

# Test Laboratory

A couple of years ago, PHOTON Europe GmbH decided to build its own test lab, resulting in the creation of PHOTON laboratory, located at the company's headquarters in Aachen, Germany. The lab was established as a means to perform independent evaluations of inverters and modules.

## Solar modules in PHOTON Lab's test field

The table starting on this page shows data for modules in PHOTON Laboratory's test field during 2011 and January 2012. The table shows full-year results for 2011, when available, as well as monthly statistics for January.

Note that the results from just 1 month tell us nothing about how the

modules function over the course of a year. For instance, modules that perform well under direct solar irradiation, and that therefore deliver high yields in the summer months, can see considerable reductions in performance during fall and winter (when the share of diffuse irradiation is higher). The opposite scenario is also pos-

sible. Naturally, the summer months play a disproportionately large role in annual yield calculations.

One should also take the installation date of each module into account when comparing figures in these tables. To ensure that test conditions are as realistic as possible, we do not clean the modules on the test field.

**PHOTON Lab's outdoor module tests: Results of 2011 and January 2012 yield measurements**

Manufacturer	Model	Cell type	Origin	Production dates*1	Installed in	STC power (W)	2011 rank	Performance Ratio		Yield (kWh/kW)
								2011	January 2012	
Aide Solar Energy Technology	AD195M5-Aa	Mono	CN	—	9/2011	198.0	—	—	91.0 %	28.7
Aleo Solar	aleo S_18 225	Multi	DE, ES	2005	2010	230.5	15	87.6 %	97.3 %	30.7
Alex Solar Energy & Technology	ALM-190D-24	Mono	CN	2009	7/2011	187.8	—	—	93.8 %	29.5
Amerisolar, Worldwide Energy & Manufacturing	AS-5M-190W	Mono	—	—	1/2012	195.0	—	—	99.9 %	31.5
	AS-6P30-230W	Multi	—	—	1/2012	236.8	—	—	95.4 %	30.1
Apollo Solar Energy	235G6M	Multi	—	—	1/2012	238.0	—	—	101.8 %	32.1
Astronergy	CHSM5612M-185	Mono	—	—	1/2012	187.4	—	—	94.1 %	29.7
	CHSM6610P-230	Multi	—	—	1/2012	234.2	—	—	91.4 %	28.8
Axitec	AC 236P/156-60S	Multi	DE	Through 2011	2/2011	232.9	—	—	96.4 %	30.4
	AC-250M/156-60S	Mono	CN, EU	—	1/2012	248.9	—	—	91.3 %	28.8
Bisol	BMU-215-2/221	Multi	SI	2007	2010	229.1	9	88.2 %	93.1 %	29.3
	BMU-215-2/233	Multi	SI	2009	2/2011	234.2	—	—	97.0 %	30.6
Bosch Solar Energy	Bosch c-Si M 60 230	Mono	DE	2009-2010	2/2011	233.2	—	—	95.4 %	30.1
BP Solar International	BP 3220 T	Multi	CN	Through 2011	7/2011	232.5	—	—	96.9 %	30.5
	BP 3280 T	Multi	—	Through 2011	5/2011	287.4	—	—	91.2 %	28.7
	BP 7185 S*2	Mono	ES, IN	—	2005	185.1*3	45	79.7 %	86.6 %	27.3
Calrays	CPM 250-A-96	Mono	—	—	7/2011	244.0	—	—	88.1 %	27.7
Canadian Solar	CS6A-170P	Multi	CN	2007 (purchased)	2007	174.4*5	36	82.6 %	88.9 %	28.0
CEEG Solar Science & Technology	SST 240-60M	Mono	CN	2005	2/2011	239.0	—	—	95.3 %	30.0
	SST 265-72P	Multi	CN	2005	2/2011	281.0	—	—	97.8 %	30.8
CH Solar	CH Solar 180 mono*2	Mono	CN	Through 2010	2010	184.4	4	89.1 %	91.0 %	28.7
China Sunergy	CSUN240-60P	Multi	CN	—	1/2012	243.7	—	—	92.2 %	29.0
	CSUN250-60M	Mono	CN	—	1/2012	248.4	—	—	94.3 %	29.7
	CSUN260-60M	Mono	CN	—	1/2012	254.0	—	—	94.3 %	29.7
CNPV Solar Power	CNPV-185M	Mono	CN	2006	2010	193.8	6	88.8 %	92.5 %	29.1
	CNPV-190M	Mono	CN	2006	7/2011	197.4	—	—	90.6 %	28.5
	CNPV-220P	Multi	CN	2006	7/2011	224.2	—	—	94.8 %	29.9
	CNPV-240M	Mono	CN	2006	7/2011	249.7	—	—	94.8 %	29.9
	CNPV-240P	Multi	CN	2006	7/2011	243.1	—	—	96.4 %	30.4
Conergy	Conergy PowerPlus 220P	Multi	DE	2009	2010	224.2	13	87.7 %	98.6 %	31.1
	PowerPlus 235P	Multi	DE	—	1/2012	240.0	—	—	96.1 %	30.3
CSG PV Tech	CSG180S1-35/36*4	Mono	CN	2008	2010	184.1	5	89.0 %	100.2 %	31.6
	CSG230M2-30*5	Multi	CN	2008	2010	228.3	10	88.2 %	94.0 %	29.6
DAQO New Energy	DQ235PSCa	Multi	CN	—	1/2012	238.0	—	—	93.1 %	29.3

