TEC NEWS

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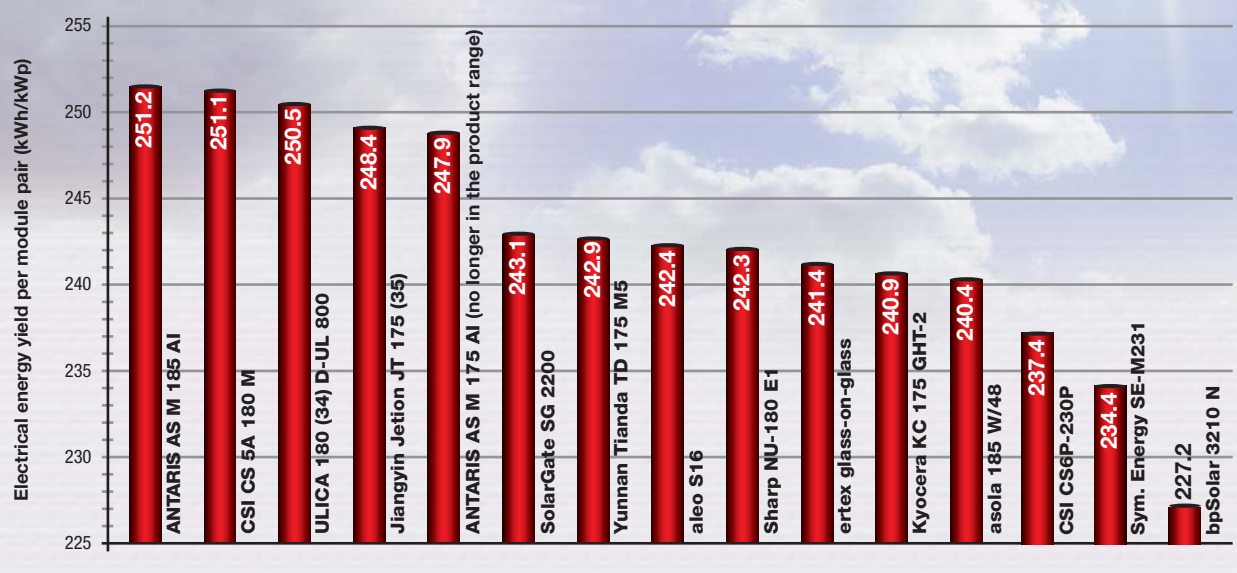
## Comparison test between photovoltaic modules:

# Best in test: ANTARIS SOLAR

### ANTARIS AS M 185 AI – The module with the greatest energy yield

Sales of photovoltaic systems are booming. However, to achieve an overview of what is available in the market requires some corresponding information. As in 2009, the TEC Institute also tested 15 modules this year from well-known photovoltaic system manufacturers. The test was conducted under real conditions again. A laboratory test would only have been of limited use in delivering objective test results. In terms of the weather conditions, there was a mixture of sunshine and cloudy skies. The basic preconditions for realistic measurements were provided: the TEC Institute operates its own weather station that records temperature, air pressure, wind, rain and humidity, and also includes a pyranometer for measuring global irradiance (the total solar radiance incident on the earth's surface as measured on a horizontal surface area). This enabled the weather conditions during the test phase to be precisely recorded parallel to the determined yield values and thus made it possible to objectively assess the actual energy yields from the different modules. With the comparison test, the ANTARIS AS M 185 AI module was awarded the best result of 1.1 for achieving the highest energy yield per individual module, and was therefore voted best in test.

