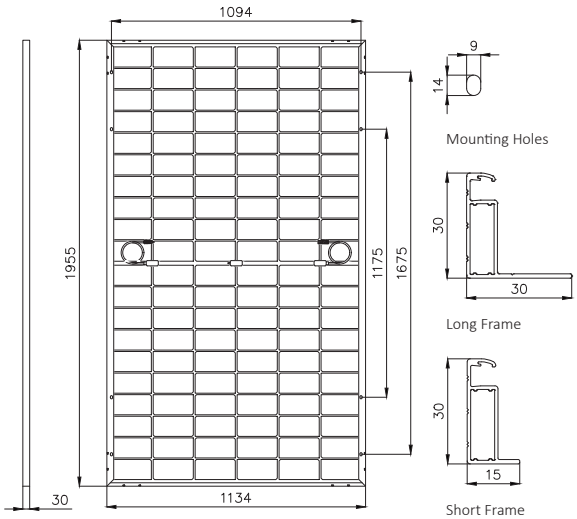
30 30-year linear power output warranty

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info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 186R-120 TC-D

MECHANICAL DIAGRAMS



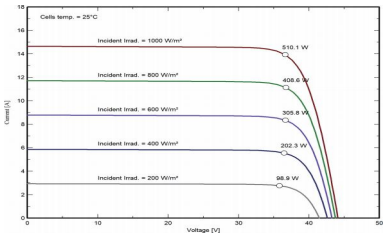
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MECHANICAL PARAMETERS

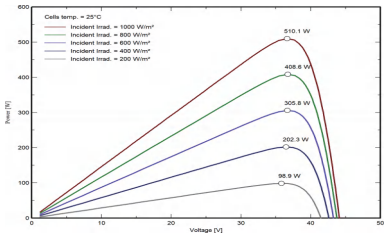
Weight	26.0kg
Dimension	1955×1134×30mm
Cell Orientation	120 (6×20)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/814pcs per 40'HC

CURVES OF PV MODULE

HS510TC-MHA-D



HS510TC-MHA-D



ELECTRICAL CHARACTERISTICS

Module Type	HS490TC-MHA-D		HS495TC-MHA-D		HS500TC-MHA-D		HS505TC-MHA-D		HS510TC-MHA-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	490	373	495	377	500	381	505	385	510	389
Open Circuit Voltage(Voc/V)	43.35	43.35	43.53	43.53	43.70	43.70	43.88	43.88	44.10	44.10
Short Circuit Current(Isc/A)	14.31	10.90	14.40	10.97	14.48	11.04	14.57	11.10	14.64	11.16
Maximum Power Voltage(Vmp/V)	36.17	36.17	36.32	36.32	36.47	36.47	36.62	36.62	36.80	36.80
Maximum Power Current(Imp/A)	13.55	10.32	13.63	10.38	13.71	10.45	13.79	10.51	13.86	10.56
Module Efficiency(%)	22.2		22.4		22.6		22.9		23.1	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	529	534	540	545	550
Open Circuit Voltage(Voc/V)	43.35	43.53	43.70	43.88	44.10
Short Circuit Current(Isc/A)	15.31	15.40	15.50	15.59	15.67
Maximum Power Voltage(Vmp/V)	36.17	36.32	36.47	36.62	36.80
Maximum Power Current(Imp/A)	14.62	14.71	14.80	14.89	14.96

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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HS 186R-132 TC-D *Alpine* *N-type Bifacial Modules*

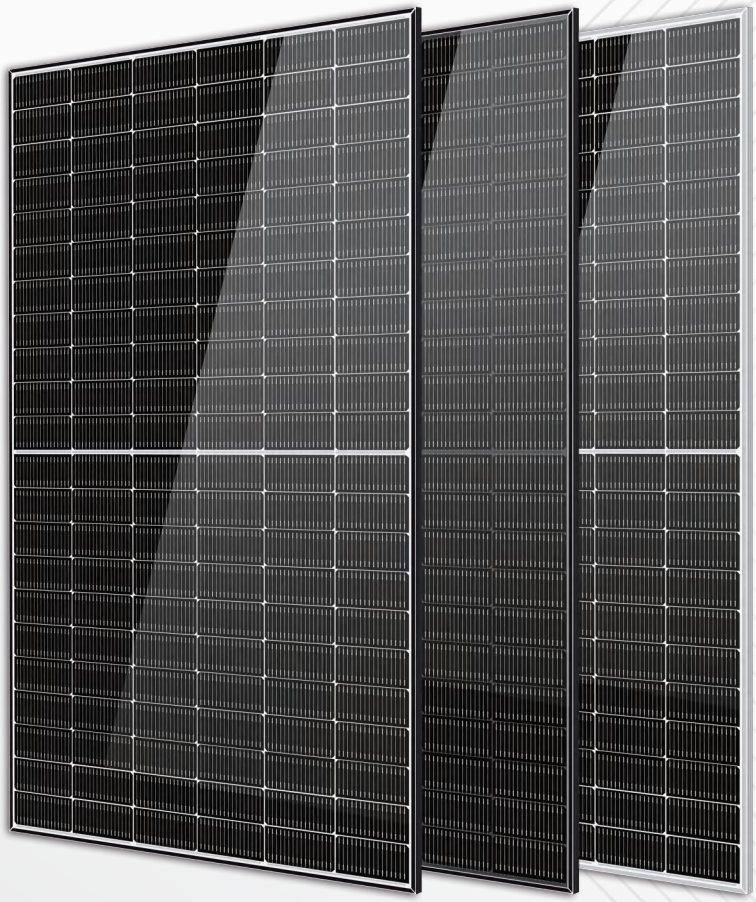
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 560W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

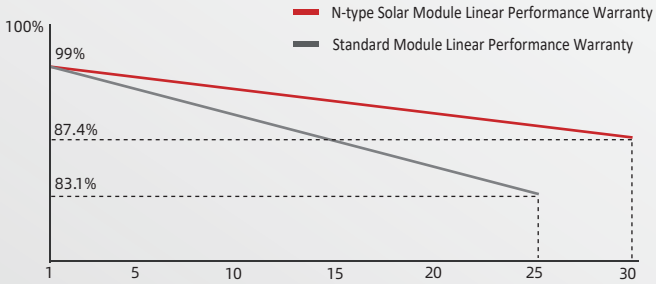
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

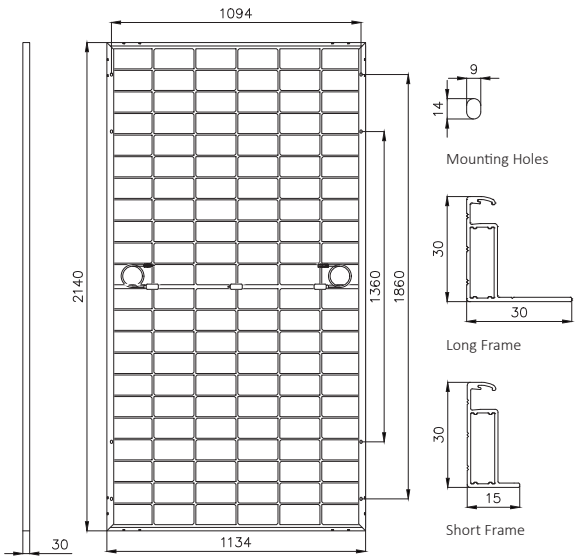
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 186R-132 TC-D

MECHANICAL DIAGRAMS



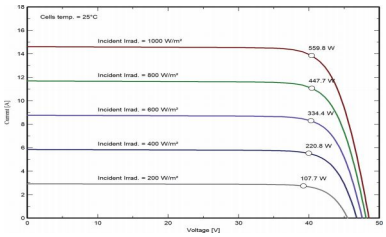
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MECHANICAL PARAMETERS

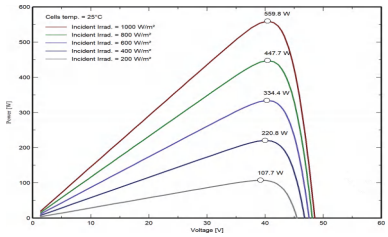
Weight	29.5kg
Dimension	2140×1134×30mm
Cell Orientation	132 (6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/740pcs per 40'HC

CURVES OF PV MODULE

HS560TC-MHA-D



HS560TC-MHA-D



ELECTRICAL CHARACTERISTICS

Module Type	HS540TC-MHA-D		HS545TC-MHA-D		HS550TC-MHA-D		HS555TC-MHA-D		HS560TC-MHA-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	540	411	545	415	550	419	555	423	560	427
Open Circuit Voltage(Voc/V)	47.68	47.68	47.88	47.88	48.07	48.07	48.27	48.27	48.51	48.51
Short Circuit Current(Isc/A)	14.34	10.92	14.41	10.98	14.48	11.04	14.56	11.09	14.61	11.14
Maximum Power Voltage(Vmp/V)	39.79	39.79	39.96	39.96	40.11	40.11	40.28	40.28	40.48	40.48
Maximum Power Current(Imp/A)	13.57	10.34	13.64	10.39	13.71	10.45	13.78	10.50	13.83	10.54
Module Efficiency(%)	22.3		22.5		22.7		22.9		23.1	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	583	588	594	599	604
Open Circuit Voltage(Voc/V)	47.68	47.88	48.07	48.27	48.51
Short Circuit Current(Isc/A)	15.34	15.42	15.50	15.58	15.64
Maximum Power Voltage(Vmp/V)	39.79	39.96	40.11	40.28	40.48
Maximum Power Current(Imp/A)	14.65	14.72	14.80	14.87	14.93

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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HS 186R-144 TC-D *Alpine* *N-type Bifacial Modules*

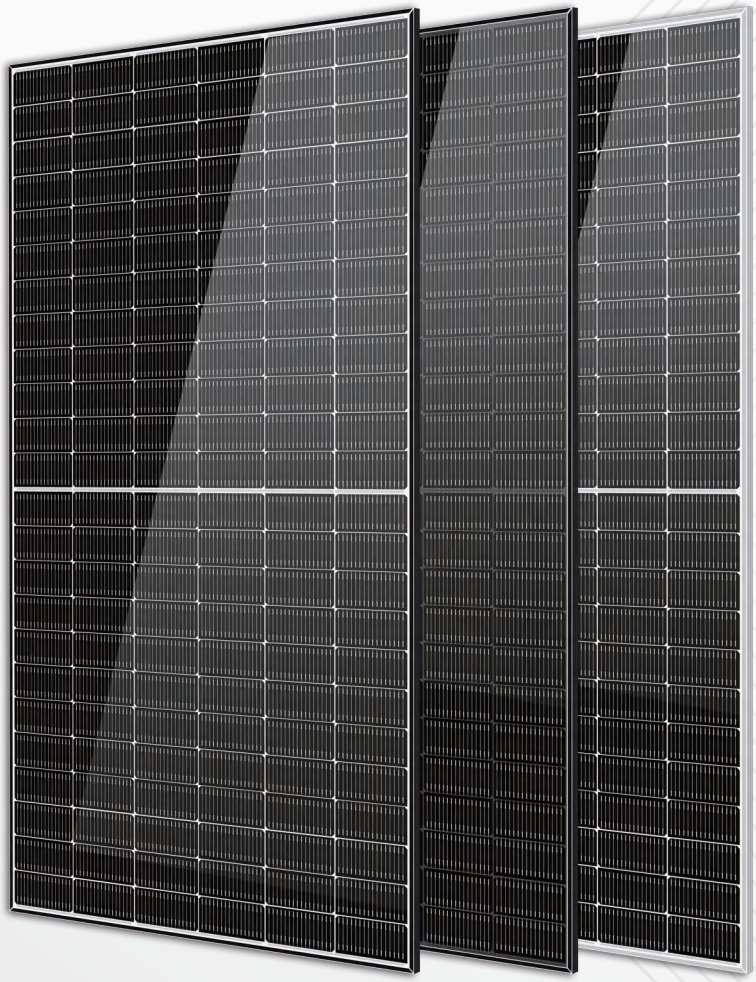
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 144 half-cells monocrystalline modules is up to 610W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

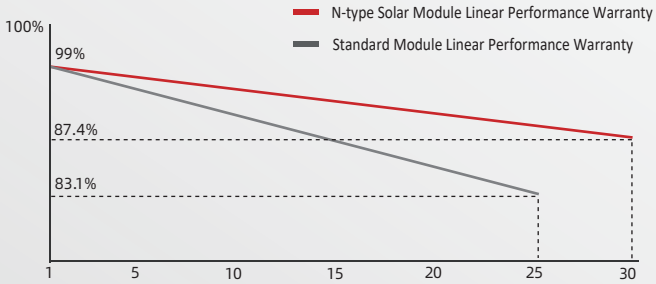
ISO14001:2015 Environmental Management System

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China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

30 30-year linear power output warranty

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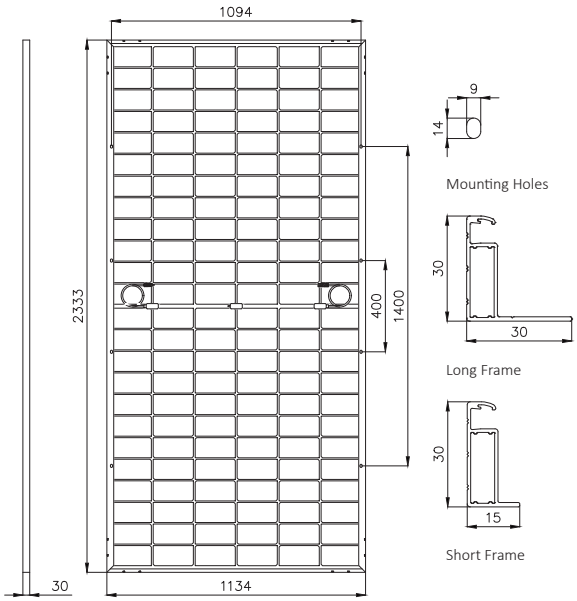
GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH

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HS 186R-144 TC-D

MECHANICAL DIAGRAMS



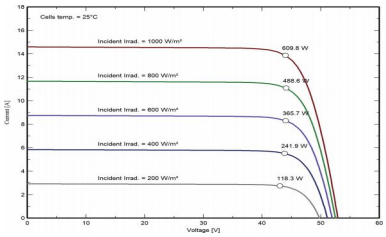
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MECHANICAL PARAMETERS

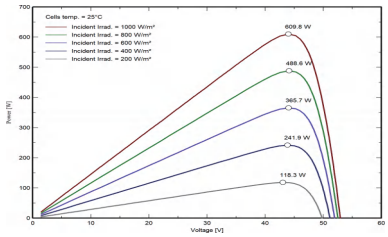
Weight	32.5kg
Dimension	2333×1134×30mm
Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	36pcs per pallet/720pcs per 40'HC

CURVES OF PV MODULE

HS610TC-MHA-D



HS610TC-MHA-D



ELECTRICAL CHARACTERISTICS

Module Type	HS590TC-MHA-D		HS595TC-MHA-D		HS600TC-MHA-D		HS605TC-MHA-D		HS610TC-MHA-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	590	450	595	453	600	457	605	461	610	465
Open Circuit Voltage(Voc/V)	52.02	52.02	52.24	52.24	52.44	52.44	52.65	52.65	52.92	52.92
Short Circuit Current(Isc/A)	14.36	10.94	14.42	10.99	14.48	11.04	14.55	11.08	14.59	11.12
Maximum Power Voltage(Vmp/V)	43.41	43.41	43.59	43.59	43.76	43.76	43.94	43.94	44.16	44.16
Maximum Power Current(Imp/A)	13.59	10.36	13.65	10.40	13.71	10.45	13.77	10.49	13.81	10.53
Module Efficiency(%)	22.3		22.5		22.7		22.9		23.1	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	637	642	648	653	658
Open Circuit Voltage(Voc/V)	52.02	52.24	52.44	52.65	52.92
Short Circuit Current(Isc/A)	15.36	15.43	15.50	15.56	15.61
Maximum Power Voltage(Vmp/V)	43.41	43.59	43.76	43.94	44.16
Maximum Power Current(Imp/A)	14.67	14.73	14.80	14.86	14.91

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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Version number: HS186R-TC-D-2025-A0

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475W

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HS 191R-108 TC-D *Basin* *N-type Bifacial Modules*

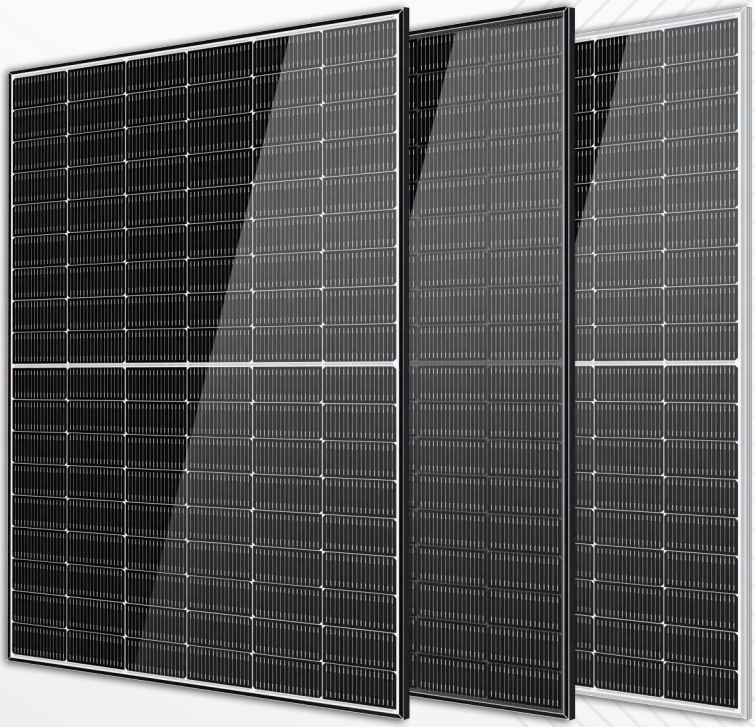
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 108 half-cells monocrystalline modules is up to 475W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

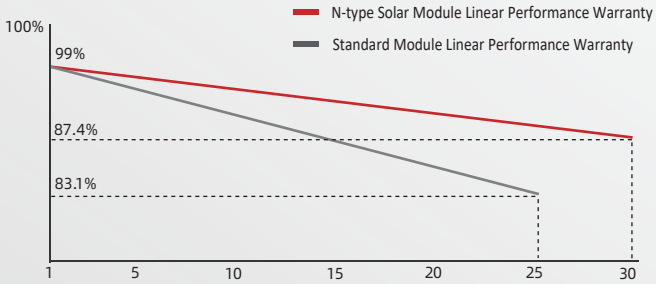
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

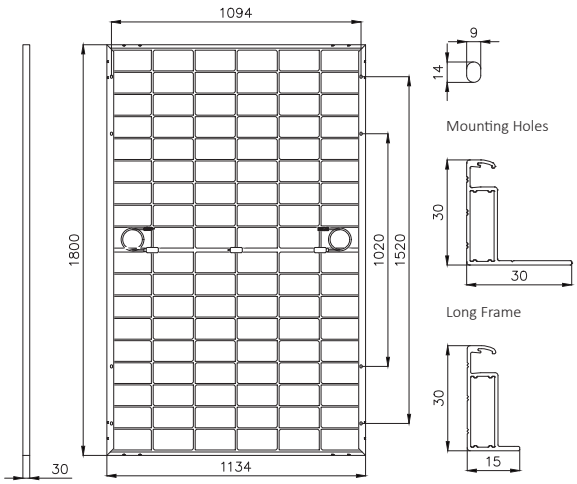
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 191R-108 TC-D

MECHANICAL DIAGRAMS



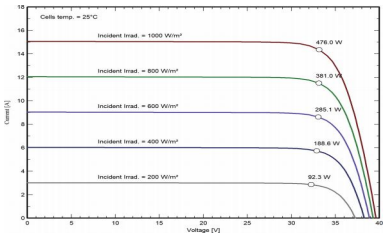
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MECHANICAL PARAMETERS

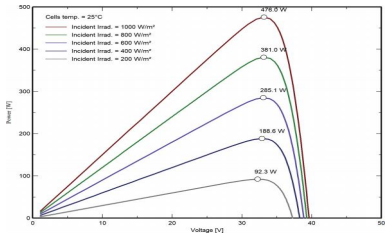
Weight	25.0kg
Dimension	1800×1134×30mm
Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/888pcs per 40'HC

CURVES OF PV MODULE

HS475TC-MHB-D



HS475TC-MHB-D



ELECTRICAL CHARACTERISTICS

Module Type	HS455TC-MHB-D		HS460TC-MHB-D		HS465TC-MHB-D		HS470TC-MHB-D		HS475TC-MHB-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	455	381	460	386	465	390	470	394	475	398
Open Circuit Voltage(Voc/V)	38.90	38.90	39.08	39.08	39.26	39.26	39.31	39.31	39.61	39.61
Short Circuit Current(Isc/A)	14.68	11.19	14.78	11.26	14.87	11.33	15.01	11.44	15.06	11.47
Maximum Power Voltage(Vmp/V)	33.00	33.00	33.15	33.15	33.30	33.30	33.35	33.35	33.60	33.60
Maximum Power Current(Imp/A)	13.79	10.51	13.88	10.57	13.96	10.64	14.10	10.74	14.14	10.77
Module Efficiency(%)	22.3		22.6		22.8		23.0		22.3	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	501	506	512	517	523
Open Circuit Voltage(Voc/V)	38.90	39.08	39.26	39.31	39.61
Short Circuit Current(Isc/A)	16.15	16.26	16.36	16.51	16.56
Maximum Power Voltage(Vmp/V)	33.00	33.15	33.30	33.35	33.60
Maximum Power Current(Imp/A)	15.17	15.26	15.36	15.50	15.55

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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520W

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HS 191R-120 TC-D *Basin* *N-type Bifacial Modules*

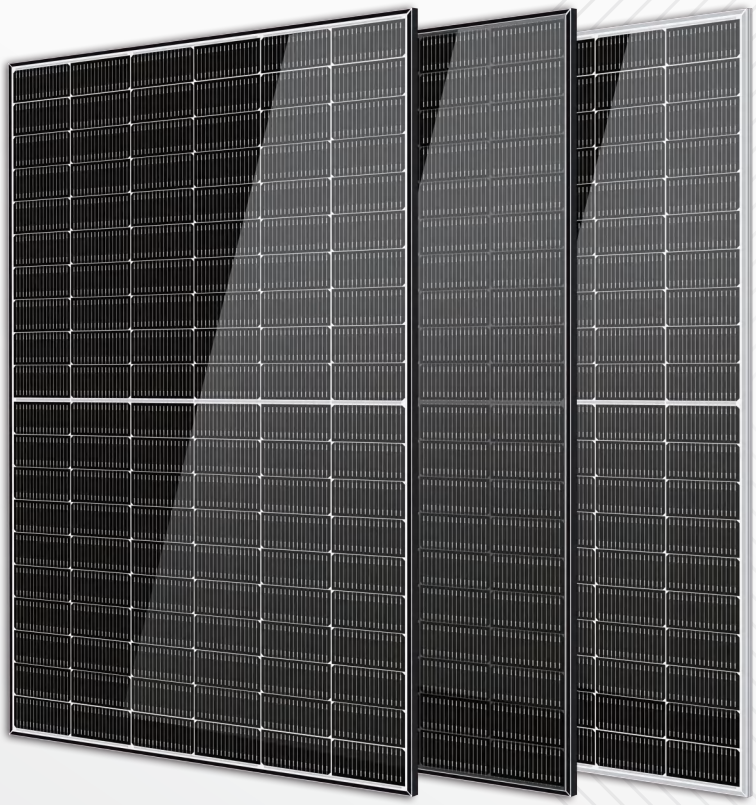
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 120 half-cells monocrystalline modules is up to 520W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

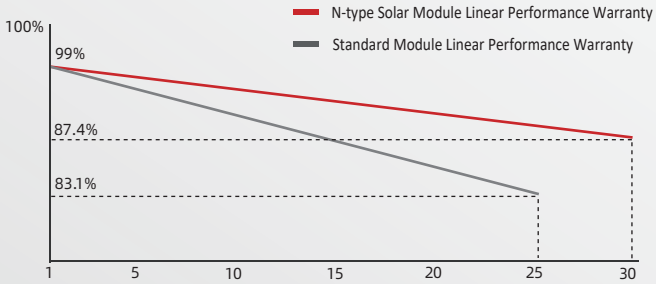
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

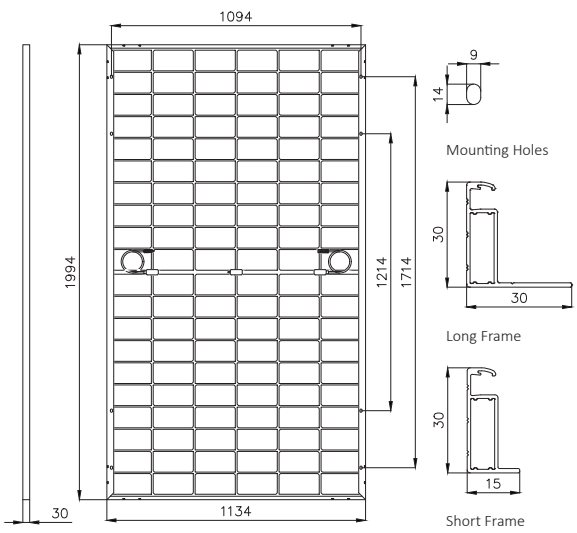
30 30-year linear power output warranty

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sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 191R-120 TC-D

MECHANICAL DIAGRAMS



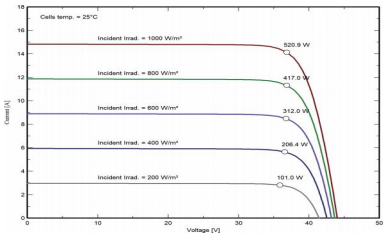
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MECHANICAL PARAMETERS

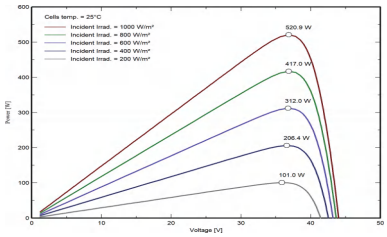
Weight	28.0kg
Dimension	1994×1134×30mm
Cell Orientation	120 (6×20)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/814pcs per 40'HC

CURVES OF PV MODULE

HS520TC-MHB-D



HS520TC-MHB-D



ELECTRICAL CHARACTERISTICS

Module Type	HS500TC-MHB-D		HS505TC-MHB-D		HS510TC-MHB-D		HS515TC-MHB-D		HS520TC-MHB-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	500	419	505	423	510	427	515	432	520	436
Open Circuit Voltage(Voc/V)	43.23	43.23	43.42	43.42	43.62	43.62	43.68	43.68	44.01	44.01
Short Circuit Current(Isc/A)	14.52	11.07	14.60	11.13	14.68	11.19	14.80	11.28	14.83	11.30
Maximum Power Voltage(Vmp/V)	36.67	36.67	36.83	36.83	37.00	37.00	37.05	37.05	37.33	37.33
Maximum Power Current(Imp/A)	13.64	10.39	13.71	10.45	13.78	10.50	13.90	10.59	13.93	10.61
Module Efficiency(%)	22.1		22.3		22.6		22.8		23.0	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	550	556	561	567	572
Open Circuit Voltage(Voc/V)	43.23	43.42	43.62	43.68	44.01
Short Circuit Current(Isc/A)	15.97	16.06	16.15	16.28	16.32
Maximum Power Voltage(Vmp/V)	36.67	36.83	37.00	37.05	37.33
Maximum Power Current(Imp/A)	15.00	15.08	15.16	15.29	15.32

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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570W

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HS 191R-132 TC-D *Basin* *N-type Bifacial Modules*

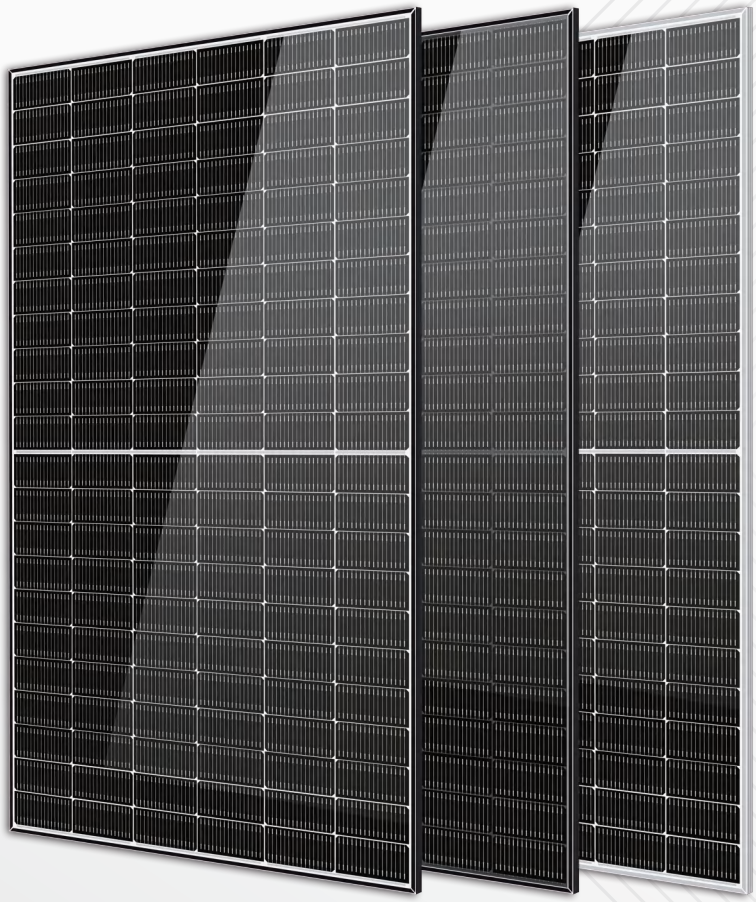
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 570W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

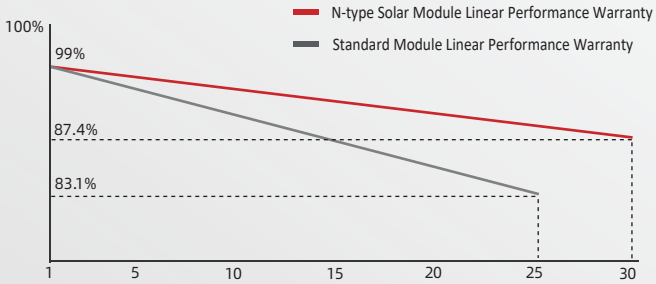
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

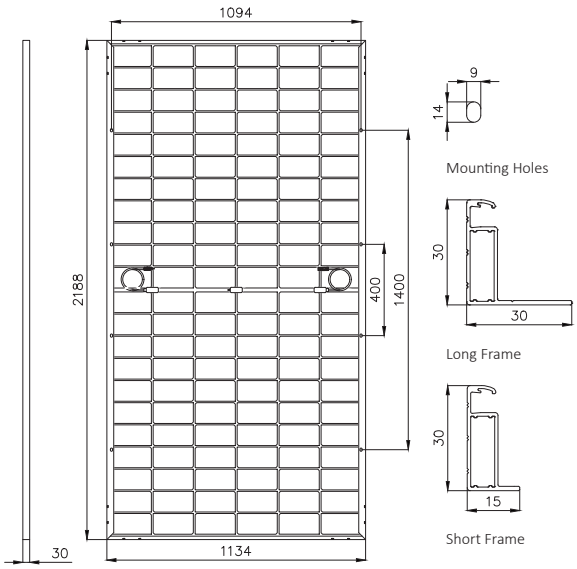
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 191R-132 TC-D

MECHANICAL DIAGRAMS



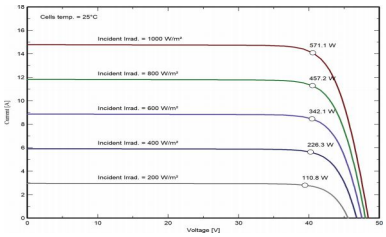
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MECHANICAL PARAMETERS

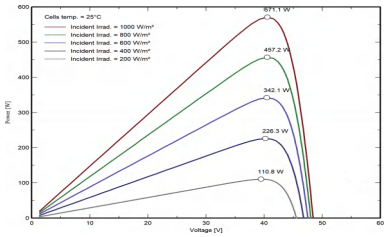
Weight	30.5kg
Dimension	2188×1134×30mm
Cell Orientation	132 (6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/740pcs per 40'HC

CURVES OF PV MODULE

HS570TC-MHB-D



HS570TC-MHB-D



ELECTRICAL CHARACTERISTICS

Module Type	HS550TC-MHB-D		HS555TC-MHB-D		HS560TC-MHB-D		HS565TC-MHB-D		HS570TC-MHB-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	550	461	555	465	560	469	565	474	570	478
Open Circuit Voltage(Voc/V)	47.55	47.55	47.76	47.76	47.98	47.98	48.05	48.05	48.41	48.41
Short Circuit Current(Isc/A)	14.52	11.07	14.59	11.12	14.65	11.17	14.76	11.25	14.78	11.26
Maximum Power Voltage(Vmp/V)	40.33	40.33	40.52	40.52	40.70	40.70	40.76	40.76	41.07	41.07
Maximum Power Current(Imp/A)	13.64	10.39	13.70	10.44	13.76	10.48	13.86	10.56	13.88	10.58
Module Efficiency(%)	22.2		22.4		22.6		22.8		23.0	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	605	611	616	622	627
Open Circuit Voltage(Voc/V)	47.55	47.76	47.98	48.05	48.41
Short Circuit Current(Isc/A)	15.97	16.05	16.12	16.24	16.26
Maximum Power Voltage(Vmp/V)	40.33	40.52	40.70	40.76	41.07
Maximum Power Current(Imp/A)	15.00	15.07	15.14	15.25	15.27

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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620W

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HS 191R-144 TC-D *Basin* *N-type Bifacial Modules*

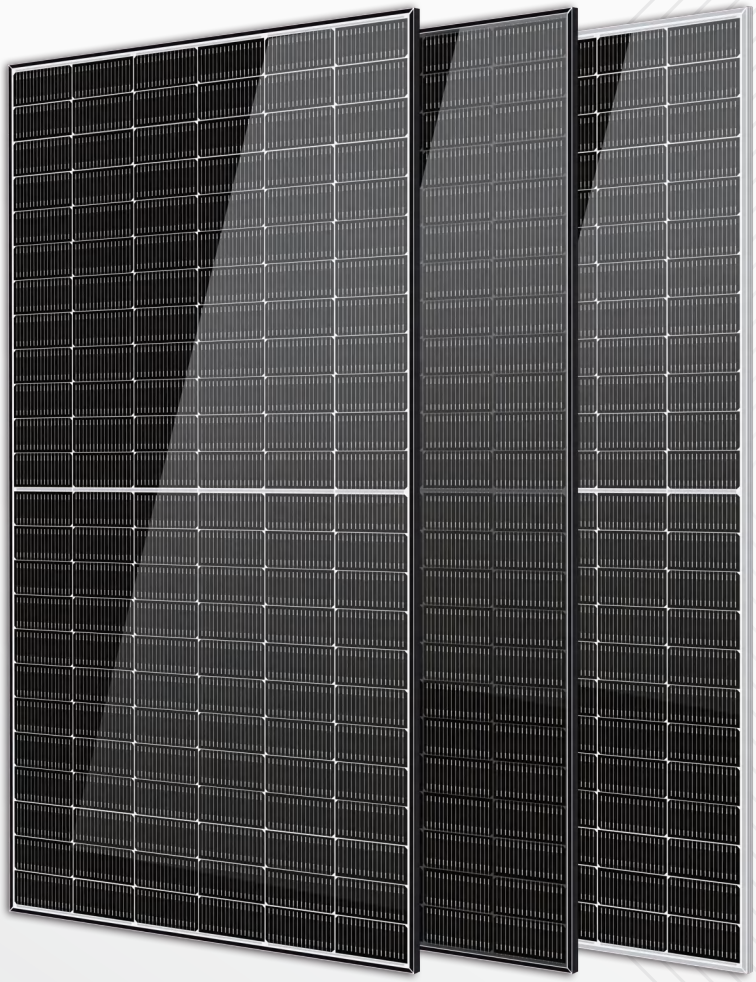
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 144 half-cells monocrystalline modules is up to 620W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

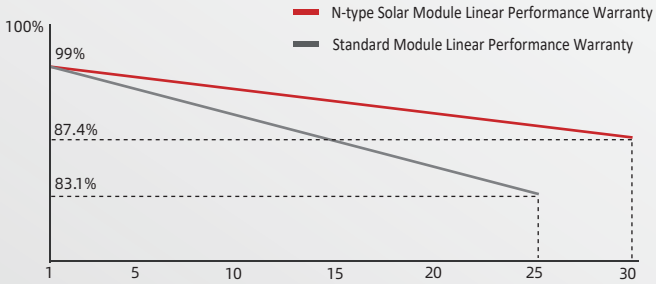
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

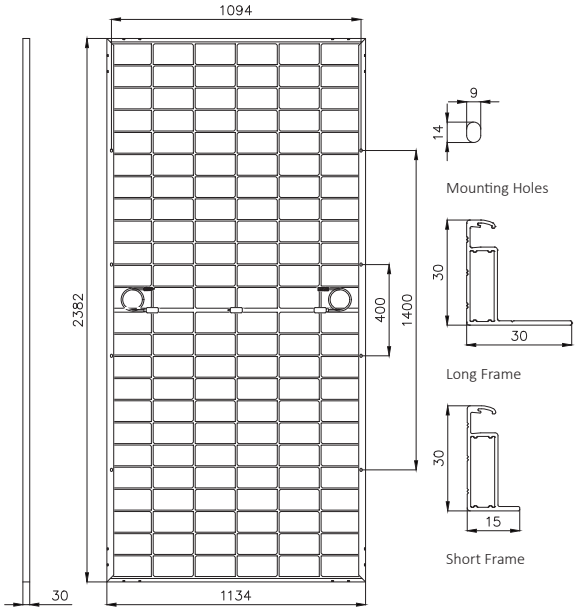
30 30-year linear power output warranty

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sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 191R-144 TC-D

MECHANICAL DIAGRAMS



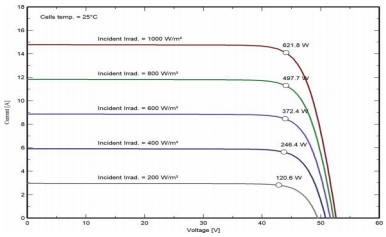
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

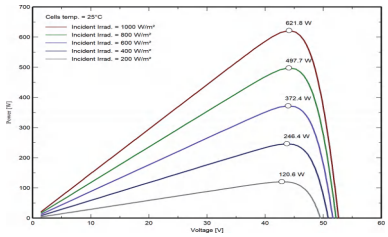
Weight	33.7kg
Dimension	2382×1134×30mm
Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	36pcs per pallet/720pcs per 40'HC

CURVES OF PV MODULE

HS620TC-MHB-D



HS620TC-MHB-D



ELECTRICAL CHARACTERISTICS

Module Type	HS600TC-MHB-D		HS605TC-MHB-D		HS610TC-MHB-D		HS615TC-MHB-D		HS620TC-MHB-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	600	503	605	507	610	511	615	515	620	520
Open Circuit Voltage(Voc/V)	51.80	51.80	52.00	52.00	52.20	52.20	52.40	52.40	52.60	52.60
Short Circuit Current(Isc/A)	14.54	11.08	14.60	11.13	14.66	11.17	14.72	11.22	14.78	11.26
Maximum Power Voltage(Vmp/V)	44.00	44.00	44.20	44.20	44.40	44.40	44.60	44.60	44.80	44.80
Maximum Power Current(Imp/A)	13.64	10.39	13.69	10.43	13.74	10.47	13.79	10.51	13.84	10.55
Module Efficiency(%)	22.2		22.4		22.6		22.8		23.0	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	660	666	671	677	682
Open Circuit Voltage(Voc/V)	51.80	52.00	52.20	52.40	52.60
Short Circuit Current(Isc/A)	15.99	16.06	16.13	16.19	16.26
Maximum Power Voltage(Vmp/V)	44.00	44.20	44.40	44.60	44.80
Maximum Power Current(Imp/A)	15.00	15.06	15.11	15.17	15.22

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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Specifications included in this datasheet are subject to change without notice.
Version number: HS191R-TC-D-2025-A0

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445~465 Watt

HORAY | TIER1 BloombergNEF

HS 210R-96 TC-D *Cosmos* *N-type Bifacial Modules*

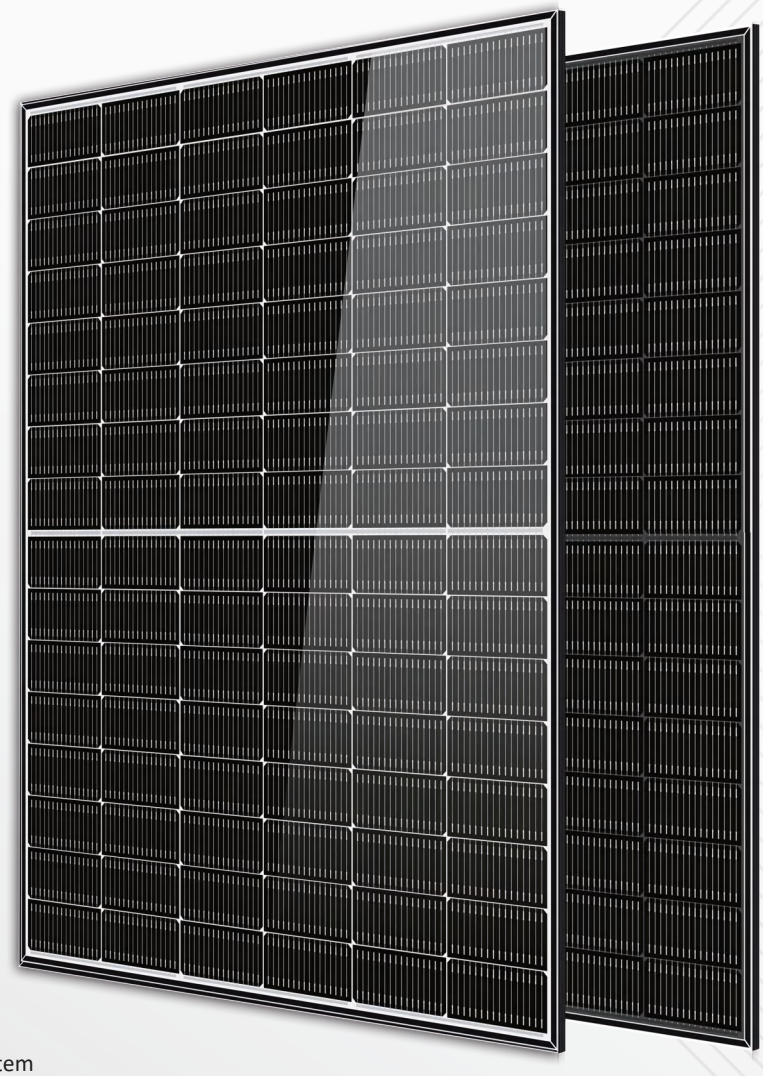
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 96 half-cells monocrystalline modules is up to 465W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

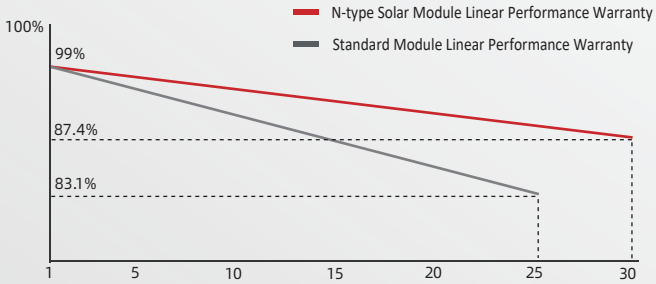
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

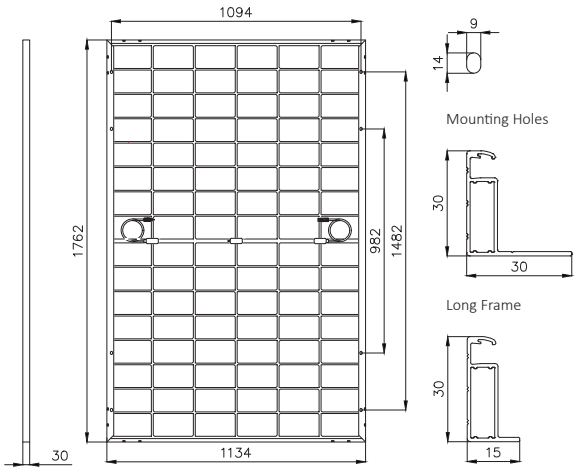
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 210R-96 TC-D

MECHANICAL DIAGRAMS



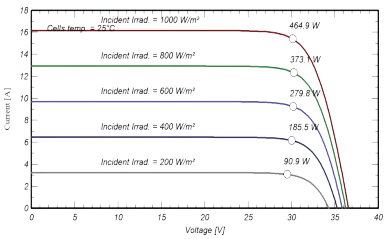
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MECHANICAL PARAMETERS

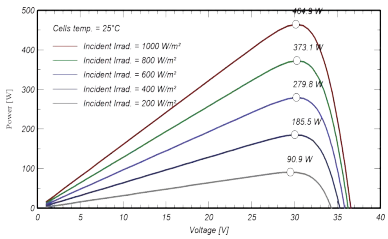
Weight	24.5kg
Dimension	1762×1134×30mm
Cell Orientation	96 (6×16)
Junction Box	IP68, three diodes
Output Cable	4mm²,±1100mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/962pcs per 40'HC

CURVES OF PV MODULE

HS465TC-MHC-D



HS465TC-MHC-D



ELECTRICAL CHARACTERISTICS

Module Type	HS445TC-MHC-D		HS450TC-MHC-D		HS455TC-MHC-D		HS460TC-MHC-D		HS465TC-MHC-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	445	347	450	351	455	355	460	359	465	363
Open Circuit Voltage(Voc/V)	35.87	35.62	36.04	35.79	36.21	35.96	36.39	36.13	36.56	36.30
Short Circuit Current(Isc/A)	15.77	12.30	15.87	12.38	15.97	12.45	16.07	12.53	16.16	12.61
Maximum Power Voltage(Vmp/V)	29.81	30.14	29.95	30.28	30.10	30.43	30.24	30.57	30.38	30.72
Maximum Power Current(Imp/A)	14.93	11.52	15.02	11.59	15.12	11.66	15.21	11.74	15.30	11.81
Module Efficiency(%)	22.3		22.5		22.8		23.0		23.3	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	490	495	501	506	512
Open Circuit Voltage(Voc/V)	35.87	36.04	36.21	36.39	36.56
Short Circuit Current(Isc/A)	17.50	17.61	17.72	17.83	17.94
Maximum Power Voltage(Vmp/V)	29.81	29.95	30.10	30.24	30.38
Maximum Power Current(Imp/A)	16.42	16.53	16.63	16.73	16.83

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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Version number: HS210R-TC-D-2025-A0

YouTube FaceBook Linkedin WeChat

500~520 Watt

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HS 210R-108 TC-D *Cosmos* *N-type Bifacial Modules*

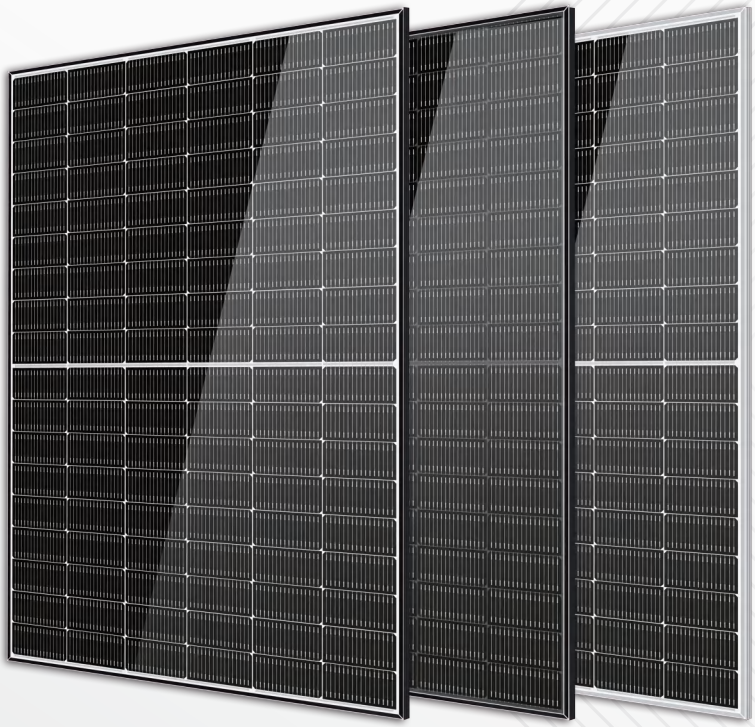
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 108 half-cells monocrystalline modules is up to 520W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

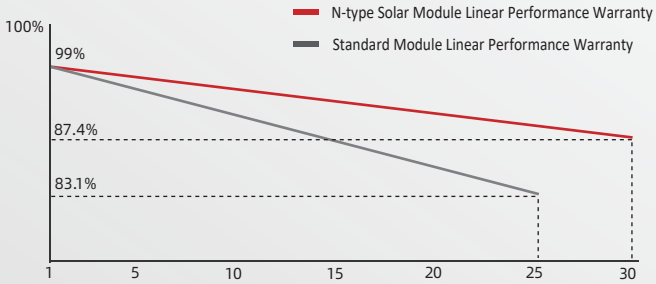
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

