


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

www.pvtest.de

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 SCHOTT POLY 290	Sharp NU-180E1	Mitsubishi Electric PV-TD185MF5	Conergy PowerPlus 225P	Sovello SV-X-195-fa1	Perfect Solar 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.