PHOTON Lab's outdoor module tests – June 2012 results

The overview tables document the current status of solar module yield measurements conducted by PHOTON Laboratory. Since 2005, the lab has been measuring solar module yields under real-world conditions. At least one module of each model is installed on an open field, facing south at a 30° incline. PHOTON Lab's proprietary measurement devices take second-by-second measurements of the IV curve for each module. The test also captures other important values such as global irradiation, as well as module and air temperature.

For testing purposes, it's important that modules actually feed in their electricity, as they would heat up in open-circuit mode. It's also important to measure yield before it hits the inverter. One common mistake made in yield comparisons, apart from using generally imprecise measurements, is capturing data at the electricity meter – after the output has passed through the inverter. Inverter efficiency impacts yield measurements. Moreover, different combinations of modules and inverters result in better or worse performances, which makes it impossible to compare results.

Another factor that poses challenges for module yield comparisons is standardization according to the manufacturer's specified nominal power. These specifications can deviate considerably from actual power – power under standard test conditions (STC). That's why PHOTON Lab's yield tests always standardize to STC power.

The table shows yield measurements for all of the modules that have been installed on PHOTON Lab's test field for at least a month (see table, p. 97). In the performance ratio column, results are shown for modules that were installed on the test field for the whole of 2011. Only monthly values are stated for modules that were installed later. It is important to consider, however, that the results from a single month say relatively little about how the modules function over the course of a full year. For instance, modules that perform well under direct solar irradiation, delivering high yield in the summer months, have considerable reductions in performance during fall and winter – when the share of diffuse irradiation is higher. The opposite scenario is also possible. Naturally, the summer months play a disproportionately large role for annual yield calculations.

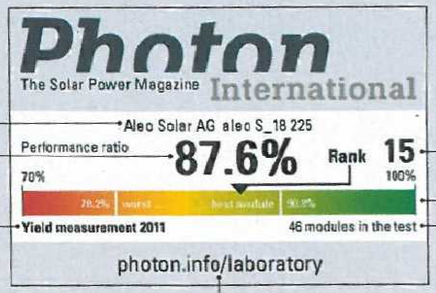
Winter can also impact results, albeit differently: modules on the test field are not cleaned during the year, and PHOTON Lab does not remove snow. Frameless modules therefore have an advantage, as snow tends to slide off these models faster.

The age of the modules should also be taken into account when analyzing yield information: a module installed in 2005 cannot be compared directly with a module just recently installed on the test field. ●

Further information

To get details about PHOTON Lab's module tests, please go to: www.photon-laboratory.com.

The PHOTON performance ratio logo – sorting the wheat from the chaff



Module data

The company listed in this field is the firm that supplied the device. In most cases, this is the company that produced the module. Some companies order devices from other manufacturers and then rebrand them as their own (in which case, the name of the former is listed, rather than the name of the original manufacturer).

Performance ratio

Performance ratio takes into account the amount of solar electricity produced by the device in relation to the solar irradiance available and the efficiency of the module under standard test conditions (STC). A performance ratio of 100 percent would mean that a module with a 15-percent conversion efficiency, for example, produced 150 kWh under 1,000 kWh per m² of solar irradiance in a year. Hence, knowing these values allows for a direct comparison between modules that use different cell technologies and have different degrees of efficiency. The best modules in this year's tests had performance ratios close to (or in the case of the top-ranked device, above) 90 percent. Performance ratios under 85 percent are considered relatively poor. Further improvements to module technology will most likely cause these values to increase in future. Eventually, it is expected that modules will have performance ratios reaching nearly 100 percent.

Yield measurement 2011

This indicates that the yield measurements used to calculate the data in the box were taken during 2011.

photon.info/laboratory

Further information on PHOTON Lab, the test field and the yield tests can be found on this website.

Modules in the test

This indicates how many modules successfully completed a full year of testing during the year in question, allowing the reader to gauge the significance of each module's rank.