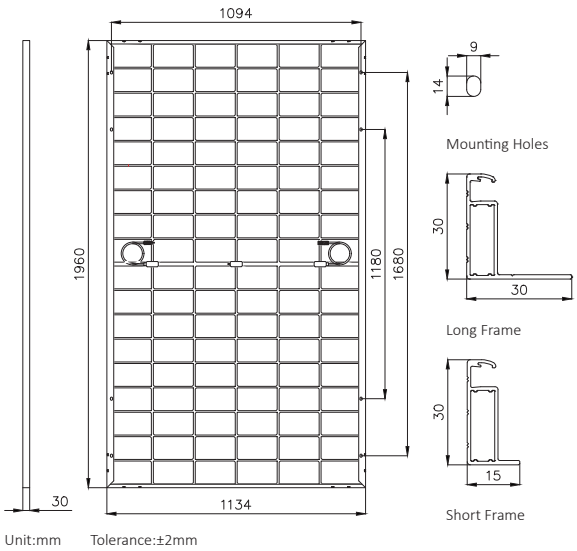
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 210R-108 TC-D

MECHANICAL DIAGRAMS



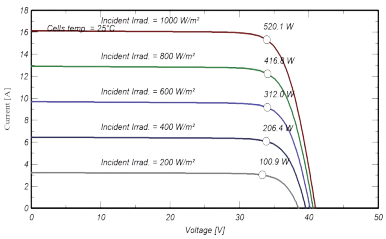
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

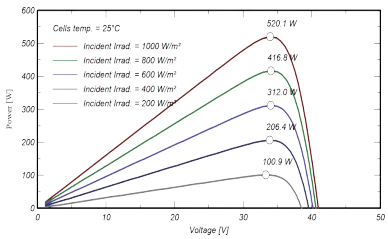
Weight	27.0kg
Dimension	1960×1134×30mm
Cell Orientation	108(6×18)
Junction Box	IP68, three diodes
Output Cable	4mm²,±1100mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/888pcs per 40'HC

CURVES OF PV MODULE

HS520TC-MHC-D



HS520TC-MHC-D



ELECTRICAL CHARACTERISTICS

Module Type	HS500TC-MHC-D		HS505TC-MHC-D		HS510TC-MHC-D		HS515TC-MHC-D		HS520TC-MHC-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	500	390	505	394	510	398	515	402	520	406
Open Circuit Voltage(Voc/V)	40.16	39.87	40.35	40.07	40.55	40.26	40.74	40.46	40.94	40.65
Short Circuit Current(Isc/A)	15.82	12.34	15.90	12.41	15.98	12.47	16.06	12.53	16.14	12.59
Maximum Power Voltage(Vmp/V)	33.37	33.74	33.53	33.90	33.70	34.07	33.86	34.23	34.02	34.39
Maximum Power Current(Imp/A)	14.98	11.56	15.06	11.62	15.14	11.68	15.21	11.74	15.29	11.79
Module Efficiency(%)	22.4		22.7		22.9		23.1		23.3	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	550	556	561	567	572
Open Circuit Voltage(Voc/V)	40.16	40.35	40.55	40.74	40.94
Short Circuit Current(Isc/A)	17.56	17.65	17.74	17.83	17.92
Maximum Power Voltage(Vmp/V)	33.37	33.53	33.70	33.86	34.02
Maximum Power Current(Imp/A)	16.48	16.57	16.65	16.73	16.81

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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515W

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HS 210R-108 TC-D *Cosmos* *N-type Bifacial Modules*

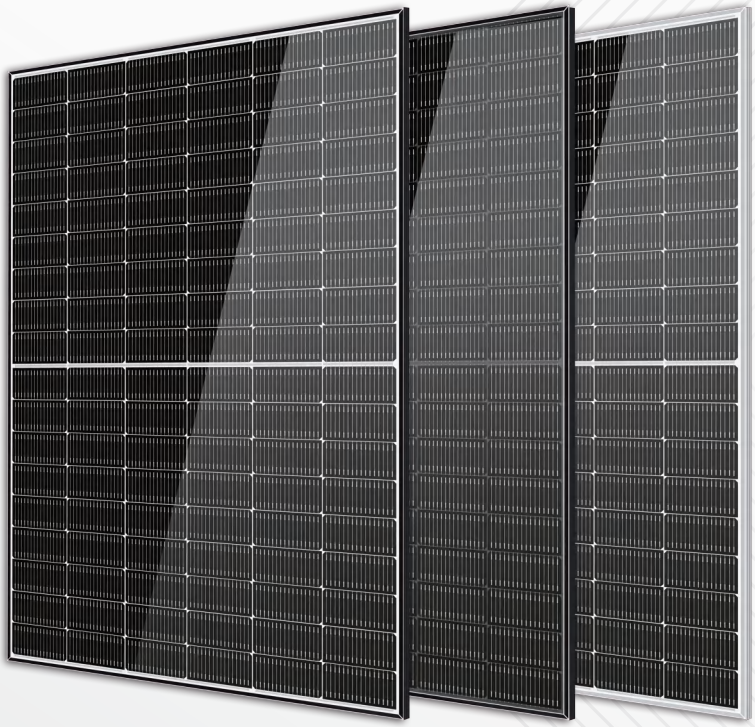
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 108 half-cells monocrystalline modules is up to 515W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

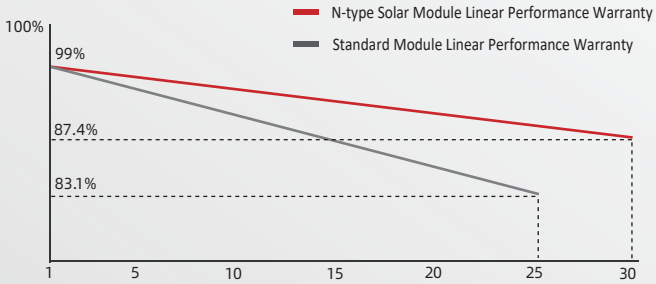
ISO14001:2015 Environmental Management System

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CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

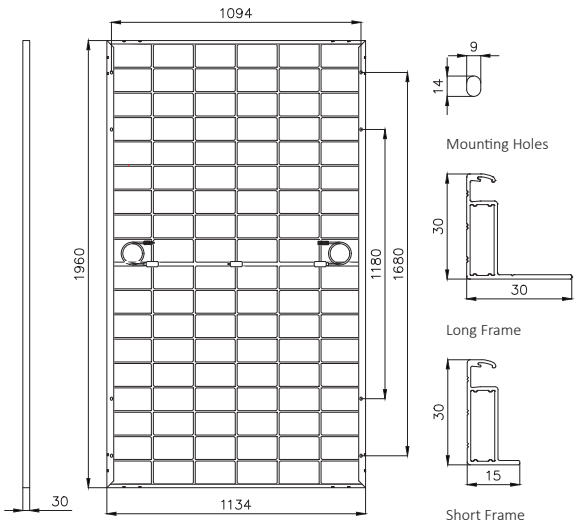
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 210R-108 TC-D

MECHANICAL DIAGRAMS



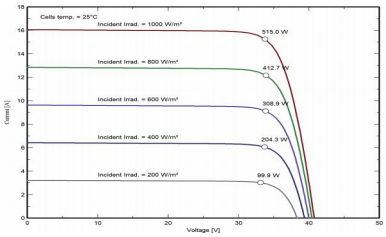
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MECHANICAL PARAMETERS

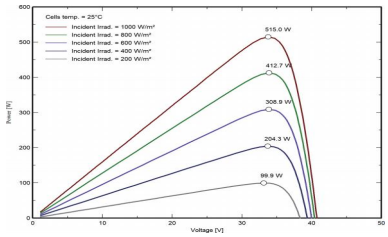
Weight	27.0kg
Dimension	1960×1134×30mm
Cell Orientation	108(6×18)
Junction Box	IP68, three diodes
Output Cable	4mm²,±1100mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/888pcs per 40'HC

CURVES OF PV MODULE

HS515TC-MHC-D



HS515TC-MHC-D



ELECTRICAL CHARACTERISTICS

Module Type	HS495TC-MHC-D		HS500TC-MHC-D		HS505TC-MHC-D		HS510TC-MHC-D		HS515TC-MHC-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	495	377	500	381	505	385	510	389	515	392
Open Circuit Voltage(Voc/V)	39.96	37.96	40.16	38.14	40.35	38.51	40.55	38.51	40.74	38.70
Short Circuit Current(Isc/A)	15.74	12.71	15.82	12.78	15.90	12.84	15.98	12.91	16.06	12.97
Maximum Power Voltage(Vmp/V)	33.21	30.93	33.37	31.08	33.53	31.23	33.70	31.38	33.86	31.53
Maximum Power Current(Imp/A)	14.91	12.20	14.98	12.26	15.06	12.32	15.14	12.38	15.21	12.45
Module Efficiency(%)	22.2		22.4		22.7		22.9		23.1	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	545	550	556	561	567
Open Circuit Voltage(Voc/V)	39.96	40.16	40.35	40.55	40.74
Short Circuit Current(Isc/A)	17.47	17.56	17.65	17.74	17.83
Maximum Power Voltage(Vmp/V)	33.21	33.37	33.53	33.70	33.86
Maximum Power Current(Imp/A)	16.40	16.48	16.57	16.65	16.73

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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560~580 Watt

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HS 210R-120 TC-D *Cosmos* *N-type Bifacial Modules*

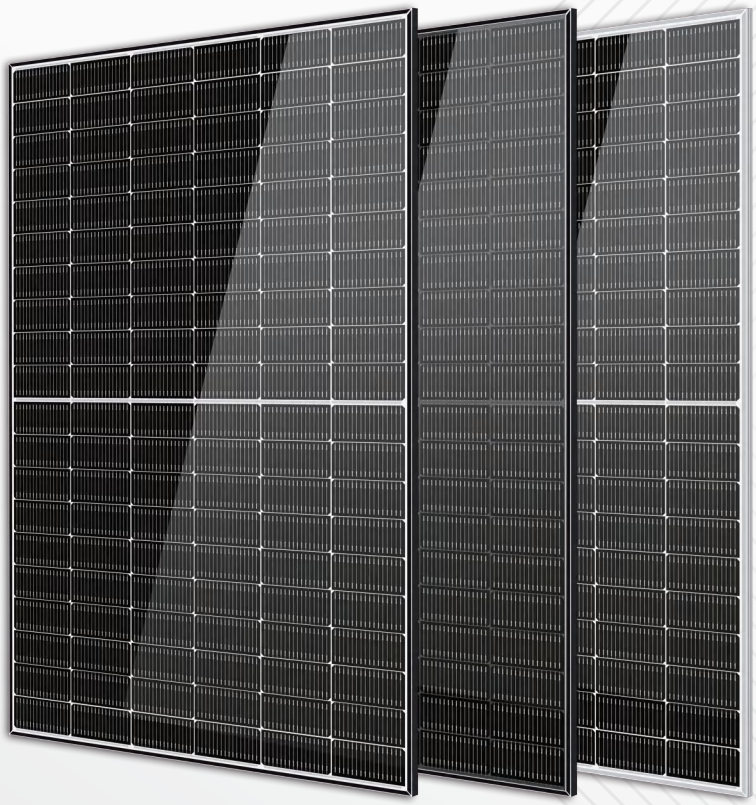
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 120 half-cells monocrystalline modules is up to 580W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

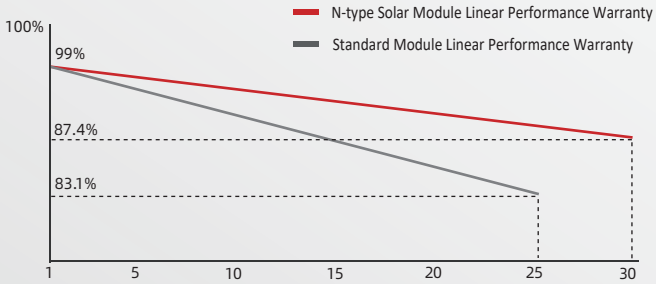
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

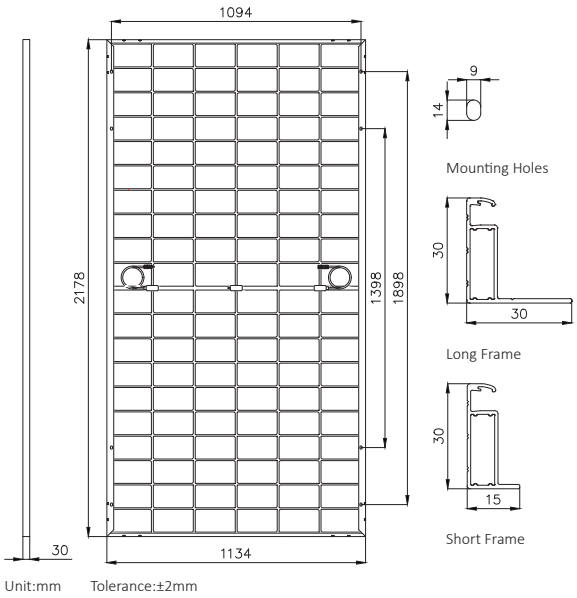
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 210R-120 TC-D

MECHANICAL DIAGRAMS



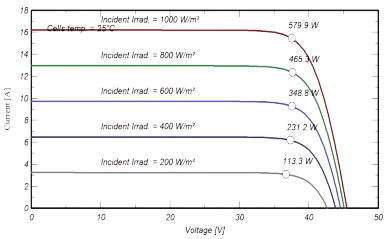
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MECHANICAL PARAMETERS

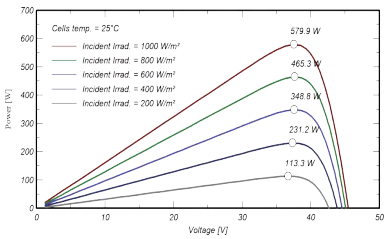
Weight	30.5kg
Dimension	2178×1134×30mm
Cell Orientation	120(6×20)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm(length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/740pcs per 40'HC

CURVES OF PV MODULE

HS580TC-MHC-D



HS580TC-MHC-D



ELECTRICAL CHARACTERISTICS

Module Type	HS560TC-MHC-D		HS565TC-MHC-D		HS570TC-MHC-D		HS575TC-MHC-D		HS580TC-MHC-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	560	437	565	441	570	445	575	449	580	452
Open Circuit Voltage(Voc/V)	44.62	44.30	44.83	44.52	45.05	44.74	45.27	44.95	45.48	45.17
Short Circuit Current(Isc/A)	15.95	12.44	16.01	12.49	16.08	12.54	16.14	12.59	16.20	12.64
Maximum Power Voltage(Vmp/V)	37.08	37.49	37.26	37.67	37.44	37.85	37.62	38.03	37.80	38.22
Maximum Power Current(Imp/A)	15.10	11.65	15.16	11.70	15.22	11.75	15.28	11.79	15.34	11.84
Module Efficiency(%)	22.7		22.9		23.1		23.3		23.5	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	616	622	627	633	638
Open Circuit Voltage(Voc/V)	44.62	44.83	45.05	45.27	45.48
Short Circuit Current(Isc/A)	17.54	17.62	17.69	17.75	17.82
Maximum Power Voltage(Vmp/V)	37.08	37.26	37.44	37.62	37.80
Maximum Power Current(Imp/A)	16.61	16.68	16.75	16.81	16.88

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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Specifications included in this datasheet are subject to change without notice.
Version number: HS210R-TC-D-2025-A0

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620~640 Watt

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HS 210R-132 TC-D *Cosmos* *N-type Bifacial Modules*

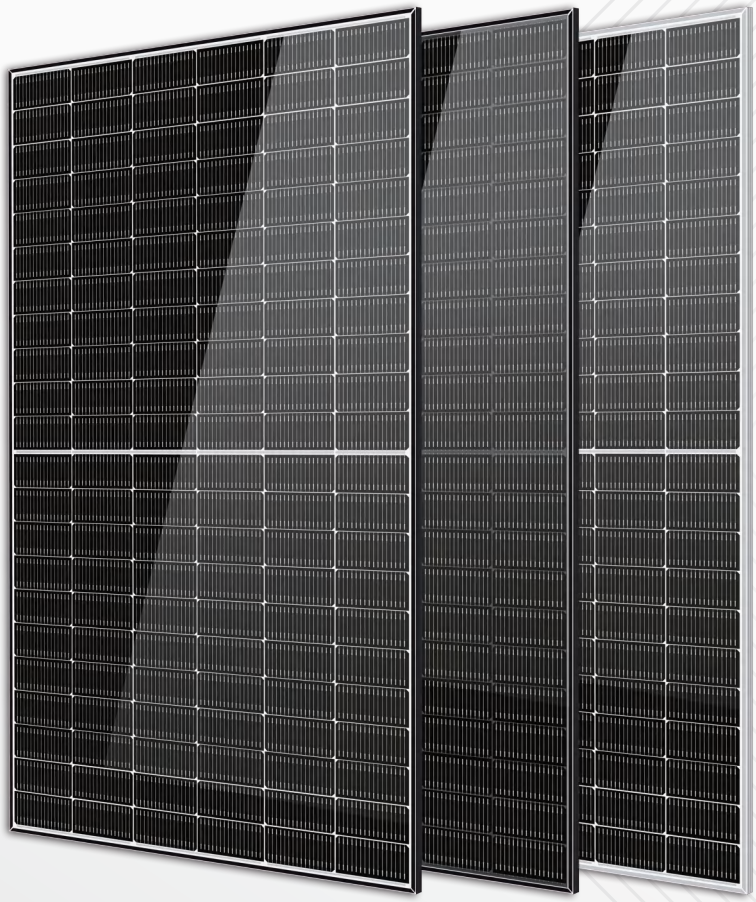
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 640W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

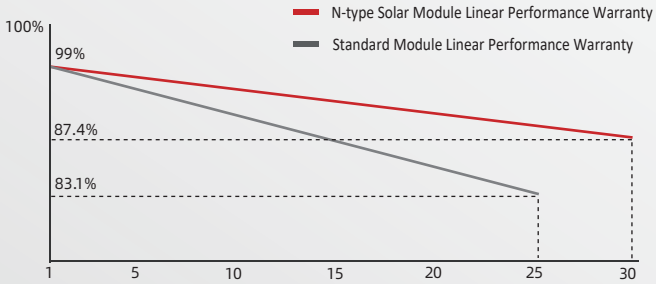
ISO14001:2015 Environmental Management System

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CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

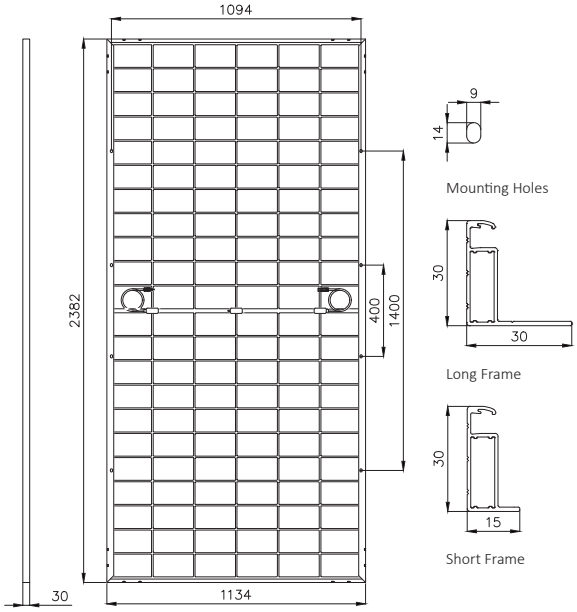
30 30-year linear power output warranty

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info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 210R-132 TC-D

MECHANICAL DIAGRAMS



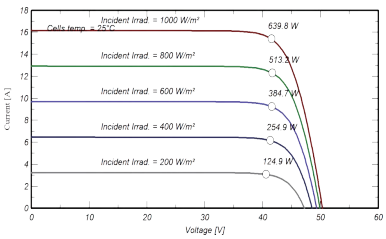
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MECHANICAL PARAMETERS

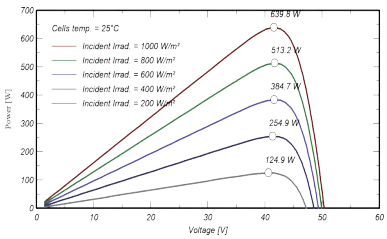
Weight	33.7kg
Dimension	2382×1134×30mm
Cell Orientation	132(6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm(length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	36pcs per pallet/720pcs per 40'HC

CURVES OF PV MODULE

HS640TC-MHC-D



HS640TC-MHC-D



ELECTRICAL CHARACTERISTICS

Module Type	HS620TC-MHC-D		HS625TC-MHC-D		HS630TC-MHC-D		HS635TC-MHC-D		HS640TC-MHC-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	620	484	625	488	630	491	635	495	640	499
Open Circuit Voltage(Voc/V)	49.40	49.05	49.63	49.29	49.87	49.52	50.11	49.76	50.35	50.00
Short Circuit Current(Isc/A)	15.95	12.44	16.00	12.48	16.05	12.52	16.10	12.56	16.15	12.60
Maximum Power Voltage(Vmp/V)	41.05	41.50	41.25	41.70	41.45	41.90	41.65	42.10	41.84	42.30
Maximum Power Current(Imp/A)	15.10	11.65	15.15	11.69	15.20	11.73	15.25	11.76	15.29	11.80
Module Efficiency(%)	22.9		23.1		23.3		23.5		23.7	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	682	688	693	699	704
Open Circuit Voltage(Voc/V)	49.40	49.63	49.87	50.11	50.35
Short Circuit Current(Isc/A)	17.55	17.60	17.66	17.71	17.77
Maximum Power Voltage(Vmp/V)	41.05	41.25	41.45	41.65	41.84
Maximum Power Current(Imp/A)	16.61	16.67	16.72	16.77	16.82

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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Version number: HS210R-TC-D-2025-A0

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630W

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HS 210R-132 TC-D *Cosmos* *N-type Bifacial Modules*

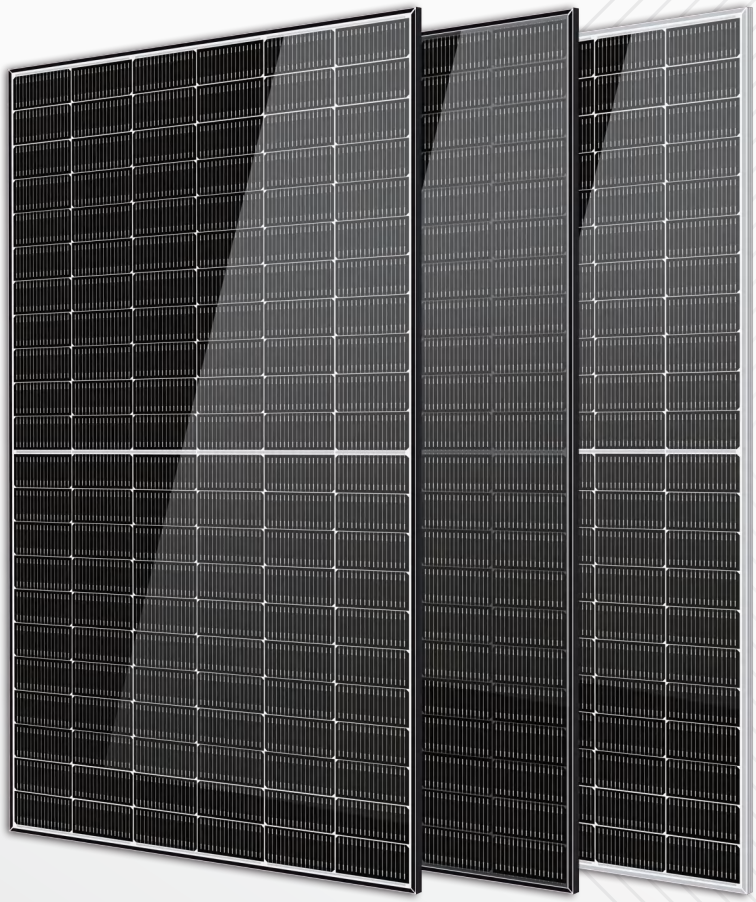
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 630W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

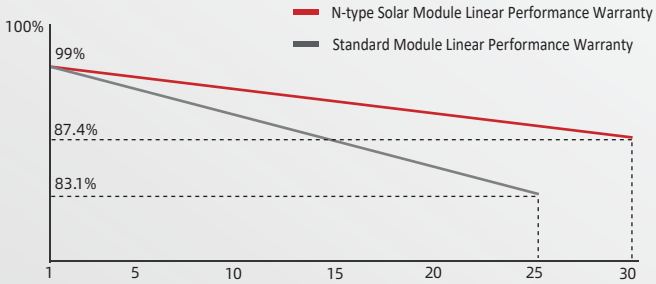
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China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

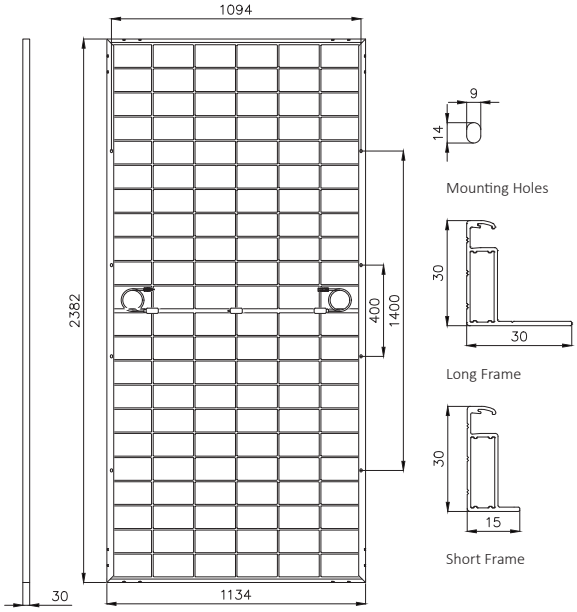
30 30-year linear power output warranty

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sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 210R-132 TC-D

MECHANICAL DIAGRAMS



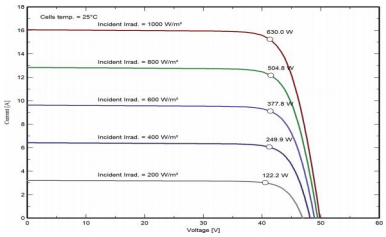
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MECHANICAL PARAMETERS

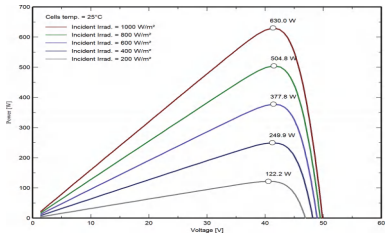
Weight	33.7kg
Dimension	2382×1134×30mm
Cell Orientation	132(6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm(length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	36pcs per pallet/720pcs per 40'HC

CURVES OF PV MODULE

HS630TC-MHC-D



HS630TC-MHC-D



ELECTRICAL CHARACTERISTICS

Module Type	HS610TC-MHC-D		HS615TC-MHC-D		HS620TC-MHC-D		HS625TC-MHC-D		HS630TC-MHC-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	610	465	615	469	620	472	625	476	630	480
Open Circuit Voltage(Voc/V)	48.92	46.47	49.16	46.70	49.40	46.92	49.63	47.15	49.87	47.38
Short Circuit Current(Isc/A)	15.85	12.80	15.90	12.84	15.95	12.88	16.00	12.92	16.05	12.96
Maximum Power Voltage(Vmp/V)	40.66	37.86	40.85	38.05	41.05	38.23	41.25	38.42	41.45	38.60
Maximum Power Current(Imp/A)	15.00	12.28	15.05	12.32	15.10	12.36	15.15	12.40	15.20	12.44
Module Efficiency(%)	22.6		22.8		22.9		23.1		23.3	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	671	677	682	688	693
Open Circuit Voltage(Voc/V)	48.92	49.16	49.40	49.63	49.87
Short Circuit Current(Isc/A)	17.43	17.49	17.55	17.60	17.66
Maximum Power Voltage(Vmp/V)	40.66	40.85	41.05	41.25	41.45
Maximum Power Current(Imp/A)	16.50	16.56	16.61	16.67	16.72

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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Version number: HS210R-TC-D-2025-A0

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485W

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HS 199R-108 TC-D *Delta* *N-type Bifacial Modules*

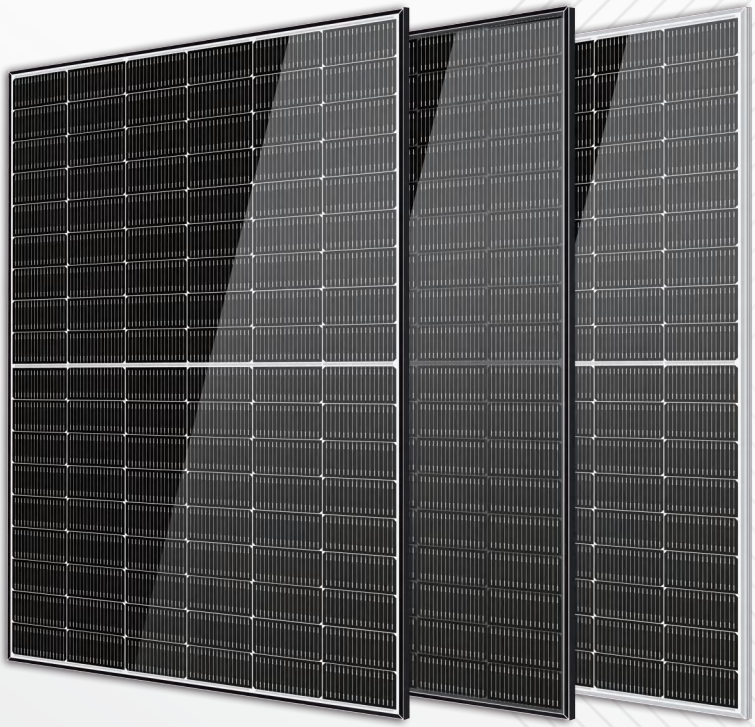
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 108 half-cells monocrystalline modules is up to 485W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

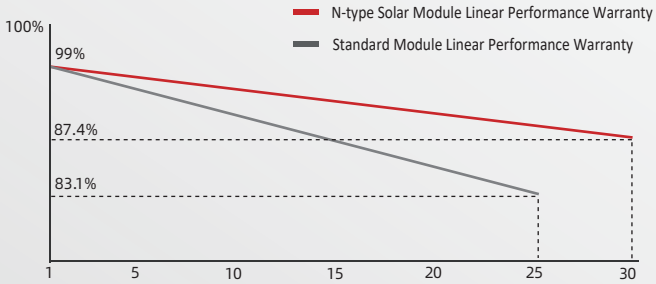
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China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

30 30-year linear power output warranty

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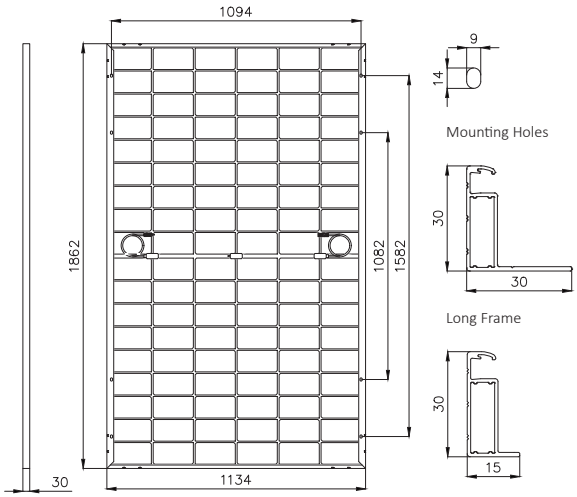
GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH

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Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 199R-108 TC-D

MECHANICAL DIAGRAMS



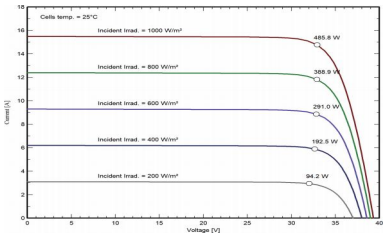
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MECHANICAL PARAMETERS

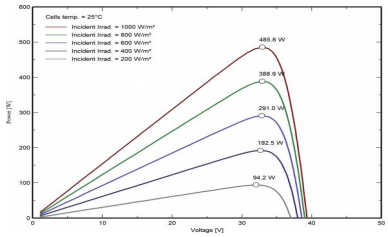
Weight	26.0kg
Dimension	1862×1134×30mm
Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/888pcs per 40'HC

CURVES OF PV MODULE

HS485TC-MHD-D



HS485TC-MHD-D



ELECTRICAL CHARACTERISTICS

Module Type	HS465TC-MHD-D		HS470TC-MHD-D		HS475TC-MHD-D		HS480TC-MHD-D		HS485TC-MHD-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	465	354	470	358	475	390	480	366	485	370
Open Circuit Voltage(Voc/V)	38.73	38.73	38.90	38.90	39.08	39.26	39.26	39.26	39.31	39.31
Short Circuit Current(Isc/A)	15.08	11.49	15.17	11.56	15.26	11.33	15.35	11.70	15.49	11.80
Maximum Power Voltage(Vmp/V)	32.85	32.85	33.00	33.00	33.15	33.30	33.30	33.30	33.35	33.35
Maximum Power Current(Imp/A)	14.16	10.79	14.24	10.85	14.33	10.64	14.41	10.98	14.54	11.08
Module Efficiency(%)	22.0		22.3		22.5		22.7		23.0	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	512	517	523	528	534
Open Circuit Voltage(Voc/V)	38.73	38.90	39.08	39.26	39.31
Short Circuit Current(Isc/A)	16.73	16.84	16.94	17.04	17.19
Maximum Power Voltage(Vmp/V)	32.85	33.00	33.15	33.30	33.35
Maximum Power Current(Imp/A)	15.57	15.67	15.76	15.86	16.00

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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Version number: HS199R-TC-D-2025-A0

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540W

HORAY | TIER1 BloombergNEF

HS 199R-120 TC-D *Delta* *N-type Bifacial Modules*

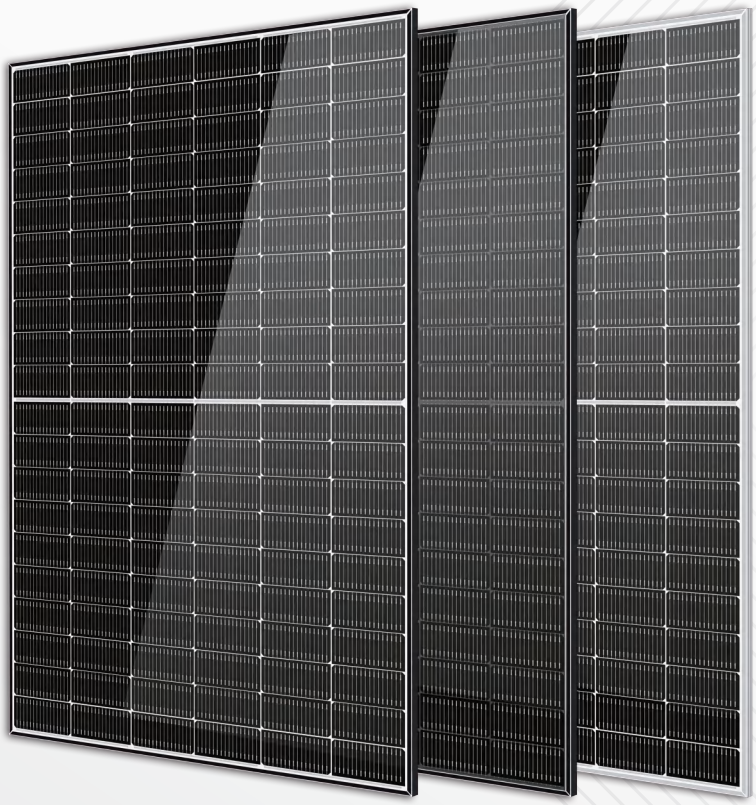
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 120 half-cells monocrystalline modules is up to 540W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

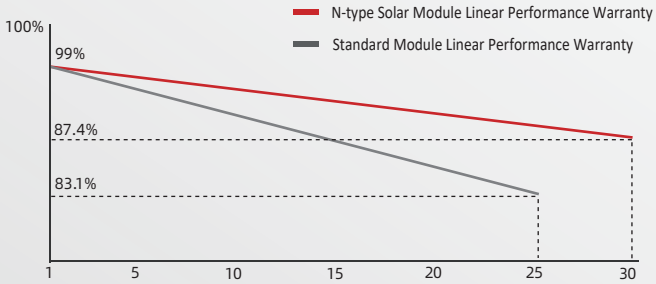
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

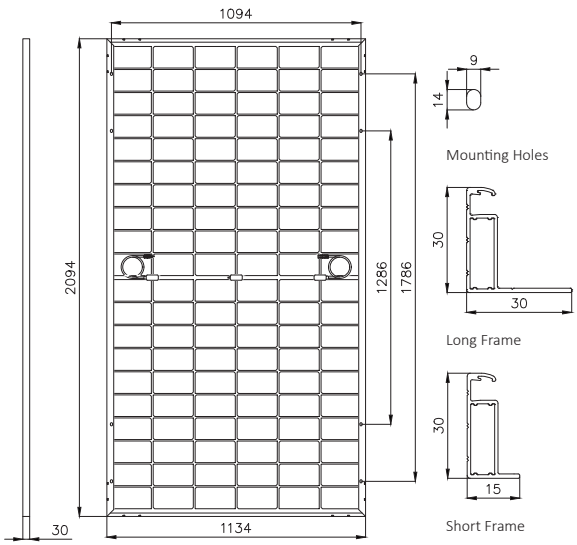
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 199R-120 TC-D

MECHANICAL DIAGRAMS



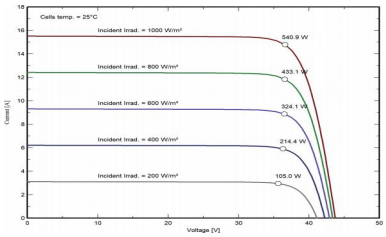
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MECHANICAL PARAMETERS

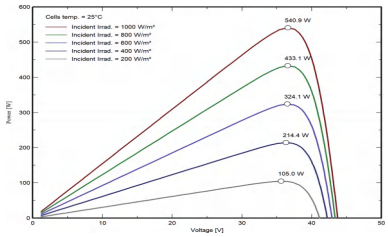
Weight	29.0kg
Dimension	2094×1134×30mm
Cell Orientation	120 (6×20)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/814pcs per 40'HC

CURVES OF PV MODULE

HS540TC-MHD-D



HS540TC-MHD-D



ELECTRICAL CHARACTERISTICS

Module Type	HS520TC-MHD-D		HS525TC-MHD-D		HS530TC-MHD-D		HS535TC-MHD-D		HS540TC-MHD-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	520	396	525	400	530	404	535	408	540	411
Open Circuit Voltage(Voc/V)	43.23	43.23	43.42	43.42	43.62	43.62	43.68	43.68	43.71	43.71
Short Circuit Current(Isc/A)	15.10	11.51	15.18	11.57	15.26	11.62	15.38	11.72	15.51	11.82
Maximum Power Voltage(Vmp/V)	36.67	36.67	36.83	36.83	37.00	37.00	37.05	37.05	37.08	37.08
Maximum Power Current(Imp/A)	14.18	10.81	14.25	10.86	14.32	10.92	14.44	11.00	14.56	11.10
Module Efficiency(%)	22.2		22.5		22.7		22.9		23.1	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	572	578	583	589	594
Open Circuit Voltage(Voc/V)	43.23	43.42	43.62	43.68	43.71
Short Circuit Current(Isc/A)	16.61	16.70	16.78	16.92	17.06
Maximum Power Voltage(Vmp/V)	36.67	36.83	37.00	37.05	37.08
Maximum Power Current(Imp/A)	15.60	15.68	15.76	15.88	16.02

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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590W

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HS 199R-132 TC-D *Delta* *N-type Bifacial Modules*

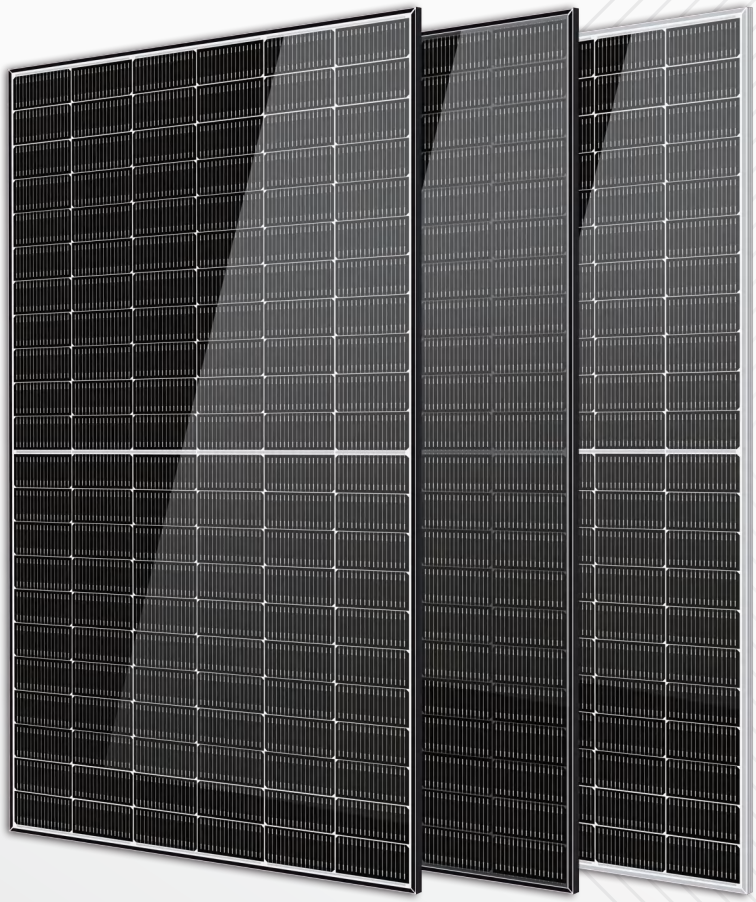
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 590W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

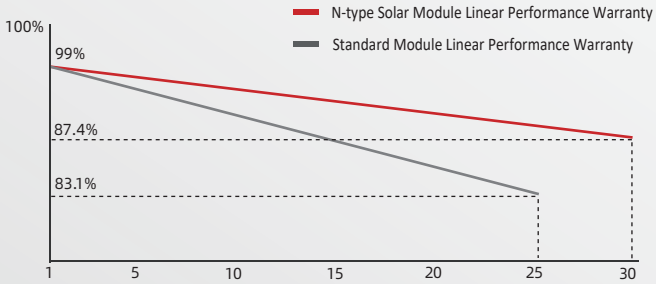
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.

sales@horaysolar.com www.horaysolar.com +86-510 83580688

No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

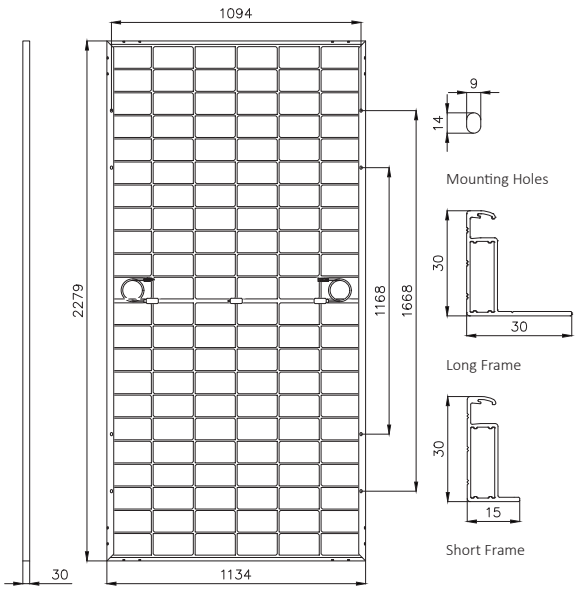
GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH

info@horaysolar.com www.horaysolar.com

Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 199R-132 TC-D

MECHANICAL DIAGRAMS



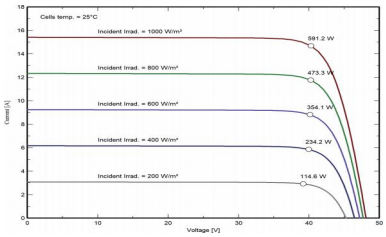
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MECHANICAL PARAMETERS

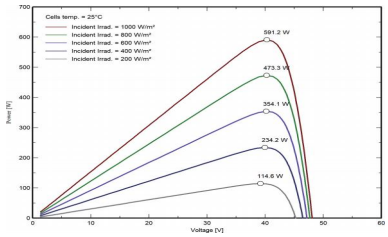
Weight	31.5kg
Dimension	2279×1134×30mm
Cell Orientation	132 (6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/740pcs per 40'HC

CURVES OF PV MODULE

HS590TC-MHD-D



HS590TC-MHD-D



ELECTRICAL CHARACTERISTICS

Module Type	HS570TC-MHD-D		HS575TC-MHD-D		HS580TC-MHD-D		HS585TC-MHD-D		HS590TC-MHD-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	570	434	575	438	580	442	585	446	590	450
Open Circuit Voltage(Voc/V)	47.55	47.55	47.76	47.76	47.98	47.98	48.05	48.05	48.08	48.08
Short Circuit Current(Isc/A)	15.05	11.47	15.11	11.52	15.18	11.56	15.29	11.65	15.41	11.74
Maximum Power Voltage(Vmp/V)	40.33	40.33	40.52	40.52	40.70	40.70	40.76	40.76	40.79	40.79
Maximum Power Current(Imp/A)	14.13	10.77	14.19	10.81	14.25	10.86	14.35	10.94	14.47	11.02
Module Efficiency(%)	22.2		22.4		22.6		22.8		23.0	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	627	633	638	644	649
Open Circuit Voltage(Voc/V)	47.55	47.76	47.98	48.05	48.08
Short Circuit Current(Isc/A)	16.56	16.63	16.69	16.82	16.95
Maximum Power Voltage(Vmp/V)	40.33	40.52	40.70	40.76	40.79
Maximum Power Current(Imp/A)	15.55	15.61	15.68	15.79	15.91

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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650W

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HS 199R-144 TC-D *Delta* *N-type Bifacial Modules*

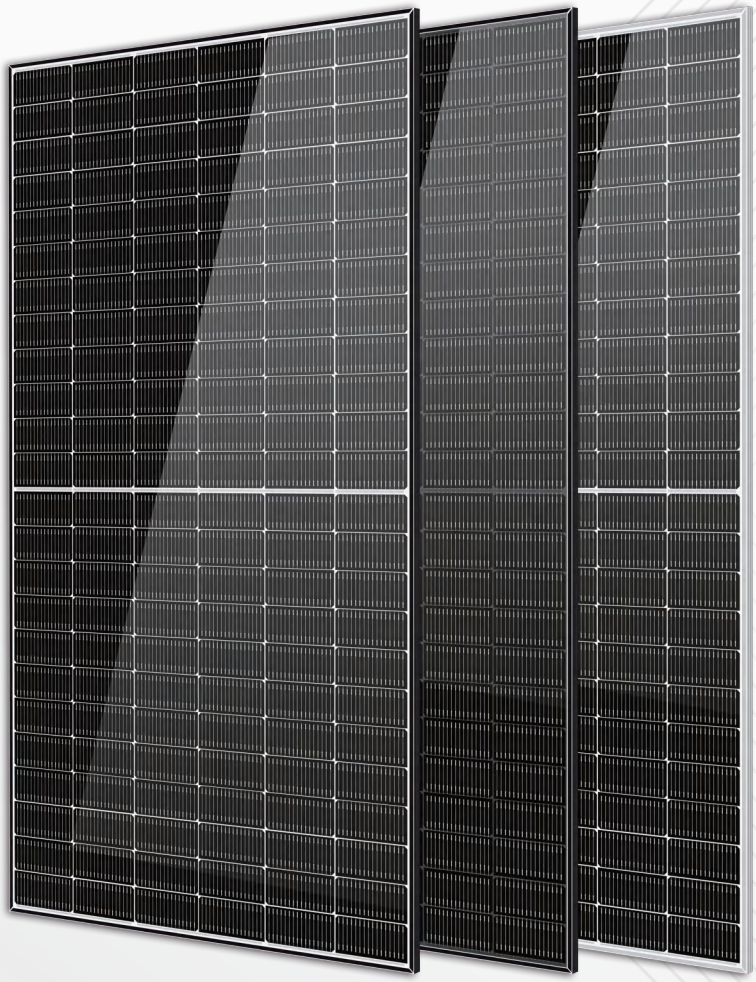
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 144 half-cells monocrystalline modules is up to 650W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

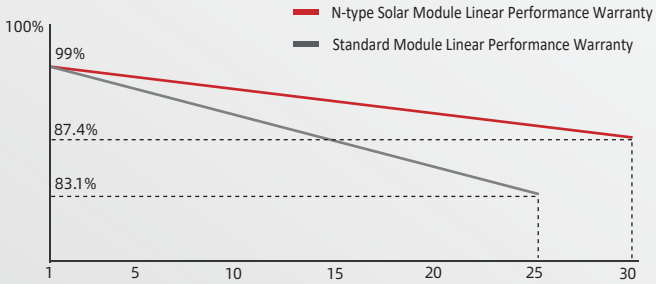
ISO14001:2015 Environmental Management System

IOS45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

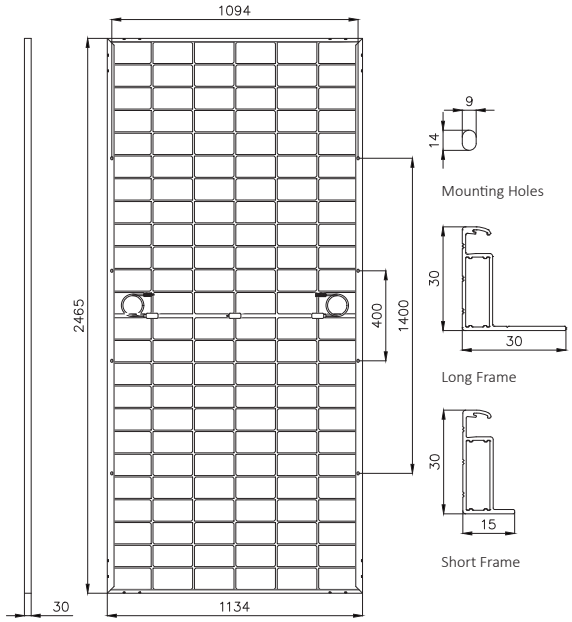
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 199R-144 TC-D