**Test system, electrical energy yield per module type from May 1st to June 30th 2010**

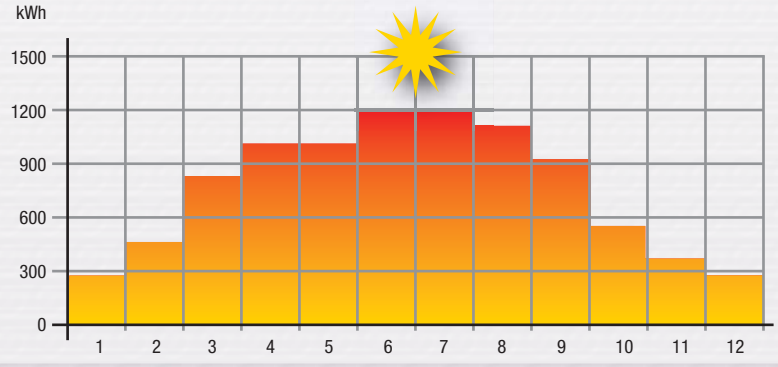


# Results of the tests conducted on PV modules to determine the maximum energy yield per module

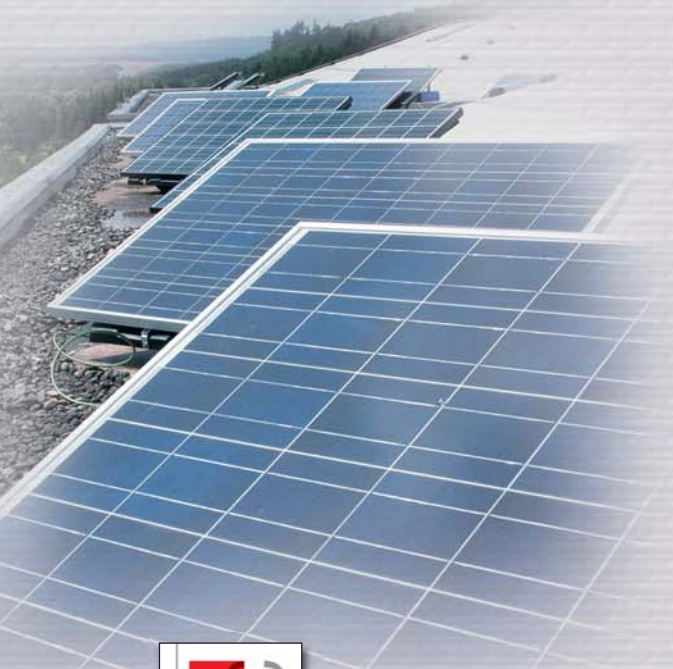
| Provider and product | Cell type | Rated output (Wp)* | Rated voltage (V)* | Rated current (A)* | Dimensions (mm) | Measured energy yield according to the test series from the TEC Institute for each individual module (kWh/kWp)** | Test result |
|---|---|---|---|---|---|---|---|
| ANTARIS AS M 185 AI | Monocrystalline | 185 | 36.80 | 5.10 | 1580 x 808 | 251.20 | 1.1 Very good |
| CSI CS 5A 180 M | Monocrystalline | 180 | 36.10 | 4.99 | 1595 x 801 | 251.05 | 1.1 Very good |
| ULICA 180 (34) D-UL 800 | Monocrystalline | 180 | 36.00 | 5.00 | 1580 x 800 | 250.52 | 1.2 Very good |
| Jiangyin Jetion JT 175 (35) | Monocrystalline | 175 | 35.30 | 4.96 | 1580 x 808 | 248.39 | 1.3 Very good |
| ANTARIS AS M 175 AI [1] | Monocrystalline | 175 | 35.20 | 4.96 | 1580 x 808 | 247.89 | 1.4 Very good |
| SolarGate SG 2200 | Polycrystalline | 220 | 30.29 | 7.23 | 1669 x 986 | 243.08 | 1.6 Good |
| Yunnan Tianda TD 175 M5 | Monocrystalline | 175 | 35.20 | 4.97 | 1589 x 806 | 242.85 | 1.7 Good |
| aleo S16 | Polycrystalline | 180 | 24.35 | 7.45 | 1660 x 830 | 242.40 | 1.8 Good |
| Sharp NU-180 E1 | Monocrystalline | 180 | 23.70 | 7.60 | 1318 x 994 | 242.27 | 1.9 Good |
| ertex Glas-auf-Glas | Monocrystalline | 128.9 | 24.64 | 5.37 | 1500 x 800 | 241.40 | 2.0 Good |
| Kyocera KC 175 GHT-2 | Polycrystalline | 175 | 23.60 | 7.42 | 1290 x 990 | 240.85 | 2.1 Good |
| asola 185W/48 | Monocrystalline | 185 | 24.85 | 7.56 | 1356 x 990 | 240.37 | 2.2 Good |
| CSI CS6P-230P | Polycrystalline | 230 | 29.80 | 7.71 | 1638 x 982 | 237.40 | 2.3 Good |
| Sym. Energy SE-M231 | Polycrystalline | 231 | 30.80 | 7.51 | 1636 x 982 | 234.39 | 2.7 Satisfactory |
| bpSolar 3210 N | Polycrystalline | 210 | 28.90 | 7.30 | 1667 x 1000 | 227.23 | 3.2 Satisfactory |

*According to the manufacturer's specifications (printed directly on the respective module) and STC. • **Test criteria: • All module types were connected in separate strings of two or three modules of the same type, depending on the amount of module voltage and the MPP voltage of the inverter. • For each string, a 'Mastervolt Soladin 600' inverter fed the electricity into the grid. • The voltage and current were recorded on the module side. Measurement frequency: 1 minute. • This data was used to calculate the DC output and the electrical power delivered by the modules. • On the AC side, a feed meter measured the energy fed into the electricity grid from each module pair. • All modules were free of shading during the test and faced directly south with a tilt angle of 30 degrees. • It was also ensured that all test strings had precisely the same cable length. • The operating range of all the strings lay within the inverters' MPP range. • **Test period:** The measurement period selected was from 1 May 2010 to 30 June 2010. The chart below outlines the expected annual average, long-term, monthly energy yield, based on a 10 kWp system. This shows that very high energy yields can be expected in May and June, therefore being the ideal months for testing the performance of the PV modules. • **Weather conditions:** There was a mixture of weather conditions with predominantly sunny weather but also heavy cloud. 1 no longer in the product range

## Expected average long-term energy yield for a 10 kWp PV system in Germany




# ANTARIS AS M 185 AI: The module with the greatest energy yield



The 15 modules from various well-known manufacturers were measured over a period from 1 May 2010 to 30 June 2010.The voltage and current on the module side were measured at 1-minute intervals. This data was used to calculate the DC output and the electrical power delivered by the modules. All module types were tested in strings (2 or 3 modules respectively) and faced due south so that there was no shading. It was also ensured that all test strings had precisely the same cable length. The operating range of all the module pairs lay within the inverters' MPP range. For each string, a 'Mastervolt Soladin 600' inverter fed the electricity into the grid. On the AC side, a feed meter measured the energy fed into the electricity grid from each string. This year also, none of the tested modules achieved a 100% energy yield, but eight came close and only five came very close.

**The ASM 185 AI from ANTARIS SOLAR with its monocrystalline cells achieved an energy yield of 251.2 kWh/kWp (equivalent to 99% of an expected energy yield of 100%). A comparison with competitive panels from 3 other manufacturers also rated "very good", but which did not quite achieve as much energy yield as the ANTARIS SOLAR ASM 185 AI, can be seen in the diagram on the front page and in the table above.**



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