Ranking

All solar modules that have been installed on the test field since January 2011 and successfully completed a full year of measurements have been ranked based on their performance ratios. Several modules exhibited ratios that were nearly identical, and these modules can be considered virtually indistinguishable with regard to ranking, especially considering measurement uncertainties. Changes in the weather (an unusually cool summer or an unusually sunny winter) can also affect the ranking. What is clear, however, is that a highly ranked module will consistently outperform a poorly ranked module.

Color bars

The color bars depict the rank of performance ratios stretching from 70 to 100 percent. Vertical white lines indicate the respective positions of the worst- and the best-performing modules in the test, with the worst appearing to the left and the best to the right (and the values for each appearing beside them). The position of the module in question in relation to the worst and best performers is indicated by a black triangle. ● pw

PHOTON Lab's outdoor module tests: Results of June 2012 yield measurements

Manufacturer	Model	Cell type	Origin	Production dates[*1]	Installed in	STC power (W)	2011 rank	Performance ratio (%) 2011	Performance ratio (%) June 2012	Performance ratio (%) January - June 2012	Yield (kWh/kW) June 2012	Yield (kWh/kW) January - June 2012
Aide Solar	AD195M5-Aa	Mono	CN	–	9/2011	198.0	–	–	88.5	88.7	120.1	545.4
Aleo Solar	aleo S_18 225	Multi	DE, ES	2005	2010	230.5	15	87.6	90.8	92.5	123.1	568.9
Alex Solar	ALM-190D-24	Mono	CN	2009	7/2011	187.8	–	–	87.2	89.8	118.2	552.1
Amerisolar	AS-5M-190W	Mono	–	–	1/2012	195.0	–	–	90.0	92.2	122.1	566.6
	AS-6P30-230W	Multi	–	–	1/2012	236.8	–	–	89.1	91.2	120.8	560.8
Apollo Solar	235G6M	Multi	–	2011	1/2012	238.0	–	–	91.2	93.7	123.6	575.7
ASE (now with Schott Solar)	ASE-300-DG-FT (300 W)[*2]	Ribbon	US	1997-2006	2007	308.1[*3]	42	80.3	83.4	82.4	113.1	506.6
Axitec	AC 236P/156-60S	Multi	DE	Through 2011	2/2011	232.9	–	–	89.8	90.5	121.8	556.4