MECHANICAL DIAGRAMS



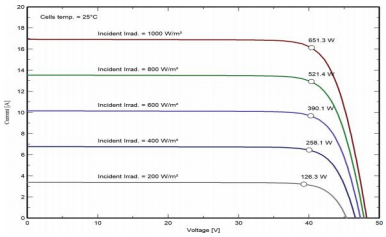
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MECHANICAL PARAMETERS

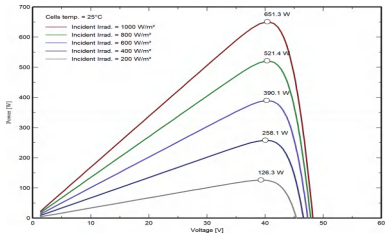
Weight	34.5kg
Dimension	2465×1134×30mm
Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	36pcs per pallet/648pcs per 40'HC

CURVES OF PV MODULE

HS650TC-MHD-D



HS650TC-MHD-D



ELECTRICAL CHARACTERISTICS

Module Type	HS630TC-MHD-D		HS635TC-MHD-D		HS640TC-MHD-D		HS645TC-MHD-D		HS650TC-MHD-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	630	480	635	484	640	488	645	491	650	495
Open Circuit Voltage(Voc/V)	47.98	47.98	48.05	48.05	48.08	48.08	48.16	48.16	48.20	48.20
Short Circuit Current(Isc/A)	16.49	12.56	16.59	12.64	16.71	12.73	16.81	12.81	16.93	12.90
Maximum Power Voltage(Vmp/V)	40.70	40.70	40.76	40.76	40.79	40.79	40.85	40.85	40.89	40.89
Maximum Power Current(Imp/A)	15.48	11.80	15.58	11.87	15.69	11.96	15.79	12.03	15.90	12.11
Module Efficiency(%)	22.5		22.7		22.9		23.1		23.3	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	693	699	704	710	715
Open Circuit Voltage(Voc/V)	47.98	48.05	48.08	48.16	48.20
Short Circuit Current(Isc/A)	18.13	18.25	18.38	18.50	18.62
Maximum Power Voltage(Vmp/V)	40.70	40.76	40.79	40.85	40.89
Maximum Power Current(Imp/A)	17.03	17.14	17.26	17.37	17.49

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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700~730 Watt

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HS 210-132 TC-D *Galaxy* *N-type Bifacial Modules*

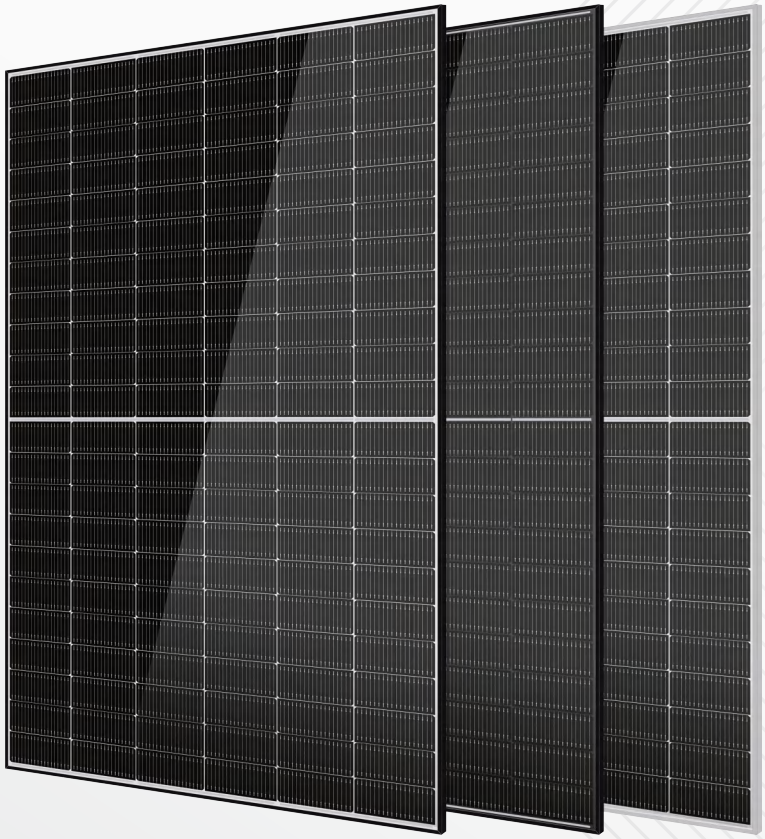
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 730W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

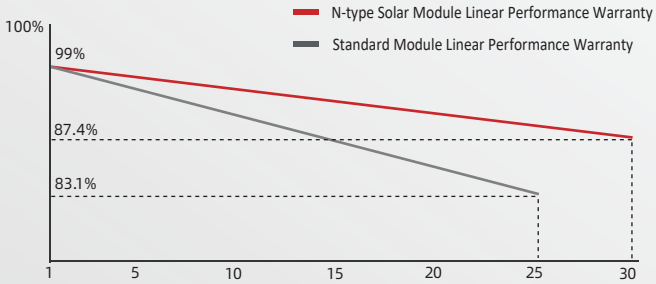
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

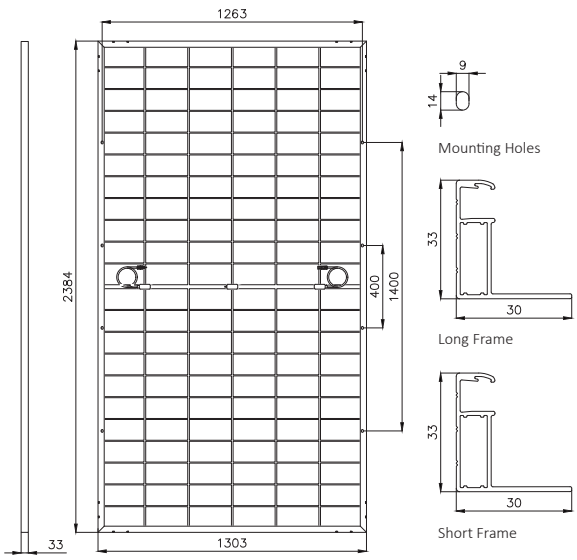
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 210-132 TC-D

MECHANICAL DIAGRAMS



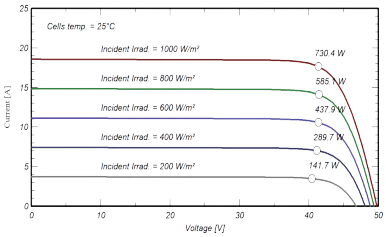
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

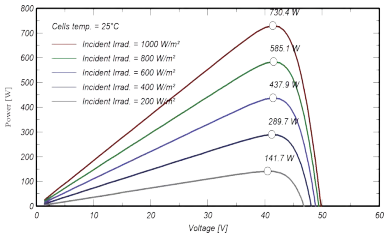
Weight	38.5kg
Dimension	2384×1303×33mm
Cell Orientation	132(6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	33pcs per pallet/594pcs per 40'HC

CURVES OF PV MODULE

HS730TC-MHG-D



HS730TC-MHG-D



ELECTRICAL CHARACTERISTICS

Module Type	HS700TC-MHG-D		HS705TC-MHG-D		HS710TC-MHG-D		HS715TC-MHG-D		HS720TC-MHG-D		HS725TC-MHG-D		HS730TC-MHG-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	700	535	705	539	710	543	715	547	720	551	725	555	730	559
Open Circuit Voltage(Voc/V)	48.75	46.10	48.80	46.30	49.00	46.50	49.20	46.70	49.40	46.90	49.60	47.10	49.80	47.30
Short Circuit Current(Isc/A)	18.27	14.71	18.36	14.76	18.40	14.83	18.44	14.86	18.49	14.90	18.52	14.96	18.56	15.01
Maximum Power Voltage(Vmp/V)	40.61	38.20	40.70	38.35	40.90	38.50	41.10	38.65	41.30	38.80	41.50	38.95	41.70	39.10
Maximum Power Current(Imp/A)	17.24	14.01	17.32	14.05	17.36	14.10	17.40	14.15	17.44	14.20	17.47	14.25	17.51	14.30
Module Efficiency(%)	22.5		22.7		22.9		23.0		23.2		23.3		23.5	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	770	776	781	786	791	796	801
Open Circuit Voltage(Voc/V)	48.75	48.80	49.00	49.20	49.40	49.60	49.80
Short Circuit Current(Isc/A)	20.09	20.21	20.24	20.27	20.30	20.33	20.36
Maximum Power Voltage(Vmp/V)	40.61	40.70	40.90	41.10	41.30	41.50	41.70
Maximum Power Current(Imp/A)	18.96	19.07	19.10	19.12	19.15	19.18	19.21

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.
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Specifications included in this datasheet are subject to change without notice.
Version number: HS210-TC-D-2025-A0

YouTube FaceBook Linkedin WeChat

700~730 Watt

HORAY | TIER1 BloombergNEF

HS 210-132 TC-D *Galaxy* *N-type Bifacial Modules*

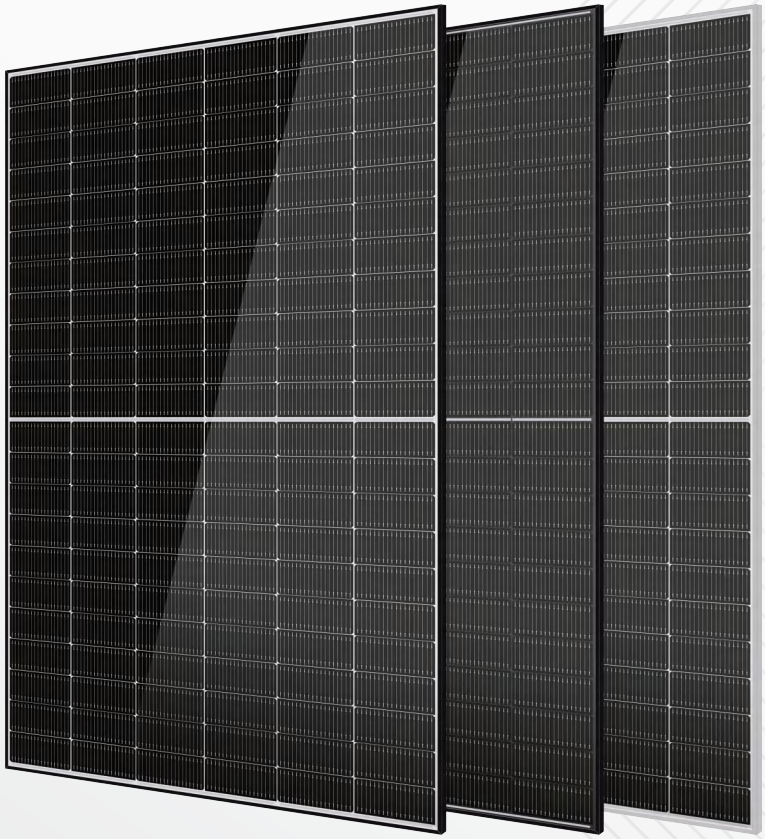
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 730W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

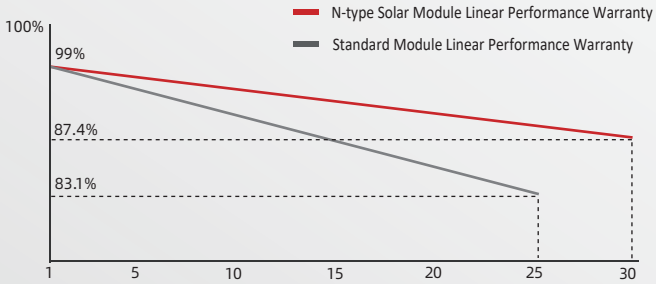
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China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

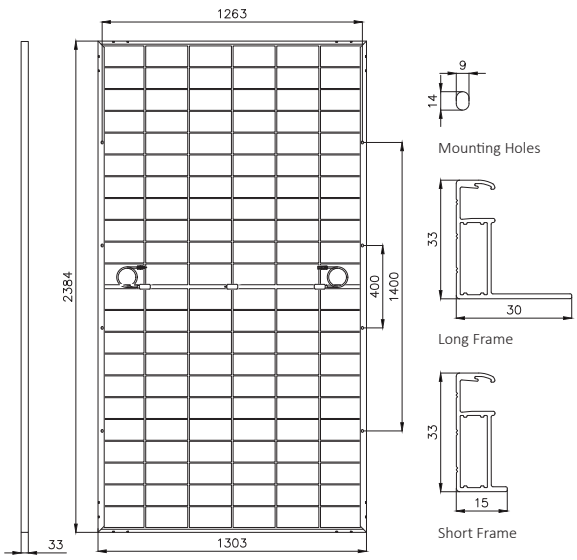
30 30-year linear power output warranty

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HS 210-132 TC-D

MECHANICAL DIAGRAMS



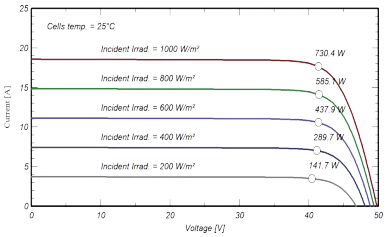
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

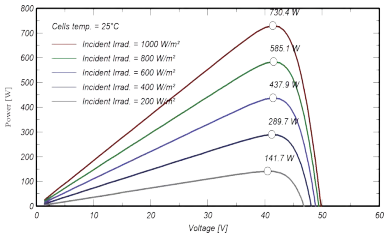
Weight	38.5kg
Dimension	2384×1303×33mm
Cell Orientation	132(6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	33pcs per pallet/594pcs per 40'HC

CURVES OF PV MODULE

HS730TC-MHG-D



HS730TC-MHG-D



ELECTRICAL CHARACTERISTICS

Module Type	HS700TC-MHG-D		HS705TC-MHG-D		HS710TC-MHG-D		HS715TC-MHG-D		HS720TC-MHG-D		HS725TC-MHG-D		HS730TC-MHG-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	700	535	705	539	710	543	715	547	720	551	725	555	730	559
Open Circuit Voltage(Voc/V)	48.75	46.10	48.80	46.30	49.00	46.50	49.20	46.70	49.40	46.90	49.60	47.10	49.80	47.30
Short Circuit Current(Isc/A)	18.27	14.71	18.36	14.76	18.40	14.83	18.44	14.86	18.49	14.90	18.52	14.96	18.56	15.01
Maximum Power Voltage(Vmp/V)	40.61	38.20	40.70	38.35	40.90	38.50	41.10	38.65	41.30	38.80	41.50	38.95	41.70	39.10
Maximum Power Current(Imp/A)	17.24	14.01	17.32	14.05	17.36	14.10	17.40	14.15	17.44	14.20	17.47	14.25	17.51	14.30
Module Efficiency(%)	22.5		22.7		22.9		23.0		23.2		23.3		23.5	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	770	776	781	786	791	796	801
Open Circuit Voltage(Voc/V)	48.75	48.80	49.00	49.20	49.40	49.60	49.80
Short Circuit Current(Isc/A)	20.09	20.21	20.24	20.27	20.30	20.33	20.36
Maximum Power Voltage(Vmp/V)	40.61	40.70	40.90	41.10	41.30	41.50	41.70
Maximum Power Current(Imp/A)	18.96	19.07	19.10	19.12	19.15	19.18	19.21

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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Specifications included in this datasheet are subject to change without notice.
Version number: HS210-TC-D-2025-A0

YouTube FaceBook Linkedin WeChat

720W

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HS 210-132 TC-D *Galaxy* *N-type Bifacial Modules*

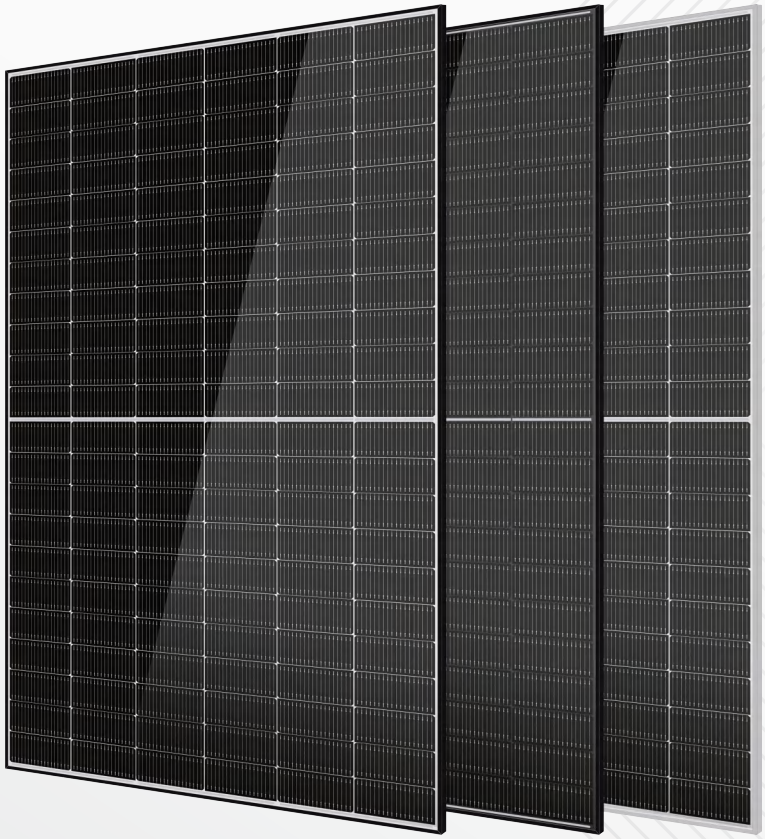
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 720W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

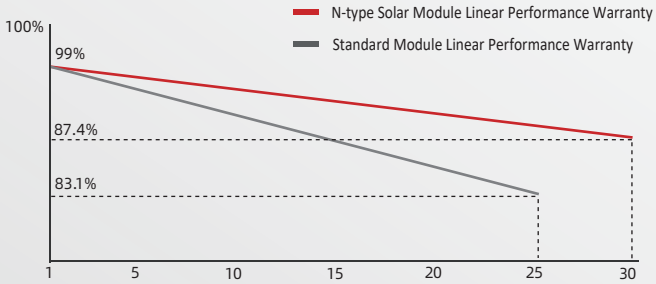
ISO14001:2015 Environmental Management System

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China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

30 30-year linear power output warranty

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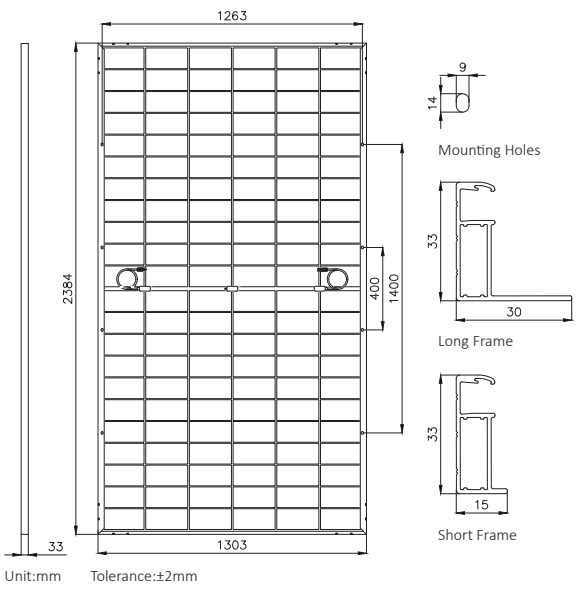
GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH

info@horaysolar.com www.horaysolar.com

Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 210-132 TC-D

MECHANICAL DIAGRAMS



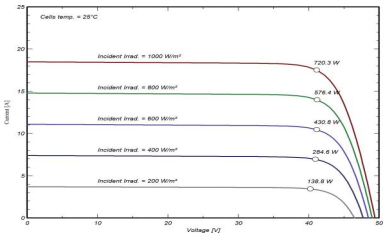
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MECHANICAL PARAMETERS

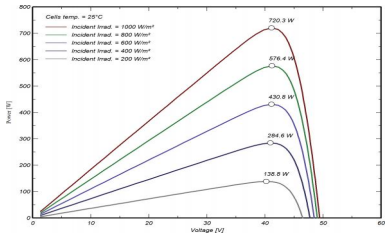
Weight	38.5kg
Dimension	2384×1303×33mm
Cell Orientation	132(6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	33pcs per pallet/594pcs per 40'HC

CURVES OF PV MODULE

HS720TC-MHG-D



HS720TC-MHG-D



ELECTRICAL CHARACTERISTICS

Module Type	HS680TC-MHG-D		HS690TC-MHG-D		HS700TC-MHG-D		HS710TC-MHG-D		HS720TC-MHG-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	680	520	690	528	700	534	710	543	720	551
Open Circuit Voltage(Voc/V)	47.80	45.41	48.20	45.79	48.60	46.10	49.00	46.50	49.40	46.90
Short Circuit Current(Isc/A)	18.15	14.63	18.23	14.70	18.32	14.76	18.40	14.83	18.49	14.90
Maximum Power Voltage(Vmp/V)	39.70	37.32	40.10	37.69	40.50	38.00	40.90	38.50	41.30	38.80
Maximum Power Current(Imp/A)	17.13	13.94	17.21	14.01	17.29	14.04	17.36	14.12	17.44	14.19
Module Efficiency(%)	21.9		22.2		22.5		22.9		23.2	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	754	765	776	787	798
Open Circuit Voltage(Voc/V)	47.80	48.20	48.60	49.00	49.40
Short Circuit Current(Isc/A)	20.12	20.21	20.30	20.39	20.49
Maximum Power Voltage(Vmp/V)	39.70	40.10	40.50	40.90	41.30
Maximum Power Current(Imp/A)	18.98	19.07	19.15	19.23	19.32

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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Version number: HS210-TC-D-2025-A0

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430~450 Watt

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HS 182-108 TC-D *Ocean* *N-type Bifacial Modules*

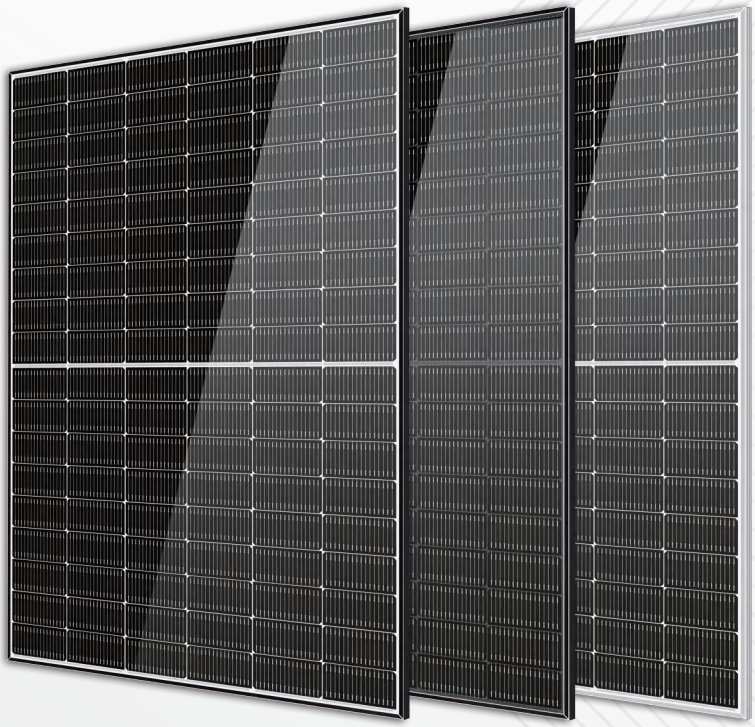
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 108 half-cells monocrystalline modules is up to 450W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

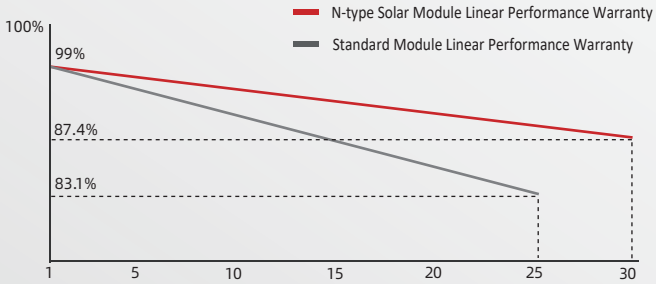
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15 15-year product warranty

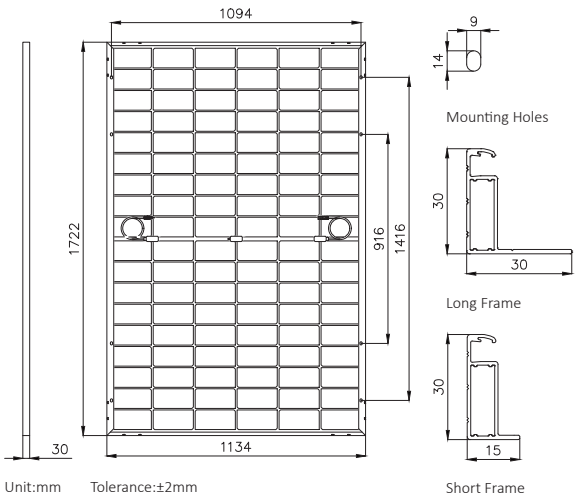
30 30-year linear power output warranty

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HS 182-108 TC-D

MECHANICAL DIAGRAMS



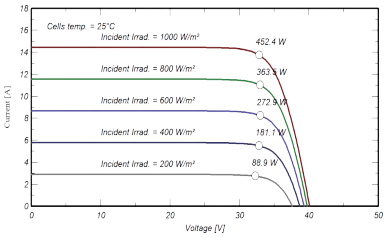
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MECHANICAL PARAMETERS

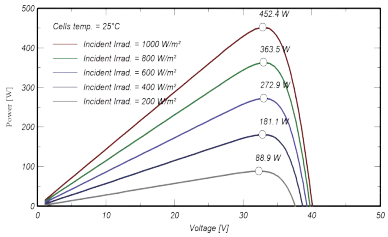
Weight	24.0kg
Dimension	1722×1134×30mm
Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm²,±1100mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/962pcs per 40'HC

CURVES OF PV MODULE

HS450TC-MHO-D



HS450TC-MHO-D



ELECTRICAL CHARACTERISTICS

Module Type	HS430TC-MHO-D		HS435TC-MHO-D		HS440TC-MHO-D		HS445TC-MHO-D		HS450TC-MHO-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	430	328	435	332	440	336	445	340	450	344
Open Circuit Voltage(Voc/V)	39.30	37.10	39.50	37.30	39.70	37.50	39.90	37.70	40.10	37.90
Short Circuit Current(Isc/A)	14.15	11.43	14.22	11.49	14.30	11.55	14.37	11.61	14.45	11.67
Maximum Power Voltage(Vmp/V)	32.84	30.50	33.04	30.70	33.24	30.90	33.44	31.10	33.64	31.30
Maximum Power Current(Imp/A)	13.10	10.74	13.17	10.80	13.24	10.86	13.31	10.93	13.38	10.99
Module Efficiency(%)	22.0		22.3		22.5		22.8		23.0	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	474	479	485	490	495
Open Circuit Voltage(Voc/V)	39.30	39.50	39.70	39.90	40.10
Short Circuit Current(Isc/A)	15.56	15.64	15.73	15.81	15.89
Maximum Power Voltage(Vmp/V)	32.84	33.04	33.24	33.44	33.64
Maximum Power Current(Imp/A)	14.43	14.50	14.59	14.65	14.71

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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Specifications included in this datasheet are subject to change without notice.
Version number: HS182-TC-D-2025-A0

YouTube FaceBook Linkedin WeChat

480~500 Watt

HORAY | TIER1 BloombergNEF

HS 182-120 TC-D *Ocean* *N-type Bifacial Modules*

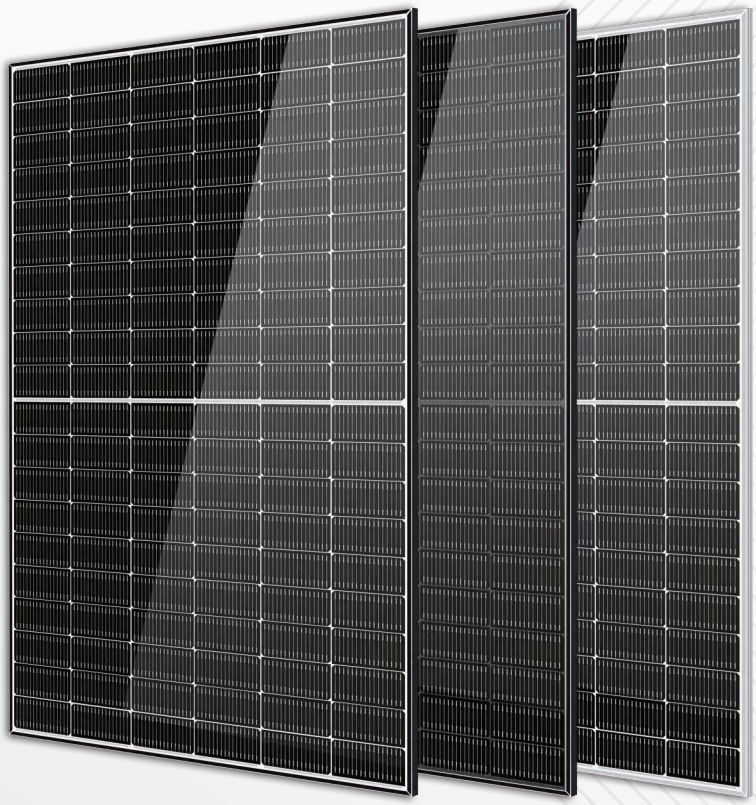
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 120 half-cells monocrystalline modules is up to 500W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

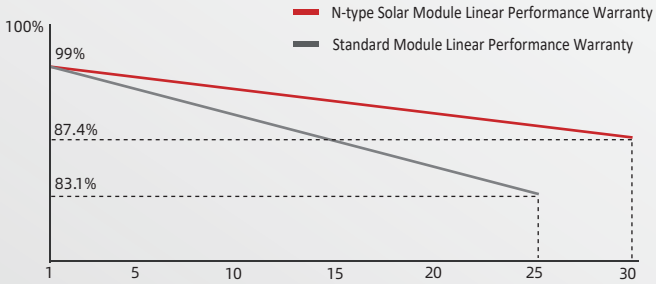
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

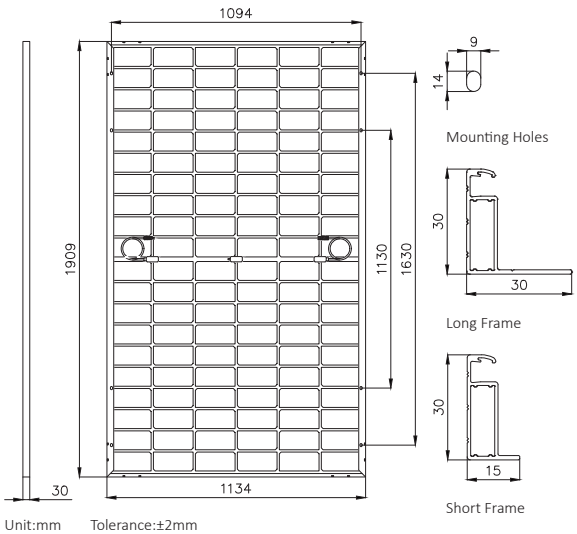
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 182-120 TC-D

MECHANICAL DIAGRAMS



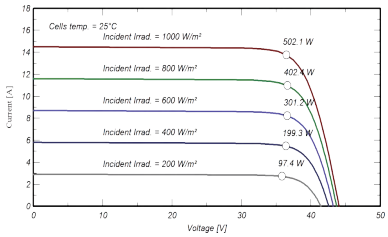
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MECHANICAL PARAMETERS

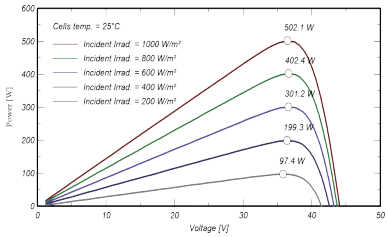
Weight	25.5kg
Dimension	1909×1134×30mm
Cell Orientation	120 (6×20)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/888pcs per 40'HC

CURVES OF PV MODULE

HS500TC-MHO-D



HS500TC-MHO-D



ELECTRICAL CHARACTERISTICS

Module Type	HS480TC-MHO-D		HS485TC-MHO-D		HS490TC-MHO-D		HS495TC-MHO-D		HS500TC-MHO-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	480	365	485	369	490	374	495	378	500	382
Open Circuit Voltage(Voc/V)	43.26	41.00	43.46	41.20	43.66	41.40	43.86	41.60	44.06	41.80
Short Circuit Current(Isc/A)	14.22	11.49	14.30	11.55	14.37	11.61	14.43	11.66	14.50	11.72
Maximum Power Voltage(Vmp/V)	36.44	33.80	36.64	34.00	36.84	34.20	37.04	34.40	37.24	34.60
Maximum Power Current(Imp/A)	13.17	10.82	13.23	10.88	13.31	10.93	13.36	10.99	13.43	11.04
Module Efficiency(%)	22.2		22.4		22.6		22.9		23.1	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	529	534	540	546	550
Open Circuit Voltage(Voc/V)	43.40	43.60	43.80	44.00	44.20
Short Circuit Current(Isc/A)	15.64	15.73	15.81	15.87	15.95
Maximum Power Voltage(Vmp/V)	36.44	36.64	36.84	37.04	37.24
Maximum Power Current(Imp/A)	14.52	14.57	14.66	14.74	14.77

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

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Version number: HS182-TC-D-2025-A0

YouTube FaceBook Linkedin WeChat

530~550 Watt

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HS 182-132 TC-D *Ocean* *N-type Bifacial Modules*

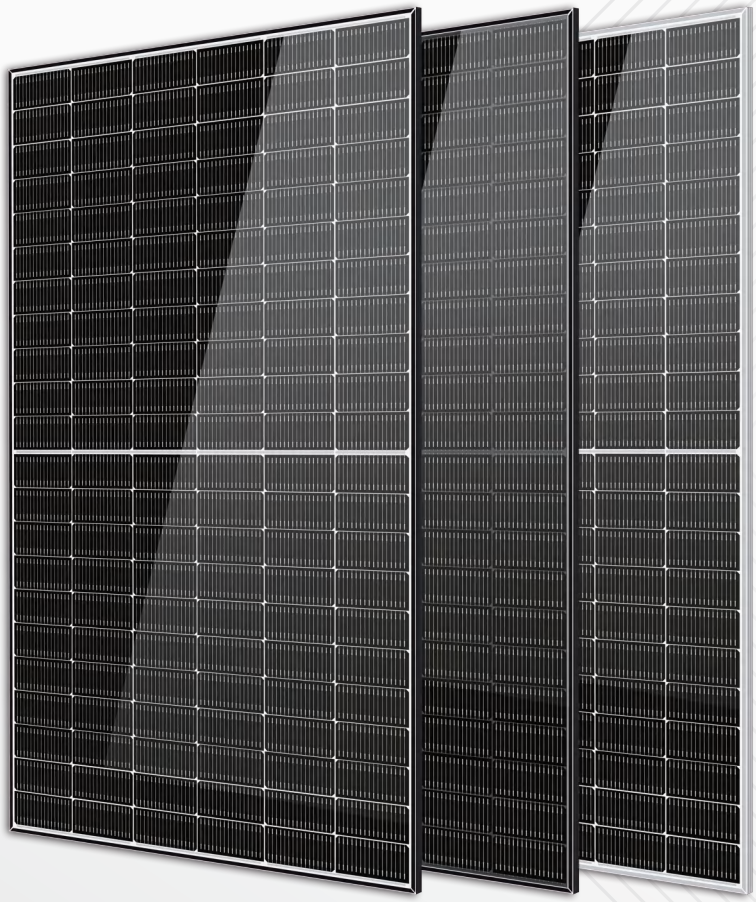
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 132 half-cells monocrystalline modules is up to 550W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

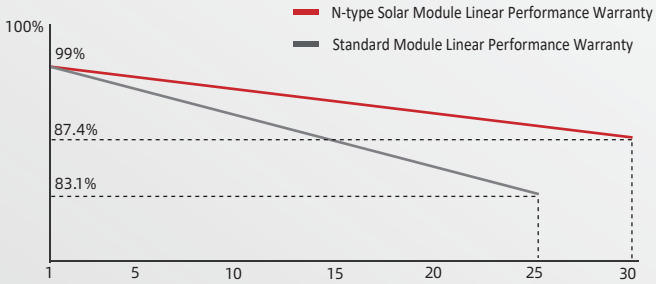
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

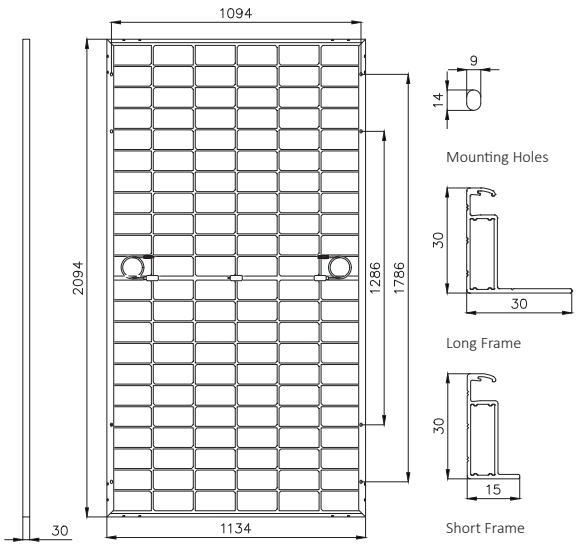
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 182-132 TC-D

MECHANICAL DIAGRAMS



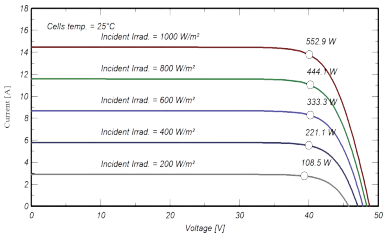
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MECHANICAL PARAMETERS

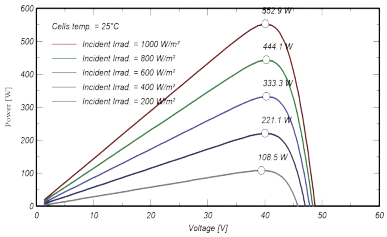
Weight	29.0kg
Dimension	2094×1134×30mm
Cell Orientation	132 (6×22)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/814pcs per 40'HC

CURVES OF PV MODULE

HS550TC-MHO-D



HS550TC-MHO-D



ELECTRICAL CHARACTERISTICS

Module Type	HS530TC-MHO-D		HS535TC-MHO-D		HS540TC-MHO-D		HS545TC-MHO-D		HS550TC-MHO-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	530	401	535	408	540	412	545	416	550	420
Open Circuit Voltage(Voc/V)	47.81	45.20	48.04	45.50	48.27	45.80	48.52	46.00	48.76	46.30
Short Circuit Current(Isc/A)	14.22	11.49	14.29	11.54	14.35	11.59	14.41	11.64	14.47	11.69
Maximum Power Voltage(Vmp/V)	40.24	37.30	40.44	37.60	40.64	37.70	40.84	37.90	41.04	38.10
Maximum Power Current(Imp/A)	13.17	10.81	13.23	10.86	13.29	10.92	13.34	10.98	13.40	11.02
Module Efficiency(%)	22.3		22.5		22.7		23.0		23.2	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	584	589	595	600	605
Open Circuit Voltage(Voc/V)	48.00	48.20	48.40	48.60	48.80
Short Circuit Current(Isc/A)	15.64	15.72	15.78	15.85	15.92
Maximum Power Voltage(Vmp/V)	40.24	40.44	40.64	40.84	41.04
Maximum Power Current(Imp/A)	14.51	14.56	14.64	14.69	14.74

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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585~605 Watt

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HS 182-144 TC-D *Ocean* *N-type Bifacial Modules*

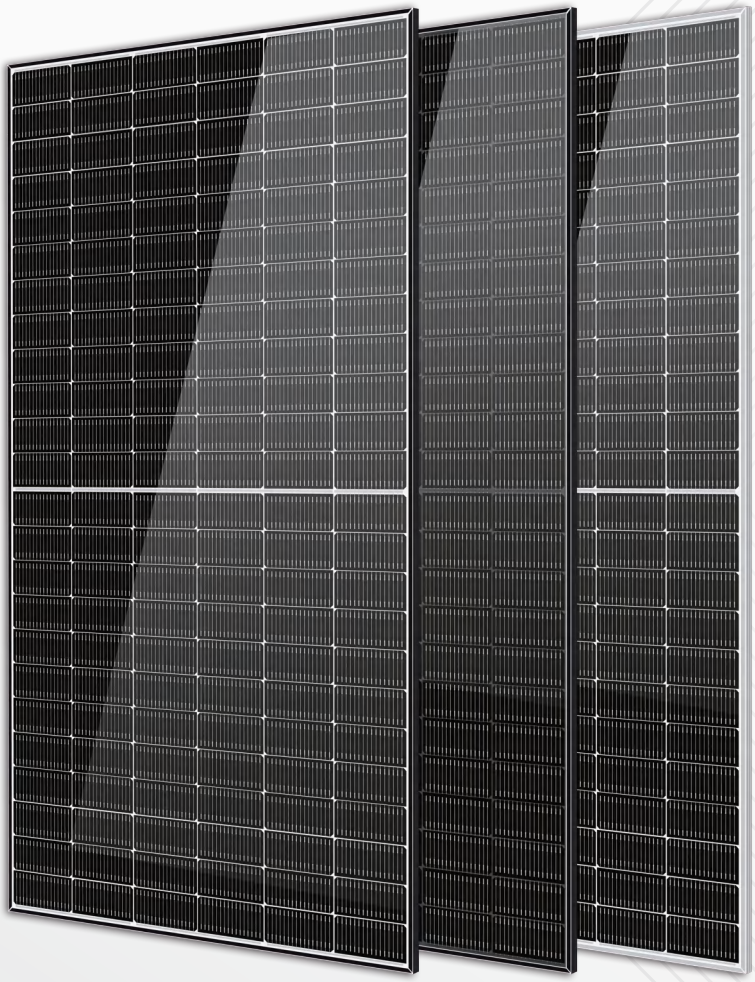
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 144 half-cells monocrystalline modules is up to 605W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

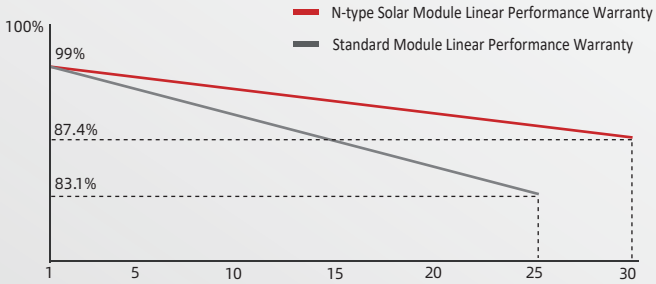
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

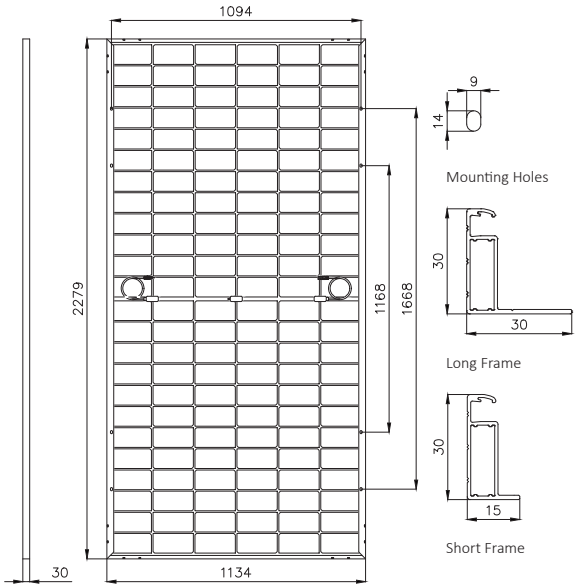
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 182-144 TC-D

MECHANICAL DIAGRAMS



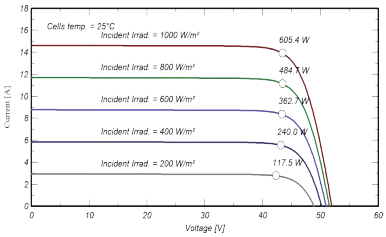
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

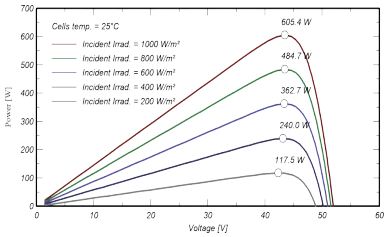
Weight	31.5kg
Dimension	2279×1134×30mm
Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/740pcs per 40'HC

CURVES OF PV MODULE

HS605TC-MHO-D



HS605TC-MHO-D



ELECTRICAL CHARACTERISTICS

Module Type	HS585TC-MHO-D		HS590TC-MHO-D		HS595TC-MHO-D		HS600TC-MHO-D		HS605TC-MHO-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	585	444	590	448	595	451	600	455	605	459
Open Circuit Voltage(Voc/V)	51.52	48.70	51.63	48.90	51.74	49.00	51.85	49.10	51.95	49.20
Short Circuit Current(Isc/A)	14.30	11.55	14.38	11.62	14.46	11.68	14.54	11.74	14.62	11.81
Maximum Power Voltage(Vmp/V)	43.33	40.50	43.44	40.70	43.55	40.80	43.66	40.90	43.76	41.00
Maximum Power Current(Imp/A)	13.51	10.94	13.59	11.00	13.66	11.05	13.74	11.12	13.83	11.20
Module Efficiency(%)	22.6		22.8		23.0		23.2		23.4	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	638	644	649	654	660
Open Circuit Voltage(Voc/V)	51.60	51.70	51.80	51.90	52.00
Short Circuit Current(Isc/A)	15.64	15.73	15.82	15.91	16.00
Maximum Power Voltage(Vmp/V)	43.33	43.44	43.55	43.66	43.76
Maximum Power Current(Imp/A)	14.72	14.83	14.90	14.98	15.08

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

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YouTube FaceBook Linkedin WeChat

590W

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HS 182-144 TC-D *Ocean* *N-type Bifacial Modules*

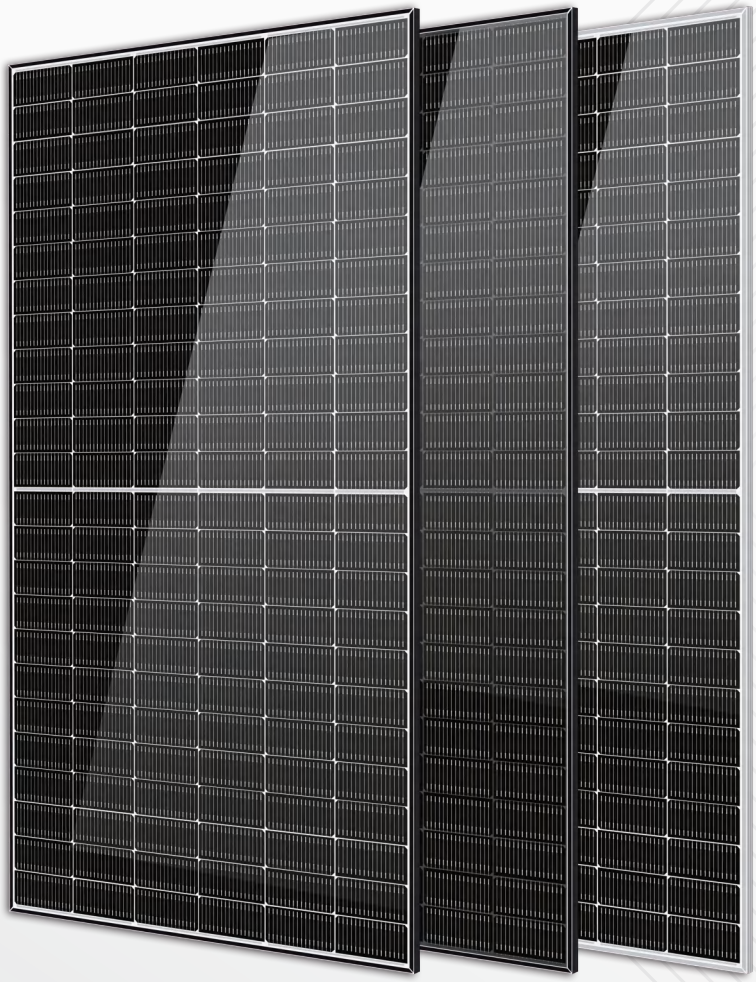
SMBB Half-Cell Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Higher Output Power
The output power of 144 half-cells monocrystalline modules is up to 590W.

Low Light Features
Higher performance under low light environment.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

N-type With Very Low LID
N-type solar cell has very low LID naturally which can reduce power degradation.



