

## BIFACIAL MONO CRYSTALLINE MODULE - SHINGLED CELL TECHNOLOGY

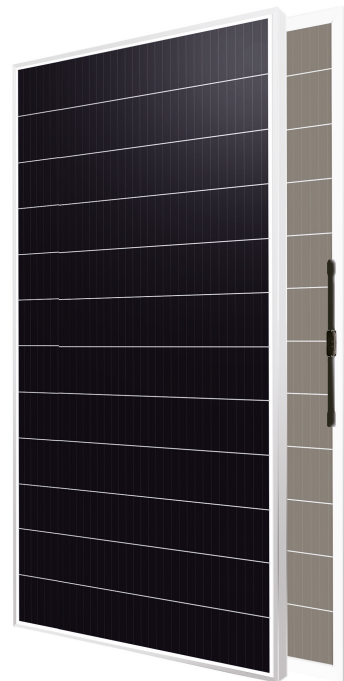
450 / 455 / 460 Watts

# Puma Series



## Superior Performance and Reliability

Shingled technology eliminates traditional ribbon connection with shingles connected in series. By removing the soldered ribbons, the active area of the module is improved and thermal stresses are reduced - resulting in exceptional efficiency and reliability over standard interconnections.



Outstanding performance under extreme heat as well as low intensity solar radiation



Industry leading low Pmax thermal coefficient



Positive Tolerance



100 % electro-luminescence tested

## Key Benefits



Higher yield per surface area



Higher Light Conversion



Higher yield in hot climate



25 Years Limited Product Warranty



Low LCOE

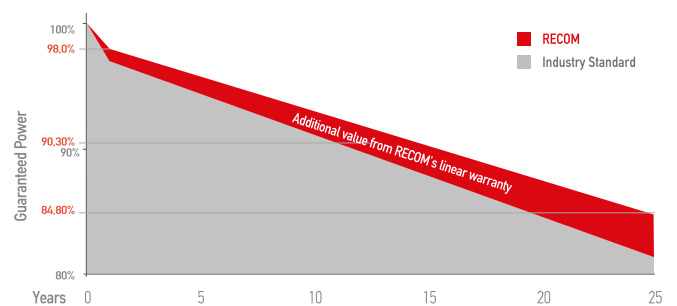


Low Resistive Losses

## Tests, Certifications and Warranties

Standard Tests	IEC 61215, IEC 61730
Factory Quality Tests	ISO 9001: 2015, ISO 14001: 2015
Certifications	Conformity to CE, PV CYCLE
Insurance	Third party liability insurance provided by Liberty Mutual
Wind and Snow Loads Testing	Module certified to withstand extreme wind (2400 Pascal) and snow loads (5400 Pascal)
Power Tolerance	Guaranteed +0%/+5% (STC condition)
Warranties	<ul style="list-style-type: none"> <li>• 25-year limited product warranty</li> <li>• 15-year manufacturer warranty on 90.30% of the nominal performance</li> <li>• 25-year transferable linear power output warranty</li> </ul>

## Linear Performance Warranty



First Year Output  $\geq 98.0\%$     2-25 Year Decline  $\leq 0.55\%$     25 Year Output  $\geq 84.80\%$

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RCM-xxx-SBML (xxx=450-460)

## Electrical Characteristics

POWER CLASS <sup>(1)</sup>			450		455		460	
Testing Condition			STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power	P <sub>max</sub>	[Wp]	450	339	455	343	460	346
Maximum Power Voltage	V <sub>mp</sub>	[V]	40,3	38,4	40,5	38,6	40,7	38,8
Maximum Power Current	I <sub>mp</sub>	[A]	11,17	8,82	11,23	8,87	11,30	8,93
Open Circuit Voltage	V <sub>oc</sub>	[V]	48,8	46,5	49,0	46,7	49,2	46,9
Short Circuit Current	I <sub>sc</sub>	[A]	11,90	9,59	11,95	9,63	11,99	9,66
Module Efficiency	Eff	[%]	20,0		20,3		20,5	
Maximum Series Fuse	I <sub>r</sub>	[A]	20					
Maximum System Voltage	V <sub>sys</sub>	[V]	1000 V DC (IEC) / 1500 V DC (IEC)					