	AC-250M/156-60S	Mono	CN, EU	–	1/2012	248.9	–	–	89.1	88.3	120.8	542.8
Bisol	BMU-215-2/221	Multi	SI	2007	2010	229.1	9	88.2	89.7	90.3	121.7	555.2
	BMU-215-2/233	Multi	SI	2009	2/2011	234.2	–	–	89.7	92.0	121.6	565.5
Bosch Solar	Bosch c-Si M 60 230	Mono	DE	2009-2010	2/2011	233.2	–	–	89.0	90.4	120.7	555.5
BP Solar	BP 3220 T	Multi	CN	Through 2011	7/2011	232.5	–	–	92.5	90.5	125.5	556.4
	BP 3280 T	Multi	–	Through 2011	5/2011	287.4	–	–	89.3	89.5	121.1	550.4
	BP 7185 S[*2]	Mono	ES, IN	–	2005	185.1[*3]	45	79.7	82.6	81.9	112.0	503.6
Calrays	CPM 250-A-96	Mono	–	–	7/2011	244.0	–	–	87.3	83.8	118.3	515.0
Canadian Solar	CS6A-170P	Multi	CN	2007 (purchased)	2007	174.4[*3]	36	82.6	85.1	85.3	115.4	524.1
CEEG Solar	SST 240-60M	Mono	CN	2005	2/2011	239.0	–	–	89.4	91.5	121.2	562.8
	SST 265-72P	Multi	CN	2005	2/2011	281.0	–	–	88.9	91.6	120.5	563.0
CH Solar	CH Solar 180 mono[*2]	Mono	CN	Through 2010	2010	184.4	4	89.1	90.3	91.3	122.5	561.3
Chaori Solar Energy	CRM240S156P-60	Multi	–	–	5/2012	241.0	–	–	90.9	–[*4]	123.2	–[*4]
	CRM245S156M-60	Mono	–	–	5/2012	246.3	–	–	90.2	–[*4]	122.3	–[*4]
China Sunergy	CSUN240-60P	Multi	CN	–	1/2012	243.7	–	–	88.7	88.9	120.3	546.7
	CSUN250-60M	Mono	CN	–	1/2012	248.4	–	–	90.6	91.2	122.8	560.5
	CSUN260-60M	Mono	CN	–	1/2012	254.0	–	–	90.5	91.4	122.8	562.1
Chint Solar / Astronergy	CHSM5612M-185	Mono	–	–	1/2012	187.4	–	–	90.8	92.2	123.1	566.5
	CHSM6610P-230	Multi	–	–	1/2012	234.2	–	–	88.4	88.8	119.8	546.1
CNPV Solar	CNPV-185M	Mono	CN	2006	2010	193.8	6	88.8	90.1	91.4	122.2	562.1
	CNPV-190M	Mono	CN	2006	7/2011	197.4	–	–	88.6	89.0	120.2	547.1
	CNPV-220P	Multi	CN	2006	7/2011	224.2	–	–	90.2	91.5	122.3	562.3
	CNPV-240M	Mono	CN	2006	7/2011	249.7	–	–	87.8	90.5	119.0	556.4
	CNPV-240P	Multi	CN	2006	7/2011	243.1	–	–	90.1	92.7	122.2	569.6
Conergy	Conergy PowerPlus 220P	Multi	DE	2009	2010	224.2	13	87.7	89.4	91.1	121.2	560.0
	PowerPlus 235P	Multi	DE	–	1/2012	240.0	–	–	91.3	93.0	123.8	571.4
CSG PV Tech	CSG180S1-35/36[*5]	Mono	CN	2008	2010	184.1	5	89.0	90.8	93.4	123.1	573.9