IEC61215:2021

IEC61730:2023

ISO9001:2015 Quality Management System

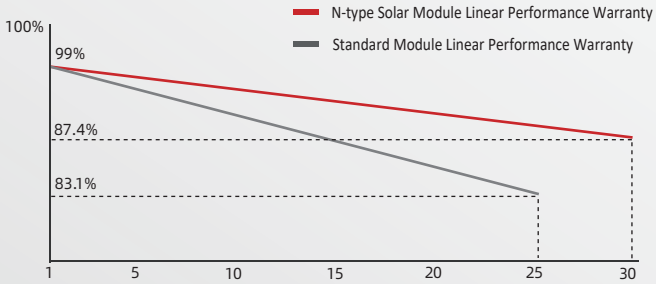
ISO14001:2015 Environmental Management System

ISO45001:2018 Occupational Health and Safety Management System

CE: Europe Standard

China Quality Certification Centre

Solar Product Certification



15 15-year product warranty

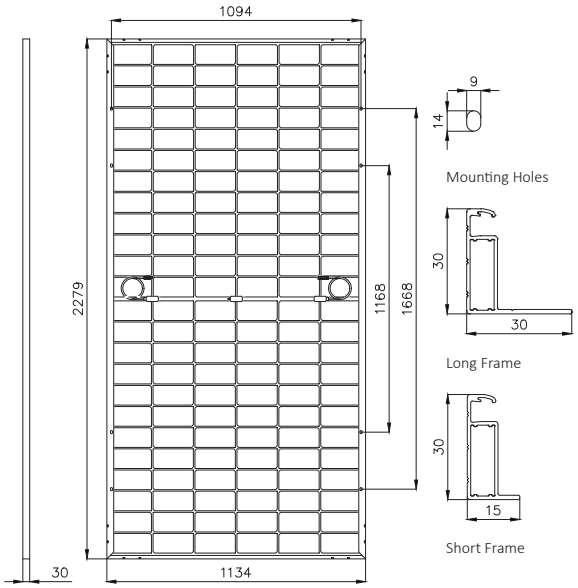
30 30-year linear power output warranty

HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
No.300 Huiming Road, Huishan District, 214177 Wuxi, Jiangsu, P.R. China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-Straße 27-29, 63225 Langen, Germany

HS 182-144 TC-D

MECHANICAL DIAGRAMS



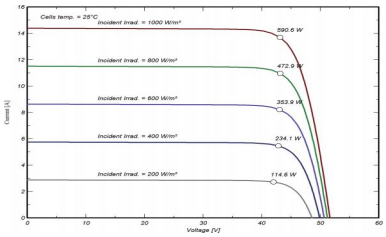
Unit:mm Tolerance:±2mm

MECHANICAL PARAMETERS

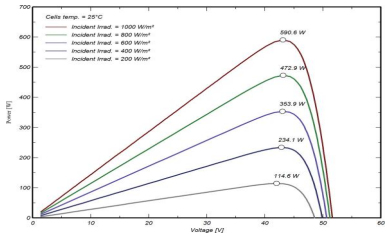
Weight	31.5kg
Dimension	2279×1134×30mm
Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm²,±300mm (length can be customized)
Connector	MC4 compatible
Glass	2.0+2.0mm AR coated heat strengthened glass
Frame	Anodized aluminum alloy frame
Packaging	37pcs per pallet/740pcs per 40'HC

CURVES OF PV MODULE

HS590TC-MHO-D



HS590TC-MHO-D



ELECTRICAL CHARACTERISTICS

Module Type	HS570TC-MHO-D		HS575TC-MHO-D		HS580TC-MHO-D		HS585TC-MHO-D		HS590TC-MHO-D	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power(Pmax/W)	570	432	575	436	580	439	585	444	590	448
Open Circuit Voltage(Voc/V)	51.19	48.41	51.30	48.52	51.41	48.62	51.52	48.73	51.63	48.94
Short Circuit Current(Isc/A)	14.05	11.35	14.14	11.43	14.22	11.49	14.30	11.55	14.38	11.62
Maximum Power Voltage(Vmp/V)	43.00	40.21	43.11	40.31	43.22	40.42	43.33	40.53	43.44	40.72
Maximum Power Current(Imp/A)	13.26	10.74	13.34	10.81	13.42	10.87	13.51	10.94	13.59	11.01
Module Efficiency(%)	22.1		22.3		22.5		22.6		22.8	

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO (BNPI)

Maximum Power(Pmax/W)	621	627	632	637	644
Open Circuit Voltage(Voc/V)	51.31	51.40	51.50	51.60	51.70
Short Circuit Current(Isc/A)	15.37	15.45	15.55	15.64	15.73
Maximum Power Voltage(Vmp/V)	42.41	42.60	42.70	42.80	42.90
Maximum Power Current(Imp/A)	14.63	14.72	14.81	14.90	15.00

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

OPERATING PARAMETERS

Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	80±5%
Fire Rating	IEC Class A

MECHANICAL LOADING

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

TEMPERATURE RATINGS (STC)

Temperature Coefficient of Isc	+0.04%/°C
Temperature Coefficient of Voc	-0.23%/°C
Temperature Coefficient of Pmax	-0.28%/°C

*The actual test value may be slightly deviated from the technical parameters due to the difference in test methods.

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.
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Version number: HS182-TC-D-2025-A0

YouTube FaceBook Linkedin WeChat

Mono Bifacial

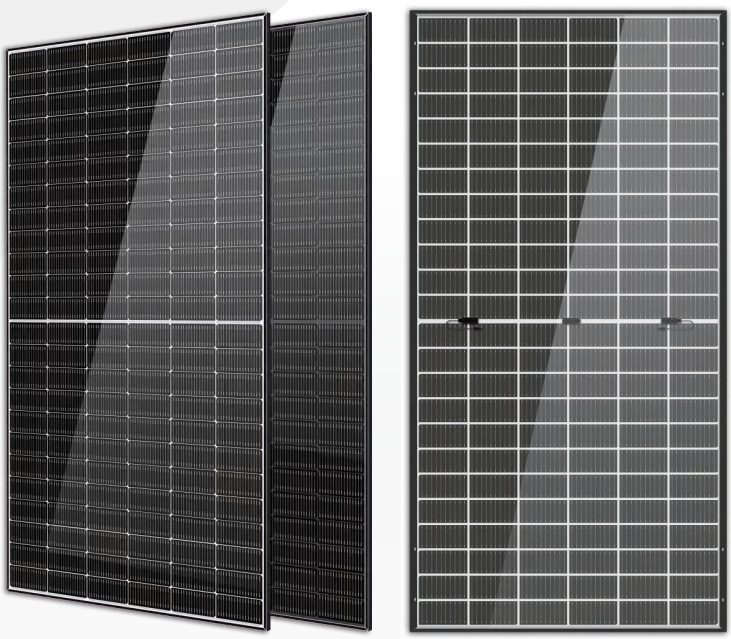
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Solar Ocean

570–590 Watt N–Type

MONO–BIFACIAL MODULE

- IEC61215: 2021
  IEC61730: 2023
  TUV Rheinland Standard
- Lloyd'S Ariel Re
  Solar Performance Insurance
- ISO9001: 2015
  Quality Management System
- ISO14001:
  Environmental Management System
- CE: Europe Standard
- Inmetro Certificate
- Japan JP-AC
- China Quality Certification Centre
  Solar product certification



KEY FEATURES

SMBB Cell
More uniform current collection capability, reducing the current heat loss of the internal cells.

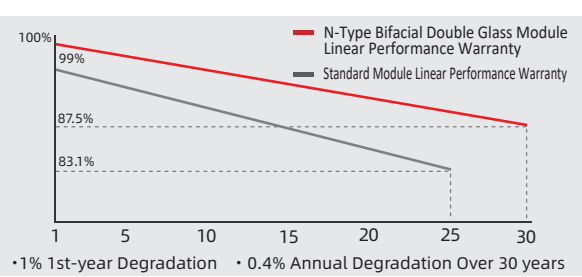
Low Light Features
Higher performance under low light environment.

Higher Output Power
The output power of 144 half-cells Monocrystalline modules is up to 590W.

LID Free
N-type solar cell has no LID naturally which can increase power generation.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosion test by the third party.

Load Capacity
Mechanical load tests including wind load 2400 Pa and snow load 5400 Pa.



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NO.30-5, East Yanxin Road, Huishan District, Wuxi 214177 Jiangsu P.R China

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info@horaysolar.com www.horaysolar.com
Robert-Bosch-StraBe 27-29,63225 Langen , Germany

SPECIFICATIONS

Weight	31.5kg
Dimension	2279mm*1134mm*30mm
Cell Dimension	182*91mm
Cell Amount	72*2 pcs
Maximum System Voltage	1500V
Junction Box	IP68
Type of the front glass	2.0mm Coated ultra clear glass
Type of the back glass	2.0mm Heat-strengthened glass
Frame	Aluminum Alloy
Cable	4mm²,+300,-300mm/±1300mm Length can be customized
Connector	MC4 compatible
Application Level	Class A

ELECTRICAL PARAMETERS AT STC

Module Type	HS570TC-MHO-D	HS575TC-MHO-D	HS580TC-MHO-D	HS585TC-MHO-D	HS590TC-MHO-D
Power	570W	575W	580W	585W	590W
Open Circuit Voltage	51.19V	51.30V	51.41V	51.52V	51.63V
Short Circuit Current	14.05A	14.14A	14.22A	14.30A	14.38A
Maximum Power Voltage	43.01V	43.11V	43.22V	43.33V	43.44V
Maximum Power Current	13.26A	13.34A	13.42A	13.51A	13.59A
Module Efficiency	22.06%	22.25%	22.50%	22.60%	22.80%

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m2, spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL PARAMETERS AT BNPI

Power	621W	627W	632W	637W	644W
Open Circuit Voltage	51.31V	51.42V	51.53V	51.64V	51.74V
Short Circuit Current	15.37A	15.45A	15.55A	15.64A	15.73A
Maximum Power Voltage	42.41V	42.63V	42.72V	42.84V	42.95V
Maximum Power Current	14.63A	14.72A	14.81A	14.9A	15A

*Rear side power gain:The additional gain from the rear side compared to the power of the front side at the standard test condition.It depends on mounting (structure,height,tilt angle etc.)and albedo of the ground.

ELECTRICAL PARAMETERS AT NMOT

Power	432W	436W	439W	444W	448W
Open Circuit Voltage	48.41V	48.52V	48.62V	48.73V	48.94V
Short Circuit Current	11.35A	11.43A	11.49A	11.55A	11.62A
Maximum Power Voltage	40.21V	40.31V	40.42V	40.53V	40.72V
Maximum Power Current	10.74A	10.81A	10.87A	10.94A	11.01A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m2, spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

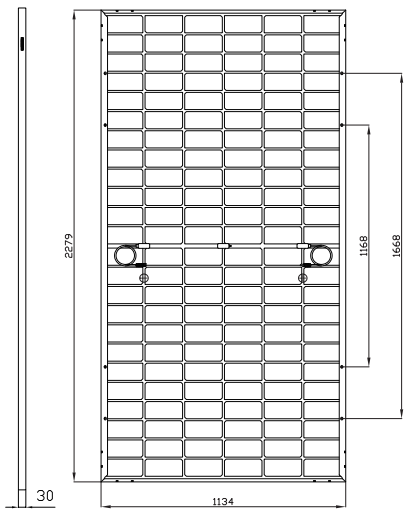
TEMPERATURE CHARACTERISTICS

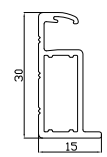
NMOT	45±2°C
Temp Coefficient of ISC	+0.04%/°C
Temp Coefficient of VOC	-0.23%/°C
Temp Coefficient of Pmax	-0.28%/°C

PACKING CONFIGURATION

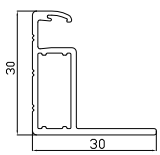
Modules/Pallet	37 Pieces
Packaging Description	20 Pallets, Total=(37+37)x10=740 Pieces
Modules/40'Container	740 Pieces

MECHANICAL DIAGRAMS





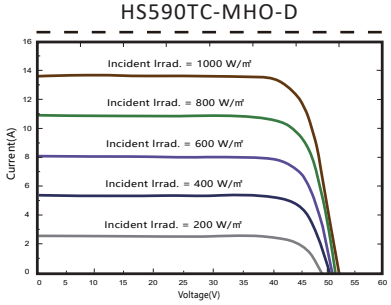
Section diagram of short frame profile

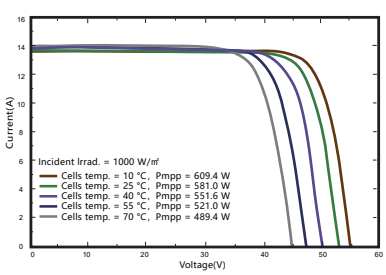


Section diagram of long frame profile

IV CHARACTERISTICS

HS590TC-MHO-D





MAXIMUM RATING

Power selection	0~+5W
Measuring uncertainty of Pm	±3%
Operating Temperature	-40°C~+85°C
Wind Load/Snow Load	2400pa/5400pa
Fuse Current	25A

15 YEARS Quality Warranty

30 YEARS Power Warranty

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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Version number: TC_MHO_D_EN_2024_A

Mono Bifacial

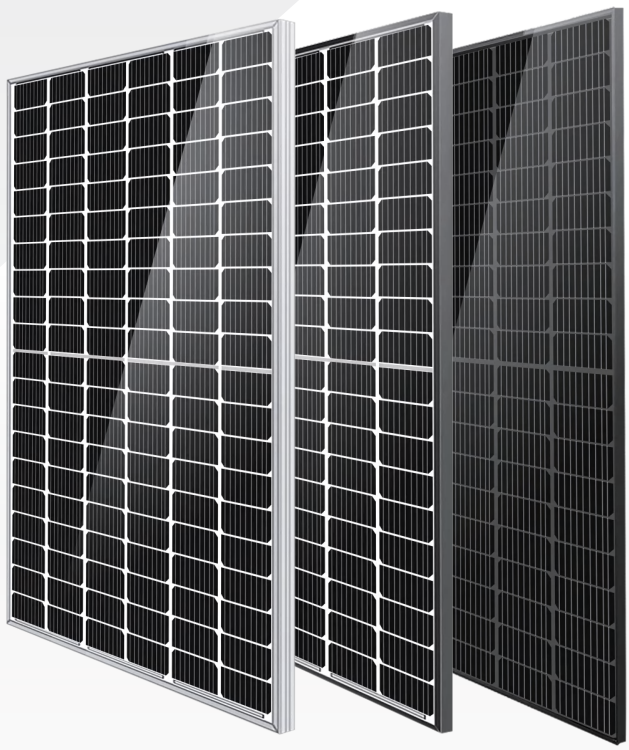
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Solar Lake

370–385 Watt

MONO–FACIAL MODULE

- IEC61215: 2021
  IEC61730: 2023
  TUV Rheinland Standard
- Lloyd'S Ariel Re
  Solar Performance Insurance
- ISO9001: 2015
  Quality Management System
- ISO14001:
  Environmental Management System
- CE: Europe Standard
- Inmetro Certificate
- Japan JP-AC
- China Quality Certification Centre
  Solar product certification



KEY FEATURES

MBB Cell
More uniform current collection capability, reducing the current heat loss of the internal cells.

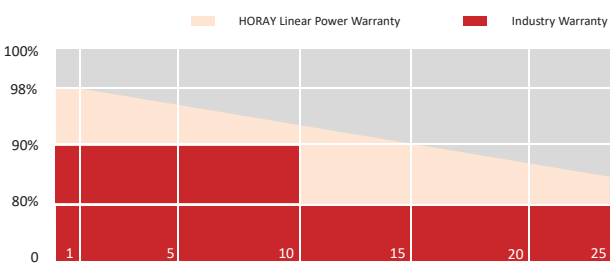
Low Light Features
Higher performance under low light environment.

Higher Output Power
The output power of 120 half-cells Monocrystalline modules is up to 385W.

PID Protection
Ensure the attenuation probability caused by PID phenomenon is minimized.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosion test by the third party.

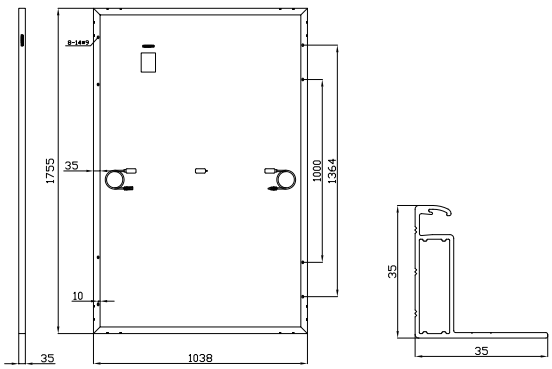
Load Capacity
Mechanical load tests including wind load 2400 Pa and snow load 5400 Pa.



HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
NO.30-5, East Yanxin Road, Huishan District, Wuxi 214177 Jiangsu P.R China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-StraBe 27-29,63225 Langen , Germany

MECHANICAL DIAGRAMS



SPECIFICATIONS

Weight	20kg
Dimension	1755mm*1038mm*35mm
Cell Dimension	166*83mm
Cell Amount	60*2 pcs
Maximum System Voltage	1500V
Junction Box	IP68
Frame	Aluminum Alloy
Cable	4mm²,+300,-300mm/±1000mm Length can be customized
Connector	MC4 compatible
Application Level	Class A

ELECTRICAL PARAMETERS AT STC

Module Type	HS370-MHL	HS375-MHL	HS380-MHL	HS385-MHL
Power	370W	375W	380W	385W
Open Circuit Voltage	41.30V	41.50V	41.70V	41.90V
Short Circuit Current	11.37A	11.46A	11.55A	11.64A
Maximum Power Voltage	34.10V	34.30V	34.50V	34.70V
Maximum Power Current	10.86A	10.95A	11.04A	11.10A
Module Efficiency	20.31%	20.59%	20.86%	21.13%

* Under Standard Test Conditions (STC) of irradiance of 1000 W/㎡, spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL PARAMETERS AT NMOT

Power	280W	284W	288W	292W
Open Circuit Voltage	38.67V	38.90V	39.13V	39.46V
Short Circuit Current	9.10A	9.17A	9.24A	9.31A
Maximum Power Voltage	32.23V	32.42	32.61V	32.88V
Maximum Power Current	8.69A	8.76A	8.83A	8.88A
Module Efficiency	15.37%	15.59%	15.81%	16.03%

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/㎡, spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

TEMPERATURE CHARACTERISTICS

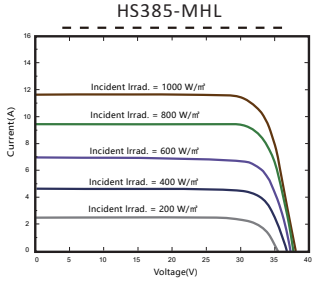
NMOT	45±2°C	Temp Coefficient of ISC	+0.05%/°C
Temp Coefficient of VOC	-0.28%/°C	Temp Coefficient of Pmax	-0.34%/°C

PACKING CONFIGURATION

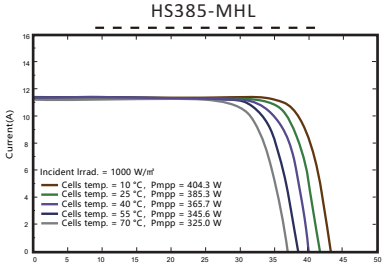
Modules/Pallet	32 Pieces	Modules/40'Container	884 Pieces
Packaging Description	26 Pallets, Total=(32+32+4)x13=884 Pieces		

IV CHARACTERISTICS

HS385-MHL



HS385-MHL



MAXIMUM RATING

Power selection	0~+5W
Measuring uncertainty of Pm	0~±3%
Operating Temperature	-40°C~+85°C
Wind Load/Snow Load	2400pa/5400pa
Fuse Current	20A

15 YEARS Quality Warranty

25 YEARS Power Warranty

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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Version number: MHO_EN_2024_A

Mono Bifacial

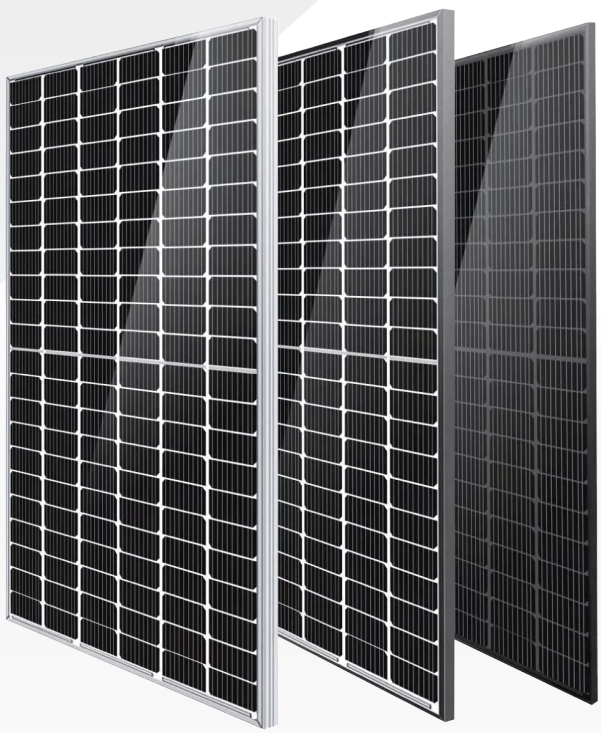
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Solar Lake

410–425 Watt

MONO–FACIAL MODULE

- IEC61215: 2021
  IEC61730: 2023
  TUV Rheinland Standard
- Lloyd'S Ariel Re
  Solar Performance Insurance
- ISO9001: 2015
  Quality Management System
- ISO14001:
  Environmental Management System
- CE: Europe Standard
- Inmetro Certificate
- Japan JP-AC
- China Quality Certification Centre
  Solar product certification



KEY FEATURES

MBB Cell
More uniform current collection capability, reducing the current heat loss of the internal cells.

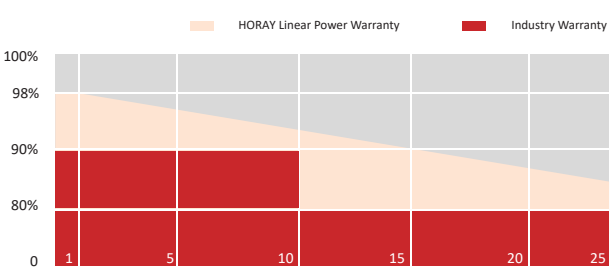
Low Light Features
Higher performance under low light environment.

Higher Output Power
The output power of 132 half-cells Monocrystalline modules is up to 425W.

PID Protection
Ensure the attenuation probability caused by PID phenomenon is minimized.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosion test by the third party.

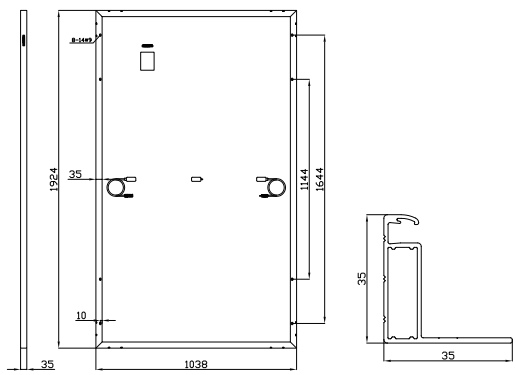
Load Capacity
Mechanical load tests including wind load 2400 Pa and snow load 5400 Pa.



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Robert-Bosch-StraBe 27-29,63225 Langen , Germany

MECHANICAL DIAGRAMS



SPECIFICATIONS

Weight	21.3kg
Dimension	1924mm*1038mm*35mm
Cell Dimension	166*83mm
Cell Amount	66*2 pcs
Maximum System Voltage	1500V
Junction Box	IP68
Frame	Aluminum Alloy
Cable	4mm²,+300,-300mm/±1100mm Length can be customized
Connector	MC4 compatible
Application Level	Class A

ELECTRICAL PARAMETERS AT STC

Module Type	HS410-MHL	HS415-MHL	HS420-MHL	HS425-MHL
Power	410W	415W	420W	425W
Open Circuit Voltage	45.70V	45.90V	46.10V	46.30V
Short Circuit Current	11.43A	11.52A	11.61A	11.69A
Maximum Power Voltage	37.82V	38.02V	38.22V	38.42V
Maximum Power Current	10.84A	10.92A	10.99A	11.06A
Module Efficiency	20.53%	20.78%	21.03%	21.28%

* Under Standard Test Conditions (STC) of irradiance of 1000 W/㎡, spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL PARAMETERS AT NMOT

Power	310W	314W	318W	322W
Open Circuit Voltage	42.90V	43.13V	43.40V	43.67V
Short Circuit Current	9.14A	9.22A	9.29A	9.35A
Maximum Power Voltage	35.75V	35.94V	36.17V	36.39V
Maximum Power Current	8.67A	8.74A	8.79A	8.85A
Module Efficiency	15.52%	15.72%	15.92%	16.12%

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/㎡, spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

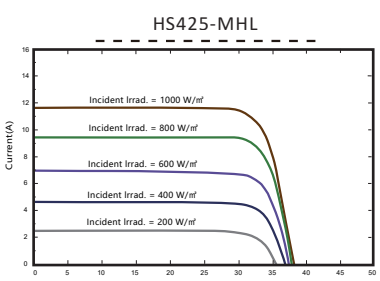
TEMPERATURE CHARACTERISTICS

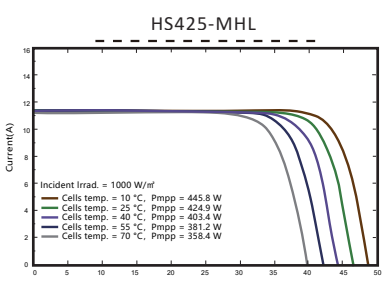
NMOT	45±2°C	Temp Coefficient of ISC	+0.05%/°C
Temp Coefficient of VOC	-0.28%/°C	Temp Coefficient of Pmax	-0.34%/°C

PACKING CONFIGURATION

Modules/Pallet	32 Pieces	Modules/40'Container	816 Pieces
Packaging Description	24 Pallets, Total=(32+32+4)x12=816 Pieces		

IV CHARACTERISTICS





MAXIMUM RATING

Power selection	0~+5W
Measuring uncertainty of Pm	0~±3%
Operating Temperature	-40°C~+85°C
Wind Load/Snow Load	2400pa/5400pa
Fuse Current	20A

15 YEARS Quality Warranty

25 YEARS Power Warranty

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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Version number: MHO_EN_2024_A

Mono Bifacial

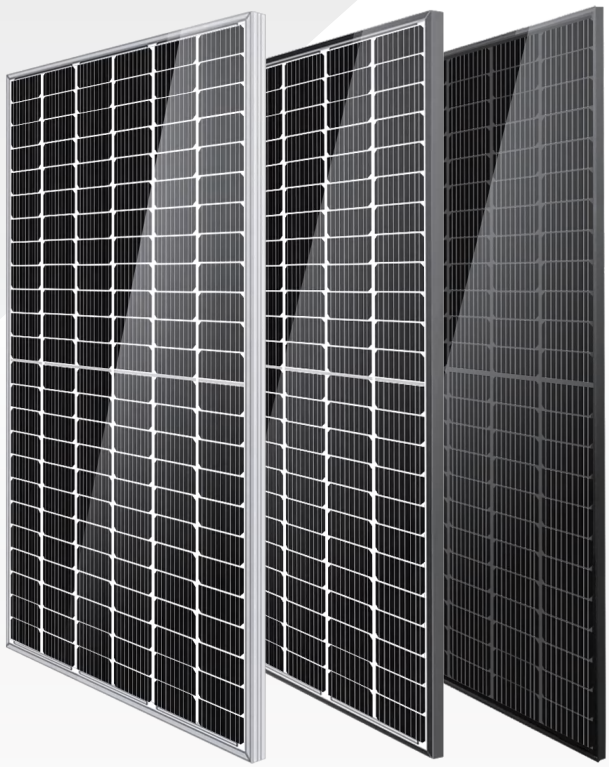
HORAY | TIER1 BloombergNEF

Solar Lake

445–465 Watt

MONO–FACIAL MODULE

- IEC61215: 2021
  IEC61730: 2023
  TUV Rheinland Standard
- Lloyd'S Ariel Re
  Solar Performance Insurance
- ISO9001: 2015
  Quality Management System
- ISO14001:
  Environmental Management System
- CE: Europe Standard
- Inmetro Certificate
- Japan JP-AC
- China Quality Certification Centre
  Solar product certification



KEY FEATURES

MBB Cell
More uniform current collection capability, reducing the current heat loss of the internal cells.

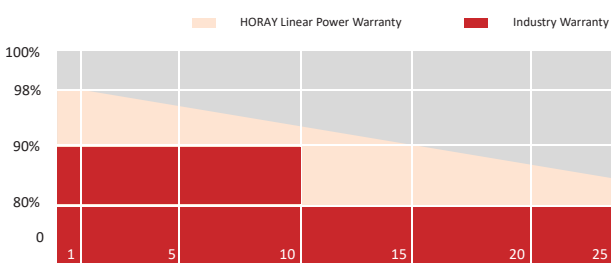
Low Light Features
Higher performance under low light environment.

Higher Output Power
The output power of 144 half-cells Monocrystalline modules is up to 465W.

PID Protection
Ensure the attenuation probability caused by PID phenomenon is minimized.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

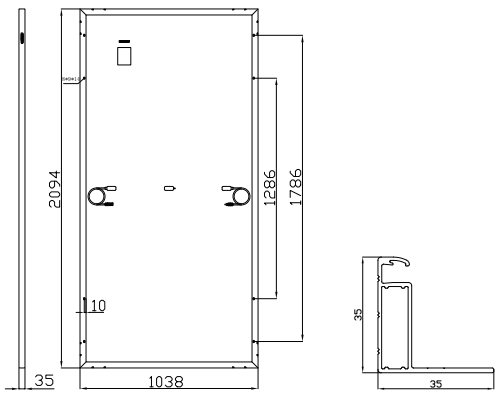
Load Capacity
Mechanical load tests including wind load 2400 Pa and snow load 5400 Pa.



HEADQUARTER: HORAY SOLAR CO., LTD.
sales@horaysolar.com www.horaysolar.com +86-510 83580688
NO.30-5, East Yanxin Road, Huishan District, Wuxi 214177 Jiangsu P.R China

GLOBAL MARKETING AND SERVICE: HORAY SOLAR GMBH
info@horaysolar.com www.horaysolar.com
Robert-Bosch-StraBe 27-29,63225 Langen , Germany

MECHANICAL DIAGRAMS



SPECIFICATIONS

Weight	24kg
Dimension	2094mm*1038mm*35mm
Cell Dimension	166*83mm
Cell Amount	72*2 pcs
Maximum System Voltage	1500V
Junction Box	IP68
Frame	Aluminum Alloy
Cable	4mm²,+300,-300mm/±1200mm Length can be customized
Connector	MC4 compatible
Application Level	Class A

ELECTRICAL PARAMETERS AT STC

Module Type	HS445-MHL	HS450-MHL	HS455-MHL	HS460-MHL	HS465-MHL
Power	445W	450W	455W	460W	465W
Open Circuit Voltage	49.80V	50.00V	50.20V	50.40V	50.60V
Short Circuit Current	11.40A	11.47A	11.54A	11.61A	11.68A
Maximum Power Voltage	41.20V	41.40V	41.60V	41.80V	42.00V
Maximum Power Current	10.81A	10.88A	10.94A	11.00A	11.08A
Module Efficiency	20.47%	20.70%	20.93%	21.16%	21.39%

* Under Standard Test Conditions (STC) of irradiance of 1000 W/ ㎡, spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL PARAMETERS AT NMOT

Power	336W	340W	344W	348W	352W
Open Circuit Voltage	46.62V	46.88V	47.17V	47.45V	47.65V
Short Circuit Current	9.12A	9.18A	9.23A	9.29A	9.34A
Maximum Power Voltage	38.85V	39.06V	39.31V	39.55V	39.71V
Maximum Power Current	8.65A	8.70A	8.75A	8.80A	8.86A
Module Efficiency	15.46%	15.64%	15.83%	16.01%	16.19%

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/ ㎡, spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

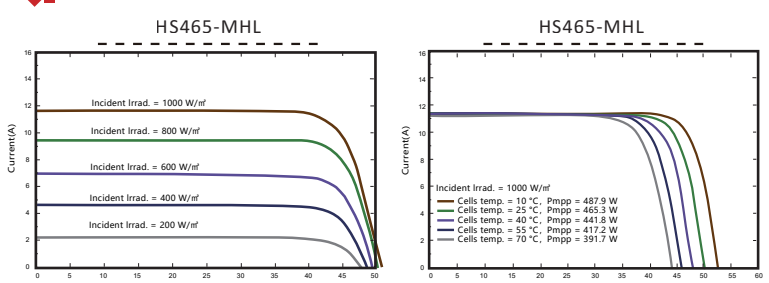
TEMPERATURE CHARACTERISTICS

NMOT	45±2°C	Temp Coefficient of ISC	+0.05%/°C
Temp Coefficient of VOC	-0.28%/°C	Temp Coefficient of Pmax	-0.34%/°C

PACKING CONFIGURATION

Modules/Pallet	32 Pieces	Modules/40'Container	748 Pieces
Packaging Description	22 Pallets, Total=(32+32+4)x11=748 Pieces		

IV CHARACTERISTICS



MAXIMUM RATING

Power selection	0~+5W
Measuring uncertainty of Pm	0~±3%
Operating Temperature	-40°C~+85°C
Wind Load/Snow Load	2400pa/5400pa
Fuse Current	20A

15 YEARS Quality Warranty

25 YEARS Power Warranty

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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Installation Manual for

HORAY PV Module Collection

HORAY

Applicable Module Type

No.	Module Type	Size
1	HSxxxTC-MHG-D (xxx=670-730, in steps of 5, 132 cells)	2384x1303x35/33mm
2	HSxxxTC-MHG-D (xxx=610-660, in steps of 5, 120 cells)	2174x1303x35/33mm
3	HSxxxTC-MHG-D (xxx=560-605, in steps of 5, 110 cells)	2384x1096x35/33mm
4	HSxxxTC-MHG-D (xxx=550-595, in steps of 5, 108 cells)	1965x1303x35/33mm
5	HSxxxTC-MHG-D (xxx=510-550, in steps of 5, 100 cells)	2174x1096x35/33mm
6	HSxxxTC-MHC-D (xxx=585-640, in steps of 5, 132 cells)	2382x1134x30/35mm
7	HSxxxTC-MHC-D (xxx=535-580, in steps of 5, 120 cells)	2178x1134x30/35mm
8	HSxxxTC-MHC-D (xxx=475-520, in steps of 5, 108 cells)	1960x1134x30/35mm
9	HSxxxTC-MHC-D (xxx=425-465, in steps of 5, 96 cells)	1762x1134x30/35mm
10	HSxxxTC-MHO-D (xxx=560-605, in steps of 5, 144 cells)	2279x1134x35/30mm
11	HSxxxTC-MHO-D (xxx=515-550, in steps of 5, 132 cells)	2094x1134x35/30mm
12	HSxxxTC-MHO-D (xxx=470-500, in steps of 5, 120 cells)	1909x1134x35/30mm
13	HSxxxTC-MHO-D (xxx=420-450, in steps of 5, 108 cells)	1722x1134x35/30mm
14	HSxxx-MHG-D (xxx=640-660, in steps of 5, 132 cells)	2384x1303x35/30mm
15	HSxxx-MHG-D (xxx=585-600, in steps of 5, 120 cells)	2174x1303x35/30mm
16	HSxxx-MHG-D (xxx=535-550, in steps of 5, 110 cells)	2384x1096x35/30mm
17	HSxxx-MHG-D (xxx=485-500, in steps of 5, 100 cells)	2174x1096x35/30mm
18	HSxxx-MHO-D (xxx=535-560, in steps of 5, 144 cells)	2279x1134x35/30mm
19	HSxxx-MHO-D (xxx=495-515, in steps of 5, 132 cells)	2094x1134x35/30mm
20	HSxxx-MHO-D (xxx=450-470, in steps of 5, 120 cells)	1909x1134x35/30mm
21	HSxxx-MHO-D (xxx=405-420, in steps of 5, 108 cells)	1722x1134x35/30mm
22	HSxxx-MHL-D (xxx=445-465, in steps of 5, 144 cells)	2094x1038x35/30mm
23	HSxxx-MHL-D (xxx=410-425, in steps of 5, 132 cells)	1924x1038x35/30mm
24	HSxxx-MHL-D (xxx=370-385, in steps of 5, 120 cells)	1755x1038x35/30mm

1. Introduction

Thanks for choosing HORAY SOLAR photovoltaic (PV) modules.

Electrical and mechanical installation information will be introduced in this installation manual, so please read and understand the information before installing HORAY modules. In addition, this manual also contains important safety information that you should be familiar with. All contents in this manual are intellectual properties of HORAY which originates from long term of technical exploration and experience accumulation of HORAY.

This installation manual does not entail any explicit or implicit quality warranty and does not stipulate on compensation schemes for losses, module damages or other costs caused by or related to module installation, operation, utilization and maintenance process. When there is a dispute between the parties about the root -cause of module damage, the judgment is based on the quality standards as per contract.

HORAY will not take any responsibility if patent rights or the third party rights are infringed by use of modules. HORAY reserves the rights for modifying product manual or installation manual without advanced notice. It is recommended to visit our website regularly at www.horaysolar.com for the latest version of this installation manual.

If customers fail to install modules as per requirements set forth in this manual, the limited warranty provided for customers will be invalid. In addition, suggestions in this manual are to improve safety of module installation, which are tested and proved through years of experience, Please provide this manual to PV system users for reference and inform the advises on operation, maintenance requirements etc.

1.1 Rules and regulations

The mechanical and electrical installation of modules must comply with all local applicable regulations and codes, including electrical norms, including construction codes and electrical connection requirements, as well as mounting and other equipment instructions. Regulations may differ based on site-specific conditions, such as building roof installation, vehicle applications, etc. Additionally, requirements may vary depending on the installed system voltage (DC or AC). For specific terms, please contact your local authorities.

1.2 Disclaimer

HORAY reserves the right to change this user manual without prior notice. This user manual is not a warranty document and does not carry any warranty significance. If the components are not operated in accordance with the requirements listed in this manual during the operation process (including but not limited to product disassembly/packaging, loading/unloading, transportation, storage, installation, use, operation, or maintenance), it will result in the

invalidation of the product's limited warranty. HORAY is not responsible for any losses caused by improper operations or mistakes by the customer that do not follow the instructions in this user manual, including but not limited to any product damage, personal injury, or other property loss resulting from failure to follow the instructions in this manual during component operation.



2. General Information

Two labels on the module contain the information below:

1. Nameplate: product type, rated power,rated current, rated voltage, open circuit voltage, short circuit current under testing conditions, certification indicator, maximum system voltage, etc.

2. Serial Number label: A unique serial number which is laminated inside the module permanently which can be found in the front of the module. There is another same serial number beside the module nameplate.

2.1 Regular Safety

Handle modules during deliveries and transport with care to avoid large shocks that could damage the assembly or/and cause cracks in the cell.

Do not apply excessive force or objects on the module surface, do not impact, and do not twist the module frame to prevent cell damages and/or cell cracks.

Do not use the modules to replace or partly replace roofs and walls of buildings. Follow your local regulations for building integration of photovoltaic.

Avoid touching or modifying any part of the modules unless explicitly authorized by HORAY. Refrain from removing, attempting to repair, or disassembling any component installed by HORAY.

Junction boxes and female-male connectors interconnections of the modules covered by this manual meet IP68 (IEC60529) requirements, However, they must be protected from prolonged direct sunlight and water immersions.to ensure long-term reliability.

Do not drill holes in the frame without authorization from HORAY, as it may cause corrosion or other negative effects.

Do not lift modules using the attached cables or the junction box.

Prohibit modules, junction boxes and connectors from coming into contact with unapproved chemicals: e.g., petrol, oil, acetone, alcohol, film strippers, potting compounds, TBP, cleaning agents, herbicides, rust inhibitors, descaling agents, etc. For more information, please contact HORAY technical support department.

Do not use junction boxes or connectors that are contaminated (with dust, corrosion, etc.), or broken modules.

Do not stand or step on the module as there is a risk of damage to the modules and injury to the user.

Pay attention to preventing sand, stones or other hard debris kicked up by operation and maintenance vehicles or lawn mowers during operation from striking the surface of the modules, causing glass or module damage.

Use appropriate protective equipment when installing modules to avoid direct contact, reduce the risk of electric shock, and protect hands from sharp edges. This includes standard and insulated safety tools and equipment (safety helmet, insulated gloves and rubber shoes, harness or belts, ladder, etc.).

When installing or maintaining the PV system, please do not wear metal rings, watches or other metal products, to avoid electric shock dangers or module damage.

Do not use wet tools, and refrain from working in rain, snow or windy conditions.

Modules should be stored at the project site with additional rain protection to avoid direct open-air placement before they are installed.

In order to avoid external matter such as sand or water vapour from entering and causing connection safety problems, once the modules are taken out of the box and installed, the connectors between the modules need to be connected in time, and the connectors need to be kept dry and clean during the installation process. In areas with heavy dust, high salinity, or severe pollution, dust plugs must be installed on the connectors to prevent contamination before the connectors are mated. Prior to purchasing the modules, it is necessary to communicate with HORAY about the project site conditions to ensure the provision of dust plugs. However, please note that the exposure time of dust plugs to the environment should not exceed one month.

2.2 Electrical performance safety

Modules generate DC electrical energy when exposed to sunlight or other light sources. Improper contact with live parts, such as terminals, may result in burns, sparks, and lethal shock.

Damage to, or opening of the front or rear glass of the module allow moisture ingress that compromise the internal circuit of the panel, can create serious electrical hazards, including the risk of fire. These modules cannot be repaired and must be removed and replaced immediately.

Electrical specifications shown in data-sheets are measured under Standard Test Conditions (STC, thus: Irradiance 1000W/m^2, module cell temperature 25℃, air mass = 1,5. The current and voltage generated by modules in different environments are different from measured at

STC. Therefore, when determining the specifications of the rated voltage, cable capacity, fuse capacity, controller capacity, and other output power related specifications, take the values of 1.25 times the short-circuit current and open-circuit voltage marked on the module. This multiplier serves as a reference and is commonly used, however, it is important to consult with your inverter/controller supplier for system configuration design, as local regulations may vary, impacting these considerations.

Snow, water, or other reflective medium in surrounding environments that intensify light reflection will increase output current and power. And module voltage and power will increase under low temperature condition.

Artificially concentrated sunlight shall not be directed on the module. Do not expose the back of the single glass module directly to sunlight.

To prevent arcs and electrical shocks, do not disconnect modules under load without authorization; if disconnecting the connector is needed, turn off DC and AC inverters or cut off the main switch of the converter first.

PV module operation can only be stopped when they are kept from sunlight or covered by hard board (opaque material) or UV-proof materials.

When connecting a battery storage system, follow the battery manufacturer's instructions for correct installation operation, and maintenance to ensure system operation and user safety.

Due to the risk of electrical shock, do not perform any work if the terminals of the module are wet.

Do not operate on wet modules, if this is needed, only by wearing PPE.

Please follow the cleaning requirements in this manual when cleaning modules, refer to section 6.2.

Only the modules of the same size and the specifications within same range can be connected in series.

The number of modules that can be connected at a PV installation shall be determined by a qualified institution or person in accordance with the design specifications of the photovoltaic system and the local electrical design specifications.

Connect the male and female connectors correctly, before connecting, always ensure that the contacts are corrosion free, clean, and dry; Check the wiring condition, all wires shall not be detached from the modules, and secure the wires with cable ties so that the wires do not scratch or squeeze the rear side of the module.

Do not touch the module, junction box or the connectors with bare hands during installation or under sunlight,regardless if the module is connected to or disconnected from the system. The glass surface and the frame may be hot, posing a risk of burns and electric shock.

Do not insert any metal object into the connector.

Keep connectors dry and clean, ensuring they are in good operating condition.

2.3 Operation safety

Read and follow the manual "Handling, Storage and Unpacking Instructions" to ensure proper management of the pallets. Custom unpacking methods are prohibited.

Before unpacking, please check the product type, power bins, serial number, and relevant suggestions on the paper of the packaging box.

t is recommended to use art knife or cutter to remove the packing belt and wrapping film. Violent removal is prohibited to avoid scratching the modules in the box.

Ensure a proper environment before unpacking as well as enough man force (2 people minimum) to prevent the module from slipping and hitting other modules, causing scratches, cracks, or deformation on the modules.

Once the modules are removed from the pallet, they shall be promptly installed and connected to the inverter. If they are not installed immediately, protective measures (such as adding rubber joint cover, etc) must be taken on the connectors' head to prevent water vapour, sand, dust, insects, or other contaminants from getting inside the connector and causing poor contact or corrosion of the connector.

When inspecting PV modules with AR coating technology, it will be normal to observe modules with a slight color difference at different angles.

Thermal expansion and contraction effects occur on the modules. During installation, the distance between two adjacent modules must be ⩾10mm. If there are special requirements, please confirm with HORAY before installation.

During the installation, as for module removal, maintenance, and any other related processes, it is recommended that the force applied between the cable and the connector, and the cable and the junction box, is not more than 60N.

Meaning of crossed -out wheeled dust bin:

(1) Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities.

Contact your local government for information regarding the collection systems available.



(2) If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being.

(3) When replacing old appliances with new ones, the retailer is legally obligated to take back your old appliance for disposals at least free of charge.

2.4 Fire safety

Please use appropriate module components to comply with local laws and regulations, as well as the building fire safety requirements before installation, such as fuses, circuit breakers and grounding connectors, etc.

HORAY modules fire rating is set according to IEC61730-2:2023 standard, and it can be found in the corresponding certificates. The fire Class Rating of a module for roof mounted system shall meet local code requirements in order to achieve the specified System fire Class Rating for a non-BIPV module. All PV systems have limitations of inclination required to maintain a specific System Fire Class Rating.

For roof-top installations, it is responsibility of the designers or installers to ensure that the roof is suitable not only in terms of the structural load-bearing capacity, but also the fire resistance for the installation of the PV modules in accordance to local regulation.

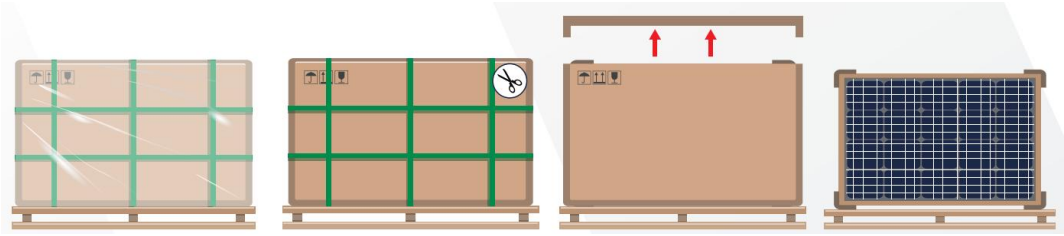
Make sure that the rear side of the module and the mounting surface are fully ventilated. When To facilitate ventilation and heat dissipation of the module, the minimum distance between the lower edge of the module frame and the highest point of the mounting surface must be ⩾ 10cm. For special installation methods, such as on corrugated metal sheets, the distance between the lower edge of the module frame and the roof shall be determined by the installer according to local regulations. Adequate ventilation must be ensured under local climatic conditions to keep the module within its operating temperature range. For minimum clearance requirements for other special cases, please contact HORAY technical support department.

Different roof structures and installation modes will affect fireproof performance of buildings. Improper installation may lead to the risk of fire.

Do not install the modules anywhere close to open flames or flammable materials (hay, straw, wood, solvents, oils,etc.), or exposed to flammable and explosive gases.

3. Unpacking mode

First place the packing on the level, dray and flattened ground, then successively remove the wrapping film, packing strap, upper cover, and carton. If you need to stack the Modules, please place the try on the level ground and the Modules must keep stacked on the tray; Number of Modules ≤10pcs, stacking time ≤4 days. The space between two Modules must be stuffed with isolating material, and the height of the isolating material must be 15mm higher than the top of the Module (wiring box). Without the isolating material, horizontal stacking is not recommended.



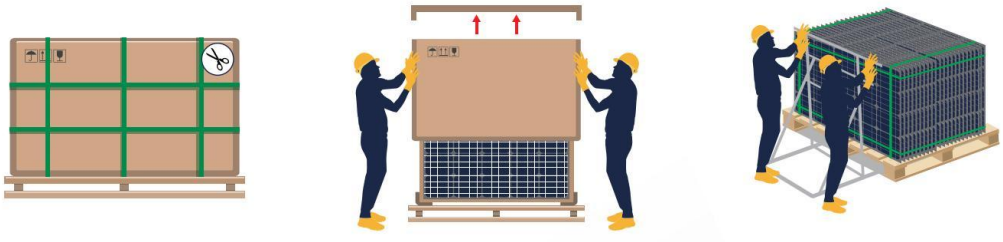
3.1 Enclosed unpacking

Prior to unpacking, please verify and confirm the intactness of the outer packing, and you are advised to remove the packing strap and wrapping film through a utility knife. Do not remove the packing materials with force, so as to avoid damage to the Modules inside.

After unpacking, please verify whether the number of Modules in the packing case and the bar-code information on the frame are the same with the shipping mark information.

Please secure the Modules in a reliably supported or fixed environment, and open the packing of the Modules according to the recommended unpacking procedure.

Based on different product models, the packing mode may be slightly varied. The precautions of unpacking are as follows.



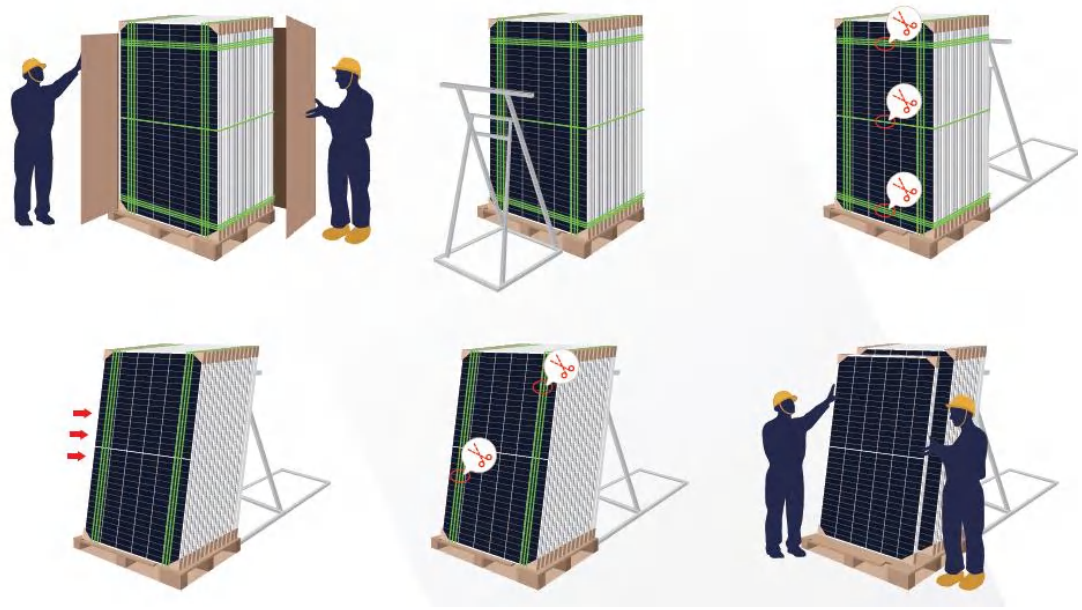


Upon unpacking, the unpacking operation must be performed by 2 or more persons simultaneously. Operators shall wear protective insulating gloves when handling the Modules to avoid injury and prevent leaving fingerprints on the glass surface.