(1) Measurement Tolerances: P<sub>max</sub> (± 3%), I<sub>sc</sub> & V<sub>oc</sub> (± 3%) - Power Classification 0/+5W

(2) STC (Standard Testing Condition): Irradiance 1000W/m<sup>2</sup>, Cell Temperature 25°C, AM 1.5

(3) NMOT (Nominal Operating Module Temperature): Irradiance 800W/m<sup>2</sup>, NMOT, Ambient Temperature 20°C, AM 1.5, Wind Speed 1m/s

### Bi Facial Output (4)

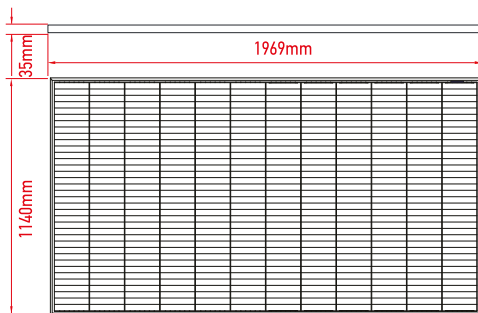
POWER CLASS			450		455		460	
Power with Backside Gain			P <sub>max</sub> [Wp]	Eff [%]	P <sub>max</sub> [Wp]	Eff [%]	P <sub>max</sub> [Wp]	Eff [%]
	+5	[%]	472,5	21,0%	477,8	21,3%	483,0	21,5%
	+10	[%]	495,0	22,1%	500,5	22,3%	506,0	22,5%
	+15	[%]	517,5	23,1%	523,3	23,3%	529,0	23,6%
	+20	[%]	540,0	24,1%	546,0	24,3%	552,0	24,6%
	+25	[%]	562,5	25,1%	568,8	25,3%	575,0	25,6%
	+30	[%]	585,0	26,1%	591,5	26,4%	598,0	26,6%

(4) Bifaciality Factor > 70% - Back-side power gain depends upon the specific project albedo - Efficiency is according to the surface of the module

## Mechanical Data

Dimensions	1969mm x 1140mm x 35mm
Weight	24.5 Kg
Cell Type	PERC Mono-crystalline (158.75 mm) - G1
Front Glass	3.2mm Tempered and low iron glass + ARC
Backsheet	Anti-aging film
Frame	Anodized Aluminum Alloy
Junction Box	IP68 - 2 bypass diodes
Connector	MC4 compatible connector
Cable	4mm <sup>2</sup> - Length 1.2m or customized

## Dimensions

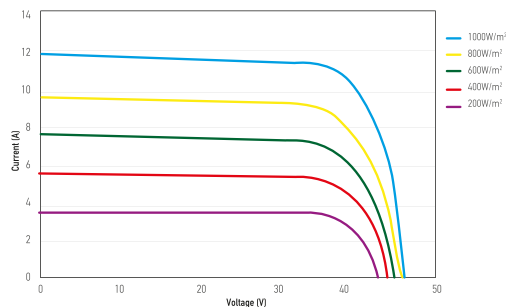


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## I-V Curve

The module relative power loss at low light irradiance of 200W/m<sup>2</sup> is less than 3%.



## Temperature Characteristics

P <sub>max</sub> Temperature Coefficient	-0.34% / °C
V <sub>oc</sub> Temperature Coefficient	-0.27% / °C
I <sub>sc</sub> Temperature Coefficient	+0.04% / °C
Operating Temperature (NMOT) Nominal Module Operating Temperature	-40 ~ +85 °C 42.3 ± 2 °C

## Packing Configuration

Container	40' HC
Pieces per Pallet	31
Pallets per Container	22
Pieces per Container	682

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