	CSG230M2-30[*6]	Multi	CN	2008	2010	228.3	10	88.2	90.3	90.8	122.5	558.2
Daqo New Energy	DQ235PSCa	Multi	CN	–	1/2012	238.0	–	–	89.2	89.7	121.0	551.6
Day4 Energy	Day4 48MC 185	Multi	CA	2006	2/2011	186.5	–	–	86.5	88.6	117.3	544.6
Eging Photovoltaic Technology	EGM-185	Mono	CN	2010	2/2011	188.4	–	–	88.7	91.2	120.2	560.8
Emmvee Photovoltaics	ES-230P60[*7]	Multi	IN	2008-2011	2010	234.0	27	86.1	88.7	85.7	120.3	526.8
ET Solar	ET-P660240	Multi	CN	–	7/2011	236.1	–	–	91.4	94.2	123.9	579.3
Eurener	PEPV230	Multi	ES	–	1/2012	235.3	–	–	90.6	91.6	122.8	563.1
Evergreen Solar	EC-120[*2]	Ribbon	US	2004-2006	2006	121.0[*3]	31	85.1	85.9	85.9	116.5	527.9
	ES-180-RL[*2]	Ribbon	DE	2006-2008	2007	185.4[*3]	44	79.8	83.3	81.1	112.9	498.6
	ES-A-210-fa2	Ribbon	US	2008	3/2011	210.0	–	–	87.7	88.0	118.9	540.7
	ES-E-210-fc3	Ribbon	US	–	2/2011	211.2	–	–	88.0	88.9	119.4	546.3
Ferrania Solis	AP 60-230	Multi	IT	2010	7/2011	228.8	–	–	90.9	87.2	123.3	536.2
First Solar	FS-265	CdTe	US	2006-2011	2007	65.4[*3]	30	85.5	86.1	87.0	116.8	534.6
Fluitecnik	FTS-220 P	Multi	PT	–	11/2011	231.8	–	–	91.9	88.2	124.6	542.0
Frankfurt Solar	FS215W-POLY	Multi	CN	–	2009	221.3	24	86.4	89.2	90.5	120.9	556.5
Galaxy Energy	GS260m-96	Mono	DE	–	2/2011	252.9	–	–	89.1	91.6	120.8	562.8
Hanwha SolarOne[*8]	SF160 M5-24 (175 W)[*2]	Mono	CN	–	2007	174.6[*3]	38	81.8	87.1	89.5	118.1	550.2
	SF160-24-1M175 (scac)	Mono	CN	–	2010	183.0	19	87.2	88.7	91.3	120.3	561.1
	SF160-24-1M180	Mono	CN	–	2/2011	178.6	–	–	87.3	89.9	118.3	552.6
Hareon Solar	HR-230P-18/Bb	Multi	–	–	7/2011	230.6	–	–	91.4	91.3	123.9	561.2
Helios Technology	H3A230P	Multi	EU	–	1/2012	232.2	–	–	89.4	88.3	121.2	542.9
Hengdian Group Dmegc	DM190-M125-72	Mono	CN	–	4/2012	196.6	–	–	89.1	–[*4]	120.8	–[*4]
Himin Solar	HG-190S/Ba	Mono	–	–	1/2012	194.5	–	–	90.6	92.4	122.8	568.3
Huanghe	HH190(36)M	Mono	CN	–	1/2012	190.9	–	–	91.0	93.2	123.4	572.8
	HH230(30)P	Multi	CN	–	1/2012	231.7	–	–	93.3	92.4	126.6	568.1
IBC Solar	IBC MonoSol 240 TT	Mono	DE	Through 2011	2/2011	246.0	–	–	87.3	84.1	118.4	516.8