If the Modules are not completely withdrawn after unpacking, then the remaining Modules shall be placed horizontally for further repacking, so as to prevent tilting (upon repacking, the glass face of the lower level of Modules shall be upwards, the glass face of the top level of Modules shall be upwards, and the others downwards). The maximum number of Modules if stacked shall not exceed 16pcs.

If the Modules after unpacking are not subject to immediate installation (due to adverse weather conditions such as strong wind below scale 6, and provided that the number of Modules is less than 12pcs), then safety ropes shall be used to fix the vertical Modules and the leaning posts with protective measures. (As shown in the figure)





In windy weather conditions, please do not handle the Modules, and properly secure and fix any unpacked Modules.

Do not move the leaning posts during the unpacking process, so as to prevent tilting of the Modules.

Do not carry out outdoor unpacking operations in harsh weather conditions such as rain and snow.

Prior to removing the inner packing straps, please carry out proper protection to prevent titing of the whole unit of Modules.

The operation ground shall be able to ensure that the packing case is steadily placed and tilting is avoided.

Do not lean the Module on the installation post. Do not use wooden strips or other items to directly contact and support the rear side of the Module.

Do not handle the Module by a single operator, so as to avoid scratches, deformation or cracks of the Module due to sliding and collision of the Module with other Modules. When lifting the Module, do not pull the wiring box or cables to withdraw the Module.

Please carry out the operation in strict accordance with the requirements of unpacking instructions. When removing the packing straps of horizontal packing, please provide protective measures to avoid scratching your face or eyes, and avoid standing on the tray during unpacking, but handle the Modules from the two sides of the tray.

4. Installation conditions

4.1 Installation Site and Working Environment

The modules cannot be used in space.

Do not manually focus sunlight with mirrors or magnifying glass onto modules.

HORAY modules shall be installed on proper buildings or other appropriate places (such as ground, garage, building outer wall, roof, PV tracking system) but shall not be installed on any vehicles.

Do not install modules at places that are possible to be flooded.

HORAY suggests that modules be installed in the working environment with the temperature of -40℃ to 40℃ of which is the monthly average highest and lowest temperature of the installation sites. The extreme working environment temperature for modules is -40℃ to 85℃.

Make sure that installed modules do not suffer wind or snow pressure that exceeds the permissible maximum load limit.

Modules shall be installed in places free from shadows throughout the year. Make sure there are no light-blocking obstacles in the installation sites.

Carry out lightning protection for modules installed in places with frequent lightning and thunder.

Do not install modules in places with possible inflammable gases.

Modules cannot be used in environments with too much hails, snows, flue gas, air pollution and soot or in places with strong corrosive substances such as salt, salt mist, saline, active chemical steam, acid rain, or other substances corroding modules, affecting modules' safety or performance.

Please take protective measures to ensure reliable and safe installation of modules in severe environments such as heavy snow, cold and strong wind or islands close to water and salt mist or deserts.

HORAY modules passed the IEC 61701 salt spray corrosion test, but the corrosion may still occur where the modules frame is connected to the bracket or where the grounding is connected. HORAY modules can be installed ⩾50 m away from the ocean side.The Sea-Shield modules are suitable for nearshore pile-mounted applications, typically within 10 km from the coastline and in waters less than 10 meters deep.

4.2 Selection of Tilt Angles

Tilt angle of PV modules refer to the included angle between module surface and horizontal ground. The module will obtain the maximum power output when directly facing the sunlight.

Modules are preferred to be south-facing in the north hemisphere and north-facing in the south hemisphere. Please refer to standard modules installation guideline or suggestions from experienced PV module installer, for the specific installation angle.

HORAY suggests that tilt angle of module installation be no less than 10", so module surface dust can be washed away easily by rainfall and frequency of cleaning can be reduced. And it is easy for accumulated water to flow away physically and avoid water mark on the glass surface which may further affect module appearance and performance.

HORAY modules connected in string should be installed with the same orientation and tilt angle. Different module orientation and tilt angle may result in different levels of solar irradiation and also power generation. In order to achieve the maximum annual generating capacity, the optimal orientation and inclination of PV modules in the installed area should be selected to ensure that sunlight can still reach to modules even on the shortest day of the year.

If HORAY modules are used in off-grid System, the tilt angle should be calculated based on seasons and irradiation to maximize the output power. If the modules output power meets the acquired load under the period of the worst irradiation in the year, the modules should be able to meet the load of the whole year. if the HORAY modules are used in grid-connected system, the tilt angle should be calculated based on the principle to maximize the yearly output power.

5. Mechanical Installation

5.1 Regular Requirements

Make sure that installation method and mounting structure are solid enough to meet the expected load-bearing requirement, which is requisite assurance from PV system installer. Installation bracket system shall be tested and inspected by the third party testing institution with static mechanical analysis capacity in accordance with local national standards or international standards.

Mounting structure shall be made from durable, corrosion resistant, UV-proof materials.

Modules shall be fixed on the bracket solidly.

In regions with heavy snowfall in winter, adjust the height of the mounting system so that the lower edge of the modules not covered by snow. Also, in order to reduce the risk of hot spots caused by flying sand and rocks damaging the module and shading, the lowest point of the module should be at a certain height to avoid the module being blocked by weeds and shrubs growing on the ground.

If modules are installed on brackets parallel to the roof , the minimum gap between the module frame and the roof/wall shall be 10cm which is good for air circulation to achieve better performance of module, Make sure the building is suitable for installation before installing modules on roof. Moreover, seal properly to prevent leakage.

The module frames can encounter thermal expansion and cold contraction. So the minimum distance between two adjoining modules shall be no less than 10 mm (0.39 inch). The specific space interval can be calculated according to the actual installation tolerance and deformation of the mounting bracket.

Ensure that the back-sheet, the front and rear glass of the module will not directly touch the mounting bracket, building structure, and environmental foreign objects (such as stones), especially under the action of external force, which will cause damage to the packaging back-sheet and glass, and therefore the product warranty is invalid.

Maximum static load of the PV module is down force 5400 Pa and uplift force 2400 Pa, which can vary from different mounting methods of the modules (please refer to the following installation guidance), the described load in this manual is for the test load.

Note: on the basis of IEC 61215-2016 installation requirements, when computing the corresponding maximum design load, a safety factor of 1.5 need to be considered in compliance with the local laws or regulations. (Test load = design load *1.5 times safety factor)

The modules can be installed in either landscape or portrait orientation. When installing the modules, be cautious not to block the drain hole of the frame.(* Note: in order for the modules to prevent dust accumulation, the anti-soling modules must be mounted in portrait orientation.)

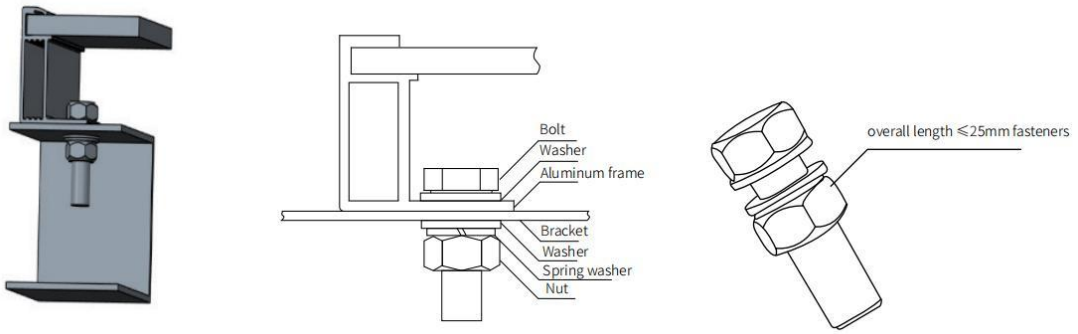
5.2 Module Mechanical installation

Module and bracket system connection can be realized by mounting holes, clamps or embedded systems. Installation shall follow the demonstration and suggestions below. If installation mode is different, please consult HORAY customer service personnel and obtain approval. Otherwise, modules may be damaged and limited warranty will be invalid. (* Note, regarding to Anti-Soiling modules only, short edge design has applied on prevention of dust from accumulating on modules, therefore , do not install at the short edge.

For special solar farm application scenarios such as heavy wind loads, valleys and steep cliffs, the installation method needs to be reinforced, and it is recommended to use Oval Washer, Flange nuts, bolts and clamps used together, and other reinforcement installation methods. For specific enquiry, please consult HORAY's customer service.)

5.2.1 Bolts Mounting

The HORAY's module has mounting holes matching M8 bolts. See the following figure for installation details and corresponding hole positions.



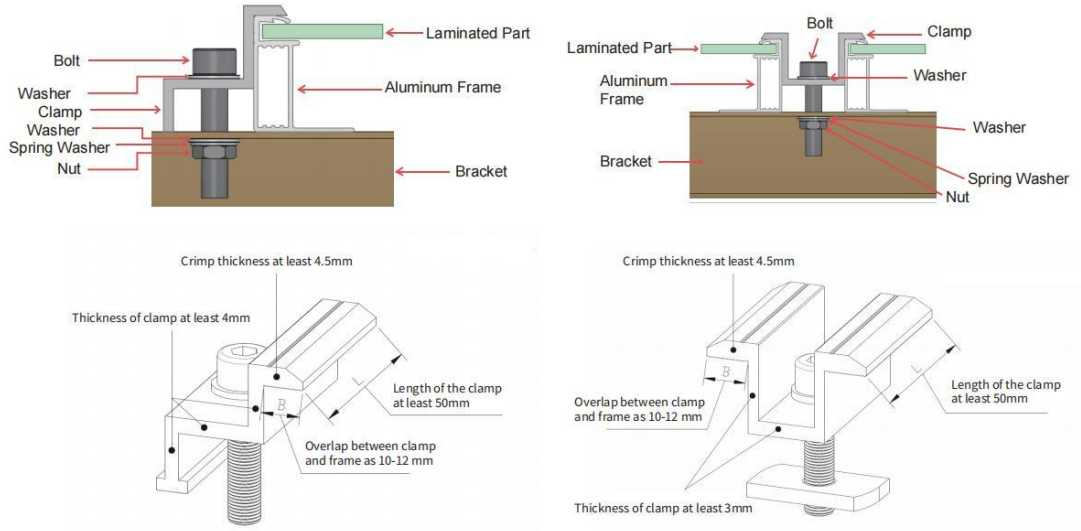
Recommended accessories are as below:

Accessories	Model	Material	Note
Bolt	M8	Q235B/SUS304	Accessories material selection should be based on application environment.
Washer	2pcs, thickness≥1.5mm and outside diameters=16mm	Q235B/SUS304	
Spring Washer	8	Q235B/SUS304	
Nut	M8	Q235B/SUS304	

Suggestion : M8 bolt tightening torque range: 12-16 N·m; When using HORAY 30 mm height frame module, it is recommended to select overall length≤25mm fasteners.

5.3.2 Clamp Mounting

The module can be mounted by a dedicated clamp, as shown in Figure.



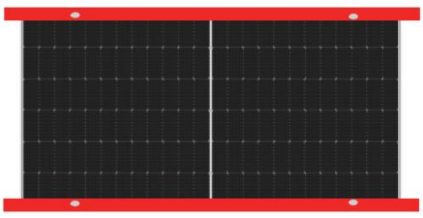
Under no circumstances should the clamp touch the glass or deform the frame. the interface of the clamp to the front of the frame must be smooth and flat to prevent frame or other components from being damaged.

Make sure that these are no shadow caused by clamps. The drain holes of module cannot be blocked by clamps.For framed PV module, it is recommended that the length of the clamp be at least 50mm, the clamp must maintain an overlap of 10-12 mm with the frame of the module (For clamp installation with an overlap of less than 10mm, HORAY technicians need to be consulted for assessment).

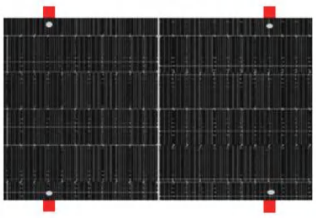
Regarding to the reference value of tightening torque, it is suggesting that for M8 bolt is 12 -16 N·m, M6 is 8 -12 N·m.

5.3 Installation and Mechanical Load of Bi-facial module

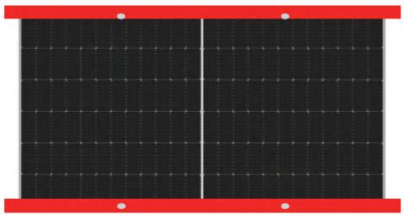
Bifacial modules can be mounted by bolts or clamps. The mounting method and maximum test load are shown as follow. (The unit of distance and length in the table below is millimeter (mm), and the unit of pressure is Pascal (Pa)).



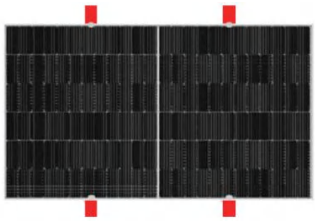
Outer four-hole bolts mounting
(Mounting rails parallel the long frame)



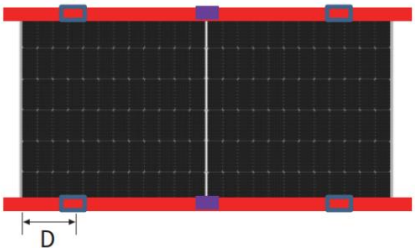
Outer four-hole bolts mounting
(Mounting rails cross the long frame)



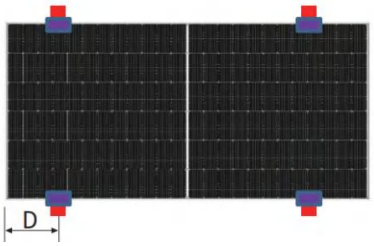
Inner four-hole bolts mounting
(Mounting rails parallel the long frame)



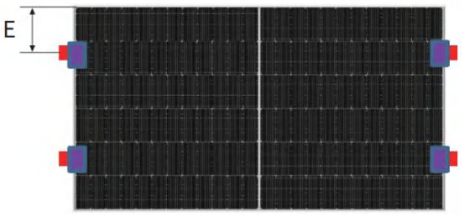
Inner four-hole bolts mounting
(Mounting rails cross the long frame)



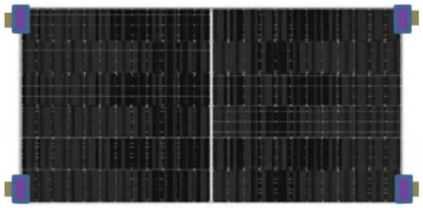
Clamps mounting
(Mounting rails parallel the long frame)



Clamps mounting
(Mounting rails cross the long frame)



Clamps mounting
(Mounting rails cross the short frame)



Clamps are mounted at the corners of short frame
(clamp length≥60mm, the overlap of clamp and frame≥10mm)

Mechanical loads information of 1722*1134 with framed bi-facial dual glass modules:

Module Type / Installation Method		Bolts Mounting		Clamps Mounting		
		Mounting rails cross the long frame		Mounting rails cross the long frame	Mounting rails cross the short frame	Clamps are mounted at the corners of short frame
		Outer four-hole	Inner four-hole	250≤D≤350	235≤E≤335	/
1722*1134 Framed bifacial dual glass module	HSXXX-MHO-D (108 CELLS)	+2400, -2400	+5400, -2400	+5400, -2400	+2400, -2400	/
	HSXXXTC-MHO-D 108 CELLS)	+2400, -2400	+5400, -2400	+5400, -2400	+2400, -2400	/

Mechanical loads information of 1762*1134 with framed bi-facial dual glass modules:

Module Type / Installation Method		Bolts Mounting		Clamps Mounting		
		Mounting rails cross the long frame		Mounting rails cross the long frame	Mounting rails cross the short frame	Clamps are mounted at the corners of short frame
		Outer four-hole	Inner four-hole	390≤D≤490	235≤E≤335	/
1762*1134 Framed bifacial dual glass module	HSXXXTC-MHA-D (108 CELLS)	+1600, -1600	+5400, -2400	+5400, -2400	+2400, -2400	/
	HSXXXTC-MHC-D (96 CELLS)	+1600, -1600	+5400, -2400	+5400, -2400	+2400, -2400	/

Mechanical loads information of 1909*1134 with framed bi-facial dual glass modules:

Module Type / Installation Method		Bolts Mounting		Clamps Mounting		
		Mounting rails cross the long frame		Mounting rails cross the long frame	Mounting rails cross the short frame	Clamps are mounted at the corners of short frame
		Outer four-hole	Inner four-hole	390≤D≤490	235≤E≤335	/
1909*1134 Framed bifacial dual glass module	HSXXXTC-MHO-D (120 CELLS)	+1600, -1600	+5400, -2400	+5400, -2400	+2400, -2400	/
	HSXXX-MHO-D (120 CELLS)	+1600, -1600	+5400, -2400	+5400, -2400	+2400, -2400	/

Mechanical loads information of 2094*1134 with framed bi-facial dual glass modules:

Module Type / Installation Method		Bolts Mounting		Clamps Mounting		
		Mounting rails cross the long frame		Mounting rails cross the long frame	Mounting rails cross the short frame	Clamps are mounted at the corners of short frame
		Outer four-hole	Inner four-hole	400≤D≤500	235≤E≤335	/
2094*1134 Framed bifacial dual glass module	HSXXXTC-MHO-D (132 CELLS)	+1600, -1600	+5400, -2400	+5400, -2400	+2400, -2400	/
	HSXXX-MHO-D (132 CELLS)	+1600, -1600	+5400, -2400	+5400, -2400	+2400, -2400	/

Mechanical loads information of 2279*1134 with framed bi-facial dual glass modules:

Module Type / Installation Method		Bolts Mounting		Clamps Mounting		
		Mounting rails cross the long frame		Mounting rails cross the long frame	Mounting rails cross the short frame	Clamps are mounted at the corners of short frame
		Outer four-hole	Inner four-hole	450≤D≤550	235≤E≤335	/
2279*1134 Framed bifacial dual glass module	HSXXXTC-MHO-D (144 CELLS)	+2400, -2400	+5400, -2400	+5400, -2400	+2400, -2400	/
	HSXXX-MHO-D (144 CELLS)	+2400, -2400	+5400, -2400	+5400, -2400	+2400, -2400	/

Mechanical loads information of 2382*1134 with framed bi-facial dual glass modules:

Module Type / Installation Method		Bolts Mounting		Clamps Mounting		
		Mounting rails cross the long frame		Mounting rails cross the long frame	Mounting rails cross the short frame	Clamps are mounted at the corners of short frame
		Outer four-hole	Inner four-hole	450≤D≤550	235≤E≤335	/
2382*1134 Framed bifacial dual glass module	HSXXXTC-MHC-D (132 CELLS)	+5400, -2400	0	+5400, -2400	+2400, -2400	/
	HSXXXTC-MHB-D (144 CELLS)	+5400, -2400	0	+5400, -2400	+2400, -2400	/

Mechanical loads information of 2384*1134 with framed bi-facial dual glass modules:

Module Type / Installation Method		Bolts Mounting		Clamps Mounting		
		Mounting rails cross the long frame		Mounting rails cross the long frame	Mounting rails cross the short frame	Clamps are mounted at the corners of short frame
		Outer four-hole	Inner four-hole	450≤D≤550	270≤E≤385	/
Framed bifacial dual	HSXXXTC-MHG-D (132 CELLS)	+5400, -2400	0	+5400, -2400	+2400, -2400	/

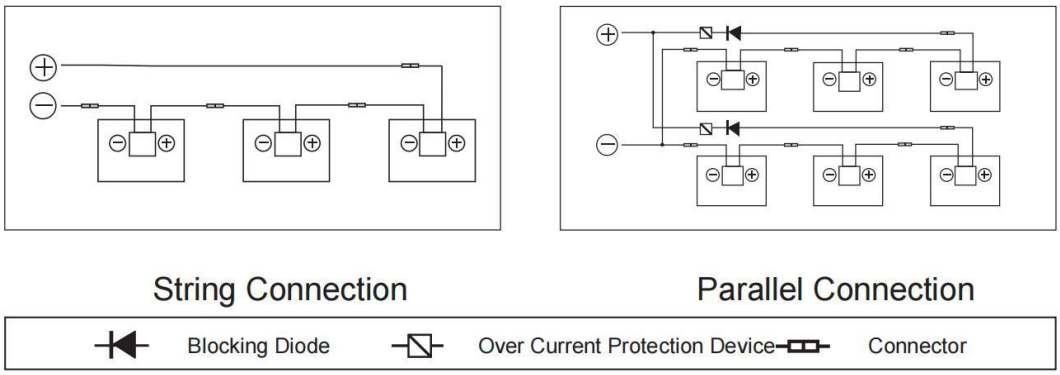
The above data is based on the static load requirements of IEC61215 standard (Tested by HORAY or third party certification institution).

6. Electrical installation

6.1 Electrical Performance

There are tolerances between the rated values of the electrical performance under $TC and measured values. Including Isc, Voc and Pmax under STC (1000 W/m^2 Irradiance, a cell temperature of 25℃ and an AM 1.5).

When modules are in series connection, the string voltage is sum of every individual module in one string. When modules are in parallel connection, the current is sum of the individual module as shown in below figure 9. Modules with different electric performance models cannot be connected in the same string.



The maximum allowed quantity of modules in string connection shall be calculated according to relative regulations. The open circuit voltage value under the expected lowest temperature shall not exceed the maximum system voltage value allowed by modules and other values required by Dc electric parts. (HORAY modules maximum system voltage is DC1000V/ DC 1500V, actually system voltage is designed based on the selected module and inverter model.)

The correction value of VOC can be calculated by the following formula: $C_{VOC}=1-\beta_{Voc}x(25-T)$.
T: The expected lowest temperature of the installation site. β: VOC temperature coefficient (%/℃) (Refer to module data sheet for further detail). If there has reverse current exceeding the maximum fuse current flowing through the module, use over current protection device with the same specifications to protect the module. If quantity of parallel connection is more than 2, there must be an over current protection device on each string of module.

6.2 Cables and Wiring

PV Module's junction boxes with the IP67 protective level, can provide the safety protection for cable and wiring connection, also for contact protection of non-insulating electric parts. Each module has two individual wires connecting the junction box, one is negative pole and the other is positive pole. Two modules can be in series connection by inserting the positive pole at

one end of wire of one module into the negative pole of the adjoining module.

According to local fire protection, building and electrical regulation, apply proper cable and connector, ensure the electrical and mechanical property of the cables (the cables should be put in a catheter with anti-UV aging properties, and if exposed to air, the cable itself should have anti-UV aging capability). For rooftop projects, it is important to utilize support and fixation measures to prevent module cables from hanging on the ground or the rooftop, ensuring the safety and durability of the cables.

The installer can only use single-wire cable, ⩾4mm^2 (12 AWG), 90 ℃ , with proper insulation capability to withstand the maximum open circuit voltage (such as EN50618 approval). Need to select appropriate wire specifications to reduce voltage drop.

HORAY requires that all wiring and electrical connections comply with the appropriate National Electrical Codes.

When cables are fixed on the bracket, avoid mechanical damaging cables or modules. Do not press cables by force. Adopt UV resistant cable ties and clamps to fix cables on the bracket. Though cables are UV resistant and water proof, it is still necessary to prevent cables from direct sun light and water immersion.

The minimum allowed bending radius of cables should be 43mm. (1.69 inch)

6.3 Connector

Please keep connectors clean and dry. Make sure connector caps are fastened before connection.

Avoid foreign objects such as moisture, dust, and organisms from entering the connector, which may cause the connector to fail to work properly or be damaged.

If the connector is wet, it is forbidden to connect.

If the connector is contaminated, it is forbidden to connect it.

If the connector is not connected positive with negative, the connector is not waterproof.

The components need to be connected as soon as possible after installation, and the connectors should meet the requirements of IP68 (IEC60529) after the connection. If the connector cannot be connected on time or the installation place is rainy and foggy, it is recommended to add a connector protection device.

Avoid connectors from direct sun light and water immersion.Avoid connectors falling onto ground or roof. incorrect connection may lead to electric arc and electric shock. Please make

sure that all electric connection is reliable, Make sure all connectors are fully locked.

Do not connect different connectors (brand and model) together.

6.4 Bypass diode

HORAY module junction box contains bypass diode which is in parallel connection with the cell string. If hot spot occurred, the diode will come into operation to stop the main current from flowing through the hot spot cells in order to prevent module over-heated and performance loss. Note, a bypass diode is not the over current protection device.

If the diode is definite or suspected to be defective, the installer or system maintenance supplier shall contact HORAY. Please do not try to open the module junction box on your own.

7. Grounding

In design of modules, the anodized corrosion resistant aluminum alloy frame is applied for rigidity support. For safety consideration and to protect modules from lightning and electrostatic damage, the module frame must be grounded.The grounding device must be in full contact with inner side of the aluminum alloy and penetrate surface oxide film of the frame.

Do not drill additional grounding holes on module frame.

The grounding conductor or wire may be copper, copper alloy, or any other material acceptable for application as an electrical conductor per respective National Electrical Codes. The grounding conductor must then make a connection to ground with a suitable ground electrode.

There are grounding holes with the diameter of Φ4.2 mm at the edge location of module's back-side frame. The grounding hole on the frame is marked with typical grounding symbol according to IEC 61730-1 standard, which can (only be used for grounding, not for module installation.

Grounding between modules shall be confirmed by qualified electricians and grounding devices shall be manufactured by qualified electric manufacturer. The copper core wire used for the grounding clamp is recommended to be 12 AWG. And copper wires cannot be pressed during installation in case of damaging.

The following is one of the recommended grounding methods of HORAY modules:

Align grounding clamp to the frame mounting hole. Use grounding bolt to go through the grounding clamp and frame.

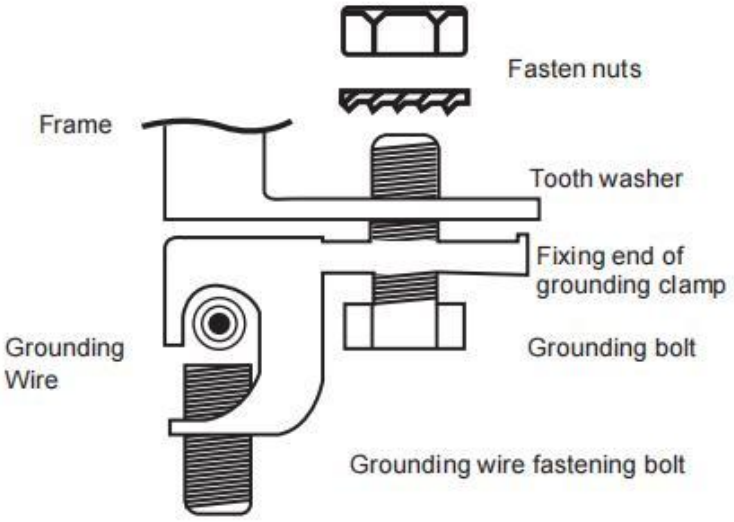
Put the tooth side of the washer on the other side and fasten the nuts.

Put grounding wires through the grounding clamp and grounding wire material and dimension shall meet requirements in local national and regional law and regulations

Fasten bolts of grounding wires and then installation is completed.

Mounting holes on modules that are not occupied can be used for installing grounding devices.

The third party grounding device can be used for grounding of HORAY modules but such grounding method shall be proved to be reliable. Grounding device shall be operated in line with stipulations of the manufacturer.


Fasten nuts
Frame
Tooth washer
Fixing end of
grounding clamp
Grounding
Wire
Grounding bolt
Grounding wire fastening bolt

8. Operation and maintenance

It is the users' responsibility to carry out regular inspection and maintenance for modules, especially during the period of limited warranty. To inform the HORAY customer service personnel within two weeks when modules are found broken or other significant abnormality. Refer to the HORAY PV Module Operation and Maintenance Manual for details on module maintenance.

8.1 Cleaning

Accumulated contaminants on module surface glass will reduce the power output and lead to local hot spot, such as dust, industrial wasted water and birds' droppings. The severity of influence is determined by transparency of wastes. Small amounts of dust will affect the intensity and evenness of received solar irradiation but are not dangerous and power will not be reduced remarkably generally.

During operation of modules, there shall be no environmental factors to shade modules fully or partially. These environment factors including other modules, module mounting system, birds dwelling, dust, soil or plants. These will significantly reduce output power. HORAY suggests that the module surface should not be shadowed in any case.

Frequency of cleaning depends on dirt accumulation speed. In normal situations, rainwater will clean the module surface and reduce the cleaning frequency. it is suggested to use sponge dipped with clean water or soft cloth to wipe the glass surface. Do not use acid and alkaline detergents to clean modules. Do not use tool with rough surface to clean in any case.

In order to avoid potential risk of electrical shock or burn, HORAY suggests cleaning the modules during early morning or evening with low irradiance and low modules temperature especially for the hot regions.

In order to avoid potential risk of electrical shock, do not try to clean the modules with glass damage or expose wires.

8.2 Module Appearance Inspection

Check module cosmetic defects with naked eyes , especially:

Module glass cracks. Special attention: avoiding rolling up sand and gravel to break the glass during the inspection of the operation and maintenance vehicles; Avoiding defects or breakage of glass caused by splashing of hard objects such as sand and gravel when using a lawn mower for weeding operations.

Corrosion at welding parts of the cell main grid (caused by moisture into the module due to

damage of sealing materials during installation or transportation).

Check whether there are traces of burning mark on the module back sheet.

Check PV modules if any signs of aging including rodent damage, climate aging, connectors tightness, corrosion and grounding condition.

Check if any sharp objects in contact with PV modules' surface.

Check if any obstacles shading the PV modules.

Check if any loose or damage screws between the modules and mounting system. If so, adjust and fix in time.

8.3 Inspection of Connectors and Cables

It is suggested to carry out the following preventive inspection twice a year:

Check the tightness of the connectors and cables.

Check if any crack or gap of silicone nearby the junction box.

HORAY



Horay Installation Manual

Double Glass

EXCELLENT PV MODULE MANUFACTURER

HORAY

HORAY SOLAR PV MODULES

Installation and User Manual

Revision date:1 Jan, 2024 | Applicable for IEC certified products

This manual applies to photovoltaic modules ("PV modules," also commonly known as solar panels) manufactured by **HoRay Solar** Co., Ltd.(**"HoRay Solar"**), and is explicitly written for qualified professionals ("Installer" or "Installers"), including without limitation licensed electricians and RAL Certified PV Installers.

INTRODUCTION

Thank you for choosing **HoRay** Solar as your PV module provider. We appreciate your business! This manual contains important information pertaining to the electrical and mechanical installation and maintenance of PV modules, and contains safety information that you must read carefully and be familiar with before handling, installing, and/or maintaining **HoRay** Solar PV modules.

HoRay Solar does not assume responsibility and expressly disclaims liability for losses, damages, or expenses arising out of, or in any way connected with this Installation and User Manual. **HoRay** Solar assumes no responsibility for any infringement of patents or other rights of third parties, which may result from using **HoRay** Solar PV modules. No license is granted expressly or by implication or under any patent or patent rights. The information in this manual is believed to be reliable, but does not constitute an expressed or implied warranty. **HoRay** Solar reserves the right to make changes to its PV modules and other products, their specifications, or this manual without prior notice.

HoRay Solar and its subsidiaries are not liable for any damages caused by inappropriate installation, use, or maintenance of **HoRay** Solar PV modules, including without limitation damages, losses, and expenses caused by nonobservance of the instructions of this manual or caused by or in connection with products of other manufacturers.

HoRay Solar PV modules are designed to meet the requirements for the standards IEC 61215 and IEC 61730, application class A. Modules rated for use in this application class may be used in systems operating at greater than 50 V DC or 240 W, where general contact access is anticipated. Modules qualified for safety through IEC 61730-1 and IEC 61730-2 and within this application class are considered to meet the requirements for safety class II. In the course of the PV module certification process, the compliance of this manual with the certification requirements has been

verified by an independent certification laboratory.

This Installation and User Manual is available in different languages. In cases of discrepancy between versions, the English language version shall control. Failure to comply with the requirements listed in this manual will invalidate the Limited Warranty for PV Modules as provided by **HoRay** Solar at the time of sale to the direct customer. Additional recommendations are provided to enhance safety practices and performance results. Please provide a copy of this manual to the PV system owner for their reference, and inform them of all relevant aspects of safety, operation, and maintenance.

SAFETY

General

You must understand and follow all applicable local, state, and federal regulations and standards for building construction, electrical design, fire, and safety, and must check with local authorities to determine applicable permitting requirements before attempting to install or maintain PV modules.

Rooftop PV systems should only be installed on dwellings that have been formally analyzed for structural integrity, and confirmed to be capable of handling the additional weighted load of PV system components, including PV modules, by a certified building specialist or engineer.



For your safety, do not attempt to work on a rooftop until safety precautions have been identified and taken, including without limitation fall protection measures, ladders or stairways, and personal protective equipment (PPE).

For your safety, do not install or handle PV modules under adverse conditions, including without limitation strong or gusty winds, and wet or frosted roof surfaces.

The flat-plate PV module construction consists of a laminated assembly of solar cells encapsulated within an insulating material with a rigid glass surface and an insulated substrate. The laminated assembly is supported by an aluminum frame that is also used for mounting the module. See Figure 1 for an illustration of the PV module components.

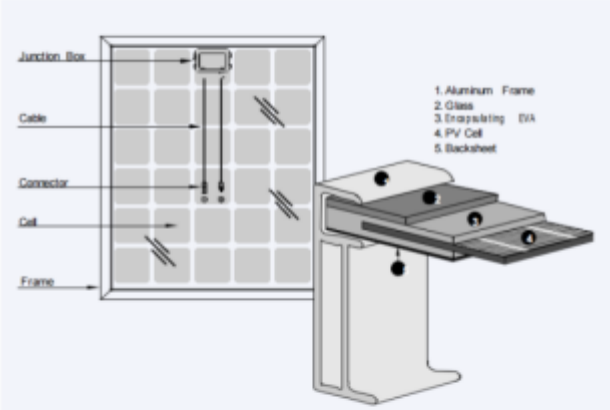


Figure 1: Module components and cross-section of the laminated assembly

Electrical



PV modules can produce current and voltage when exposed to light of any intensity. Electrical current increases with higher light intensity. DC voltage of 30 Volts or higher is potentially lethal. Contacting the live circuitry of a PV system operating under light can result in lethal electric shock.

De-energize PV modules by removing them entirely from light or by covering their front surface with an opaque material. Regard the safety regulations for live electrical equipment when working with modules that are exposed to any light. Use insulated tools and do not wear metallic jewelry while working with PV modules.

In order to avoid arcing and electrical shock, do not disconnect electrical connections under load. Faulty connections can also result in arcing and electrical shock. Keep connectors dry and clean, and ensure that they are in proper working condition. Never insert metallic objects into the connectors, or modify them in any way in order to secure an electrical connection.

Do not touch or handle PV modules with broken glass, separated frames, or a damaged backsheet unless the PV modules are first disconnected and you are wearing proper PPE. Avoid handling PV modules when they are wet unless cleaning the PV modules as directed in this manual. Never touch electrical connections that are wet without protecting yourself with insulated gloves.

Transport and Handling

HoRay Solar PV modules must be transported in the supplied packaging only and kept in the packaging until they are ready to be installed. Protect pallets against movement and exposure to damage during transportation. Secure pallets from falling over. Do not exceed the maximum height of pallets to be stacked, as indicated on the pallet packaging. Store pallets in a cool and dry location until the PV modules are ready to be unpackaged.

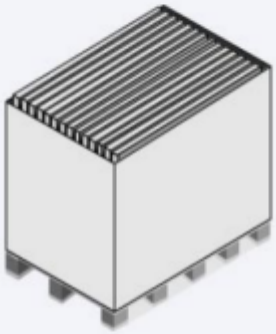


Figure 2: Pallet of PV modules

HoRay Solar PV modules are heavy and should be handled with care. PV modules shall be handled at the frame; never use the junction box or cables as a grip. Do not exert mechanical stress on the cables. Never step on PV modules or drop or place heavy objects on them. Be

careful when placing PV modules on hard surfaces, and secure them from falling. Broken glass can result in personal injury. PV modules with broken glass cannot be repaired and must not be used. Broken or damaged PV modules must be handled carefully and disposed of properly.

For unpacking PV modules from the **HoRay** Solar supplied packaging, first remove the pallet lid (after removing securing straps, if provided). Remove PV modules one at a time by sliding them up the channel in the package (see Figure 3). You may need to secure the remaining PV modules in the pallet packaging to prevent them from falling over.

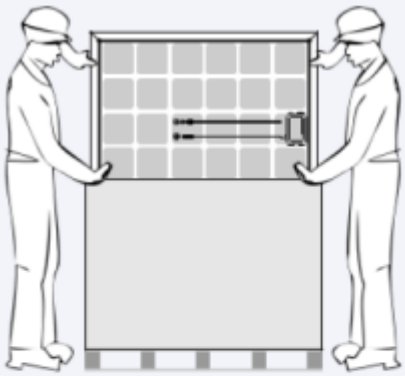


Figure 3: Removing PV modules from a pallet

Check PV modules for damage due to transportation before they are installed; do not install damaged modules. Contact the company you purchased the **HoRay** Solar PV modules from in order to obtain information on making claims for defective PV modules.

PV module surfaces are susceptible to damage that could affect the performance or safety of the PV module; do not damage or scratch the PV module surfaces, and do not apply paint or adhesive to any of the surfaces, including the frame. For your safety, do not disassemble or modify **HoRay** Solar PV modules in any way. Doing so may degrade performance or cause irreparable damage and will void any applicable warranties.

If it is necessary to store PV modules prior to installation, the PV modules should remain inside the packaging and protected from exposure that could compromise the durability of the packaging.

Fire

HoRay Solar PV Modules have a Class C fire resistance rating in accordance with the IEC 61730-2 certification. When PV modules are mounted on rooftops, the roof must have a fire-resistant covering suitable for this application. PV modules are electrical generating devices that may affect the fire safety of a building. The use of improper installation methods and/or defective parts may result in the unexpected occurrence of an electrical arc during operation. In order to mitigate the risk of fire in this event, PV modules should not be installed near flammable liquids, gases, or locations with hazardous materials.

In the event of a fire, PV modules may continue to produce a dangerous voltage, even if they have been disconnected from the inverter, have been partly or entirely destroyed, or the system wiring has been compromised or destroyed. In the event of fire, inform the fire crew about the

particular hazards from the PV system, and stay away from all elements of the PV system during and after a fire until the necessary steps have been taken to make the PV system safe.

APPLICATION INFORMATION

Application Restrictions

HoRay Solar PV modules must be mounted on appropriate mounting structures positioned on suitable buildings, the ground, or other structures suitable for PV modules (e.g., carports, building facades, or PV trackers). PV modules must not be mounted on moving vehicles of any kind. **HoRay** Solar PV modules must not be installed in locations where they could be submerged in water.

HoRay Solar PV modules must not be sited in locations where aggressive substances such as salt or salt-water, or any other type of corrosive agent, could affect the safety and/or performance of the PV modules. Although some types of **HoRay** Solar PV modules have passed the IEC 61701 salt-mist corrosion test with a salt concentration of 5% by weight, galvanic corrosion can occur between the aluminum frame of the PV module and mounting or grounding hardware if such hardware is comprised of dissimilar metals. **HoRay** Solar recommends that only stainless steel and aluminum metal directly contact PV modules in seaside installations to limit corrosion.

Artificially concentrated light must not be directed on **HoRay** Solar PV modules.

Design Recommendations

HoRay Solar recommends that PV modules be mounted at a minimum tilt angle of 10 degrees to allow for proper self-cleaning from normal rain showers. Partial or complete shading of a PV module or modules can significantly reduce system performance. **HoRay** Solar recommends minimizing the amount of shade throughout the year to increase the amount of energy produced by the PV modules.

Lightning protection is recommended for PV systems that are to be installed in locations with high probability of lightning strikes.

High system voltages could be induced in the event of an indirect lightning strike, which could cause damage to PV system components. The open area of wire loops should be minimized, as shown in Figure 4, in order to reduce the risk of lightning-induced voltage surges.

HoRay recommends that modules used or installed should be 2000 meters (altitude) at most.

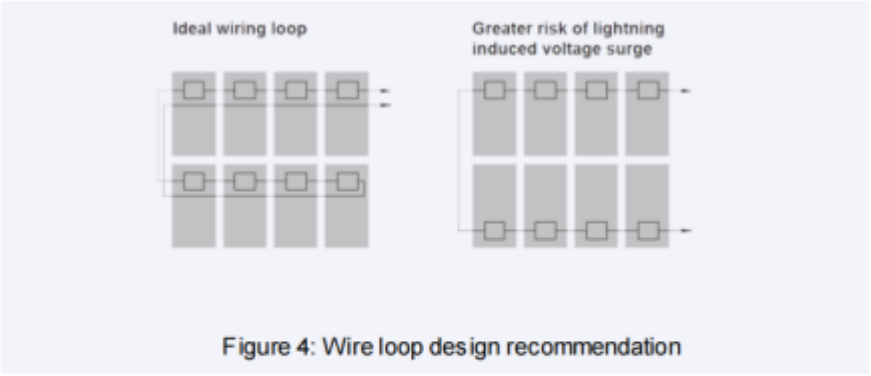


Figure 4: Wire loop design recommendation

ELECTRICAL INSTALLATION

Electrical Configuration

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at Standard Test Conditions (STC: 1000 W/m², AM 1.5, and 25°C cell temperature). The short-circuit current (ISC) should be multiplied by a factor of 1.25 and the open-circuit voltage (VOC) should be multiplied by a factor of up to 1.25 based on the lowest ambient temperature recorded for the installation location when determining component voltage ratings, conductor current ratings, fuse sizes, and size of controls connected to the PV output.

Voltages are additive when PV modules are connected directly in series, and module currents are additive when PV modules are connected directly in parallel, as illustrated in Figure 5. PV modules with different electrical characteristics must not be connected directly in series. The use of suitable third-party electronic devices connected to PV modules may enable different electrical connections and must be installed according to the manufacturer's specified instructions.

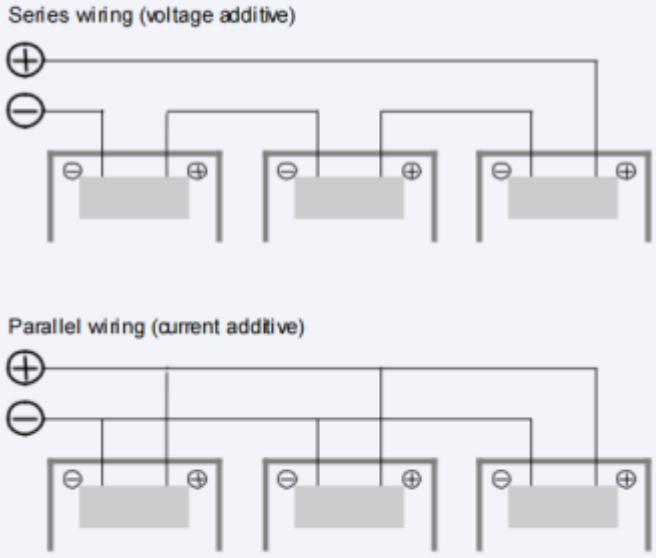


Figure 5: Electrical diagrams of series and parallel wiring

The maximum number of PV modules that can be connected in a series string must be calculated in accordance with applicable regulations in such a way that the specified maximum system voltage of the PV module and all other electrical DC components will not be exceeded in open-circuit operation at the lowest temperature expected at the PV system location.

An appropriately rated overcurrent protection device must be used when the reverse current could exceed the value of the maximum fuse rating of the module. An overcurrent protection device and anti-reflection diode module are required for each series string if more than two series strings are connected in parallel, and reverse polarity is forbidden.

Cables and Wiring

HoRay Solar PV modules are provided with two (2) stranded, sunlight-resistant output cables that are terminated with PV connectors ready for most installations. The positive (+) terminal has a female connector while the negative (-) terminal has a male connector. The module wiring is intended for series connections [i.e., female (+) to male (-) interconnections], but can also be used to connect suitable third-party electrical devices that may have alternative wiring configurations so long as the manufacturer's instructions are followed.

Use field wiring with suitable cross-sectional areas that are approved for use at the maximum short-circuit current of the PV module. **HoRay** Solar recommends installers use only sunlight-resistant cables qualified for direct current (DC) wiring in PV systems. The minimum wire size should be 4 mm².

Table 1: Required minimum field wiring specifications

	Testing Standard	Wire Size	Temperature Rating
Required Minimum Field Wiring	EN 50618	4mm²	-40°C to +90°C

Cables should be fixed to the mounting structure in such a way that mechanical damage of the cable and/or the module is avoided. Do not apply stress to the cables. Do not bend cables to a bending radius of less than 40mm. For fixing, use appropriate means, such as sunlight-resistant cable ties and/or wire management clips specifically designed to attach to the PV module frame. While the cables are sunlight-resistant and waterproof, where possible, avoid direct sunlight exposure and water immersion of the cables.

Connectors



Keep connectors dry and clean, and ensure that connector caps are hand-tight before connecting the modules. Do not attempt making an electrical connection with wet, soiled, or otherwise faulty connectors. Avoid sunlight exposure and water immersion of the connectors. Avoid connectors resting on the ground or roof surface.

Faulty connections can result in arcs and electrical shock. Check that all electrical connections are securely fastened. Make sure that all locking connectors are fully engaged and locked.
Modules must not be interconnected using connectors from different manufacturers and/or of different types. If modules having such different connectors need to be interconnected, a qualified professional may replace connectors according to the manufacturer's specified instructions such that an interconnection can be made with connectors from the same manufacturer and the same type.

The suppliers and types of connectors should be in accordance with the standard IEC 62852. For more details, please see the CDF.

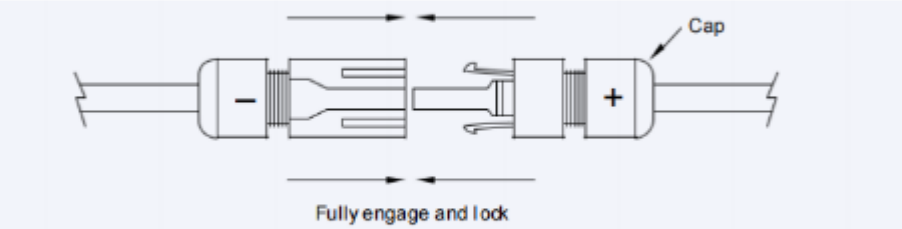


Figure 6: Series interconnection of a male (-) and female (+) connector

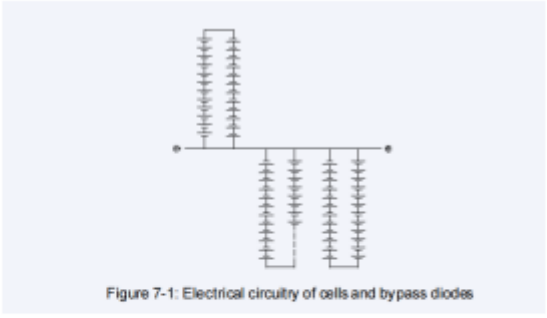
Bypass Diodes

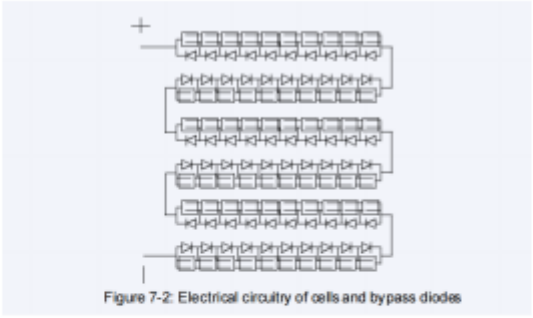
The junction boxes used with **HoRay** Solar PV modules (not Smart Hot Spot Free module) contain bypass diodes wired in parallel with the PV cell strings. In the case of partial shading, the diodes bypass the current generated by the non-shaded cells, thereby limiting module heating and performance losses. Bypass diodes are not overcurrent protection devices.

Bypass diodes divert current from the cell strings in the event of partial shading. See Figure 7-1 for a diagram showing how the cell strings are electrically connected with the diodes.

Every piece of cells from **HoRay** Smart Hot Spot Free module parallels a diode, with a cell is covered by shade or occurs an exception, the paralleled diode can bypass this cell, thus avoid hot spot, and can retain the maximum power output.

Bypass diodes divert current from a cell in the event of partial shading. See Figure 7-2 for a diagram showing how the cells are electrically connected with the diodes.


Figure 7-1: Electrical circuitry of cells and bypass diodes


Figure 7-2: Electrical circuitry of cells and bypass diodes

In the event of a known or suspected diode failure, installers or maintenance providers should contact the company the PV modules were purchased from. Never attempt to open the junction box of a **HoRay** Solar PV module yourself.

