


# PV+Test – Independent Photovoltaic Module Test by TÜV Rheinland und Solarpraxis AG

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| Scoring system    |               |          |      |          |                  |              |      |           |
|-------------------|---------------|----------|------|----------|------------------|--------------|------|-----------|
| Modules tested: 8 |               |          |      |          |                  |              |      |           |
| excellent         | excellent (-) | good (+) | good | good (-) | satisfactory (+) | satisfactory | poor | very poor |
| 0                 | 2             | 2        | 2    | 1        | 0                | 0            | 1    | 0         |

| Results  |  | Schott Solar<br>SCHOTT POLY 290 | Sharp<br>NU-180E1            | Mitsubishi Electric<br>PV-TD185MF5 | Conergy<br>PowerPlus 225P    | Sovello<br>SV-X-195-fa1   | Perfect Solar<br>PS230-6P-TOP                 |
|--|---|---------------------------------|------------------------------|------------------------------------|------------------------------|---------------------------|---|
| Made in  |   | Germany                         | Japan                        | Japan                              | Germany                      | Germany                   | Germany/OEM (original manufacturer in Taiwan) |
| Size (millimeters)   |   | 1,685 mm x 1,281 mm x 50 mm     | 1,318 mm x 994 mm x 46 mm    | 1,658 mm x 834 mm x 46 mm          | 1,651 mm x 986 mm x 46 mm    | 1,650 mm x 951 mm x 46 mm | 1,663 mm x 997 mm x 39 mm                     |
| Weight   |   | 41.5 kg                         | 16.0 kg                      | 17.0 kg                            | 19.6 kg                      | 18.6 kg                   | 22.0 kg                                       |
| Cell type  |   | Polycrystalline 6-inch cells    | Monocrystalline 6-inch cells | Polycrystalline 6-inch cells       | Polycrystalline 6-inch cells | String-ribbon cells       | Polycrystalline 6-inch cells                  |
| Module type  |   | glass/EVA/cells/EVA/glass       | glass/EVA/cells/EVA/foil     | glass/EVA/cells/EVA/foil           | glass/EVA/cells/EVA/foil     | glass/EVA/cells/EVA/foil  | glass/EVA/cells/EVA/foil                      |
| Specified performance                                      |   | 290 watts                       | 180 watts                    | 185 watts                          | 225 watts                    | 195 watts                 | 230 watts                                     |
| Output tolerance (negative, positive, in percent)          |   | (-0%, not specified)            | (-5%, +10%)                  | (-3%, not specified)               | (0%, 2.5%)                   | (0%, +2.6%)               | (-3%,+3%)                                     |
| Individual evaluation                                      |   |                                 |                              |                                    |                              |                           |   |
| Performance parameters (20%)                               |   | +++                             | +                            | +                                  | +++                          | ++                        | +   |
| Aging behavior (25%)                                       |   | +++                             | ++                           | ++                                 | +                            | +                         | +   |
| Documentation (15%)  |   | +++                             | +++                          | +++                                | +++                          | +++                       | +   |
| Electrical safety (25%)                                    |   | +++                             | +++                          | +++                                | +++                          | ++                        | ++  |
| Processing (10%)   |   | ++                              | +++                          | +                                  | ++                           | o                         | ++  |
| Warranty and ease of installation (5%)                     |   | +                               | +++                          | ++                                 | +++                          | +++                       | ++  |
| Overall evaluation   |   |                                 |                              |                                    |                              |                           |   |
| Results within the requirements of IEC 61215 and IEC 61730 |   | yes                             | yes                          | yes                                | yes*                         | yes                       | yes   |
| Overall evaluation (maximum 100 points)                    |   | 91.3                            | 90.7                         | 89.0                               | 88.1                         | 84.3                      | 80.0  |
| Scores   |   | excellent (-)                   | excellent (-)                | good (+)                           | good (+)                     | good                      | good (-)                                      |

The PV+Test experts believe the tests ran very positively. Most of the modules were ranked as “good” or “excellent” and are thus in line with state-of-the-art technology. Only one module was ranked as “poor”. Its manufacturer rejected publication, as did another whose panels ranked as “good”. The overall score is based on a large number of measurements conducted by TÜV Rheinland, not all of which are included in the table. pv magazine subscribers can, however, refer to both the PV+Test glossary and accompanying article, for full details. Each item receives a score from zero to ten, and each of these scores is weighted as part of the total score. The total scores are ranked as follows:  $\geq 90\%$  of the maximum number of points -> excellent |  $\geq 80\%$  -> good |  $\geq 70\%$  -> satisfactory |  $\geq 50\%$  -> poor |  $< 50\%$  -> very poor. The sub-items are assessed as: +++/ ++/ +/ o / -. The industry council came up with the weighting for the sub-items towards the overall score. \*Conergy: In the insulation measurement after temperature fluctuations, leakage current was detected at the plug of one of the two modules tested, which is in violation of the IEC standard. The second measurement taken was, however, successful; see article.