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Manufacturer	Model	Cell type	Origin	Production dates*1	Installed in	STC power (W)	2011 rank	Performance ratio (%) 2011	Performance ratio (%) June 2012	Performance ratio (%) January - June 2012	Yield (kWh/kW) June 2012	Yield (kWh/kW) January - June 2012
IBC Solar	IBC MonoSol 240 TT	Mono	DE	Through 2011	4/2012	245.2	–	–	88.4	–*4	119.9	–*4
Isofoton	I-110/24*2	Mono	ES	Through 2005	2006	102.5*3	37	82.1	84.3	83.7	114.3	514.4
	IS-170/24*2	Mono	ES	2007	2009	172.8	40	81.0	83.9	83.6	113.8	513.6
	ISF-255	Mono	–	–	4/2012	255.0	–	–	89.0	–*4	120.7	–*4
ITS Innotech Solar	EcoPlus ITS220ECU5*9	Multi	SE	2011	1/2012	242.7	–	–	91.3	91.2	123.8	560.6
Jetion Solar	JT230(30)P1655x992	Mono	CN	2005	2/2011	232.4	–	–	89.3	88.4	121.1	543.3
Jinko Solar	JKM190M-72	Mono	–	2010	7/2011	191.1	–	–	91.0	93.9	123.4	577.2
	JKM235P-60	Multi	–	–	1/2012	231.4	–	–	91.0	94.3	123.4	579.9
	JKM255M-96	Mono	–	–	7/2011	259.7	–	–	89.3	89.5	121.2	550.3
	JKM275P	Multi	–	–	4/2012	275.5	–	–	92.0	–*4	124.8	–*4
JZ Solar	JZM290M-72	Mono	–	–	1/2012	296.9	–	–	90.5	90.5	122.8	556.3
Kenmec Mechanical	TKSA-23001	Multi	TW	–	7/2011	235.0	–	–	89.6	89.5	121.6	550.0
Kinmac Solar	KSS-6P6A-230	Multi	TW	2010	2/2011	234.1	–	–	90.8	91.7	123.1	564.0
Kioto Photovoltaics	KPV 210 PE*2	Multi	AT	2008-2010	2009	206.6	16	87.4	89.8	92.2	121.8	567.0
Kyocera	KC170GT-2*2	Multi	JP	Through 2006	2006	178.4*3	39	81.7	82.9	83.7	112.4	514.4
	KD210GH-2PU	Multi	EU	2009	2/2011	212.1	–	–	86.5	87.5	117.3	537.7
Latitude Solar	Latitude P6-60/6 (235)	Multi	SE	–	2/2011	240.5	–	–	–*10	–*11	–*10	–*11
	Latitude P6-60/6 (235)	Multi	SE	–	1/2012	241.2	–	–	78.5	74.6	106.5	458.9
Lightway Green New Energy	LW235(29)P1650*990	Multi	CN	–	4/2012	235.7	–	–	91.4	–*4	123.9	–*4
Lilie Energie	Lilie SPL 185	Mono	–	–	2/2011	185.3	–	–	88.0	90.2	119.3	554.6
	Lilie SPL 185-I	Mono	–	–	2/2011	187.1	–	–	87.5	88.7	118.7	545.3
Linsun Renewable	SK60P6	Multi	–	–	7/2011	228.3	–	–	90.6	93.5	122.8	574.5
Linuo	LN180(36)M-185	Mono	–	2003	7/2011	191.8	–	–	89.8	90.7	121.7	557.7
	LN240(30)P-225	Multi	–	2003	7/2011	236.5	–	–	89.3	90.1	121.2	554.1
Luxor Solar	LX-185M/125-72+	Mono	CN	2007	2/2011	188.4	–	–	88.3	88.6	119.7	544.6
Mage Solar	Mage Powertec Plus 225/6PJ	Multi	CN	Through 2011	2009	232.0	22	86.9	89.4	91.3	121.2	561.4
	Mage Powertec Plus 230/6PH-US	Multi	US	–	7/2011	231.8	–	–	90.2	90.7	122.2	554.7
	Mage Powertec Plus 230/6PO	Multi	CN	–	2/2011	229.9	–	–	62.7	64.2	85.0	394.7
	Mage Powertec Plus 230/6PO	Multi	CN	–	1/2012	229.9	–	–	85.2	88.2	115.5	542.1