Grounding

The frame of the PV module, as well as any exposed non-current-carrying metal parts of fixed equipment that are able to become energized by the PV system, must be connected to the equipment grounding conductor (EGC) in order to prevent electrical shock. Even when applicable regulations, code requirements, and standards do not require safety-related grounding, **HoRay** Solar recommends grounding all PV module frames in order to ensure the voltage between electrically conductive equipment and earth ground is zero in all circumstances.

Proper equipment grounding is achieved by bonding all exposed non-current-carrying metal equipment continuously to one another using an appropriately sized EGC or racking system that can be used for integrated grounding (see Option B in Grounding Methods below).

HoRay Solar PV modules employ a coated aluminum frame for corrosion resistance. In order to properly ground the module frame, the coating must be penetrated.

The potential for corrosion due to the electrochemical action between dissimilar metals in contact is minimized if the electrochemical voltage potential between the dissimilar metals is low. The grounding method must not result in the direct contact of dissimilar metals with the aluminum frame of the PV module that will result in galvanic corrosion. An addendum to UL Standard 1703 "Flat Plate Photovoltaic Modules and Panels" recommends metal combinations not exceed an electrochemical potential difference of 0.5 Volts.

The frame rails have pre-drilled holes marked with a grounding sign, as illustrated in Figure 8. These holes should be used for grounding purposes and must not be used for mounting the PV modules. Do not drill additional holes into the frame rails.

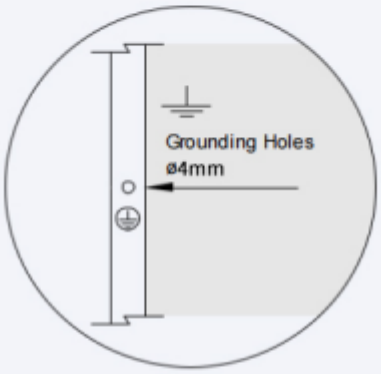


Figure 8: Grounding hole detail

The following grounding methods are available:

Option A: Screw Assembly (see Figure 9)

1. A grounding screw assembly must be attached at a designated grounding hole location using only stainless steel hardware. Insert an M3 stainless steel screw first through the stainless steel cup washer, and then through the grounding hole.
2. Loosely engage a stainless steel backing nut and toothed lockwasher to the screw.
3. Bend the EGC into an omega (Ω) shape to tightly fit between the partially installed screw head and cup washer. The EGC shall be exclusively in contact with stainless steel.
4. Tighten the screw to 2.3 N·m torque. The toothed lockwasher should be visibly engaged to the frame.
5. Route the appropriately sized EGC in such a way as to avoid contact with the aluminum module frame.

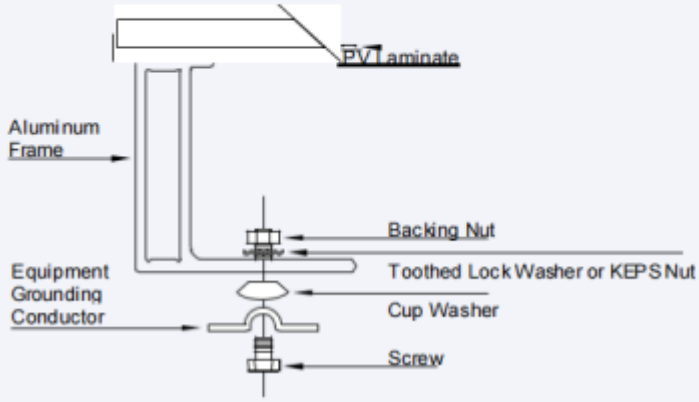


Figure 9: Grounding screw assembly detail

Option B: Racking Manufacturer Integrated

Grounding Methods

HoRay Solar PV modules can be grounded by bonding PV modules to a grounded racking system. Integrated grounding methods must be certified for grounding PV modules and must be installed in accordance with the specified instructions of their respective manufacturers.

Option C: Additional Third-party Grounding Devices

HoRay Solar PV modules can be grounded using third-party grounding devices so long as they are certified for grounding PV modules and the devices are installed according to the manufacturer' s specified instructions.

MECHANICAL INSTALLATION

General

HoRay Solar PV Modules have been certified for a maximum static load on the back of the module of up to 1600 Pa (i.e. wind load) and a maximum static load on the front of the module of up to either 1600 Pa or 3600 Pa (i.e. wind and snow load) with a safety factor of 1.5 depending on the module type (please refer to the data sheet for this information).

Mounting structures and other mechanical parts must be designed and approved to withstand the design wind and snow loads applicable for a particular site. **HoRay** Solar PV modules must not be subjected to forces from the substructure, including forces caused by thermal expansion.

The mounting method must not result in the direct contact of dissimilar metals with the aluminum frame of the PV module that will result in galvanic corrosion. An addendum to UL Standard 1703 "Flat Plate Photovoltaic Modules and Panels" recommends metal combinations not exceed an electrochemical potential difference of 0.5 Volts.

HoRay Solar PV modules can be mounted in landscape or portrait orientation, as illustrated in Figure 10, provided that the mounting method follows one of the acceptable methods listed below.

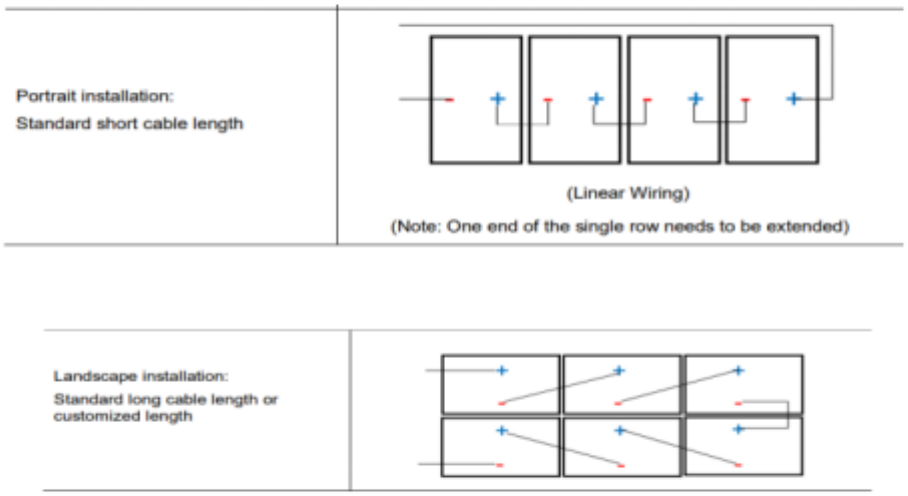


Figure 10: Landscape and portrait mounting

In order to maintain the fire class rating, the distance between the PV module front surface (glass) and the roof surface shall be at least 10 cm. This spacing also allows air flow to cool the PV module. Install PV modules with a minimum spacing of 1 cm between neighboring frames to allow for thermal expansion.

Mounting Methods

The following mounting methods are available:

Bolts or Clamps

Refer to the Module Supplement distributed with this manual to determine how many connection points are required for a specific module series. The locations of mounting holes and clamp tolerances are illustrated in the drawings located in the Module Supplement. Do not modify the existing mounting holes or drill new holes. Do not apply excessive pressure on the frame such that the frame deforms.

Bolts: Modules must be mounted using the mounting holes located on the rear side of the long frame parts using M8 stainless steel bolts, nuts, and washers. The torque of screw tightening should be between 14 N·m to 20 N·m.

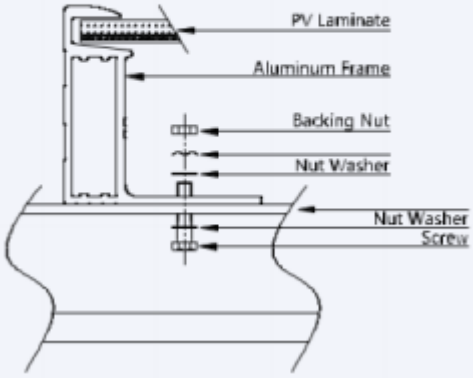


Figure 11: Detail of a bolt mounting attachment

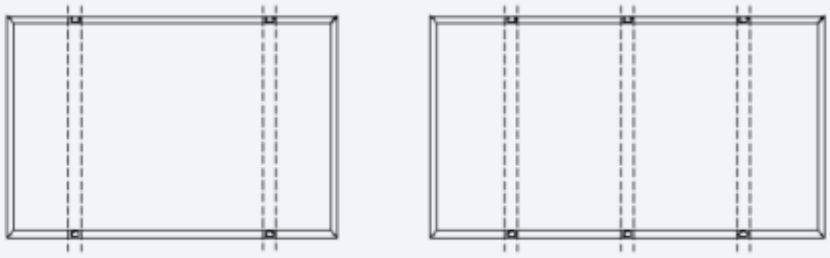


Figure 12-1 : Mounting rails must run perpendicularly tothe long frame (60 or 72 cell modules)

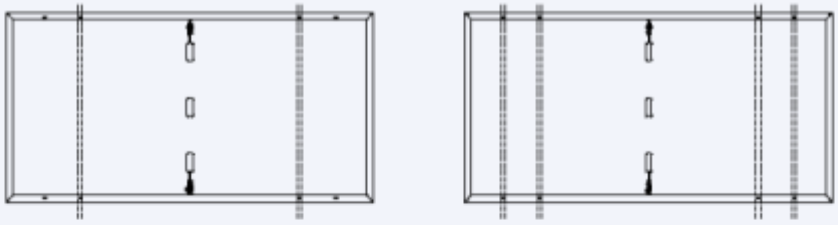


Figure 12-2 : Mounting rails must run perpendicularly tothe long frame (120 or 144cell modules)

Top-down Clamps: Third-party clamps that have been designed for PV mounting structures are an approved mounting attachment method for **HoRay** Solar PV modules. Modules must be fastened using clamps applied to the top side of the long frame parts. A clamp holds two modules except for the clamps at the beginning and end of a module row. The centerline of the clamps must be in line with the mounting hole positions plus or minus a distance of 50mm. The module clamps should not contact with the front glass and deform the frame, and avoiding shadowing effects from the module clamps. The module frame is not to be modified under any circumstances. The applied torque value should be big enough to fix the modules steadily, the torque of screw tightening should be between 16N·m to 24N·m.

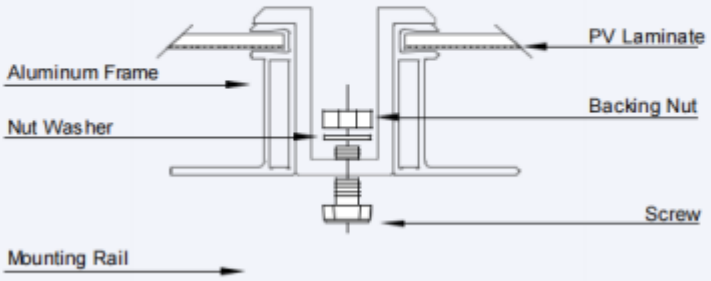


Figure 13: Detail of a top-down clamp mounting attachment

MAINTENANCE

General

HoRay Solar recommends that PV systems be periodically inspected by the installer, or other qualified person.

The purpose of the PV system inspection is to ensure that all system components are functioning properly. At a minimum, this inspection should confirm the following:

All cables and connector attachments are undamaged and properly secured.
- No sharp objects are in contact with the PV module surfaces.
- PV modules are not shaded by unwanted obstacles and/or foreign material.
- Mounting and grounding components are tightly secured with no corrosion. Defects should be addressed immediately.

Cleaning

Over time, dirt and dust can accumulate on the glass surface of the module, reducing its power output. **HoRay Solar** recommends periodic cleaning of PV modules to ensure maximum power output, especially in regions with low precipitation.

In order to reduce the potential for electrical and thermal shock, **HoRay** Solar recommends cleaning PV modules during early morning or late afternoon hours when solar radiation is low and the modules are cooler, especially in regions with hotter temperatures.

Never attempt to clean a PV module with broken glass or other signs of exposed wiring, as this presents a shock hazard.

Clean the glass surface of the PV modules with a soft brush using soft, clean water (pH 6-9) with a recommended pressure less than 690 kPa, which is typical of most municipal water systems. Water with high mineral content may leave deposits on the glass surface and is not recommended.

HoRay Solar PV modules may contain a hydrophobic anti-reflective coating on the glass surface to enhance power output and reduce dirt and dust buildup. In order to avoid module damage, do not clean PV modules with a power washer or pressure washer. Do not use steam or corrosive chemicals to facilitate the cleaning of modules. Do not use aggressive tools or abrasive materials that could scratch or damage the glass surface. Failure to comply with these requirements may adversely affect the PV module performance.

HoRay Solar PV modules are designed to withstand high snow loads. However, if removing snow is desired to enhance production, use a brush to gently remove snow. Do not try to remove frozen snow or ice from PV modules.

DECOMMISSIONING

The dismantling of PV systems must be performed with the same care and safety precautions used during the initial installation. The PV system can generate hazardous voltage even after the system has been disconnected. Follow safety regulations for working with live electrical equipment.

Meaning of crossed –out wheeled dustbin:



Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities.
Contact your local government for information regarding the collection systems available.
If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. When replacing old appliances with new ones, the retailer is legally obligated to take back your old appliance for disposal at least free of charge.

HoRay Solar Co.,LTD.

No. 30-5, Yanxin East Road, Huishan District, Wuxi City, Jiangsu, P.R. China

info@Horaysolar.com

Tel:+86-510-83580688

www.horaysolar.com

MODULE SUPPLEMENT

Revision date: 1 Jan, 2024 | Applicable for IEC certified products.

The information in this supplement is believed to be reliable, but does not constitute an expressed or implied warranty. Solar reserves the right to make changes to its PV modules and other products, their specifications, or this supplement without prior notice.
This supplement to the installation manual does not contain information about some older module series no longer being manufactured by **HoRay Solar**.
If you require information about such modules, please contact **HoRay Solar**.
This supplement refers to modules of the following types:

Table 1: Module types

TYPE	(Pmax) STC	(Pmax) BNPI	(Vmpp)	(Impp)	(Voc)	(Isc)	system voltage	Fuse rating
HS640-MHG-D	640	701	37.21	17.20	45.18	18.06	1500V	30A
HS645-MHG-D	645	706	37.41	17.24	45.38	18.11	1500V	30A
HS650-MHG-D	650	712	37.61	17.28	45.58	18.16	1500V	30A
HS655-MHG-D	655	717	37.81	17.32	45.78	18.21	1500V	30A
HS660-MHG-D	660	723	38.01	17.36	45.98	18.26	1500V	30A
HS585-MHG-D	585	641	33.80	17.31	40.90	18.37	1500V	30A
HS590-MHG-D	590	646	34.00	17.35	41.10	18.42	1500V	30A
HS595-MHG-D	595	652	34.20	17.40	41.30	18.47	1500V	30A
HS600-MHG-D	600	657	34.40	17.44	41.50	18.52	1500V	30A
HS535-MHG-D	535	586	31.36	17.06	37.66	18.07	1500V	30A
HS540-MHG-D	540	591	31.56	17. 11	37.86	18.12	1500V	30A
HS545-MHG-D	545	597	31.76	17.16	38.06	18.17	1500V	30A
HS550-MHG-D	550	602	31.96	17.21	38.26	18.22	1500V	30A
HS485-MHG-D	485	531	28.49	17.03	34.22	18.05	1500V	30A
HS490-MHG-D	490	537	28.69	17.08	34.42	18.13	1500V	30A
HS495-MHG-D	495	542	28.89	17.13	34.62	18.21	1500V	30A
HS500-MHG-D	500	548	29.09	17.19	34.82	18.29	1500V	30A
HS535-MHO-D	535	586	41.00	13.05	49.20	13.81	1500V	25A
HS540-MHO-D	540	591	41.20	13. 11	49.40	13.87	1500V	25A
HS545-MHO-D	545	597	41.40	13. 17	49.60	13.93	1500V	25A
HS550-MHO-D	550	602	41.60	13.23	49.80	13.99	1500V	25A
HS555-MHO-D	555	608	41.80	13.28	50.00	14.05	1500V	25A
HS560-MHO-D	560	613	42.00	13.33	50.20	14.11	1500V	25A
HS495-MHO-D	495	542	37.60	13. 17	45.10	13.78	1500V	25A
HS500-MHO-D	500	548	37.80	13.23	45.30	13.83	1500V	25A
HS505-MHO-D	505	553	38.00	13.29	45.50	13.89	1500V	25A

HS510-MHO-D	510	558	38.20	13.35	45.70	13.94	1500V	25A
HS515-MHO-D	515	564	38.40	13.41	45.90	14.00	1500V	25A
HS450-MHO-D	450	493	34.60	13.01	41.40	13.68	1500V	25A
HS455-MHO-D	455	498	34.80	13.08	41.60	13.73	1500V	25A
HS460-MHO-D	460	504	35.00	13.15	41.80	13.78	1500V	25A
HS465-MHO-D	465	509	35.20	13.21	42.00	13.84	1500V	25A
HS470-MHO-D	470	515	35.40	13.28	42.20	13.90	1500V	25A
HS405-MHO-D	405	443	31.02	13.06	37.14	14.93	1500V	25A
HS410-MHO-D	410	449	31.22	13.13	37.34	15.03	1500V	25A
HS415-MHO-D	415	454	31.42	13.21	37.54	15.13	1500V	25A
HS420-MHO-D	420	460	31.62	13.28	37.74	15.23	1500V	25A
HS445-MHL-D	445	487	41.20	10.81	49.80	11.40	1500V	20A
HS450-MHL-D	450	493	41.40	10.88	50.00	11.47	1500V	20A
HS455-MHL-D	455	498	41.60	10.94	50.20	11.54	1500V	20A
HS460-MHL-D	460	504	41.80	11.00	50.40	11.61	1500V	20A
HS465-MHL-D	465	509	42.00	11.08	50.60	11.68	1500V	20A
HS410-MHL-D	410	449	37.82	10.84	45.70	11.43	1500V	20A
HS415-MHL-D	415	454	38.02	10.92	45.90	11.52	1500V	20A
HS420-MHL-D	420	460	38.22	10.99	46.10	11.61	1500V	20A
HS425-MHL-D	425	465	38.42	11.06	46.30	11.69	1500V	20A
HS370-MHL-D	370	405	34.10	10.86	41.30	11.37	1500V	20A
HS375-MHL-D	375	411	34.30	10.95	41.50	11.46	1500V	20A
HS380-MHL-D	380	416	34.50	11.04	41.70	11.55	1500V	20A
HS385-MHL-D	385	422	34.70	11.10	41.90	11.66	1500V	20A

MODULE SUPPLEMENT

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This supplement refers to modules of the following types:

Table 2: Module types

TYPE	(Pmax) STC	(Pmax) BNPI	(Vmpp)	(Impp)	(Voc)	(Isc)	system voltage	Fuse rating
HS590 TC-MHO- D	590	644	43.44	13.59	51.63	14.38	1500V	25A
HS585 TC-MHO- D	585	637	43.33	13.51	51.52	14.30	1500V	25A
HS580 TC-MHO- D	580	632	43.22	13.42	51.41	14.22	1500V	25A
HS575 TC-MHO- D	575	627	43. 11	13.34	51.30	14. 14	1500V	25A
HS570 TC-MHO- D	570	621	43.00	13.26	51. 19	14.05	1500V	25A
HS565 TC-MHO- D	565	616	42.91	13. 17	51.09	13.97	1500V	25A
HS560 TC-MHO- D	560	611	42.82	13.08	50.99	13.89	1500V	25A
HS540 TC-MHO- D	540	595	40.64	13.29	48.27	14.35	1500V	25A
HS535 TC-MHO- D	535	589	40.44	13.23	48.04	14.29	1500V	25A
HS530 TC-MHO- D	530	584	40.24	13. 17	47.81	14.22	1500V	25A
HS525 TC-MHO- D	525	578	40.04	13. 11	47.57	14. 16	1500V	25A
HS520 TC - MHO- D	520	573	39.84	13.05	47.33	14. 10	1500V	25A
HS515 TC - MHO- D	515	568	39.64	12.99	46.98	14.03	1500V	25A
HS490TC- MHO- D	490	540	36.84	13.3	43.66	14.37	1500V	25A
HS485TC- MHO- D	485	534	36.64	13.23	43.46	14.30	1500V	25A
HS480TC- MHO- D	480	529	36.44	13. 17	43.26	14.22	1500V	25A
HS475 TC - MHO- D	475	523	36.24	13. 11	43.06	14. 15	1500V	25A
HS470 TC - MHO- D	470	518	36.04	13.04	42.86	14.08	1500V	25A
HS440 TC - MHO- D	440	485	33.24	13.24	39.53	14.30	1500V	25A
HS435 TC - MHO- D	435	479	33.04	13. 17	39.33	14.22	1500V	25A
HS430 TC - MHO- D	430	474	32.84	13. 10	39. 13	14. 15	1500V	25A
HS425 TC - MHO- D	425	468	32.64	13.03	38.93	14.07	1500V	25A
HS420 TC - MHO- D	420	463	32.44	12.95	38.73	14.00	1500V	25A
HS700TC - MHG- D	700	770	42.77	16.37	49.50	17.68	1500V	30A
HS695TC - MHG- D	695	765	42.57	16.33	49.43	17.63	1500V	30A
HS690TC - MHG- D	690	759	42.31	16.31	48.84	17.61	1500V	30A
HS685TC - MHG- D	685	754	42.04	16.29	48.64	17.60	1500V	30A
HS680TC - MHG- D	680	748	41.84	16.25	48.51	17.55	1500V	30A

HS675TC - MHG- D	675	743	41.71	16.18	48.38	17.48	1500V	30A
HS670TC - MHG- D	670	737	41.51	16.14	48.25	17.43	1500V	30A
HS635TC - MHG- D	635	699	38.70	16.41	44.94	17.72	1500V	30A
HS630TC - MHG- D	630	693	38.46	16.38	44.40	17.69	1500V	30A
HS625TC - MHG- D	625	688	38.22	16.35	44.22	17.66	1500V	30A
HS620TC - MHG- D	620	682	38.04	16.30	44.10	17.60	1500V	30A
HS615TC - MHG- D	615	677	37.92	16.22	43.98	17.52	1500V	30A
HS610TC - MHG- D	610	671	37.74	16.16	43.86	17.46	1500V	30A
HS580TC - MHG- D	580	638	35.26	16.45	40.70	17.77	1500V	30A
HS575TC - MHG- D	575	633	35.04	16.41	40.54	17.73	1500V	30A
HS570TC - MHG- D	570	627	34.87	16.35	40.43	17.65	1500V	30A
HS565TC - MHG- D	565	622	34.76	16.25	40.32	17.55	1500V	30A
HS560TC - MHG- D	560	616	34.60	16.19	40.21	17.48	1500V	30A
HS530TC - MHG- D	530	583	32.05	16.54	37.00	17.86	1500V	30A
HS525TC - MHG- D	525	578	31.85	16.48	36.86	17.80	1500V	30A
HS520TC - MHG- D	520	572	31.70	16.40	36.75	17.72	1500V	30A
HS515TC - MHG- D	515	567	31.60	16.30	36.65	17.60	1500V	30A
HS510TC - MHG- D	510	561	31.45	16.22	36.55	17.51	1500V	30A
HS445TC-MHA-D	445	490	33.19	13.41	39.77	13.87	1500V	25A
HS440TC-MHA-D	440	484	32.99	13.34	39.57	13.80	1500V	25A
HS435TC-MHA-D	435	478	32.78	13.27	39.36	13.72	1500V	25A
HS430TC-MHA-D	430	473	32.58	13.20	39.16	13.65	1500V	25A
HS425TC-MHA-D	425	468	32.37	13.13	38.95	13.58	1500V	25A
HS620TC-MHB-D	620	462	44.80	13.84	52.60	14.78	1500V	30A
HS615TC-MHB-D	615	677	44.60	13.79	52.40	14.72	1500V	30A
HS610TC-MHB-D	610	671	44.40	13.74	52.20	14.66	1500V	30A
HS605TC-MHB-D	605	666	44.20	13.69	52.00	14.60	1500V	30A
HS600TC-MHB-D	600	660	44.00	13.64	51.80	14.54	1500V	30A
HS595TC-MHB-D	595	655	43.80	13.59	51.60	14.48	1500V	30A
HS590TC-MHB-D	590	649	43.60	13.54	51.40	14.42	1500V	30A
HS605TC-MHC-D	605	666	40.50	14.94	48.70	15.83	1500V	30A
HS600TC-MHC-D	600	660	40.30	14.91	48.40	15.80	1500V	30A
HS595TC-MHC-D	595	655	40.00	14.89	48.10	15.76	1500V	30A
HS590TC-MHC-D	590	649	39.70	14.86	47.80	15.72	1500V	30A
HS585TC-MHC-D	585	644	39.50	14.82	47.50	15.68	1500V	30A
HS440TC-MHC-D	440	483	31.90	13.78	34.75	14.01	1500V	25A
HS435TC-MHC-D	435	478	31.86	13.64	34.60	13.98	1500V	25A
HS430TC-MHC-D	430	473	31.81	13.53	34.50	13.96	1500V	25A
HS425TC-MHC-D	425	468	31.68	13.42	34.37	13.93	1500V	25A

MOUNTING REQUIREMENTS

Mounting Method: Clamps

Table 2: Mounting requirements

Modules that Require Four (4) Connection Points
HS 60 Cell Series 2 HS60 Cell Series 2
HS60 Cell HS 60 Cell1 500V
HS 120 Cell half Cell HS 120 Cell half Cell
HS 60 Cell HS 60 Cell
HS 108 Cells

ELECTRICAL CHARACTERISTICS

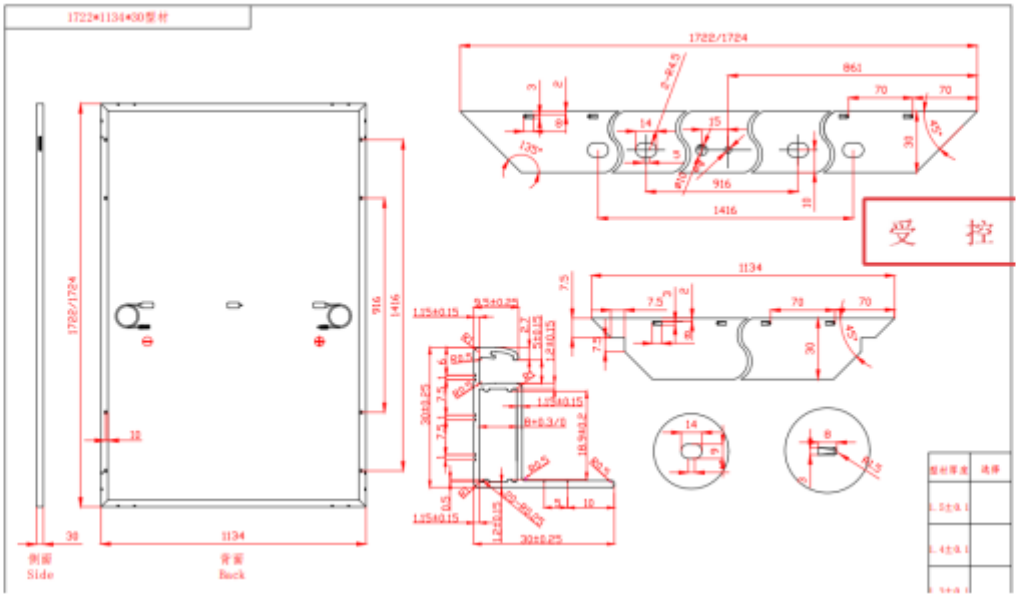
Nameplate ratings are average values. The electrical characteristics are within ±10 percent of the indicated values of Isc, Voc, and Pmax under Standard Test Conditions (irradiance of 1000 W/m², AM 1.5 spectrum, and a cell temperature of 25°C). Refer to module datasheets for specific power output tolerances. Please refer to Table 1 to see which power classes actually exist for which module series.

REAR AND SIDE VIEW DIMENSIONS OF MODULE SERIES WITH 30MM FRAME (CONT.)

UNITS: mm

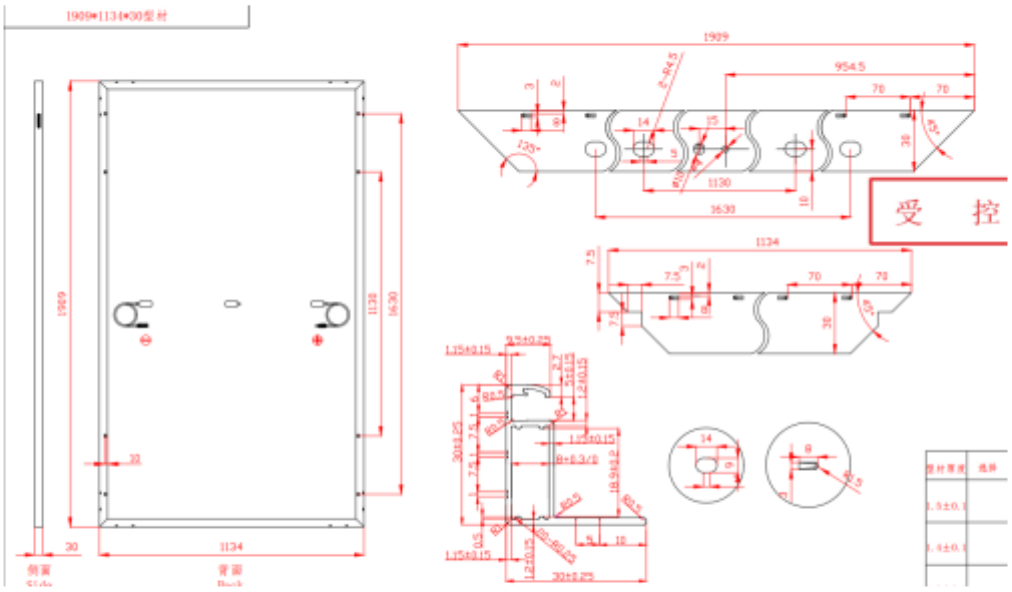
MüllerSolartechnik 108 Cells

(also valid for MüllerSolartechnik 108 Cells)



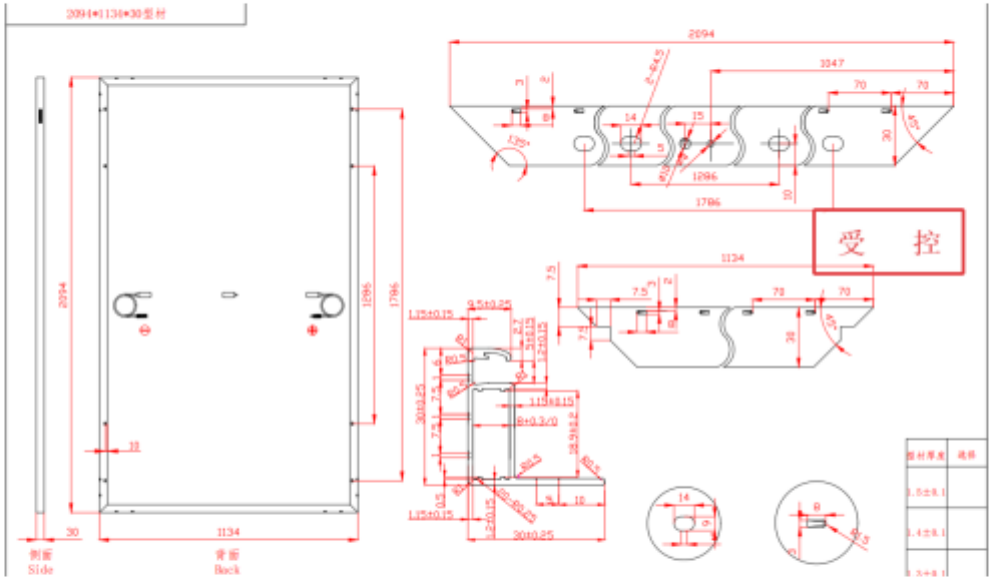
MüllerSolartechnik 120 Cells

(also valid for MüllerSolartechnik 120 Cells)



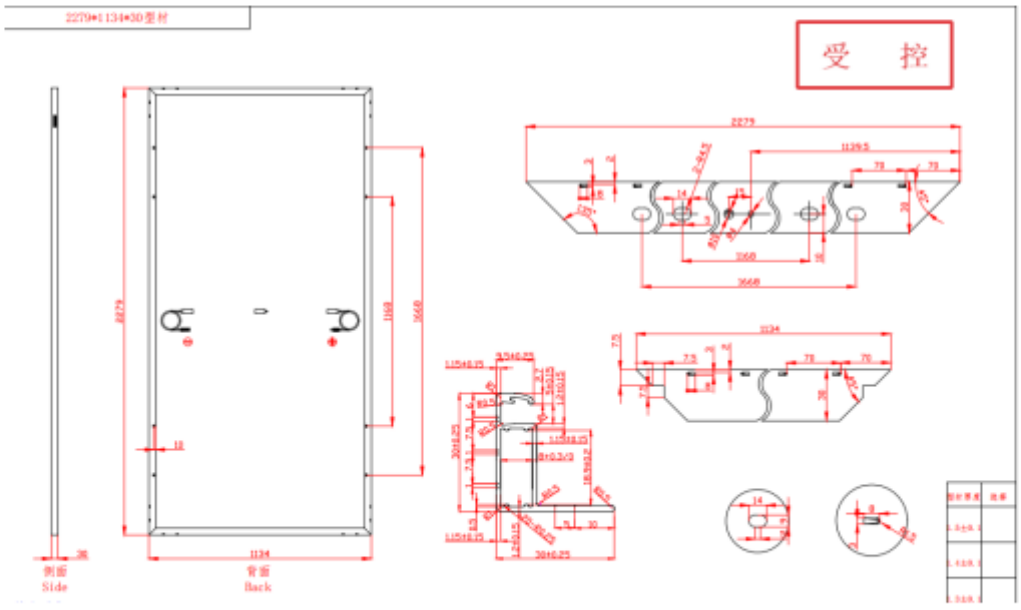
MüllerSolartechnik 132 Cell half Cell

(also valid for MüllerSolartechnik 132 Cell Half cell)



MüllerSolartechnik 144 Cell half Cell

(also valid for MüllerSolartechnik 144 Cell Half cell)



HoRay Solar Co.,LTD.

No. 30-5, Yanxin East Road, Huishan District, Wuxi City, Jiangsu, P.R. China

info@Horaysolar.com

Tel:+86-510-83580688

www.horaysolar.com

HORAY

EXCELLENT PV MODULE MANUFACTURER

HORAY SOLAR CO., LTD.

No.30-5 East Yanxin Road, Huishan District, Wuxi,Jiangsu, China

+86 510 83580688

www.horaysolar.com

sales@horaysolar.com

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HORAY



Horay Installation Manual

Single Glass

EXCELLENT PV MODULE MANUFACTURER

HORAY

HORAY SOLAR PV MODULES

Installation and User Manual

Revision date: 1 Jan, 2024 | Applicable for IEC certified products

This manual applies to photovoltaic modules ("PV modules", also commonly known as solar panels) manufactured by **HoRay Solar** Co., Ltd. ("**HoRay Solar**"), and is explicitly written for qualified professionals ("Installer" or "Installers"), including without limitation licensed electricians and RAL Certified PV Installers.

INTRODUCTION

Thank you for choosing **HoRay Solar** as your PV module provider. We appreciate your business! This manual contains important information pertaining to the electrical and mechanical installation and maintenance of PV modules, and includes safety information that you must read carefully and be familiar with before handling, installing, and/or maintaining **HoRay Solar** PV modules.

HoRay Solar does not assume responsibility and expressly disclaims liability for losses, damages, or expenses arising out of, or in any way connected with this Installation and User Manual. **HoRay Solar** assumes no responsibility for any infringement of patents or other rights of third parties, which may result from using **HoRay Solar** PV modules. No license is granted expressly or by implication or under any patent or patent rights. The information in this manual is believed to be reliable, but does not constitute an expressed or implied warranty. **HoRay Solar** reserves the right to make changes to its PV modules and other products, their specifications, or this manual without prior notice.

HoRay Solar and its subsidiaries are not liable for any damages caused by inappropriate installation, use, or maintenance of **HoRay Solar** PV modules, including without limitation damages, losses, and expenses caused by nonobservance of the instructions of this manual or caused by or in connection with products of other manufacturers.

HoRay Solar PV modules are designed to meet the requirements for the standards IEC 61215 and IEC 61730, application class A. Modules rated for use in this application class may be used in systems operating at greater than 50 VDC or 240 W, where general contact access is anticipated. Modules qualified for safety through IEC 61730-1 and IEC 61730-2 and within this application class are considered to meet the requirements for safety class II. In the course of the PV module certification process, the compliance of this manual with the certification requirements has been

verified by an independent certification laboratory. This Installation and User Manual is available in different languages. In cases of discrepancy between versions, the English language version shall control. Failure to comply with the requirements listed in this manual will invalidate the Limited Warranty for PV Modules as provided by **HoRay Solar** at the time of sale to the direct customer. Additional recommendations are provided to enhance safety practices and performance results. Please provide a copy of this manual to the PV system owner for their reference, and inform them of all relevant aspects of safety, operation, and maintenance.

SAFETY

General

You must understand and follow all applicable local, state, and federal regulations and standards for building construction, electrical design, fire, and safety. It is imperative to check with local authorities to determine the applicable permitting requirements before attempting to install or maintain PV modules.



Rooftop PV systems should only be installed on dwellings that have undergone a formal analysis by a certified building specialist or engineer to confirm their structural integrity and ability to support the additional weight of PV system components, including PV modules.

For your safety, never work on a rooftop until all necessary safety precautions have been identified and implemented. This includes, but is not limited to, ensuring fall protection measures are in place, using proper ladders or stairways, and wearing personal protective equipment (PPE).

Avoid installing or handling PV modules under adverse conditions such as strong or gusty winds, and wet or frosted roof surfaces, as these can pose significant safety risks.

The flat-plate PV module is constructed from a laminated assembly of solar cells encapsulated within an insulating material. This assembly is protected by a rigid glass surface on one side and an insulated substrate on the other. The entire assembly is supported by an aluminum frame, which also serves as the mounting structure for the module. Refer to Figure 1 for a visual representation of the PV module components.

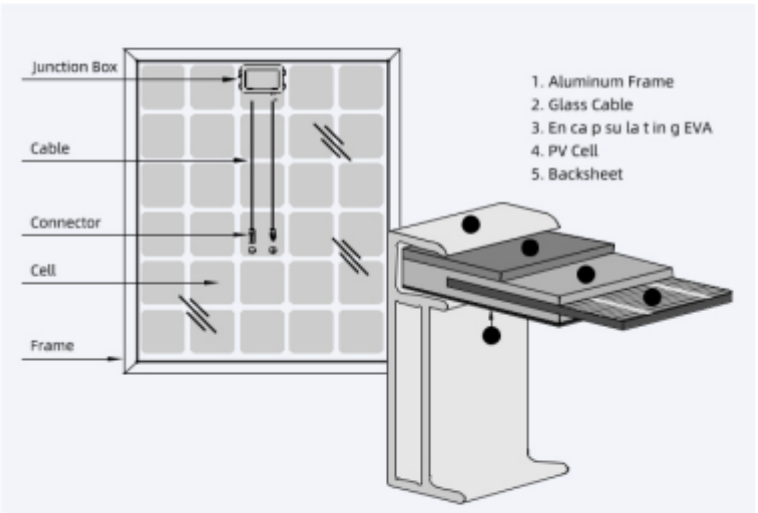


Figure 1: Module components and cross-section of the laminated assembly

Electrical



PV modules can produce current and voltage when exposed to light of any intensity. Electrical current increases with higher light intensity. DC voltage of 30 Volts or higher is potentially lethal. Contacting the live circuitry of a PV system operating under light can result in lethal electric shock.

De-energize PV modules by removing them entirely from light or by covering their front surface with an opaque material. Regard the safety regulations for live electrical equipment when working with modules that are exposed to any light. Use insulated tools and do not wear metallic jewelry while working with PV modules.

In order to avoid arcing and electrical shock, do not disconnect electrical connections under load. Faulty connections can also result in arcing and electrical shock. Keep connectors dry and clean, and ensure that they are in proper working condition. Never insert metallic objects into the connectors, or modify them in any way in order to secure an electrical connection.

Do not touch or handle PV modules with broken glass, separated frames or a damaged backsheet unless the PV modules are first disconnected and you are wearing proper PPE. Avoid handling PV modules when they are wet unless cleaning the PV modules as directed in this manual. Never touch electrical connections that are wet without protecting yourself with insulated gloves.

Transport and Handling

HoRay Solar PV modules must be transported in the supplied packaging only and kept in the packaging until they are ready to be installed. Protect pallets against movement and exposure to damage during transportation. Secure pallets from falling over. Do not exceed the maximum height of pallets to be stacked, as indicated on the pallet packaging. Store pallets in a cool and dry location until the PV modules are ready to be unpackaged.

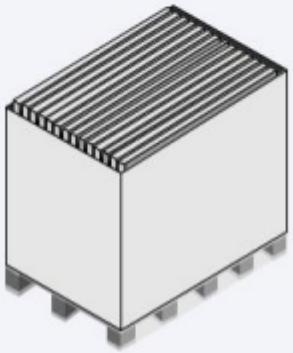


Figure 2: Pallet of PV modules

HoRay Solar PV modules are heavy, and should be handled with care. PV modules shall be handled at the frame; never use the junction box or cables as a grip. Do not exert mechanical stress on the cables. Never step on PV modules or drop or place heavy objects on them. Be careful when placing PV modules on hard surfaces, and secure them from falling. Broken glass can result in personal injury. PV modules with broken glass cannot be repaired and must not be used. Broken or damaged PV modules must be handled carefully and disposed of properly.

For unpacking PV modules from the **HoRay Solar** supplied packaging, first remove the pallet lid (after removing securing straps, if provided). Remove PV modules one at a time by sliding them up the channel in the package (see Figure 3). You may need to secure the remaining PV modules in the pallet packaging to prevent them from falling over.

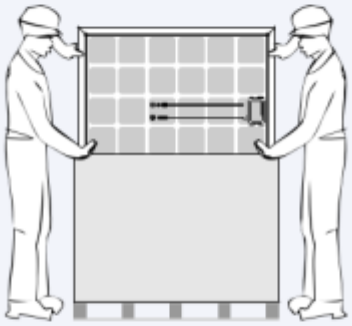


Figure 3: Removing PV modules from a pallet

Check PV modules for damage due to transportation before they are installed; do not install damaged modules. Contact the company you purchased the **HoRay Solar** PV modules from in order to obtain information on making claims for defective PV modules.

PV module surfaces are susceptible to damage that could affect the performance or safety of the PV module; do not damage or scratch the PV module surfaces, and do not apply paint or adhesive to any of the surfaces, including the frame. For your safety, do not disassemble or modify **HoRay Solar** PV modules in any way. Doing so may degrade performance or cause irreparable damage and will void any applicable warranties.

If it is necessary to store PV modules prior to installation, the PV modules should remain inside the packaging and protected from exposure that could compromise the durability of the packaging.

Fire

HoRay Solar PV Modules have a Class C fire resistance rating in accordance with the IEC 61730-2 certification. When PV modules are mounted on rooftops, the roof must have a fire resistant covering suitable for this application. PV modules are electrical generating devices that may affect the fire safety of a building. The use of improper installation methods and/or defective parts may result in the unexpected occurrence of an electrical arc during operation. In order to mitigate the risk of fire in this event, PV modules should not be installed near flammable liquids, gases, or locations with hazardous materials.

In the event of a fire, PV modules may continue to produce a dangerous voltage, even if they have been disconnected from the inverter, have been partly or entirely destroyed, or the system wiring has been compromised or destroyed. In the event of fire, inform the fire crew about the particular hazards from the PV system, and stay away from all elements of the PV system during and after a fire until the necessary steps have been taken to make the PV system safe.

APPLICATION INFORMATION

Application Restrictions

HoRay Solar PV modules must be mounted on appropriate mounting structures positioned on suitable buildings, the ground, or other structures suitable for PV modules (e.g. carports, building facades or PV trackers). PV modules must not be mounted on moving vehicles of any kind. **HoRay Solar** PV modules must not be installed in locations where they could be submerged in water.

HoRay Solar PV modules must not be sited in locations where aggressive substances such as salt or salt-water, or any other type of corrosive agent, could affect the safety and/or performance of the PV modules. Although some types of **HoRay Solar** PV modules have passed the IEC 61701 salt-mist corrosion test with a salt concentration of 5% by weight, galvanic corrosion can occur between the aluminum frame of the PV module and mounting or grounding hardware if such hardware is comprised of dissimilar metals. **HoRay Solar** recommends that only stainless steel and aluminum metal directly contact PV modules in seaside installations to limit corrosion.

Artificially concentrated light must not be directed on **HoRay Solar** PV modules. Design Recommendations: **HoRay Solar** recommends that PV Modules be mounted at a minimum tilt angle of 10 degrees to allow for proper self-cleaning from normal rain showers. Partial or complete shading of a PV module or modules can significantly reduce system performance. **HoRay Solar** recommends minimizing the amount of shade throughout the year to increase the amount of energy produced by the PV modules.

Lightning protection is recommended for PV systems that are to be installed in locations with a high probability of lightning strikes.

High system voltages could be induced in the event of an indirect lightning strike, which could cause damage to PV system components. The open area of wire loops should be minimized, as shown in Figure 4, in order to reduce the risk

HoRay recommends that modules used or installed should be 2000 meters (altitude) at most of lightning induced voltage surges.

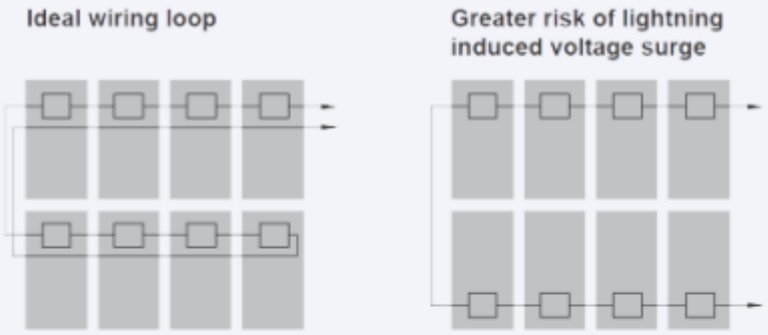


Figure 4: Wire loop design recommendation

ELECTRICAL INSTALLATION

Electrical Configuration

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at Standard Test Conditions (STC: 1000 W/m^2, AM 1.5, and 25℃ cell temperature). The short-circuit current (ISC) should be multiplied by a factor of 1.25 and the open-circuit voltage (VOC) should be multiplied by a factor of up to 1.25 based on the lowest ambient temperature recorded for the installation location when determining component voltage ratings, conductor current ratings, fuse sizes, and size of controls connected to the PV output.

Voltages are additive when PV modules are connected directly in series, and module currents are additive when PV modules are connected directly in parallel, as illustrated in Figure 5. PV modules with different electrical characteristics must not be connected directly in series. The use of suitable third-party electronic devices connected to PV modules may enable different electrical connections and must be installed according to the manufacturer's specified instructions.

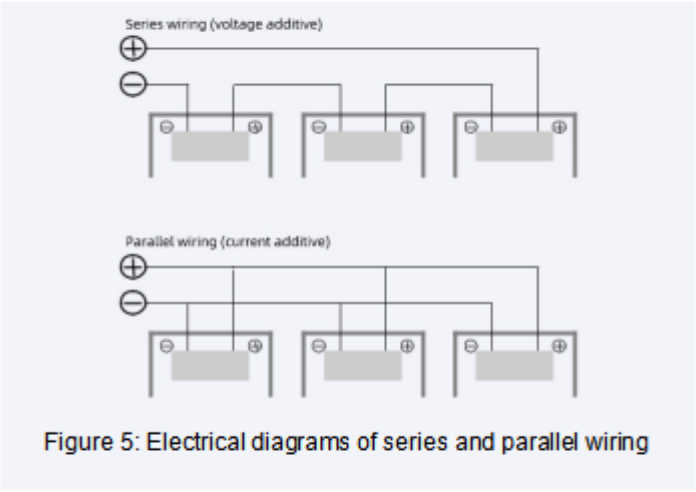


Figure 5: Electrical diagrams of series and parallel wiring

The maximum number of PV modules that can be connected in a series string must be calculated in accordance with applicable regulations in such a way that the specified maximum system voltage of the PV module and all other electrical DC components will not be exceeded in open-circuit operation at the lowest temperature expected at the PV system location.

An appropriately rated overcurrent protection device must be used when the reverse current could exceed the value of the maximum fuse rating of the module. An over current protection device and anti-reflection diode module are required for each series string if more than two series strings are connected in parallel. and reverse polarity is forbidden.

Cables and Wiring

HoRay Solar PV modules are provided with two(2) stranded, sunlight resistant output cables that are terminated with PV connectors ready for most installations. The positive (+) terminal has a female connector while the negative (-) terminal has a male connector. The module wiring is intended for series connections [i.e. female (+) to male (-) interconnections], but can also be used to connect suitable third-party electrical devices that may have alternative wiring configurations so long as the manufacturer' s instructions are followed.

Use field wiring with suitable cross-sectional areas that are approved for use at the maximum short-circuit current of the PV module. **HoRay Solar** recommends installers use only sunlight resistant cables qualified for direct current (DC) wiring in PV systems. The minimum wire size should be 4m ㎡ .

Table 1: Required minimum field wiring specifications

	Testing Standard	Wire Size	Temperature Rating
Required Minimum Field Wiring	EN 50618	4m m 2	-40°C to +90°C

Cables should be fixed to the mounting structure in such a way that mechanical damage of the cable and/or the module is avoided. Do not apply stress to the cables. Do not bend cables to a bending radius of less than 40mm. For fixing, use appropriate means, such as sunlight resistant cable ties and/or wire management clips specifically designed to attach to the PV module frame. While the cables are sunlight resistant and waterproof, where possible, avoid direct sunlight exposure and water immersion of the cables.

