

# Hyundai 400W Bifacial Series Solar Panels: A Technical Review

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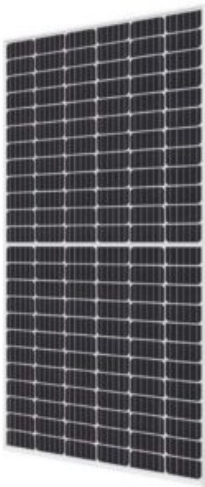
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The launch of the Hyundai 400W Bifacial Series Solar Panels is exciting news for homeowners utilizing renewable energy resources. There's no denying that since its inception in 2019, Hyundai Energy Solutions has established itself as a renewable energy PV manufacturer to reckon with. After all, Hyundai has earned a reputation for being one of the most reliable and economical players in the PV market.

Does the HiS-S400YH(BK) Bifacial Dual Black Max deliver on its promise of maximized power generation even under low light and bad weather conditions? You'll find the answers to all that and more in this review.

## Hyundai 400W Bifacial Series Solar Panels: Product Overview



The Hyundai Dual Black Max boasts a half-cut shingled solar module with a 9-wire technology. This particular design has multiple advantages. The shingled design provides more area per square meter for solar power absorption. That's because the parallel arrangement of its photovoltaic (PV) cells allows for much less shading than regular solar panels. A combination of these factors boosts the overall energy harvest per solar module. And given that the module is bifacial (two-faced), you have a solar panel built for

maximizing power generation by a significant margin. But Hyundai does not stop there. It further focuses on maximizing output by putting 132 half-cut bifacial solar cells in place. The half-cut cells reduce the overall resistance produced by the solar module by half without affecting the current production. Everybody knows that less resistance equals less power loss. And in this case, we're talking of **75% less power loss**. This confirms that the half-cut cell structure improves the solar module's efficiency. That's excellent news for any homeowner because you're getting optimal output at a minimal cost. And Hyundai supplements these features with a 9BB (busbar) solar module, as opposed to the traditional 5BB one. The reduced busbar area also reduces current loss due to resistance, offering a module efficiency of up to 20.5%. On average, even the most advanced PV modules offer an efficiency of **15% that rarely goes up to 20%**.

So, the Hyundai 400W bifacial series panels offer better performance in every aspect. Add to this the fact that the 400W bifacial series is a monocrystalline PV and you have a solar module designed for ultimate performance, even in bad weather conditions.

- Cell Type Monocrystalline, 9 busbar
  - Dimensions 1,038 mm (W) x 1,924 mm (L) x 35 mm (H)
  - Weight Approx. 21.1 kg
  - Solar Cells 132 half cut bifacial cells (2 parallel x 66 half cells in series)
  - Output Cables 1,200mm / 4mm<sup>2</sup> Connector: MC4 genuine connector
  - Junction Box IP68, weatherproof, IEC certified (UL listed)
  - Bypass Diodes 3 bypass diodes to prevent power decrease by partial shade
  - Construction Front: 3.2mm, High Transmission, AR Coated Tempered Glass Encapsulant: EVA Back Sheet: Black Meshed Transparent Backsheet
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- Frame Anodized aluminum alloy type 6063

## What To Expect from the Hyundai 400W Bifacial Series Solar Panels

A cursory glance would tell you there's a lot packed in this model of Hyundai's YH(BK) series solar module.

### Optimal Performance

Several factors contribute to the consistent performance of YH(BK) Dual Black Max.

First off, the shingled bifacial cells are arranged in two parallel rows of 66 cells each. Usually, shingled solar modules do not have more than 34 to 40 half cells. So, the 66-cell structure, apart from reducing resistance, also lowers the chances of hotspots forming in your panel.

This means you do not need to worry about a faulty cell or external factors like bird droppings, falling leaves, etc. affecting your solar panel's performance.

The shingled cells also provide for improved shade tolerance. So your solar module works at its optimal best, even under partial shading. And it already comes with monocrystalline solar cells, which possess a higher energy conversion efficiency than polycrystalline cells.

Since this solar panel is bifacial, under optimal conditions, even the back of the panel can offer up to 25% power gain compared to the front. However, that does not imply it won't perform well under low light conditions. You can still expect a 5-15% power gain compared to the total output from the front.

The Hyundai solar panel also has a sleek design and weighs less than 22 kg, despite its capacity to produce 400W power. It is more suited for rooftop residential usage than commonly available variants, which can weigh up to 20 kg with a capacity of 250W.

## **Durability**

Solar panels are an investment. Hyundai understands the need to build long-lasting models that will not malfunction or break down after a few years of usage.

The HiS-S400YH(BK) series panels are made from tempered glass with reinforced frames. So come hail storms, winds (4,000 PA), snow (up to 5,400 Pa), or blazing sunshine; your solar module is designed to withstand harsh weather conditions.

Reinforced glass is already tougher than standard glass. And the anti-reflective (AR) coating on it helps in better light transmission, again adding to the efficiency of the solar panel.

In addition, all Hyundai solar panels are built to be anti-LID (Light Induced Degradation) and PID (Potential Induced Degradation). So, these solar cells do not degrade rapidly due to continuous exposure to heavy sunlight and voltage fluctuations.

And, the shingled half-cut cells already take care of any hotspots or microcracks that regular solar panels are prone to.

Hyundai also utilizes Ethylene Vinyl Acetate (EVA) as their encapsulant for the solar panels. EVA is known for its excellent radiation transmission properties and does not degrade easily, even when exposed to harsh sunlight.

To conclude, the HiS-S400YH(BK) series solar panels are built to last. What more could one ask for?

## **Product and Performance Warranty**

Another factor that works in favor of Hyundai's 400W bifacial series panels is their 25-year product and performance warranty. It's at par with industry standards and marks a significant improvement over their other solar modules, which came with only a 10-year product warranty.

This latest model proves that Hyundai has spared no effort in upping its game as far as residential use solar panels are concerned.

However, there's a fine print you cannot overlook here. Hyundai states there will be a 0.54% annual degradation in performance after the second year of use. That said, it still promises a stellar 85% performance till the 25th year of usage.

## **Aesthetic Appeal**

Attaching a humongous solar panel to your rooftop can easily take away from its aesthetic appeal. But the Hyundai 400W bifacial's sleek design is ultra stylish and easy on the eye.

In fact, the black meshed transparent back sheet, in addition to allowing for superior absorption of sunlight, adds to the visual appeal of the solar panel.

## **Cost Effective**

Roughly costing \$2.48-\$3.56 per watt, most Hyundai solar panels are much more cost-effective than equivalent models from other brands.

When installed and maintained right, this particular model gives you a module efficiency of up to 20.5%. Add to that the 25-year warranty, and you have a product you can rely on for years to come.

## The Verdict:



The latest Hyundai HiS-S400YH(BK) Dual Black Max series brings together the most innovative PV tech to give you a solar module that's effort efficient and cost-effective. Be it output, reliability, or cost efficiency, the Dual Black Max steals the show with its incredible performance.

So, if you're looking to switch your existing solar panels or planning to invest in a good renewable energy PV, the 400W bifacial should be your top consideration.