Magi Solar	MGSM-240D-60	Mono	CN	–	7/2011	246.1	–	–	88.6	90.4	120.1	555.5
	MGSM-295-D	Mono	CN	Through 2011	7/2011	294.0	–	–	89.9	89.9	122.0	552.6
M-Prime	M 235P	Multi	PT	–	1/2012	240.7	–	–	91.0	90.9	123.4	558.7
Nelumbo	NEI 230-3VA	Multi	CZ	–	2/2011	228.5	–	–	90.4	93.1	122.6	572.1
Nesl Solartech	DJ-235P	Multi	CN	–	5/2012	237.7	–	–	91.3	–*4	123.8	–*4
NexPower Technology	NT-125AX*2	µc-Si / a-Si	TW	2009-2010	2010	125.4	3	89.6	93.1	91.7	126.3	563.5
Ningbo Solar	Sun Earth TDB125x125-72-P 160W*2	Mono	CN	–	2/2011	161.6	–	–	88.4	89.3	119.9	548.9
	Sun Earth TDB125x125-72-P 180W*2	Mono	CN	Through 2010	2/2011	179.2	–	–	89.4	90.6	121.2	556.8
Perfectenergy	PEM-180/185-72M-SCC	Mono	CN	2008	2010	191.3	25	86.1	87.7	87.7	118.9	539.2
Phono Solar	PS190M-24/F	Mono	CN	–	5/2012	192.0	–	–	91.7	–*4	124.3	–*4
	PS230P-20/U	Multi	CN	–	5/2012	235.8	–	–	91.7	–*4	124.4	–*4
Photowatt International	PW 1650-175W	Multi	FR	2005 (purchased)	2006	171.4*3	34	84.7	82.3	81.6	111.6	501.4
PV Power Technologies	PVQ3 220	Multi	IN	2008	2009	223.6	18	87.3	89.8	91.5	121.8	562.5
Q-Cells	Q.SMART UF 95	CIGS	DE	2008	2/2011	97.3	–	–	90.4	89.3	122.6	549.2
Qixin Solar	SL230CE-30P	Multi	–	–	4/2012	239.6	–	–	91.1	–*4	123.6	–*4
Electrical Appliance	SL250CE-48M	Mono	–	–	4/2012	255.9	–	–	90.2	–*4	122.3	–*4
REC	Premium 210	Multi	SE	Through 2008	2/2011	212.2	–	–	91.4	91.9	123.9	564.8
	REC230AE*2	Multi	SE	2007-2010	2010	228.6	1	90.8	91.8	91.5	124.5	562.6
	REC230PE	Multi	SG	2010	2/2011	237.6	–	–	90.2	91.5	122.3	562.5
ReneSola	JC250S-24/Bb	Mono	–	–	6/2012	246.5	–	–	91.4	–*4	123.9	–*4
Risen Energy	SYP185S-M	Mono	CN	–	7/2011	191.7	–	–	89.0	92.1	120.8	566.5
Runda PV	RS230P-60	Multi	CN	–	1/2012	237.8	–	–	91.8	87.3	124.5	536.8
Scheuten Solar	Multisol P6-60	Multi	DE	–	6/2011	238.1	–	–	87.9	90.3	119.2	555.3
Schott Solar*12	SCHOTT PERFORM Poly 235	Multi	CZ	Since 2011	1/2012	239.0	–	–	90.9	93.0	123.2	572.0
	SCHOTT POLY TM 220	Multi	CZ	2008-2009	2/2011	224.7	–	–	85.9	86.4	116.5	531.4
S-Energy	SM-220PA8	Multi	KR	–	2009	224.4	20	87.1	89.8	89.9	121.8	552.5
Seraphim Solar System	SRP-220-6PB	Multi	CN	–	10/2011	226.1	–	–	92.1	95.1	124.9	584.6
Sharp	NT-R5E3E*2	Mono	JP	2003	2005	187.9*3	46	78.2	80.5	78.4	109.2	482.0
	NU-185E1	Mono	GB	2005	3/2011	186.1	–	–	86.2	89.2	116.8	548.3
Shell Solar	Shell PowerMax Eclipse 80-C*2	CIS	US	2005-2006	2007	90.8*3	33	84.9	85.9	86.1	116.5	529.2
Shell Solar (now with SolarWorld)	Shell SQ 150-C*2	Mono	PT	Through 2005	2006	155.8*3	26	86.1	88.3	88.9	119.7	546.3
Shinsung	SS-BM260C	Mono	KR	–	4/2012	258.8	–	–	88.8	–*4	120.5	–*4