Connectors

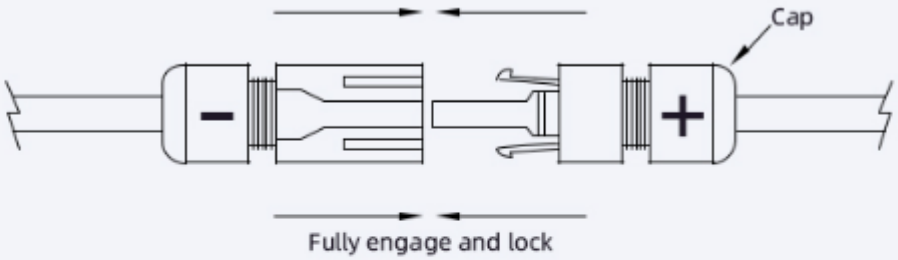


Keep connectors dry and clean, and ensure that connector caps are hand tight before connecting the modules. Do not attempt making an electrical connection with wet, soiled, or otherwise faulty connectors. Avoid sunlight exposure and water immersion of the connectors. Avoid connectors resting on the ground or roof surface.

Faulty connections can result in arcs and electrical shock. Check that all electrical connections are securely fastened. Make sure that all locking connectors are fully engaged and locked.

Modules must not be interconnected using connectors from different manufacturers and/or of different types. If modules having such different connectors need to be interconnected, a qualified professional may replace connectors according to the manufacturer' s specified instructions such that an interconnection can be made with connectors from the same manufacturer and the same type.

The Suppliers and types of connectors should be in accordance with the Standard IEC 62852. For more details, please see the CDF.



Fully engage and lockFigure 6: Series interconnection of a male (-) and female (+) connector

Bypass Diodes

The junction boxes used with **HoRay Solar** PV modules (not Smart Hot Spot Free module) contain bypass diodes wired in parallel with the PV cell strings. In the case of partial shading, the diodes bypass the current generated by the non-shaded cells, thereby limiting module heating and performance losses. Bypass diodes are not over current protection devices.

Bypass diodes divert current from the cell strings in the event of partial shading. See Figure 7-1 for a diagram showing how the cell strings are electrically connected with the diodes.

Every piece of cells from HoRay Smart Hot Spot Free module parallels a diode. If a cell is covered by shade or an exception occurs, the paralleled diode can bypass this cell, thereby avoiding a hot spot and retaining the maximum power output.

Bypass diodes divert current from a cell in the event of partial shading. See Figure 7-2 for a diagram showing how the cells are electrically connected with the diodes.

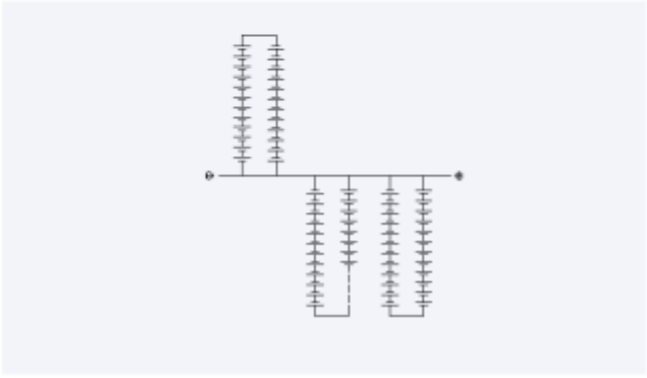


Figure 7-1: Electrical circuitry of cells and bypass diodes

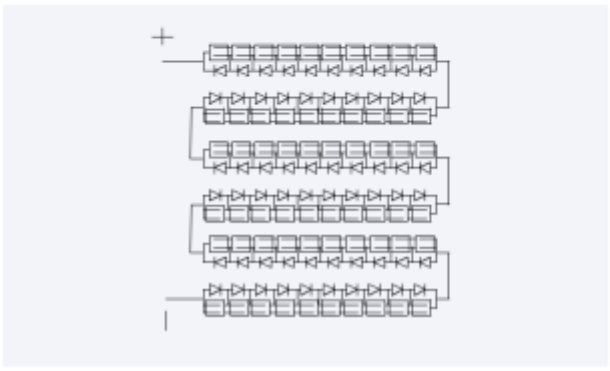


Figure 7-2: Electrical circuitry of cells and bypass diodes

In the event of a known or suspected diode failure, installers or maintenance providers should contact the company from which the PV modules were purchased. Never attempt to open the junction box of a **HoRay Solar** PV module yourself.

Grounding

The frame of the PV module, as well as any exposed non-current-carrying metal parts of fixed equipment that are able to become energized by the PV system, must be connected to the equipment grounding conductor (EGC) in order to prevent electrical shock. Even when applicable regulations, code requirements, and standards do not require safety-related grounding, **HoRay Solar** recommends grounding all PV module frames in order to ensure the voltage between electrically conductive equipment and earth ground is zero in all circumstances.

Proper equipment grounding is achieved by bonding all exposed non-current-carrying metal equipment continuously to one another using an appropriately sized EGC or racking system that can be used for integrated grounding (see Option B in Grounding Methods below).

HoRay Solar PV modules employ a coated aluminum frame for corrosion resistance. In order to properly ground the module frame, the coating must be penetrated.

The potential for corrosion due to the electrochemical action between dissimilar metals in contact is minimized if the electrochemical voltage potential between the dissimilar metals is low. The grounding method must not result in the direct contact of dissimilar metals with the aluminum frame of the PV module that will result in galvanic corrosion. An addendum to UL Standard 1703 "Flat Plate Photovoltaic Modules and Panels" recommends metal combinations not exceed an electrochemical potential difference of 0.5 Volts.

The frame rails have pre-drilled holes marked with a grounding sign, as illustrated in Figure 8. These holes should be used for grounding purposes and must not be used for mounting the PV modules. Do not drill additional holes into the frame rails.

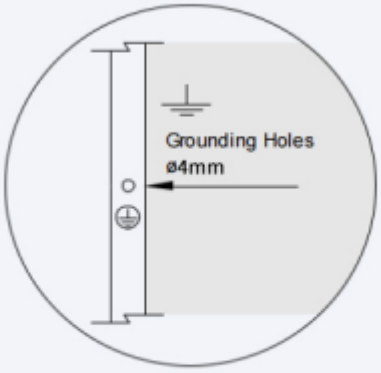


Figure 8: Grounding hole detail

The following grounding methods are available:

Option A: Screw Assembly (see Figure 9)

1.A grounding screw assembly must be attached at a designated grounding hole location using only stainless steel hardware. Insert an M3 stainless steel screw first through the stainless steel cup washer, and then through the grounding hole.

2.Loosely engage a stainless steel backing nut and toothed lock washer to the screw.

3.Bend the EGC into an omega (Ω) shape to tightly fit between the partially installed screw head and cup washer. The EGC shall be exclusively in contact with stainless steel.

4.Tighten the screw to 2.3 N·m torque. The toothed lock washer should be visibly engaged to the frame.

5.Route the appropriately sized EGC in such a way as to avoid contact with the aluminum module frame.

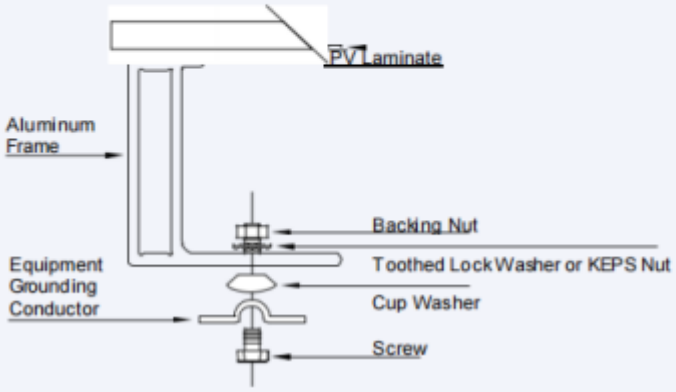


Figure 9: Grounding screw assembly detail

Option B: Racking Manufacturer Integrated Grounding Methods

HoRay Solar PV modules can be grounded by bonding PV modules to a grounded racking system. Integrated grounding methods must be certified for grounding PV modules and must be installed in accordance with the specified instructions of their respective manufacturers.

Option C: Additional Third-party Grounding Devices

HoRay Solar PV modules can be grounded using third party grounding devices so long as they are certified for grounding PV modules and the devices are installed according to the manufacturer' s specified instructions.

MECHANICAL INSTALLATION

General

HoRay Solar PV Modules have been certified for a maximum static load on the back of the module of up to 1600 Pa (i.e. wind load) and a maximum static load on the front of the module of up to either 1600 Pa or 3600 Pa (i.e. wind and snow load) with a safety factor of 1.5 depending on the module type (please refer to the data sheet for this information).

Mounting structures and other mechanical parts must be designed and approved to withstand the design wind and snow loads applicable for a particular site. **HoRay Solar** PV modules must not be subjected to forces from the substructure, including forces caused by thermal expansion.

The mounting method must not result in the direct contact of dissimilar metals with the aluminum frame of the PV module that will result in galvanic corrosion. An addendum to UL Standard 1703 "Flat Plate Photovoltaic Modules and Panels" recommends metal combinations not exceed an electrochemical potential difference of 0.5 Volts.

HoRay Solar PV modules can be mounted in landscape or portrait orientation, as illustrated in Figure 10, provided that the mounting method follows one of the acceptable methods listed below.

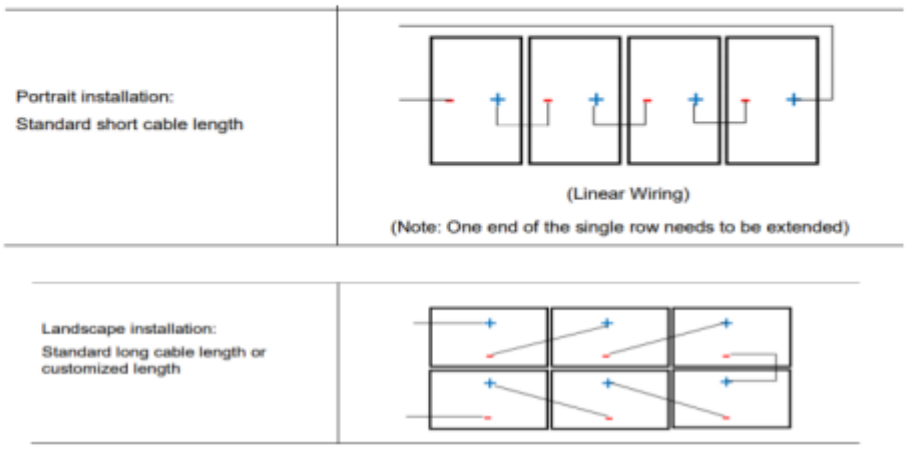


Figure 10: Landscape and portrait mounting

In order to maintain the fire class rating, the distance between the PV module front surface (glass) and the roof surface shall be at least 10 cm. This spacing also allows air flow to cool the PV module. Install PV modules with a minimum spacing of 1 cm between neighboring frames to allow for thermal expansion.

Mounting Methods

The following mounting methodsare available:

Bolts or Clamps

Refer to the Module Supplement distributed with this manual to determine how many connection points are required for a specific module series. The locations of mounting holes and clamp tolerances are illustrated in the drawings located in the Module Supplement. Do not modify the existing mounting holes or drill new holes. Do not apply excessive pressure on the frame such that the frame deforms.

Bolts: Modules must be mounted using the mounting holes located on the rear side of the long frame parts using M8 stainless steel bolts, nuts, and washers. The torque of screw tightening should be between 14N ·m to 20N ·m.

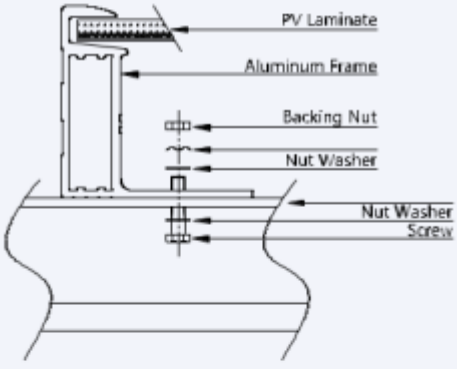


Figure 11: Detail of a bolt mounting attachment

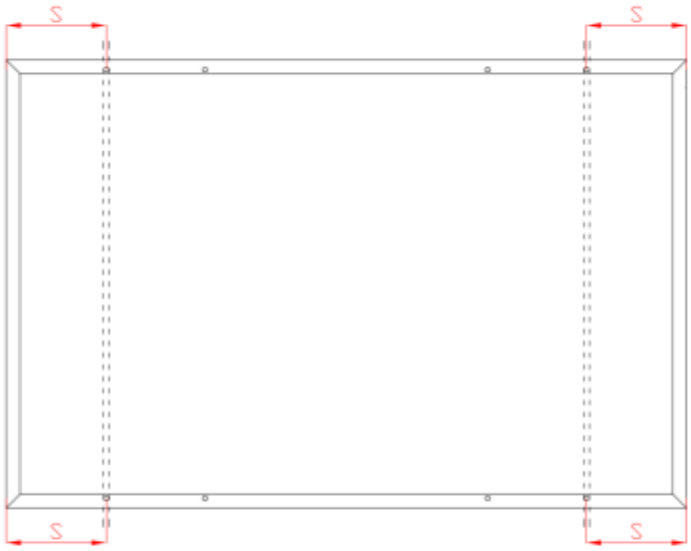


Figure12-1:Mountingrailsmustrunperpendicularlytothelongframe 360mm < S < 410mm

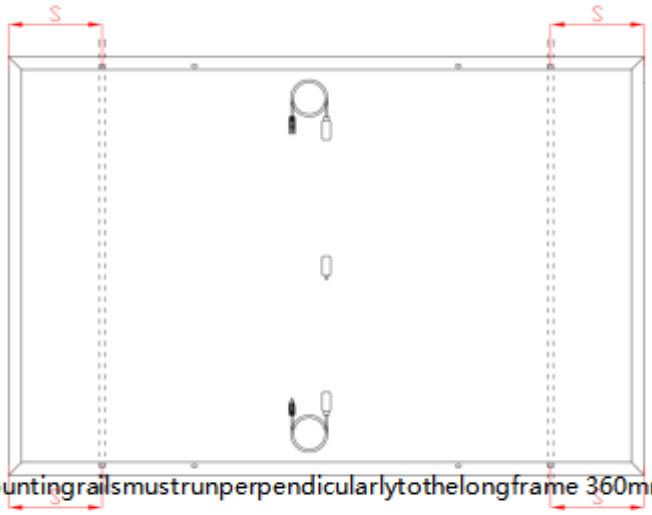


Figure12-1:Mountingrailsmustrunperpendicularlytothelongframe 360mm < S < 410mm

• **Top-down Clamps:** Third-party clamps that have been designed for PV mounting structures are an approved mounting attachment method for **HoRay Solar** PV modules. Modules must be fastened using clamps applied to the top side of the long frame parts. A clamp holds two modules except for the clamps at the beginning and end of a module row. The centerline of the clamps must be in line with the mounting hole positions plus or minus a distance of 50mm. The module clamps should not contact with the front glass and deform the frame, and should avoid shadowing effects from the module clamps. The module frame is not to be modified under any circumstances. The applied torque value should be big enough to fix the modules steadily. The torque of screw tightening should be between 16N·m to 24N·m.

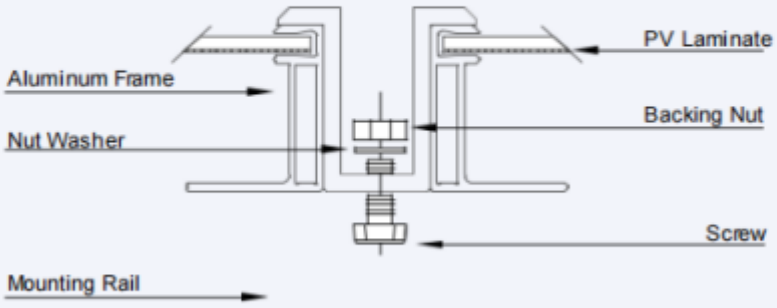


Figure 13: Detail of a top-down clamp mounting attachment

MAINTENANCE

General

HoRay Solar recommends that PV systems be periodically inspected by the installer, or other qualified person.

The purpose of the PV system inspection is to ensure that all system components are functioning properly. At a minimum, this inspection should confirm the following:

All cables and connector attachments are undamaged and properly secured.

- No sharp objects are in contact with the PV module surfaces.

- PV modules are not shaded by unwanted obstacles and/or foreign material.

- Mounting and grounding components are tightly secured with no corrosion. Defects should be addressed immediately.

Cleaning

Over time, dirt and dust can accumulate on the glass surface of the module, reducing its power output. **HoRay Solar** recommends periodic cleaning of PV modules to ensure maximum power output, especially in regions with low precipitation.

In order to reduce the potential for electrical and thermal shock, **HoRay Solar** recommends cleaning PV modules during early morning or late afternoon hours when solar radiation is low and the modules are cooler, especially in regions with hotter temperatures.

Never attempt to clean a PV module with broken glass or other signs of exposed wiring, as this presents a shock hazard.

Clean the glass surface of the PV modules with a soft brush using soft, clean water (PH6-9) with a recommended pressure less than 690kPa, which is typical of most municipal water systems.

Water with high mineral content may leave deposits on the glass surface and is not recommended.

HoRay Solar PV modules may contain a hydrophobic anti-reflective coating on the glass



surface to enhance power output and reduce dirt and dust buildup. In order to avoid module damage, do not clean PV modules with a power washer or pressure washer. Do not use steam or corrosive chemicals to facilitate the cleaning of modules. Do not use aggressive tools or abrasive materials that could scratch or damage the glass surface. Failure to comply with these requirements may adversely affect the PV module performance.

HoRay Solar PV modules are designed to withstand high snow loads. However, if removing snow is desired to enhance production, use a brush to gently remove snow. Do not try to remove frozen snow or ice from PV modules.

DECOMMISSIONING

The dismantling of PV systems must be performed with the same care and safety precautions used during the initial installation. The PV system can generate hazardous voltage even after the system has been disconnected. Follow safety regulations for working with live electrical equipment.

Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities.

Contact your local government for information regarding the collection systems available.

If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. When replacing old appliances with new ones, the retailer is legally obligated to take back your old appliance for disposal at least free of charge.

HoRay Solar CO.,LTD.

info@horaysolar.com

Tel:+86-510-83580688

www.horaysolar.com

HORAY SOLAR PV MODULES

Module Supplement

Revision date: 1 Jan, 2024 | Applicable for IEC certified products.

The information in this supplement is believed to be reliable, but does not constitute an expressed or implied warranty. Solar reserves the right to make changes to its PV modules and other products, their specifications, or this supplement without prior notice.

This supplement to the installation manual does not contain information about some older module series no longer being manufactured by **HoRay Solar**. If you require information about such modules, please contact **HoRay Solar**. This supplement refers to modules of the following types:

Table 1: Module types

TYPE	(Pmax) STC	(Vmpp)	(Impp)	(Voc)	(Isc)	system voltage	Fuse rating
HS640-MHG	640	37.21	17.20	45.18	18.06	1500V	30A
HS645-MHG	645	37.41	17.24	45.38	18.11	1500V	30A
HS650-MHG	650	37.61	17.28	45.58	18.16	1500V	30A
HS585-MHG	585	33.8	17.3	40.9	18.37	1500V	30A
HS590-MHG	590	34.0	17.35	41.1	18.42	1500V	30A
HS595-MHG	595	34.2	17.4	41.3	18.47	1500V	30A
HS600-MHG	600	34.4	17.44	41.5	18.52	1500V	30A
HS535-MHG	535	31.36	17.06	37.66	18.07	1500V	30A
HS540-MHG	540	31.56	17.11	37.86	18.12	1500V	30A
HS545-MHG	545	31.76	17.16	38.06	18.17	1500V	30A
HS550-MHG	550	31.96	17.21	38.26	18.22	1500V	30A
HS485-MHG	485	28.49	17.05	34.22	18.08	1500V	30A
HS490-MHG	490	28.69	17.08	34.42	18.13	1500V	30A
HS495-MHG	495	28.89	17.13	34.62	18.21	1500V	30A
HS500-MHG	500	29.09	17.19	34.82	18.29	1500V	30A
HS535-MHO	535	41.00	13.05	49.20	13.81	1500V	25A
HS540-MHO	540	41.20	13.11	49.40	13.87	1500V	25A
HS545-MHO	545	41.40	13.17	49.60	13.93	1500V	25A
HS550-MHO	550	41.60	13.23	49.80	13.99	1500V	25A
HS555-MHO	555	41.80	13.28	50.00	14.05	1500V	25A
HS560-MHO	560	42.00	13.34	50.20	14.11	1500V	25A
HS495-MHO	495	37.60	13.17	45.10	13.78	1500V	25A
HS500-MHO	500	37.80	13.23	45.30	13.83	1500V	25A
HS505-MHO	505	38.00	13.29	45.50	13.89	1500V	25A
HS510-MHO	510	38.20	13.35	45.70	13.94	1500V	25A
HS515-MHO	515	38.40	13.41	45.90	14.00	1500V	25A

HS450-MHO	450	34.60	13.01	41.40	13.68	1500V	25A
HS455-MHO	455	34.80	13.08	41.60	13.73	1500V	25A
HS460-MHO	460	35.00	13.15	41.80	13.78	1500V	25A
HS465-MHO	465	35.20	13.21	42.00	13.84	1500V	25A
HS470-MHO	470	35.40	13.28	42.20	13.90	1500V	25A
HS405-MHO	405	31.02	13.06	37.14	13.65	1500V	25A
HS410-MHO	410	31.22	13.14	37.34	13.70	1500V	25A
HS415-MHO	415	31.42	13.21	37.54	13.77	1500V	25A
HS420-MHO	420	31.62	13.28	37.74	13.86	1500V	25A
HS445-MHL	445	41.20	10.81	49.80	11.40	1500V	20A
HS450-MHL	450	41.40	10.88	50.00	11.47	1500V	20A
HS455-MHL	455	41.60	10.94	50.20	11.54	1500V	20A
HS460-MHL	460	41.80	11.00	50.40	11.61	1500V	20A
HS465-MHL	465	42.00	11.07	50.60	11.68	1500V	20A
HS410-MHL	410	37.82	10.84	45.70	11.43	1500V	20A
HS415-MHL	415	38.02	10.92	45.90	11.52	1500V	20A
HS420-MHL	420	38.22	10.99	46.10	11.61	1500V	20A
HS425-MHL	425	38.42	11.06	46.30	11.69	1500V	20A
HS370-MHL	370	34.10	10.86	41.30	11.37	1500V	20A
HS375-MHL	375	34.30	10.95	41.50	11.46	1500V	20A
HS380-MHL	380	34.50	11.04	41.70	11.55	1500V	20A
HS385-MHL	385	34.70	11.10	41.90	11.66	1500V	20A

TYPE	(Pmax)	(Vmpp)	(Impp	(Voc	(Isc)	system voltage	Fuse
HS80-MHG	80	21.50	3.72	25.60	3.95	1500V	15A
HS85-MHG	85	21.60	3.94	25.92	4. 17	1500V	15A
HS90-MHG	90	21.70	4.15	26.04	4.40	1500V	15A
HS110-MHG	110	21.60	5.10	25.80	5.41	1500V	15A
HS115-MHG	115	21.70	5.30	25.90	5.73	1500V	15A
HS120-MHG	120	21.80	5.50	26.16	5.83	1500V	15A
HS170-MHG	170	21.70	7.84	25.90	8.31	1500V	15A
HS175-MHG	175	21.80	8.03	26.16	8.51	1500V	15A
HS180-MHG	180	21.90	8.22	26.28	8.71	1500V	15A
HS60-MHO	60	21.10	2.85	24.90	3.02	1500V	15A
HS65-MHO	65	21.20	3.07	25.44	3.25	1500V	15A
HS80-MHO	80	21.20	3.78	25.10	4.01	1500V	15A
HS85-MHO	85	21.30	3.99	25.56	4.23	1500V	15A
HS90-MHO	90	21.40	4.21	25.68	4.46	1500V	15A
HS120-MHO	120	21.30	5.64	25.20	5.98	1500V	15A
HS125-MHO	125	21.40	5.84	25.68	6.19	1500V	15A
HS130-MHO	130	21.50	6.05	25.80	6.41	1500V	15A
HS50-MHL	50	20.70	2.42	24.80	2.56	1500V	15A
HS55-MHL	55	20.80	2.64	25.00	2.80	1500V	15A

HS70-MHL	70	20.80	3.37	25.00	3.57	1500V	15A
HS75-MHL	75	20.90	3.59	25.10	3.80	1500V	15A
HS100-MHL	100	20.90	4.79	25.10	5.08	1500V	15A
HS105-MHL	105	21.00	5.00	25.20	5.30	1500V	15A
HS110-MHL	110	21.10	5.21	25.32	5.53	1500V	15A
HS590TC-MHO	590	43.44	13.59	51.63	14.38	1500V	25A
HS585TC-MHO	585	43.33	13.51	51.52	14.30	1500V	25A
HS580TC-MHO	580	43.22	13.42	51.41	14.22	1500V	25A
HS575TC-MHO	575	43. 11	13.34	51.30	14.	1500V	25A
HS570TC-MHO	570	43.00	13.26	51.19	14.05	1500V	25A
HS565TC-MHO	565	42.91	13. 17	51.09	13.97	1500V	25A
HS560TC-MHO	560	42.82	13.08	50.99	13.89	1500V	25A
HS540TC-MHO	540	40.64	13.29	48.27	14.35	1500V	25A
HS535TC-MHO	535	40.44	13.23	48.04	14.29	1500V	25A
HS530TC-MHO	530	40.24	13. 17	47.81	14.22	1500V	25A
HS525TC-MHO	525	40.04	13. 11	47.57	14.16	1500V	25A
HS520TC-MHO	520	39.84	13.05	47.33	14.10	1500V	25A
HS515TC-MHO	515	39.64	12.99	46.98	14.03	1500V	25A
HS490TC-MHO	490	36.84	13.3	43.66	14.37	1500V	25A
HS485TC-MHO	485	36.64	13.23	43.46	14.30	1500V	25A
HS480TC-MHO	480	36.44	13. 17	43.26	14.22	1500V	25A
HS475TC-MHO	475	36.24	13. 11	43.06	14.15	1500V	25A
HS470TC-MHO	470	36.04	13.04	42.86	14.08	1500V	25A
HS440TC-MHO	440	33.24	13.24	39.53	14.30	1500V	25A
HS435TC-MHO	435	33.04	13. 17	39.33	14.22	1500V	25A
HS430TC-MHO	430	32.84	13.10	39.13	14.15	1500V	25A
HS425TC-MHO	425	32.64	13.03	38.93	14.07	1500V	25A
HS420TC-MHO	420	32.44	12.95	38.73	14.00	1500V	25A
HS445TC-MHA	445	33.19	13.41	39.77	13.87	1500V	25A
HS440TC-MHA	440	32.99	13.34	39.57	13.80	1500V	25A
HS435TC-MHA	435	32.78	13.27	39.36	13.72	1500V	25A
HS430TC-MHA	430	32.58	13.20	39.16	13.65	1500V	25A
HS425TC-MHA	425	32.37	13.13	38.95	13.58	1500V	25A
HS620TC-MHB	620	44.80	13.84	52.60	14.78	1500V	25A
HS615TC-MHB	615	44.60	13.79	52.40	14.72	1500V	25A
HS610TC-MHB	610	44.40	13.74	52.20	14.66	1500V	25A
HS605TC-MHB	605	44.20	13.69	52.00	14.60	1500V	25A
HS600TC-MHB	600	44.00	13.64	51.80	14.54	1500V	25A
HS595TC-MHB	595	43.80	13.59	51.60	14.48	1500V	25A
HS590TC-MHB	590	43.60	13.54	51.40	14.42	1500V	25A

MOUNTING REQUIREMENTS

Mounting Method: Clamps

Table 2: Mounting requirements

Modules that Require Four (4) Connection Points
HS 60Cell Series 2 HS 60Cell Series 2
HS 60Cell HS 60 Cell1 500V
HS 120 Cell half Cell HS 120 Cell half Cell
HS 60Cell HS 60Cell

ELECTRICAL CHARACTERISTICS

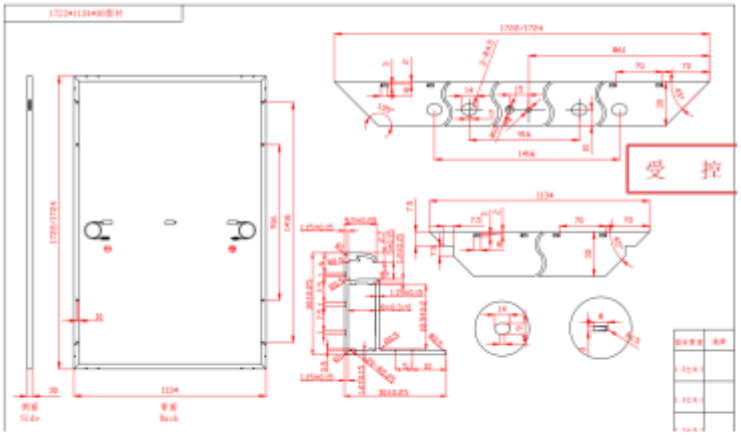
Nameplate ratings are average values. The electrical characteristics are within +/- 10 percent of the indicated values of Isc, Voc, and Pmax under Standard Test Conditions (irradiance of 1000 W/m², AM 1.5 spectrum, and a cell temperature of 25℃). Refer to module datasheets for specific power output tolerances. Please refer to Table 1 to see which power classes actually exist for which module series.

REAR AND SIDE VIEW DIMENSIONS OF MODULE SERIES WITH 30MM FRAME (CONT.)

UNITS: mm

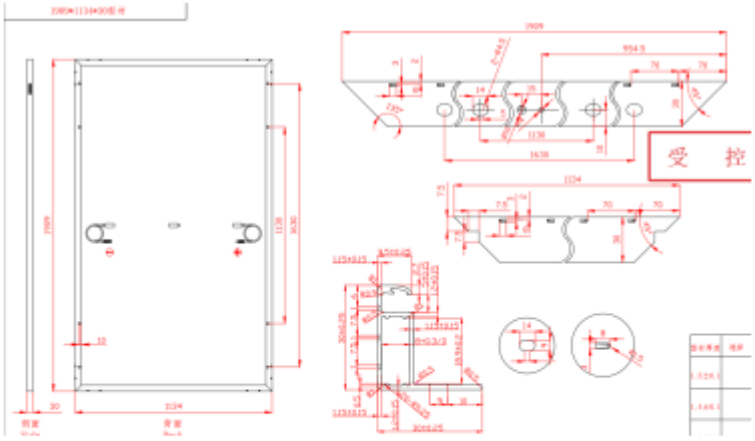
HORAY 108 Cells

(also valid for HORAY108 Cells)



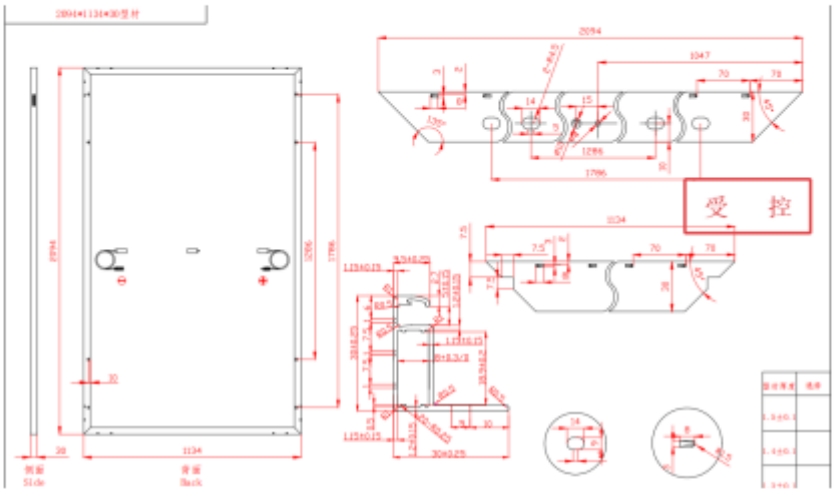
HORAY 120 Cells

(also valid for HORAY120 Cells)



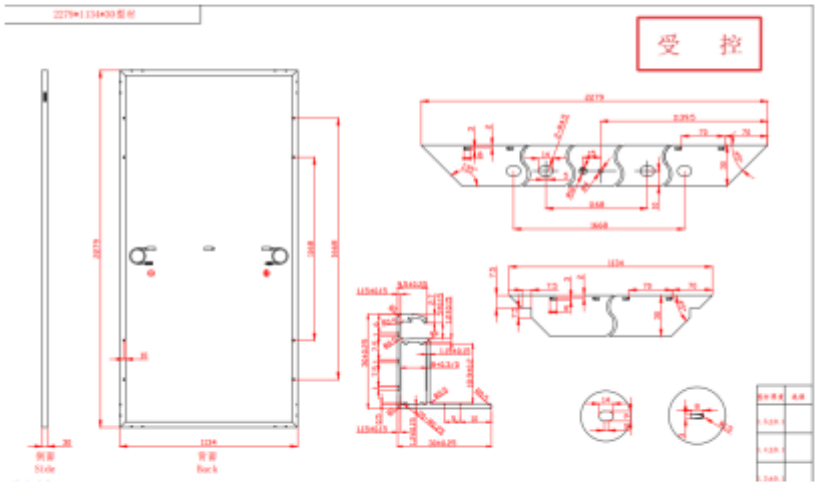
HORAY 132Cell half Cell

(also valid for HORAY 132 Cell Half cell)



HORAY 144 Cell half Cell

(also valid for HORAY144 Cell Half cell)



HoRay Solar Co.,LTD.

No. 30-5, Yanxin East Road, Huishan District, Wuxi City, Jiangsu, P.R. China

info@Horaysolar.com

Tel:+86-510-83580688

www.horaysolar.com

HORAY

EXCELLENT PV MODULE MANUFACTURER

HORAY SOLAR CO., LTD.

No.30-5 East Yanxin Road, Huishan District, Wuxi,Jiangsu, China

+86 510 83580688

www.horaysolar.com

sales@horaysolar.com

Scan the QR code to follow WeChat

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HORAY

Customized & Non-Standard Expert

+86-510-83580688
sales@horaysolar.com
www.horaysolar.com
No.300 Huiming Road, Huishan District, Wuxi, Jiangsu, China

Official Website | Official WeChat Account | Official Video Account | Official TikTok Account



Solar Creek Mini Series

Non-Standard PV Module Collection

HORAY



ABOUT HORAY SOLAR

HORAY SOLAR is a leading integrated photovoltaic company specializing in the research and development, production, and sales of solar cells, modules, and power systems. Our comprehensive product range includes high-quality solar cells and modules, among others.

Our state-of-the-art manufacturing facility is accredited with ISO9001, 45001, and 14001 certifications. We adhere to the highest standards of production and follow the international norms of IEC 61215 & IEC 61730 for the manufacture of HORAY SOLAR panels. Additionally, we offer OEM and ODM services to cater to the specific requirements of our customers. Our solar panels are certified with CE, TüV and CQC, ensuring their compliance with various quality and safety standards.

Since its establishment, HORAY SOLAR has consistently prioritized product quality. Backed by strong technical support, professional production equipment, scientific production management, and stringent quality control, their products have achieved industry-leading standards. They have obtained numerous authoritative certifications both domestically and internationally, earning recognition and trust from a multitude of customers.

Looking ahead, HORAY SOLAR will persistently dedicate itself to the photovoltaic module industry, assuming the responsibility of promoting global green energy development. Together with global partners, we strive to create a better life for humanity and contribute to a greener home for every individual worldwide.

HORAY

PRODUCT FEATURES

SMBB Technology
More uniform current collection capability, reducing the current heat loss of the internal cells.

Harsh Environmental Adaptability
Strict salt spray and ammonia corrosiontest by the third party.

Higher Output Power
The output power of monocrystalline modules is higher than normal modules.

With Very Low LID
Monocrystalline solar cell has very low LID which can reduce power degradation.

Low Light Features
Higher performance under low light environment.

PID Protection
Ensure the attenuation probability caused by PID phenomenon is minimized.

CERTIFICATES

IEC 61215:2021
IEC61730:2023

ISO9001:2015
ISO14001:2015
ISO45001:2018

Europe Standard

China Quality Certification Centre

APPLICATION



POWER FOR RVS



POWER FOR LIGHTS



POWER FOR CAMPING



POWER FOR CARPORT

CUSTOMIZATION

We offer complete customization of solar panels to meet the unique demands of your application.

Size & Shape: Specify exact dimensions, or request unique shapes to fit constrained or innovative designs.

Power Output: We can tailor the cell configuration to achieve your precise power requirements.

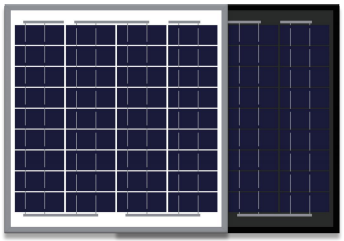
Electrical Parameters: Customize electrical characteristics to perfectly match your system.

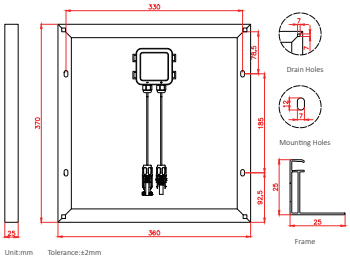
Durability & Aesthetics: Choose from various frame finishes, backsheet colors, junction box and so on.

HS 1/10G1-36 Mini

HORAY | TIER1 BloombergNEF

20W





Dimension	370×360×25mm
Cell Orientation	36 (4×9)
Weight	2.0kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES
IEC 61215:2021 / IEC61730:2023
ISO9001:2015 / ISO14001:2015 / ISO45001:2018
Europe Standard / China Quality Certification Centre

10 10-year product warranty

25 25-year power output warranty

Module Type	HM20-MHL
Testing Condition	STC
Maximum Power(Pmax/W)	20
Open Circuit Voltage(Voc/V)	25.21
Short Circuit Current(Isc/A)	1.01
Maximum Power Voltage(Vmp/V)	20.95
Maximum Power Current(Imp/A)	0.95
Module Efficiency(%)	15.0
Temperature Coefficient of Isc	+0.05%/°C
Temperature Coefficient of Voc	-0.28%/°C
Temperature Coefficient of Pmax	-0.34%/°C

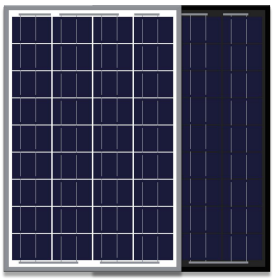
* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

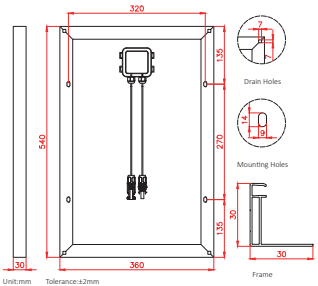
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HS 1/6G1-36 Mini

HORAY | TIER1 BloombergNEF

30W





Dimension	540×360×30mm
Cell Orientation	36 (4×9)
Weight	2.5kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES
IEC 61215:2021 / IEC61730:2023
ISO9001:2015 / ISO14001:2015 / ISO45001:2018
Europe Standard / China Quality Certification Centre

10 10-year product warranty

25 25-year power output warranty

Module Type	HM30-MHL
Testing Condition	STC
Maximum Power(Pmax/W)	30
Open Circuit Voltage(Voc/V)	24.26
Short Circuit Current(Isc/A)	1.57
Maximum Power Voltage(Vmp/V)	20.16
Maximum Power Current(Imp/A)	1.49
Module Efficiency(%)	15.4
Temperature Coefficient of Isc	+0.05%/°C
Temperature Coefficient of Voc	-0.28%/°C
Temperature Coefficient of Pmax	-0.34%/°C

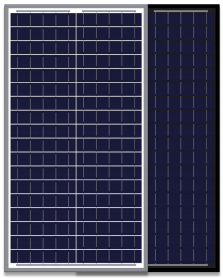
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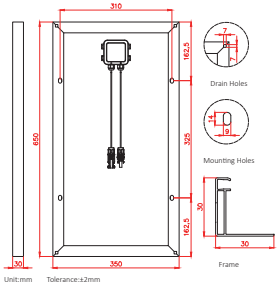
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HS 1/5G1-36 Mini

HORAY | TIER1 BloombergNEF

40W





Dimension	650×350×30mm
Cell Orientation	36 (2×18)
Weight	3.0kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES

IEC 61215:2021 / IEC61730:2023

ISO9001:2015 / ISO14001:2015 / ISO45001:2018

Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM40-MHL
Testing Condition	STC
Maximum Power(Pmax/W)	40
Open Circuit Voltage(Voc/V)	25.21
Short Circuit Current(Isc/A)	2.02
Maximum Power Voltage(Vmp/V)	20.95
Maximum Power Current(Imp/A)	1.91
Module Efficiency(%)	17.6
Temperature Coefficient of Isc	+0.05%/°C
Temperature Coefficient of Voc	-0.28%/°C
Temperature Coefficient of Pmax	-0.34%/°C

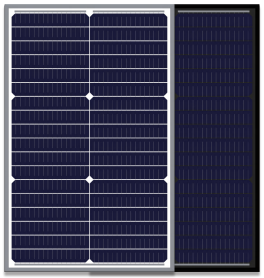
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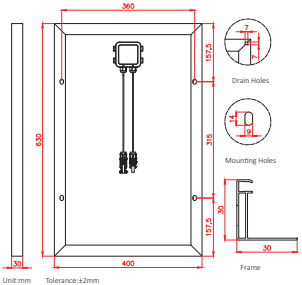
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HS 1/6M10-36 TC Mini

HORAY | TIER1 BloombergNEF

45W / 50W





Dimension	630×400×30mm
Cell Orientation	36 (2x18)
Weight	4.0kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES

IEC 61215:2021 / IEC61730:2023

ISO9001:2015 / ISO14001:2015 / ISO45001:2018

Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM45TC-MHO	HM50TC-MHO
Testing Condition	STC	STC
Maximum Power(Pmax/W)	45	50
Open Circuit Voltage(Voc/V)	26.86	27.68
Short Circuit Current(Isc/A)	2.13	2.30
Maximum Power Voltage(Vmp/V)	22.32	23.00
Maximum Power Current(Imp/A)	2.02	2.17
Module Efficiency(%)	17.9	19.8
Temperature Coefficient of Isc	+0.04%/°C	
Temperature Coefficient of Voc	-0.23%/°C	
Temperature Coefficient of Pmax	-0.28%/°C	

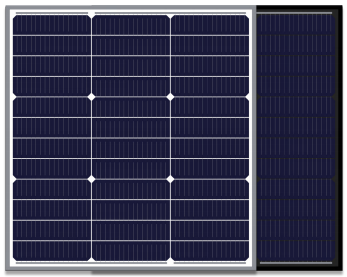
* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

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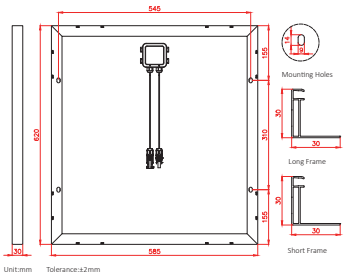
HS 1/4M10-36 TC *Mini*

HORAY | TIER1 BloombergNEF

70W / 75W



Dimension	620×585×30mm
Cell Orientation	36 (3x12)
Weight	4.5kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C



CERTIFICATES
IEC 61215:2021 / IEC61730:2023
ISO9001:2015 / ISO14001:2015 / ISO45001:2018
Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM70TC-MHO	HM75TC-MHO
Testing Condition	STC	STC
Maximum Power(Pmax/W)	70	75
Open Circuit Voltage(Voc/V)	27.03	27.90
Short Circuit Current(Isc/A)	3.29	3.42
Maximum Power Voltage(Vmp/V)	22.46	23.18
Maximum Power Current(Imp/A)	3.12	3.23
Module Efficiency(%)	19.3	20.7
Temperature Coefficient of Isc	+0.04%/°C	
Temperature Coefficient of Voc	-0.23%/°C	
Temperature Coefficient of Pmax	-0.28%/°C	

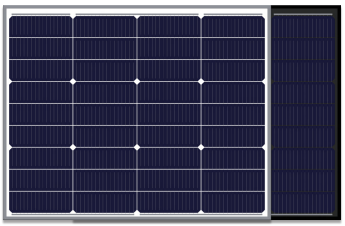
* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

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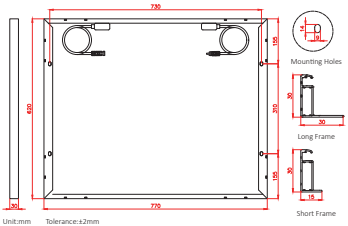
HS 1/3M10-36 TC *Mini*

HORAY | TIER1 BloombergNEF

90W / 95W / 100W



Dimension	620×770×30mm
Cell Orientation	36 (4×9)
Weight	5.5kg
Junction Box	IP68
Output Cable	4mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	20A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C



CERTIFICATES
IEC 61215:2021 / IEC61730:2023
ISO9001:2015 / ISO14001:2015 / ISO45001:2018
Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM90TC-MHO	HM95TC-MHO	HM100TC-MHO
Testing Condition	STC	STC	STC
Maximum Power(Pmax/W)	90	95	100
Open Circuit Voltage(Voc/V)	26.86	27.29	27.72
Short Circuit Current(Isc/A)	4.26	4.42	4.58
Maximum Power Voltage(Vmp/V)	22.32	22.68	23.04
Maximum Power Current(Imp/A)	4.03	4.19	4.34
Module Efficiency(%)	18.9	19.9	20.9
Temperature Coefficient of Isc	+0.04%/°C		
Temperature Coefficient of Voc	-0.23%/°C		
Temperature Coefficient of Pmax	-0.28%/°C		

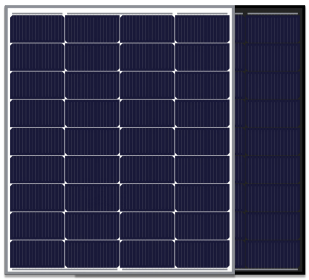
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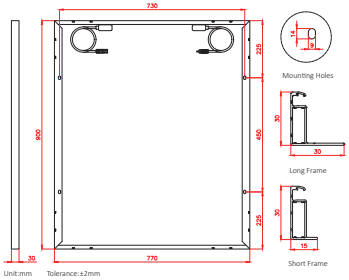
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HS 1/2M10-36 TC *Mini*

HORAY | TIER1 BloombergNEF

140W / 145W / 150W





Dimension	900×770×30mm
Cell Orientation	36 (4×9)
Weight	8.5kg
Junction Box	IP68
Output Cable	4mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	20A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES
IEC 61215:2021 / IEC61730:2023
ISO9001:2015 / ISO14001:2015 / ISO45001:2018
Europe Standard / China Quality Certification Centre

10 10-year product warranty

25 25-year power output warranty

Module Type	HM140TC-MHO	HM145TC-MHO	HM150TC-MHO
Testing Condition	STC	STC	STC
Maximum Power(Pmax/W)	140	145	150
Open Circuit Voltage(Voc/V)	27.03	27.64	27.90
Short Circuit Current(Isc/A)	6.58	6.67	6.83
Maximum Power Voltage(Vmp/V)	22.46	22.97	23.18
Maximum Power Current(Imp/A)	6.23	6.31	6.47
Module Efficiency(%)	20.2	20.9	21.6
Temperature Coefficient of Isc	+0.04%/°C		
Temperature Coefficient of Voc	-0.23%/°C		
Temperature Coefficient of Pmax	-0.28%/°C		

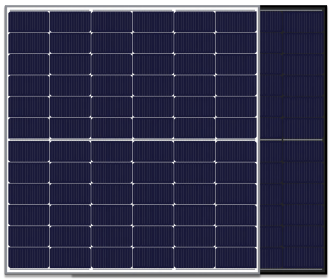
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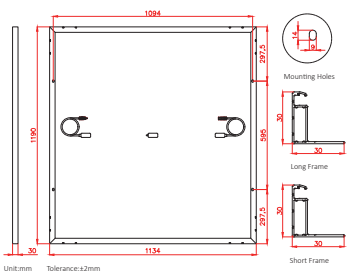
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HS 1/2M10-72 TC *Mini*

HORAY | TIER1 BloombergNEF

280W / 285W / 290W / 295W / 300W





Dimension	1190×1134×30mm
Cell Orientation	72 (6×12)
Weight	15.5kg
Junction Box	IP68
Output Cable	4mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	20A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES
IEC 61215:2021 / IEC61730:2023
ISO9001:2015 / ISO14001:2015 / ISO45001:2018
Europe Standard / China Quality Certification Centre

10 10-year product warranty

25 25-year power output warranty

Module Type	HM280TC-MHO	HM285TC-MHO	HM290TC-MHO	HM295TC-MHO	HM300TC-MHO
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	280	285	290	295	300
Open Circuit Voltage(Voc/V)	26.86	27.16	27.46	27.68	27.90
Short Circuit Current(Isc/A)	13.25	13.33	13.42	13.54	13.67
Maximum Power Voltage(Vmp/V)	22.32	22.57	22.82	23.00	23.18
Maximum Power Current(Imp/A)	12.54	12.63	12.71	12.82	12.94
Module Efficiency(%)	20.7	21.1	21.5	21.9	22.2
Temperature Coefficient of Isc	+0.04%/°C				
Temperature Coefficient of Voc	-0.23%/°C				
Temperature Coefficient of Pmax	-0.28%/°C				

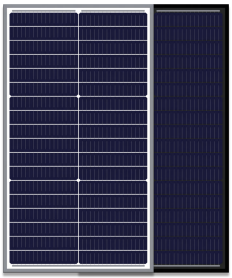
* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

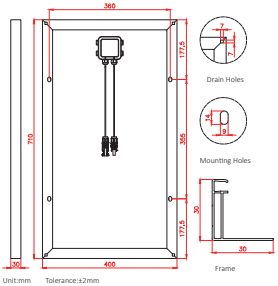
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HS 1/6G12R-36 TC *Mini*

