



**pa $\eta$ da 3.0 Mini 2**

**465W**

MAXIMUM MODULE EFFICIENCY

**23.3%**

POSITIVE POWER TOLERANCE

**0~+5<sub>w</sub>**



N-type TOPCon Bifacial Module

**IMPROVED POWER  
NEVER SETTLE FOR LESS**



Backside Yield



Wide Applications



Superior Yield



Outstanding Bifaciality



Excellent Durability



Yingli Solar Website



#### QUALIFICATIONS & CERTIFICATES

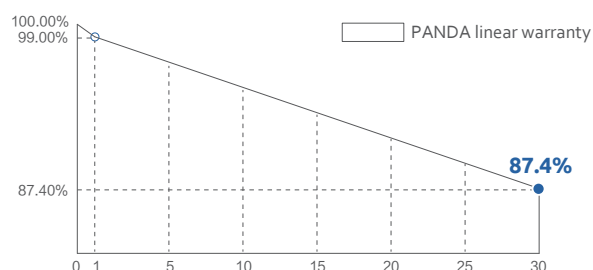
IEC 61215, IEC 61730, CE

ISO 9001: Quality management systems

ISO 14001: Environmental management systems

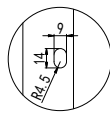
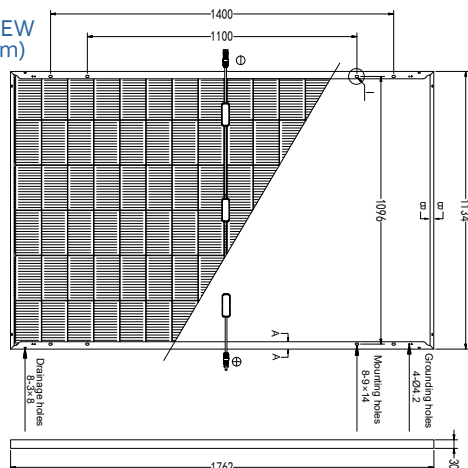
IEC 62941: Quality system for PV module manufacturing

ISO 45001: Occupational health and safety management systems

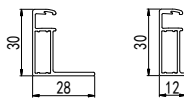


**1.00%** the 1st year power degradation  
**0.40%** annual power degradation

BACK VIEW  
(units:mm)



DETAIL I

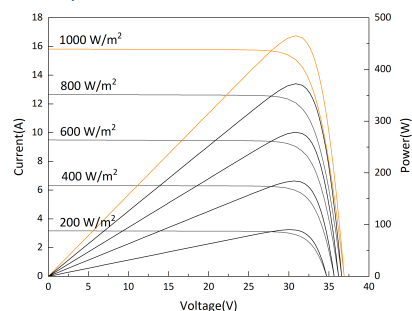


Schematic Section



Warning: Read the Installation and User Manual in its entirety before handling, installing and operating Yingli Solar modules.

I-V / P-V CURVES



## Electrical Parameters at Standard Test Conditions (STC)

|                                              |                          |       |       |       |       |       |
|----------------------------------------------|--------------------------|-------|-------|-------|-------|-------|
| Module type                                  | YLxxxCF48 i/2 (xxx=Pmax) |       |       |       |       |       |
| Power output* $P_{max}$ (W)                  | 440                      | 445   | 450   | 455   | 460   | 465   |
| Power output tolerances $\Delta P_{max}$ (W) | 0 / + 5                  |       |       |       |       |       |
| Module efficiency $\eta_m$ (%)               | 22.0                     | 22.3  | 22.5  | 22.8  | 23.0  | 23.3  |
| Voltage at $P_{max}$ - $V_{mpp}$ (V)         | 29.68                    | 29.91 | 30.14 | 30.37 | 30.60 | 30.83 |
| Current at $P_{max}$ - $I_{mpp}$ (A)         | 14.83                    | 14.88 | 14.94 | 14.99 | 15.04 | 15.09 |
| Open-circuit voltage $V_{oc}$ (V)            | 35.84                    | 36.05 | 36.26 | 36.47 | 36.68 | 36.89 |
| Short-circuit current $I_{sc}$ (A)           | 15.52                    | 15.58 | 15.64 | 15.70 | 15.76 | 15.82 |

STC: 1000 W·m<sup>-2</sup> irradiance, 25°C cell temperature, AM 1.5. \*Measuring tolerance:  $\pm 3\%$ .