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Manufacturer	Model	Cell type	Origin	Production dates*1	Installed in	STC power (W)	2011 rank	Performance ratio (%) 2011	Performance ratio (%) June 2012	Performance ratio (%) January - June 2012	Yield (kWh/kW) June 2012	Yield (kWh/kW) January - June 2012
Siliken	SLK60P6L 230Wp	Multi	ES	–	2009	229.7	2	89.6	92.1	93.8	124.8	576.6
Solar Modules Nederland	TC245-MO	Mono	NL	2010-2011	2/2011	246.7	–	–	90.2	92.4	122.3	567.8
Solarbest Energy-Tech	ZSB M190	Mono	CN	–	12/2011	186.1	–	–	88.2	90.7	119.5	557.8
Solar-Fabrik	Premium L poly (225)	Multi	DE	–	2/2011	223.6	–	–	87.8	86.1	119.1	529.4
	SF 130/4-130*2	Mono	DE	2006-2010	2010	130.7	35	83.0	85.7	85.4	116.2	525.1
	SF 145A*2	Ribbon	DE	2003-2004	2005	145.8*3	41	80.3	85.1	82.6	115.4	507.6
Solargate	SG-2350	Multi	TW	–	1/2012	246.3	–	–	89.1	89.2	120.8	548.6
Solaria Energia	S6P2G225	Multi	ES	2010	5/2011	232.7	–	–	89.1	91.6	120.8	562.9
Solarwatt	M220-60 GET AK (230)	Mono	DE	2005	2/2011	231.5	–	–	88.9	89.8	120.6	552.1
SolarWorld	Sunmodule Plus SW 210 poly*13	Multi	DE	2004	2006	212.2*3	28	85.8	88.9	90.7	120.5	557.4
	Sunmodule Plus SW 225 mono	Mono	US	2009	2010	233.4	8	88.7	90.1	92.7	122.2	569.8
	Sunmodule Plus SW 225 poly	Multi	DE	2004-2011	2/2011	228.6	–	–	89.7	90.6	121.6	556.7
	SW 245 poly	Multi	DE	–	1/2012	245.3	–	–	90.3	91.8	122.4	564.2
Solon	SOLON Blue 230/07(225)	Multi	DE	2008	2/2011	226.9	–	–	90.7	91.5	123.0	562.5
Sonalis*14	SL-180CE-36M	Mono	CN	–	2010	185.1	23	86.8	88.6	89.5	120.1	550.2
	SL-190CE-36M	Mono	–	–	1/2012	188.9	–	–	87.0	86.8	118.0	533.6
Sovello	SV-X-200-fa1*15	Ribbon	DE	2009-2011	2011	205.0	32	85.1	86.0	84.5	116.6	519.5
	SV-X-205-fa1	Ribbon	DE	–	2/2011	206.1	–	–	86.6	85.3	117.4	524.6
Sunage	SAM 96/5	Mono	CH	–	7/2011	256.6	–	–	88.9	88.6	120.5	544.9
Sunerg Solar	XP 60/156-230	Multi	IT	–	2/2011	226.0	–	–	91.7	94.0	124.3	577.6
Sunflower Light	SF125x125-72-M(180)	Mono	CN	–	2/2011	176.6	–	–	89.8	91.2	121.7	560.8
Sungen	SGM-195D	Mono	–	–	5/2012	196.5	–	–	89.7	–*4	121.6	–*4
	SGM-235P	Multi	–	–	5/2012	235.4	–	–	90.9	–*4	123.3	–*4
Sunlink PV	SL220-20M230	Mono	CN	–	2/2011	237.9	–	–	89.5	91.6	121.4	563.1
Sunpeak / Alpexsolar*16	ALP235W*2	Mono	IN	2009-2010	2010	233.0	17	87.4	88.9	88.8	120.6	545.6
SunPower	SPR-245NE-WHT-D	Mono	–	–	1/2012	245.2	–	–	95.4	95.1	129.3	584.8
	SPR-320NE-WHT-D	Mono	–	–	1/2012	325.5	–	–	95.8	95.2	130.0	585.2
	SPR-327NE-WHT-D	Mono	–	–	1/2012	325.8	–	–	95.9	96.1	130.0	590.7
Sunrise Solartech	SRM 180D72-GE	Mono	CN	–	2009	181.5	29	85.6	88.2	90.6	119.5	557.1
Suntech Power	STP190-18/Ub*2	Multi	CN	2005	2/2011	182.9	–	–	85.0	87.2	115.3	535.8
	STP205-18/Ud	Multi	CN	–	2/2011	213.8	–	–	88.8	89.8	120.5	552.2
Sunways	MHH plus 190 (190 Wp)*2	Multi	DE	2003-2005	2005	199.5*3	43	80.1	83.9	84.0	113.7	516.2