HORAY | TIER1 BloombergNEF

50W / 55W





Dimension	710×400×30mm
Cell Orientation	36 (2×18)
Weight	4.0kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES
IEC 61215:2021 / IEC61730:2023
ISO9001:2015 / ISO14001:2015 / ISO45001:2018
Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM50TC-MHC	HM55TC-MHC
Testing Condition	STC	STC
Maximum Power(Pmax/W)	50	55
Open Circuit Voltage(Voc/V)	26.64	27.42
Short Circuit Current(Isc/A)	2.39	2.55
Maximum Power Voltage(Vmp/V)	22.14	22.79
Maximum Power Current(Imp/A)	2.26	2.41
Module Efficiency(%)	17.6	19.4
Temperature Coefficient of Isc	+0.04%/°C	
Temperature Coefficient of Voc	-0.23%/°C	
Temperature Coefficient of Pmax	-0.28%/°C	

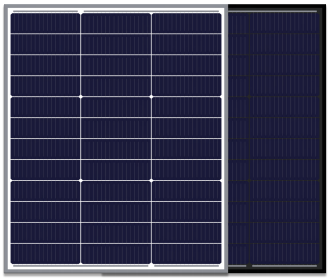
* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

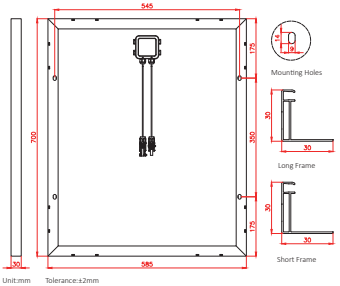
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HS 1/4G12R-36 TC *Mini*

HORAY | TIER1 BloombergNEF

80W / 85W





Dimension	700×585×30mm
Cell Orientation	36 (3×12)
Weight	5.0kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES
IEC 61215:2021 / IEC61730:2023
ISO9001:2015 / ISO14001:2015 / ISO45001:2018
Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM80TC-MHC	HM85TC-MHC
Testing Condition	STC	STC
Maximum Power(Pmax/W)	80	85
Open Circuit Voltage(Voc/V)	26.77	27.90
Short Circuit Current(Isc/A)	3.80	3.87
Maximum Power Voltage(Vmp/V)	22.25	23.18
Maximum Power Current(Imp/A)	3.60	3.67
Module Efficiency(%)	19.5	20.8
Temperature Coefficient of Isc	+0.04%/°C	
Temperature Coefficient of Voc	-0.23%/°C	
Temperature Coefficient of Pmax	-0.28%/°C	

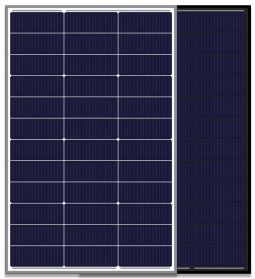
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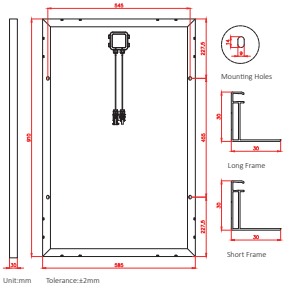
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HS 1/3G12R-36 TC *Mini*

HORAY | TIER1 BloombergNEF

105W / 110W / 105W





Dimension	910×585×30mm
Cell Orientation	36 (3×12)
Weight	6.0kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES

IEC 61215:2021 / IEC61730:2023

ISO9001:2015 / ISO14001:2015 / ISO45001:2018

Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM105TC-MHC	HM110TC-MHC	HM115TC-MHC
Testing Condition	STC	STC	STC
Maximum Power(Pmax/W)	105	110	115
Open Circuit Voltage(Voc/V)	26.77	27.42	27.90
Short Circuit Current(Isc/A)	4.98	5.10	5.24
Maximum Power Voltage(Vmp/V)	22.25	22.79	23.18
Maximum Power Current(Imp/A)	4.72	4.83	4.96
Module Efficiency(%)	19.7	20.7	21.6
Temperature Coefficient of Isc		+0.04%/°C	
Temperature Coefficient of Voc		-0.23%/°C	
Temperature Coefficient of Pmax		-0.28%/°C	

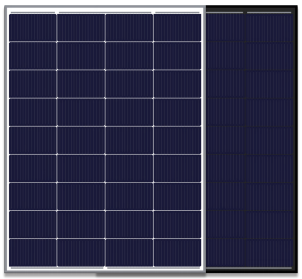
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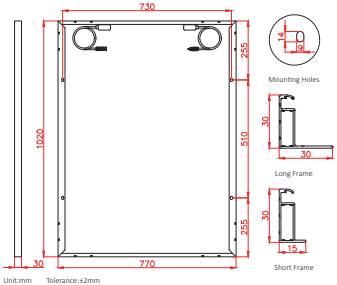
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HS 1/2G12R-36 TC *Mini*

HORAY | TIER1 BloombergNEF

160W / 165W / 170W





Dimension	1020×770×30mm
Cell Orientation	36 (4×9)
Weight	8.5kg
Junction Box	IP68
Output Cable	4mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	20A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES

IEC 61215:2021 / IEC61730:2023

ISO9001:2015 / ISO14001:2015 / ISO45001:2018

Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM160TC-MHC	HM165TC-MHC	HM170TC-MHC
Testing Condition	STC	STC	STC
Maximum Power(Pmax/W)	160	165	170
Open Circuit Voltage(Voc/V)	26.77	27.42	27.90
Short Circuit Current(Isc/A)	7.60	7.65	7.74
Maximum Power Voltage(Vmp/V)	22.25	22.79	23.18
Maximum Power Current(Imp/A)	7.19	7.24	7.33
Module Efficiency(%)	20.4	21.0	21.6
Temperature Coefficient of Isc		+0.04%/°C	
Temperature Coefficient of Voc		-0.23%/°C	
Temperature Coefficient of Pmax		-0.28%/°C	

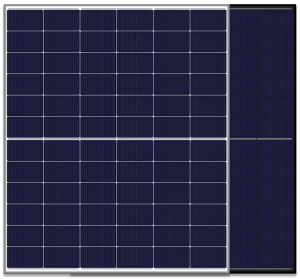
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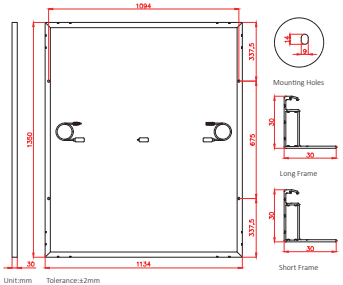
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HS 1/2G12R-72 TC Mini

HORAY | TIER1 BloombergNEF

320W / 325W / 330W / 335W / 340W





Dimension	1350×1134×30mm
Cell Orientation	72 (6×12)
Weight	15.5kg
Junction Box	IP68
Output Cable	4mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	20A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES
IEC 61215:2021 / IEC61730:2023
ISO9001:2015 / ISO14001:2015 / ISO45001:2018
Europe Standard / China Quality Certification Centre

10 10-year product warranty

25 25-year power output warranty

Module Type	HM320TC-MHC	HM325TC-MHC	HM330TC-MHC	HM335TC-MHC	HM340TC-MHC
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	320	325	330	335	340
Open Circuit Voltage(Voc/V)	26.64	26.86	27.12	27.51	27.90
Short Circuit Current(Isc/A)	15.26	15.38	15.46	15.48	15.49
Maximum Power Voltage(Vmp/V)	22.14	22.32	22.54	22.86	23.18
Maximum Power Current(Imp/A)	14.45	14.56	14.64	14.65	14.67
Module Efficiency(%)	20.9	21.2	21.6	21.9	22.2
Temperature Coefficient of Isc	+0.04%/°C				
Temperature Coefficient of Voc	-0.23%/°C				
Temperature Coefficient of Pmax	-0.28%/°C				

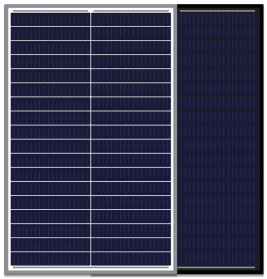
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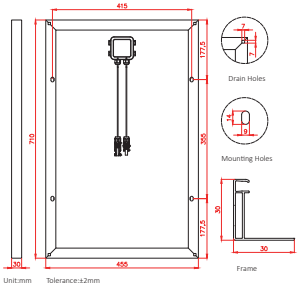
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HS 1/6G12-36 TC Mini

HORAY | TIER1 BloombergNEF

60W / 65W





Dimension	710×455×30mm
Cell Orientation	36 (2×18)
Weight	4.0kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES
IEC 61215:2021 / IEC61730:2023
ISO9001:2015 / ISO14001:2015 / ISO45001:2018
Europe Standard / China Quality Certification Centre

10 10-year product warranty

25 25-year power output warranty

Module Type	HM60TC-MHG	HM65TC-MHG
Testing Condition	STC	STC
Maximum Power(Pmax/W)	60	65
Open Circuit Voltage(Voc/V)	26.64	27.29
Short Circuit Current(Isc/A)	2.86	3.03
Maximum Power Voltage(Vmp/V)	22.14	22.68
Maximum Power Current(Imp/A)	2.71	2.87
Module Efficiency(%)	18.6	20.1
Temperature Coefficient of Isc	+0.04%/°C	
Temperature Coefficient of Voc	-0.23%/°C	
Temperature Coefficient of Pmax	-0.28%/°C	

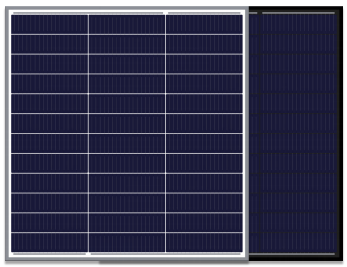
* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

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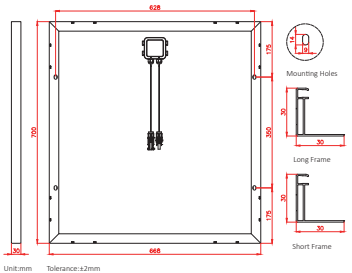
HS 1/4G12-36 TC Mini

HORAY | TIER1 BloombergNEF

90W / 95W / 100W



Dimension	700×668×30mm
Cell Orientation	36 (3×12)
Weight	5.5kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C



CERTIFICATES

IEC 61215:2021 / IEC61730:2023

ISO9001:2015 / ISO14001:2015 / ISO45001:2018

Europe Standard / China Quality Certification Centre

10 10-year product warranty

25 25-year power output warranty

Module Type	HM90TC-MHG	HM95TC-MHG	HM100TC-MHG
Testing Condition	STC	STC	STC
Maximum Power(Pmax/W)	90	95	100
Open Circuit Voltage(Voc/V)	26.64	27.07	27.29
Short Circuit Current(Isc/A)	4.29	4.46	4.66
Maximum Power Voltage(Vmp/V)	22.14	22.50	22.68
Maximum Power Current(Imp/A)	4.07	4.22	4.41
Module Efficiency(%)	19.2	20.3	21.4
Temperature Coefficient of Isc	+0.04%/°C		
Temperature Coefficient of Voc	-0.23%/°C		
Temperature Coefficient of Pmax	-0.28%/°C		

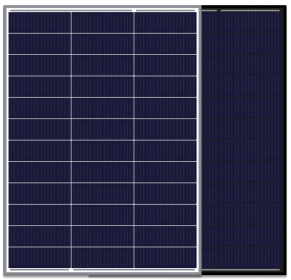
* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

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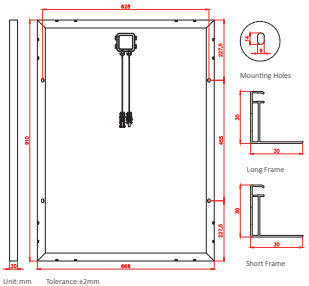
HS 1/3G12-36 TC Mini

HORAY | TIER1 BloombergNEF

120W / 125W / 130W



Dimension	910×668×30mm
Cell Orientation	36 (3×12)
Weight	7.0kg
Junction Box	IP67
Output Cable	1.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	10A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C



CERTIFICATES

IEC 61215:2021 / IEC61730:2023

ISO9001:2015 / ISO14001:2015 / ISO45001:2018

Europe Standard / China Quality Certification Centre

10 10-year product warranty

25 25-year power output warranty

Module Type	HM120TC-MHG	HM125TC-MHG	HM130TC-MHG
Testing Condition	STC	STC	STC
Maximum Power(Pmax/W)	120	125	130
Open Circuit Voltage(Voc/V)	26.64	26.99	27.29
Short Circuit Current(Isc/A)	5.72	5.89	6.05
Maximum Power Voltage(Vmp/V)	22.14	22.43	22.68
Maximum Power Current(Imp/A)	5.42	5.57	5.73
Module Efficiency(%)	19.7	20.6	21.4
Temperature Coefficient of Isc	+0.04%/°C		
Temperature Coefficient of Voc	-0.23%/°C		
Temperature Coefficient of Pmax	-0.28%/°C		

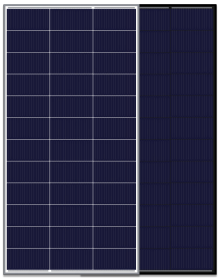
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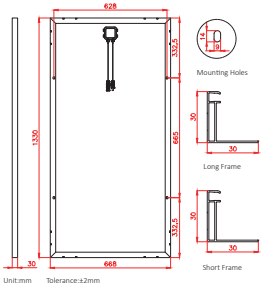
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HS 1/2G12-36 TC Mini

HORAY | TIER1 BloombergNEF

185W / 190W / 195W / 200W





Dimension	1330×668×30mm
Cell Orientation	36 (3×12)
Weight	10.0kg
Junction Box	IP67
Output Cable	2.5mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1000V
Maximum Series Fuse Rating	15A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES

IEC 61215:2021 / IEC61730:2023

ISO9001:2015 / ISO14001:2015 / ISO45001:2018

Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM185TC-MHG	HM190TC-MHG	HM195TC-MHG	HM200TC-MHG
Testing Condition	STC	STC	STC	STC
Maximum Power(Pmax/W)	185	190	195	200
Open Circuit Voltage(Voc/V)	26.64	27.03	27.29	27.38
Short Circuit Current(Isc/A)	8.82	8.93	9.08	9.11
Maximum Power Voltage(Vmp/V)	22.14	22.46	22.68	22.72
Maximum Power Current(Imp/A)	8.36	8.46	8.60	8.80
Module Efficiency(%)	20.8	21.4	22.0	22.5
Temperature Coefficient of Isc	+0.04%/°C			
Temperature Coefficient of Voc	-0.23%/°C			
Temperature Coefficient of Pmax	-0.28%/°C			

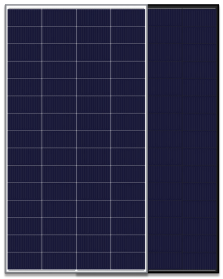
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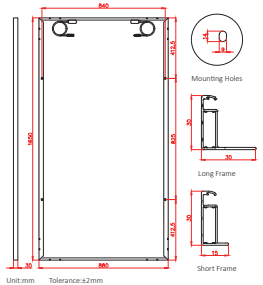
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HS 1/2G12-60 TC Mini

HORAY | TIER1 BloombergNEF

300W / 305W / 310W / 315W / 320W





Dimension	1650×880×30mm
Cell Orientation	60 (4×15)
Weight	15.0kg
Junction Box	IP68
Output Cable	4mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	20A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C

CERTIFICATES

IEC 61215:2021 / IEC61730:2023

ISO9001:2015 / ISO14001:2015 / ISO45001:2018

Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM300TC-MHG	HM305TC-MHG	HM310TC-MHG	HM315TC-MHG	HM320TC-MHG
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	300	305	310	315	320
Open Circuit Voltage(Voc/V)	44.40	44.55	44.76	45.12	45.48
Short Circuit Current(Isc/A)	8.59	8.70	8.80	8.87	8.94
Maximum Power Voltage(Vmp/V)	36.90	37.02	37.20	37.50	37.80
Maximum Power Current(Imp/A)	8.13	8.24	8.33	8.40	8.47
Module Efficiency(%)	20.7	21.0	21.4	21.7	22.0
Temperature Coefficient of Isc	+0.04%/°C				
Temperature Coefficient of Voc	-0.23%/°C				
Temperature Coefficient of Pmax	-0.28%/°C				

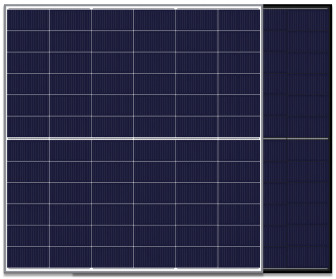
* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

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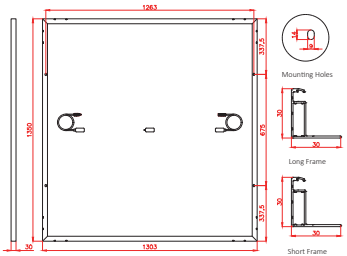
HS 1/2G12-72 TC *Mini*

HORAY | TIER1 BloombergNEF

370W / 375W / 380W / 385W / 390W



Dimension	1350×1303×30mm
Cell Orientation	72 (6×12)
Weight	17.5kg
Junction Box	IP68
Output Cable	4mm², length can be customized
Connector	MC4 compatible
Glass	3.2mm AR coated tempered glass
Frame	Anodized aluminum alloy frame
Operational Temperature	-40°C~+85°C
Power Output Tolerance	0~3%
Maximum System Voltage	1500V
Maximum Series Fuse Rating	20A
Nominal Operating Cell Temperature	45±2°C
Fire Rating	IEC Class C



CERTIFICATES

IEC 61215:2021 / IEC61730:2023

ISO9001:2015 / ISO14001:2015 / ISO45001:2018

Europe Standard / China Quality Certification Centre

10 **10-year product warranty**

25 **25-year power output warranty**

Module Type	HM370TC-MHG	HM375TC-MHG	HM380TC-MHG	HM385TC-MHG	HM390TC-MHG
Testing Condition	STC	STC	STC	STC	STC
Maximum Power(Pmax/W)	370	375	380	385	390
Open Circuit Voltage(Voc/V)	26.64	26.86	27.03	27.16	27.29
Short Circuit Current(Isc/A)	17.65	17.74	17.86	18.01	18.16
Maximum Power Voltage(Vmp/V)	22.14	22.32	22.46	22.57	22.68
Maximum Power Current(Imp/A)	16.74	16.80	16.92	17.06	17.20
Module Efficiency(%)	21.0	21.3	21.6	21.9	22.2
Temperature Coefficient of Isc	+0.04%/°C				
Temperature Coefficient of Voc	-0.23%/°C				
Temperature Coefficient of Pmax	-0.28%/°C				

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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Specifications included in this datasheet are subject to change without notice.

Zertifikat *Certificate*

Zertifikatsnummer *Certificate No.:*
PV 50653396 0001

Berichtsnummer *Report No.:*
CN242O4G 001

Genehmigungsinhaber *License Holder:*
HORAY SOLAR CO., LTD
No.30-5,
Yanxin East Road, Huishan District
Wuxi,
214177 Jiangsu
P.R. China

Fertigungsstätte *Manufacturing Site:*
HORAY SOLAR CO., LTD
No.30-5,
Yanxin East Road, Huishan District
Wuxi,
214177 Jiangsu
P.R. China

Prüfzeichen *Test Mark:*

TÜVRheinland CERTIFIED
IEC 61215
IEC 61730
Regular Production Surveillance
www.tuv.com
ID 1111293019

Geprüft nach *Tested according to:*
IEC 61215-1:2021
IEC 61215-1-1:2021
IEC 61215-2:2021
IEC 61730-1:2023
IEC 61730-2:2023
EN IEC 61215-1:2021
EN IEC 61215-1-1:2021
EN IEC 61215-2:2021
EN IEC 61730-1:2018
EN IEC 61730-2:2018

Geräteidentifikation
Product Identification

Produkt: *Product:* PV Module

Modell: *Type:* Modelle sind auf nächste(r) Seite(n) gelistet
Type designation(s) are listed on the next page(s)

Technische Daten: *Technical Data:*
Class II acc. to IEC 61140
For other ratings, refer to the test report.

Gültig bis: *Date of expiry:* 2029-11-10

Gültig ab: *Valid from:* 2024-11-11

Ausstellungsdatum: *Date of issue:* 2024-11-11

Zertifizierungsstelle: *Certification body:*

TÜV Rheinland LGA Products GmbH Zertifizierungsstelle

Angela Yao

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Dem Zertifikat liegt unsere Prüf- und Zertifizierungsordnung zugrunde.
Das Produkt entspricht den o.g. Anforderungen, die Herstellung wird überwacht.
This certificate is based on our Testing and Certification Regulation. The product fulfills above mentioned requirements, the production is subject to surveillance.

TÜV Rheinland LGA Products GmbH, Tillystraße 2, 90431 Nürnberg
http://www.tuv.com/safety E-mail: markcheck@tuv.com
Fax: +49 221 806-3935

Zertifikat *Certificate*

Zertifikatsnummer *Certificate No.:*
PV 50653396 0001

Berichtsnummer *Report No.:*
CN242O4G 001

Produkt *Product:* PV Module

Modell *Type:*

Bezeichnung *Designation:*

Max. system voltage: up to 1500 VDC (Voc at STC):
With 1/2 cut of mono N-type c-Si cell (Under STC):
HSxxxTC-MHG-D (xxx=670-700, in steps of 5, 132 cells)
HSxxxTC-MHG-D (xxx=610-635, in steps of 5, 120 cells)
HSxxxTC-MHG-D (xxx=560-580, in steps of 5, 110 cells)
HSxxxTC-MHG-D (xxx=550-570, in steps of 5, 108 cells)
HSxxxTC-MHG-D (xxx=510-530, in steps of 5, 100 cells)
HSxxxTC-MHA-D (xxx=575-610, in steps of 5, 144 cells)
HSxxxTC-MHA-D (xxx=530-560, in steps of 5, 132 cells)
HSxxxTC-MHA-D (xxx=480-510, in steps of 5, 120 cells)
HSxxxTC-MHA-D (xxx=425-455, in steps of 5, 108 cells)
HSxxxTC-MHB-D (xxx=590-620, in steps of 5, 144 cells)
HSxxxTC-MHB-D (xxx=540-570, in steps of 5, 132 cells)
HSxxxTC-MHB-D (xxx=490-520, in steps of 5, 120 cells)
HSxxxTC-MHB-D (xxx=445-475, in steps of 5, 108 cells)
HSxxxTC-MHC-D (xxx=585-630, in steps of 5, 132 cells)
HSxxxTC-MHC-D (xxx=535-570, in steps of 5, 120 cells)
HSxxxTC-MHC-D (xxx=480-515, in steps of 5, 108 cells)
HSxxxTC-MHC-D (xxx=425-455, in steps of 5, 96 cells)
HSxxxTC-MHO-D (xxx=560-590, in steps of 5, 144 cells)
HSxxxTC-MHO-D (xxx=515-540, in steps of 5, 132 cells)
HSxxxTC-MHO-D (xxx=470-490, in steps of 5, 120 cells)
HSxxxTC-MHO-D (xxx=420-440, in steps of 5, 108 cells)
HSxxxTC-MHD-D (xxx=610-650, in steps of 5, 144 cells)
HSxxxTC-MHD-D (xxx=560-590, in steps of 5, 132 cells)
HSxxxTC-MHD-D (xxx=510-540, in steps of 5, 120 cells)
HSxxxTC-MHD-D (xxx=460-485, in steps of 5, 108 cells)
With 1/2 cut of mono Perc c-Si cell (Under STC):
HSxxx-MHG-D (xxx=640-660, in steps of 5, 132 cells)
HSxxx-MHG-D (xxx=585-600, in steps of 5, 120 cells)
HSxxx-MHG-D (xxx=535-550, in steps of 5, 110 cells)
HSxxx-MHG-D (xxx=485-500, in steps of 5, 100 cells)
HSxxx-MHO-D (xxx=535-560, in steps of 5, 144 cells)
HSxxx-MHO-D (xxx=495-515, in steps of 5, 132 cells)
HSxxx-MHO-D (xxx=450-470, in steps of 5, 120 cells)
HSxxx-MHO-D (xxx=405-420, in steps of 5, 108 cells)
HSxxx-MHL-D (xxx=445-465, in steps of 5, 144 cells)
HSxxx-MHL-D (xxx=410-425, in steps of 5, 132 cells)
HSxxx-MHL-D (xxx=370-385, in steps of 5, 120 cells)
With 1/2 cut of mono N-type c-Si cell (Under BNPI):
HSxxxTC-MHG-D (xxx=737,743,748,754,759,765,770, 132 cells)
HSxxxTC-MHG-D (xxx=671,677,682,688,693,699, 120 cells)
HSxxxTC-MHG-D (xxx=616,622,627,633,638, 110 cells)
HSxxxTC-MHG-D (xxx=605,610.5,616,621.5,627, 108 cells)
HSxxxTC-MHG-D (xxx=561,567,572,578,583, 100 cells)
HSxxxTC-MHA-D (xxx=621,626,631,637,642,648,653,658, 144 cells)
HSxxxTC-MHA-D (xxx=572,577,583,588,594,599,604, 132 cells)
HSxxxTC-MHA-D (xxx=518,523,529,534,540,545,550, 120 cells)

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Zertifikat *Certificate*

Zertifikatsnummer *Certificate No.:*
PV 50653396 0001

Berichtsnummer *Report No.:*
CN242O4G 001

Produkt *Product:* PV Module

Modell *Type:*

Bezeichnung *Designation:*

HSxxxTC-MHA-D (xxx=459,464,469,475,480,486,491, 108 cells)
HSxxxTC-MHB-D (xxx=649,655,660,666,671,677,682, 144 cells)
HSxxxTC-MHB-D (xxx=594,599.5,605,610.5,616,621.5,627, 132 cells)
HSxxxTC-MHB-D (xxx=539,544.5,550,555.5,561,566.5,572, 120 cells)
HSxxxTC-MHB-D (xxx=489.5,495,500.5,506,511.5,517,522.5, 108 cells)
HSxxxTC-MHC-D (xxx=644,649,655,660,666,671,677,682,688,693, 132 cells)
HSxxxTC-MHC-D (xxx=589,594,600,605,611,616,622,627, 120 cells)
HSxxxTC-MHC-D (xxx=528,534,539,545,550,556,561,567, 108 cells)
HSxxxTC-MHC-D (xxx=468,473,479,484,490,495,501, 96 cells)
HSxxxTC-MHO-D (xxx=611,616,622,627,633,638,644, 144 cells)
HSxxxTC-MHO-D (xxx=562,568,573,578,584,589, 132 cells)
HSxxxTC-MHO-D (xxx=513,518,524,529,535, 120 cells)
HSxxxTC-MHO-D (xxx=458,464,469,475,481, 108 cells)
HSxxxTC-MHD-D (xxx=671,677,682,688,693,699,704,710,715, 144 cells)
HSxxxTC-MHD-D (xxx=616,622,627,633,638,644,649, 132 cells)
HSxxxTC-MHD-D (xxx=561,567,572,578,583,589,594, 120 cells)
HSxxxTC-MHD-D (xxx=506,512,517,523,528,534, 108 cells)
With 1/2 cut of mono Perc c-Si cell (Under BNPI):
HSxxx-MHG-D (xxx=701,706,712,717,723, 132 cells)
HSxxx-MHG-D (xxx=641,646,652,657, 120 cells)
HSxxx-MHG-D (xxx=586,591,597,602, 110 cells)
HSxxx-MHG-D (xxx=531,537,542,548, 100 cells)
HSxxx-MHO-D (xxx=586,591,597,602,608,613, 144 cells)
HSxxx-MHO-D (xxx=542,548,553,558,564, 132 cells)
HSxxx-MHO-D (xxx=493,498,504,509,515, 120 cells)
HSxxx-MHO-D (xxx=443,449,454,460, 108 cells)
HSxxx-MHL-D (xxx=487,493,498,504,509, 144 cells)
HSxxx-MHL-D (xxx=449,454,460,465, 132 cells)
HSxxx-MHL-D (xxx=405,411,416,422, 120 cells)
xxx represents output power at STC in Wp

Remarks:
Fire Rating: Class A (according to UL 790)
Design Load / Safety Factors: 3600 Pa / 1.5 (downward)
1600 Pa / 1.5 (upward)

Conditions:
The product test is voluntarily according to technical regulations. Any change of the design, materials, components or processing may require the repetition of some of the qualification tests in order to retain type approval.

TÜV Rheinland LGA Products GmbH Zertifizierungsstelle TÜVRheinland

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Zertifikat *Certificate*

Zertifikat Nr. *Certificate No.*
PV Horay Rights

Blatt *Sheet*
0001

Ihr Zeichen *Client Reference*	Unser Zeichen *Our Reference*	Ausstellungsdatum *Date of Issue*
M.G	01-Ruanand-CN22NKK2 001	11.05.2022 *(day/mo/yr)*

Genehmigungsinhaber *License Holder*
HORAY SOLAR CO., LTD
No.30-5,
Yanxin East Road, Huishan District
Wuxi,
214177 Jiangsu
P.R. China

Fertigungsstätte *Manufacturing Plant*
Refer to latest revision
of the annex list of factories

Prüfzeichen *Test Mark*

TÜVRheinland CERTIFIED
IEC 61215
IEC 61730
Regular Production Surveillance
www.tuv.com
ID 1111253582

Geprüft nach *Tested acc. to*
IEC 61215-1:2021
IEC 61215-1-1:2021
IEC 61215-2:2021
IEC 61730-1:2016
IEC 61730-2:2016
EN IEC 61215-1:2021
EN IEC 61215-1-1:2021
EN IEC 61215-2:2021
EN IEC 61730-1:2018
EN IEC 61730-2:2018

Zertifiziertes Produkt (Geräteidentifikation)
Certified Product (Product Identification)

Lizenzentgelte - Einheit
License Fee - Unit

PV Module

Type Designation:
Max. System Voltage: up to 1500 VDC (Voc at STC):
With 1/2 cut of mono c-Si cells:
HSxxx-MHG (xxx=640-660, in steps of 5, 132 cells)
HSxxx-MHG (xxx=585-600, in steps of 5, 120 cells)
HSxxx-MHG (xxx=535-550, in steps of 5, 110 cells)
HSxxx-MHG (xxx=485-500, in steps of 5, 100 cells)
HSxxx-MHO (xxx=535-560, in steps of 5, 144 cells)
HSxxx-MHO (xxx=495-515, in steps of 5, 132 cells)
HSxxx-MHO (xxx=450-470, in steps of 5, 120 cells)
HSxxx-MHO (xxx=405-420, in steps of 5, 108 cells)
HSxxx-MHL (xxx=445-465, in steps of 5, 144 cells)
HSxxx-MHL (xxx=410-425, in steps of 5, 132 cells)
HSxxx-MHL (xxx=370-385, in steps of 5, 120 cells)

Continued on Page 0002

Dem Zertifikat liegt unsere Prüf- und Zertifizierungsordnung zugrunde.
Das Produkt entspricht den o.g. Anforderungen, die Herstellung wird überwacht.
This certificate is based on our Testing and Certification Regulation. The product fulfills above mentioned requirements, the production is subject to surveillance.

TÜV Rheinland LGA Products GmbH Zertifizierungsstelle

Zertifizierungsstelle

TÜV Rheinland LGA Products GmbH, Tillystraße 2, 90431 Nürnberg
http://www.tuv.com/safety E-mail: markcheck@tuv.com
Fax: +49 221 806-3935

Dipl.-Ing. (FH) Tim Kirschner

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Zertifikat *Certificate*

Zertifikat Nr. ***Certificate No.*** **Blatt** ***Sheet***
PV Horay Rights 0002

Ihr Zeichen ***Client Reference***	**Unser Zeichen** ***Our Reference***	**Ausstellungsdatum**	***Date of Issue***
M.G	01-Ruanand-CN22NKK2 001	11.05.2022	*(day/mo/yr)*

Genehmigungsinhaber ***License Holder***
HORAY SOLAR CO., LTD
No.30-5,
Yanxin East Road, Huishan District
Wuxi,
214177 Jiangsu
P.R. China

Fertigungsstätte ***Manufacturing Plant***
Refer to latest revision
of the annex list of factories

Prüfzeichen ***Test Mark***

TÜVRheinland CERTIFIED
IEC 61215
IEC 61730
Regular Production Surveillance
www.tuv.com
ID 1111253582

Geprüft nach ***Tested acc. to***
IEC 61215-1:2021
IEC 61215-1-1:2021
IEC 61215-2:2021
IEC 61730-1:2016
IEC 61730-2:2016
EN IEC 61215-1:2021
EN IEC 61215-1-1:2021
EN IEC 61215-2:2021
EN IEC 61730-1:2018
EN IEC 61730-2:2018

Zertifiziertes Produkt (Geräteidentifikation)
Certified Product (Product Identification)

Lizenzentgelte - Einheit
License Fee - Unit

PV Module

Continuation of Page 0001

Remarks:
Class II acc. to IEC 61140
Fire Rating: Class C (according to UL 790)
Design Load/ Safety Factors: 3600 Pa / 1.5 (downward)
1600 Pa / 1.5 (upward)

Conditions:
The product test is voluntarily according to technical regulations. Any change of the design, materials, components or processing may require the repetition of some of the qualification tests in order to retain type approval.
The certificate is valid until 10 May 2027.

Dem Zertifikat liegt unsere Prüf- und Zertifizierungsordnung zugrunde.
Das Produkt entspricht den o.g. Anforderungen, die Herstellung wird überwacht.
This certificate is based on our Testing and Certification Regulation. The product fulfills above mentioned requirements, the production is subject to surveillance.

TÜV Rheinland LGA Products GmbH Zertifizierungsstelle

Zertifizierungsstelle

TÜV Rheinland LGA Products GmbH, Tillystraße 2, 90431 Nürnberg
http://www.tuv.com/safety E-mail: markcheck@tuv.com
Fax: +49 221 806-3935

Dipl.-Ing. (FH) Tim Kirschner

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Anlage Fertigungsstättenliste
/Attachment List of Factories

PV Horay Rights 001

1 HORAY SOLAR CO., LTD
No.30-5,
Yanxin East Road, Huishan District
Wuxi,
214177 Jiangsu
P.R. China

Dieser Anhang ersetzt den Vorgänger vom/
This annex replaces the previous annex dated

Datum / Date 11.05.2022

Zertifizierungsstelle
/ Certification Body

Dipl.-Ing. (FH) Tim Kirschner

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Any copy for reference only,
Please verify the latest version.

File Level	Serial Number	Edition	Author	Approved
	HR/QD--QC-001	A/0		
Auditor				

Update Record

Version	Effective date	Update description
I	20241104	The first edition

Documents:

HORAY SOLAR CO., LTD.
Add：NO.300,Huiming Road, Huishan District, Wuxi 214177 Jiangsu P.R China
Tel：+86 510 83580688 www.horaysolar.com

Horay solar Co., Ltd.

Limited warranty of Horay solar PV Modules

1. Limited material warranty - Twelve years for Monofacial and Fifteen years for Bifacial, including replacement or repair

Horay solar warrants its PV modules to be free from defects in materials and workmanship under normal application, installation,use and service conditions. If bifacial modules fail to conform to this warranty, then for a period ending 180 months(for monofacial models,this period is 144 months) from the date of sales to the original terminal customer(hereinafter referred to as "customer"), Horay solar will repair or replace the modules for the customers. The repair or the replacement shall be the sole and exclusive remedy provided under the "Limited product warranty" and shall not extend beyond the 180 months period set forth herein(for monofacial models,this period is 144 months). The "Limited product warranty" does not warrant a specific power output, which shall be exclusively covered under clause 2 hereinafter("Limited peak power warranty").

2. Limited Peak Power Warranty

1) Power test conditions： The test of the peak power of the delivered modules should be made under standard test conditions - an irradiation of 1000W/㎡, temperature 25℃, AM1.5。1000W/㎡ is the standard light intensity when we test the solar cells. AM1.5 refers to the actual distance of light pass through the atmosphere is 1.5 times of the vertical thickness of the atmosphere . 25℃ means the modules should work in the temperature of 25℃.

2) Warranty conditions： The customer must handle the product properly. The design, installation, operation environment and maintenance of the solar system should follow the installation guide and relevant regulations.

3) Power Attenuation

3.1) PERC solar module

A. Monofacial

The Warranty Start Date is the date of installation of the Product(s) or three months after delivery (Incoterms 2020) of the Products(s) to the Buyer, whichever date is earlier. In addition, Horay solar warrants that for a period of twenty-five years commencing on the Warranty Start Date, the loss of power output relating to the initial guaranteed power which is defined as Peak Power Watts Pmax (Wp) plus Peak Power Watts Pmax(Wp) multiplied by the lower limit of the Power Output Tolerance Pmax(%) – as specified in the relevant Product Data Sheet and measured at Standard Test Conditions (STC) for the Product(s) shall not exceed

• For monocrystalline products (according to the model in the IEC certificate) : 2.5% in the first year, 0.65% per year thereafter, at the end of the 25-year warranty not less than 81.9 % of the maximum output power.

• Actual output power must be verified under STC conditions and measured by Horay solar Energy or a third party testing facility approved by Horay solar Energy. (Note: According to the STC, the uncertainty of the measurement system will apply to all actual power output measurements.)

• The definition of high temperature and high humidity environment: temperature condition is annual average temperature > 23℃, minimum monthly average temperature > 18℃, humidity condition is annual average RH > 70%, minimum monthly average RH > 60%

B. Bifacial With Transparent Backsheet

The Warranty Start Date is the date of installation of the Product(s) or three months after delivery (Incoterms 2020) of the Products(s) to the Buyer, whichever date is earlier. In addition, Horay solar Energy warrants that for a period of thirty years commencing on the Warranty Start Date, the loss of power output relating to the initial guaranteed power which is defined as Peak Power Watts Pmax (Wp) plus Peak Power Watts Pmax(Wp) multiplied by the lower limit of the Power Output Tolerance Pmax(%) – as specified in the relevant Product Data Sheet and measured at Standard Test Conditions (STC) for the Product(s) shall not exceed

• For monocrystalline products (according to the model in the IEC certificate) : 2.5 % in the first year, 0.65% per year thereafter, at the end of the 30-year warranty not less than 78.65% of the maximum output power.

• Actual output power must be verified under STC conditions and measured by Horay solar Energy or a third party testing facility approved by Horay solar Energy. (Note: According to the STC, the uncertainty of the measurement system will apply to all actual power output measurements.)

• The definition of high temperature and high humidity environment: temperature condition is annual average temperature > 23℃, minimum monthly average temperature > 18℃, humidity condition is annual average RH > 70%, minimum monthly average RH > 60%.

C. Bifacial With Dual Glass

The Warranty Start Date is the date of installation of the Product(s) or three months after delivery (Incoterms 2020) of the Products(s) to the Buyer, whichever date is earlier. In addition, Horay solar Energy warrants that for a period of thirty years commencing on the Warranty Start Date, the loss of power output relating to the initial guaranteed power which is defined as Peak Power Watts Pmax (Wp) plus Peak Power Watts Pmax(Wp) multiplied by the lower limit of the Power Output Tolerance Pmax(%) – as specified in the relevant Product Data Sheet and measured at Standard Test Conditions (STC) for the Product(s) shall not exceed.

• For mono crystalline products (according to the model in the IEC certificate) : 2% in the first year, 0.45% per year thereafter, at the end of the 30-year warranty not less than 84.95% of the maximum output power.

• Actual output power must be verified under STC conditions and measured by Horay solar Energy or a third party testing facility approved by Horay solar Energy. (Note: According to the

STC, the uncertainty of the measurement system will apply to all actual power output measurements.)

• The definition of high temperature and high humidity environment: temperature condition is annual average temperature > 23℃, minimum monthly average temperature > 18℃, humidity condition is annual average RH > 70%, minimum monthly average RH > 60%.

3.2) N-TYPE solar module

A. Monofacial

The Warranty Start Date is the date of installation of the Product(s) or three months after delivery (Incoterms 2020) of the Products(s) to the Buyer, whichever date is earlier. In addition, Horay solar Energy warrants that for a period of thirty years commencing on the Warranty Start Date, the loss of power output relating to the initial guaranteed power which is defined as Peak Power Watts Pmax (Wp) plus Peak Power Watts Pmax(Wp) multiplied by the lower limit of the Power Output Tolerance Pmax(%) – as specified in the relevant Product Data Sheet and measured at Standard Test Conditions (STC) for the Product(s) shall not exceed.

• For mono crystalline products (according to the model in the IEC certificate) : 1% in the first year, 0.4% per year thereafter, at the end of the 30-year warranty not less than 87.4% of the maximum output power.

• Actual output power must be verified under STC conditions and measured by Horay solar Energy or a third party testing facility approved by Horay solar Energy. (Note: According to the STC, the uncertainty of the measurement system will apply to all actual power output measurements.)

• The definition of high temperature and high humidity environment: temperature condition is annual average temperature > 23℃, minimum monthly average temperature > 18℃, humidity condition is annual average RH > 70%, minimum monthly average RH > 60%.

B. Bifacial With Transparent Backsheet

The Warranty Start Date is the date of installation of the Product(s) or three months after delivery (Incoterms 2020) of the Products(s) to the Buyer, whichever date is earlier. In addition, Horay solar Energy warrants that for a period of thirty years commencing on the Warranty Start Date, the loss of power output relating to the initial guaranteed power which is defined as Peak Power Watts Pmax (Wp) plus Peak Power Watts Pmax(Wp) multiplied by the lower limit of the Power Output Tolerance Pmax(%) – as specified in the relevant Product Data Sheet and measured at Standard Test Conditions (STC) for the Product(s) shall not exceed

• For monocrystalline products (according to the model in the IEC certificate) : 1 % in the first year, 0.4% per year thereafter, at the end of the 30-year warranty not less than 87.4% of the maximum output power.

• Actual output power must be verified under STC conditions and measured by Horay solar Energy or a third party testing facility approved by Horay solar Energy. (Note: According to the STC, the uncertainty of the measurement system will apply to all actual power output measurements.)

• The definition of high temperature and high humidity environment: temperature condition is annual average temperature > 23℃, minimum monthly average temperature > 18℃, humidity condition is annual average RH > 70%, minimum monthly average RH > 60%.

C.Bifacial With Dual Glass

The Warranty Start Date is the date of installation of the Product(s) or three months after delivery (Incoterms 2020) of the Products(s) to the Buyer, whichever date is earlier. In addition, Horay solar Energy warrants that for a period of thirty years commencing on the Warranty Start Date, the loss of power output relating to the initial guaranteed power which is defined as Peak Power Watts Pmax (Wp) plus Peak Power Watts Pmax(Wp) multiplied by the lower limit of the Power Output Tolerance Pmax(%) – as specified in the relevant Product Data Sheet and measured at Standard Test Conditions (STC) for the Product(s) shall not exceed.

• For monocrystalline products (according to the model in the IEC certificate) : 1% in the first year, 0.4% per year thereafter, at the end of the 30-year warranty not less than 87.4% of the maximum output power.

• Actual output power must be verified under STC conditions and measured by Horay solar Energy or a third party testing facility approved by Horay solar Energy. (Note: According to the STC, the uncertainty of the measurement system will apply to all actual power output measurements.)

• The definition of high temperature and high humidity environment: temperature condition is annual average temperature > 23℃, minimum monthly average temperature > 18℃, humidity condition is annual average RH > 70%, minimum monthly average RH > 60%.

• Within the limitation of the corresponding quality assurance if the product is doubt, can be sent to pointed by Horay solar Solar or admitted by the Horay solar Solar for testing, Horay solar authorized letter must be confirmed before send samples for testing, product must good appearance. During the testing, such as a power output is lower than the standards listed in the above form, and proved that the loss of power is Horay solar Solar reasons, after the customer provide the relevant documentary evidence, Horay solar Solar will providing additional product to compensate for the power loss portion;

The remedy provided in this article is the only and exclusive remedy under the "limited Peak power guarantee".

Defects caused by material and process problems should be given after-sales plan in accordance with the terms of "Limited Product Warranty", "Limited Peak Power Guarantee" No compensation will be given to the power loss caused by the above-mentioned defects.

3.Exclusions and Limitations

A． In any event, all warranty claims must be received within the applicable warranty period for this warranty to be effective.

B． The “Limited Product Warranty” and the “Limited Peak Power Warranty” do not apply to any MODULES which have been subjected to:

- Misuse, abuse, vandalism, neglect or accident;

- Alteration, improper installation or application;

- Non-observance of Horay solar Energy’s installation manual or maintenance instructions;

- Repair or modifications by someone other than an approved service technician of Horay solar Energy;

- Power failure surges, lightning, flood, fire, accidental breakage, improper connections resulting in hazardous reverse current or other events outside Horay solar Energy’s control.

C． Both “Limited Product Warranty” and “Limited Peak Power Warranty” do not cover any costs associated with transportation, installation, removal or re-installation for return of the modules.

D． Warranty claims will not be honored if the type or serial number of the MODULES have been altered, removed or made illegible.

4.Limitation of Warranty Scope

This “limited warranty for pv modules” as set forth herein is expressly in lieu of and excludes all other express or implied warranties, including but not limited to warranties of merchantability and of fitness for particular purpose, use, or application, and all other obligations or liabilities on the part of Horay solar Energy, unless such other obligations or liabilities are expressly agreed to in writing signed and approved by Horay solar Energy. Horay solar Energy shall have no responsibility or liability whatsoever for damage or injury to persons or property, or for other loss or injury resulting from any cause whatsoever arising out of or related to the modules, including, without limitation, any defects in the modules, or from use or installation. Under no circumstances shall Horay solar Energy be liable for incidental, consequential or special damages, howsoever caused. Loss of use, loss of profits, loss of production, and loss of revenues are specifically and without limitation excluded. Horay solar Energy´s aggregate liability, if any, in damages or otherwise, shall not exceed the invoice value as paid by the customer, for the single unit of module.

5.Obtaining Warranty Performance

If the customer has a justified claim covered by this “Limited Warranty of PV Modules”, an immediate notification shall be filed in writing to (a) the vendor or (b) Horay solar Energy’s authorized distribution partner, who supplied affected modules, or (c) Horay solar Energy office. Together with the notification, the customer should enclose the evidence of the date on which the modules have been purchased. If applicable, the vendor or distributor will give advice on the processing of the claim. If more assistance is required, the customer may request guidance from Horay solar Energy in writing. The return of any modules will not be accepted unless prior written authorization has been given by Horay solar Energy.

Obtain Horay solar service:

E-mail: info@horaysolar.com
NO.300, Huiming Road, Huishan District, Wuxi 214177 Jiangsu P.R China

6. Disputes

In any form, in the event of a dispute that has occurred for more than one year, the customer shall not make any dispute regarding this limited warranty.

7. Various

The repair or replacement of the modules or the supply of additional modules, does not cause the beginning of new warranty terms, nor shall the original terms of this "Limited Warranty of PV Modules" be extended. Any replaced modules shall become the property of Horay solar Energy for their disposal. Horay solar Energy has the right to deliver another type (different in size, color, shape and/or power) in case Horay solar Energy has discontinued producing the replaced modules at the time of the claim.

If the customer purchased module is not listed in "Limited Warranty of PV Modules", customer may contact Horay solar Energy for more information on the applicable warranty.

8. Force Majeure

Horay solar Energy shall not be responsible or liable in any way to the customer or any third-party arising from any non-performance or delay in performance of any terms and conditions of sale, including but not limited to any technical and substantive events or environmental conditions that can not be reasonably foreseen and understood in the event of the sale of PV modules or claims,due to natural disasters, war, riots, strikes, etc. can not get appropriate and adequate labor, materials, mold, production capacity, technology; or any other similar cause or circumstance beyond the reasonable control of Horay solar Energy. In such cases, performance by Horay solar Energy of this Limited Warranty shall be suspended without liability for the period of delay reasonably attributable to such causes.

Nominal Power Output in product datasheet is the power in Watt peak that a Photovoltaic Solar Modules generates in its Maximum Power Point under Standard Testing Conditions(STC). STC are as follows:

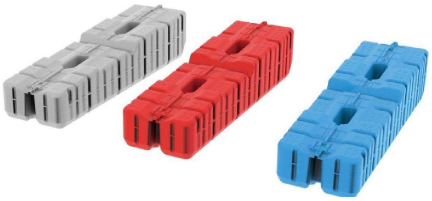
(1) light spectrum of AM 1.5,

(2) an irradiation of 1000 W per m^2

(3) a cell temperature of 25 degrees centigrade at right angle irradiation.

The measurements are carried out in accordance with IEC 61215 as tested at the connectors or junction box terminals – as applicable – per calibration and testing standards of Horay solar Energy valid at the date of manufacture of the PV-modules.

ACHYRA®
Soluzioni Energetiche Sostenibili
Achyra Holding srl
Milano - Nola - HongKong - Guangzhou





Tipo	**AZ-01**
Luogo di installazione	**Tetto piano in cemento / Terra**
Angolo di installazione	**5°**
Resistenza al vento	**40 m/s (Max. Categoria 13 Typhoon)**
Dimensione del modulo	**Universale**
Tipo di carico	**Riempibile ad acqua**
Materiali	**HDPE Polietilene ad alta densità +**
	Anti-UV e anti-usura
Dimensioni	**1470 x 415 x 300 (mm)**
Tempo di installazione	**<1 Minuto / Modulo**
Temperatura di esercizio	**-40°C to 85°C**
Installazione Modulo	**Verticale**
Peso	**< 6 kg / Unità**
Tipo di Modulo	**Universale**
Carico massimo d'acqua	**120 kg / Unità**
Materiale fissaggi	**ALLUMINIO AL6063-T5**
Volume	**36 Unità / 5,85 m³**
Quantità contenitore	**452 pz / 40 HQ**
Riciclabilità dei materiali	**Completamente riciclabile**
Garanzia	**Durabilità 25 anni**
	Garanzia di 10 anni