## Electrical Parameters at Nominal Operating Cell Temperature (NOCT)

|                                      |       |       |       |       |       |       |
|--------------------------------------|-------|-------|-------|-------|-------|-------|
| Power output- $P_{max}$ (W)          | 335   | 338   | 342   | 346   | 350   | 354   |
| Voltage at $P_{max}$ - $V_{mpp}$ (V) | 28.31 | 28.53 | 28.75 | 28.97 | 29.19 | 29.41 |
| Current at $P_{max}$ - $I_{mpp}$ (A) | 11.82 | 11.86 | 11.91 | 11.95 | 11.99 | 12.03 |
| Open-circuit voltage- $V_{oc}$ (V)   | 34.03 | 34.23 | 34.43 | 34.63 | 34.83 | 35.03 |
| Short-circuit current- $I_{sc}$ (A)  | 12.50 | 12.55 | 12.60 | 12.65 | 12.70 | 12.75 |

NOCT: open-circuit module operation temperature at 800 W·m<sup>-2</sup> irradiance, 20°C ambient temperature, 1 m·s<sup>-1</sup> wind speed.

## Bifacial Electrical Parameters at Standard Test Conditions (BNPI)

|                                      |       |       |       |       |       |       |
|--------------------------------------|-------|-------|-------|-------|-------|-------|
| Power output- $P_{max}$ (W)          | 488   | 493   | 499   | 504   | 510   | 515   |
| Voltage at $P_{max}$ - $V_{mpp}$ (V) | 29.68 | 29.91 | 30.14 | 30.37 | 30.60 | 30.83 |
| Current at $P_{max}$ - $I_{mpp}$ (A) | 16.43 | 16.49 | 16.55 | 16.61 | 16.66 | 16.72 |
| Open-circuit voltage- $V_{oc}$ (V)   | 35.84 | 36.05 | 36.26 | 36.47 | 36.68 | 36.89 |
| Short-circuit current- $I_{sc}$ (A)  | 17.20 | 17.26 | 17.33 | 17.40 | 17.46 | 17.53 |

BNPI: 1000W·m<sup>-2</sup> on the front side and 135 W·m<sup>-2</sup> on the back side, 25°C cell temperature, AM 1.5. Bifaciality coefficient is 80%  $\pm$  5%.

## Thermal Characteristics

|                                                          |            |
|----------------------------------------------------------|------------|
| Nominal operating cell temperature-NOCT(°C)              | 42 $\pm$ 2 |
| Temperature coefficient of $P_{max}$ - $\gamma$ (% / °C) | - 0.29     |
| Temperature coefficient of $V_{oc}$ - $\beta$ (% / °C)   | - 0.24     |
| Temperature coefficient of $I_{sc}$ - $\alpha$ (% / °C)  | 0.042      |

## Packaging Specifications

|                                      |                             |
|--------------------------------------|-----------------------------|
| Number of modules per pallet         | 37                          |
| Number of pallets per 40' container  | 26                          |
| Packaging box dimensions (L / W / H) | 1790 mm / 1140 mm / 1250 mm |
| Box weight                           | 820 kg                      |

## Operating Conditions

|                                             |                              |
|---------------------------------------------|------------------------------|
| Max. system voltage                         | 1500 V <sub>DC</sub>         |
| Max. series fuse rating*                    | 30 A                         |
| Operating temperature range                 | - 40°C ~ 85°C                |
| Max. static load, front (e.g., snow)        | 5400 Pa                      |
| Max. static load, back (e.g., wind)         | 2400 Pa                      |
| Max. hailstone impact (diameter / velocity) | 25 mm / 23 m·s <sup>-1</sup> |

\*Do not connect fuse in combiner box with two or more strings in parallel connection.

## General Characteristics

|                        |                           |
|------------------------|---------------------------|
| Dimensions (L / W / H) | 1762 mm / 1134 mm / 30 mm |
| Weight                 | 21.0 kg                   |

## Construction Materials

|                                         |                                         |
|-----------------------------------------|-----------------------------------------|
| Cell (material / quantity)              | n-type monocrystalline silicon / 6 x 16 |
| Glass (thickness)                       | 1.6 mm / 1.6 mm                         |
| Frame (material)                        | anodized aluminum alloy                 |
| Junction box (type / protection degree) | 3 bypass diodes / $\geq$ IP68           |
| Cable (length / cross-sectional area)   | $\pm$ 1200 mm / 4 mm <sup>2</sup>       |

• Due to continuous innovation, research and product improvement, the specifications in this product information sheet are subject to change without prior notice.

• The specifications may deviate slightly and are not guaranteed.

• The data do not refer to a single module and they are not part of the offer, they only serve for comparison to different module types.



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