SWAT-International	SWAT-240-PS	Multi	–	–	5/2011	245.1	–	–	89.3	91.8	121.1	564.1
Talesun Solar	TP572M-195	Mono	CN	2011	1/2012	196.1	–	–	88.8	90.3	120.4	555.2
Topray Solar	TPS105T-180W	Mono	CN	–	5/2011	184.8	–	–	89.8	89.5	121.8	550.5
Topsolar Green	TSM72-125M-190W	Mono	CN	–	7/2011	185.9	–	–	90.0	88.8	122.1	546.1
	TSM96-125M-250W	Mono	CN	–	3/2012	246.6	–	–	90.8	–*4	123.1	–*4
Trina Solar	TSM-180DC01	Mono	CN	2007	2009	176.2	14	87.6	89.5	91.1	121.4	559.9
	TSM-225PC05	Multi	CN	–	2010	233.0	12	87.8	89.4	91.5	121.3	562.6
	TSM-250PC05	Multi	–	–	6/2012	249.3	–	–	90.7	–*4	123.0	–*4
Upsolar	UP-M180M	Mono	CN	2010-2011	2010	181.5	11	88.1	89.9	91.9	121.9	564.9
	UP-M185M	Mono	CN	2010-2011	2/2011	189.2	–	–	88.0	90.4	119.3	555.8
	UP-M220P	Multi	CN	2010-2011	2/2011	219.2	–	–	91.4	92.0	124.0	565.8
V-Energy	VE260PV	Multi	IT	–	1/2012	234.6	–	–	91.8	91.1	124.5	560.1
Vikram Solar	ELDORA 220	Multi	–	–	7/2011	233.3	–	–	90.2	90.6	122.3	557.1
Win Win Precision	Winaico WSP-230P6	Multi	TW	2009	2009	234.4	21	87.0	89.3	86.3	121.1	530.4
	Winaico WSP-235P6	Multi	TW	–	2010	240.1	7	88.8	90.2	91.7	122.4	563.9
	Winaico WSP-240P6	Multi	–	–	4/2012	245.2	–	–	89.3	–*4	121.2	–*4
	Winaico WSP-250P6	Multi	–	–	1/2012	249.3	–	–	91.7	91.4	124.4	561.7
Yingli Green Energy	YL210P-29b	Multi	CN	2009	2/2011	214.3	–	–	88.6	89.8	120.2	552.2
	YL240P-29b	Multi	CN	–	1/2012	246.6	–	–	93.0	93.7	126.1	576.2
	YL260C-30b (Panda)	Mono	CN	–	1/2012	267.9	–	–	89.3	90.0	121.1	553.0
Zentralsolar Deutschland	Genius SDM 185-10004-185	Mono	–	–	7/2011	190.6	–	–	89.2	89.9	121.0	552.7
ZN Shine PV-Tech	ZX250(48)MS	Mono	CN	–	7/2011	252.3	–	–	91.4	92.4	123.9	567.9
Zytech Engineering	ZT 230P	Multi	CN	–	2/2011	230.8	–	–	88.1	90.4	119.5	555.9

*1 in a few cases, production data was not available, so PHOTON Lab substituted sales data whenever possible, *2 no longer manufactured, *3 STC power specification does not depend on PHOTON Lab's flasher measurement, *4 installed after January of the current year, *5 previous model designation: CSG180S1-35/1589×807, *6 previous model designation: CSG230M2-30/1640×992, *7 previous model designation: ES-200-P60(230), *8 previously manufactured by Solarfun Power Holdings Co. Ltd., *9 previous model designation: Economy New ITS220ECU5, *10 since this module is undergoing further investigation, it has been temporarily removed from the evaluation, *11 this module has not been evaluated continuously through this year, *12 this company has withdrawn from crystalline silicon PV manufacturing, *13 previous model designation: SW 210 poly, *14 for manufacturer Ningbo Qixin Solar Electrical Appliance Co. Ltd., *15 this model was referred to as Pure Power SV-X-200 (LV) in previous issues, *16 manufactured by Alpexsolar and available through Sunpeak-Vertrieb Unternehmensgruppe Ratio-Data