**PHOTON Lab's outdoor module tests: Results of 2011 and January 2012 yield measurements (continued)**

Manufacturer	Model	Cell type	Origin	Production dates*1	Installed in	STC power (W)	2011 rank	Performance Ratio		Yield (kWh/kW)
								2011	January 2012	
Day 4 Energy	Day4 48MC 185	Multi	CA	2006	2/2011	186.5	—	—	91.3 %	28.8
Eging Photovoltaic Technology	EGM-185	Mono	CN	2010	2/2011	188.4	—	—	98.1 %	30.9
Emmvee Photovoltaics	ES-230P60**	Multi	IN	2008-2011	2010	234.0	27	86.1 %	92.4 %	29.1
ET Solar Industry	ET-P660240	Multi	CN	—	7/2011	236.1	—	—	102.3 %	32.2
Eurener	PEPV230	Multi	ES	—	1/2012	235.3	—	—	95.5 %	30.1
Evergreen Solar	EC-120*2	Ribbon	US	2004-2006	2006	121.0*3	31	85.1 %	89.9 %	28.3
	ES-180-RL*2	Ribbon	DE	2006-2008	2007	185.4*3	44	79.8 %	90.1 %	28.4
	ES-A-210-fa2	Ribbon	US	2008	3/2011	210.0	—	—	90.2 %	28.4
	ES-E-210-fc3	Ribbon	US	—	2/2011	211.2	—	—	90.2 %	28.4
Ferrania Solis	AP 60-230	Multi	IT	2010	7/2011	228.8	—	—	94.6 %	29.8
First Solar	FS-265	CdTe	US	2006-2011	2007	65.4*3	30	85.5 %	—	*7
Fluitemik	FTS-220-P	Multi	—	—	11/2011	231.8	—	—	94.9 %	29.9
Frankfurt Solar	FS215W-POLY	Multi	CN	—	2009	221.3	24	86.4 %	93.5 %	29.5
Galaxy Energy	GS260m-96	Mono	DE	—	2/2011	252.9	—	—	97.2 %	30.6
Hanwha Solar One**	SF160 M5-24 (175 W)*2	Mono	CN	—	2007	174.6*3	38	81.8 %	95.6 %	30.1
	SF160-24-1M175 (scac)	Mono	CN	—	2010	183.0	19	87.2 %	94.4 %	29.8
	SF160-24-1M180	Mono	CN	—	2/2011	178.6	—	—	92.8 %	29.2
Hareon Solar Technology	HR-230P-18/Bb	Multi	—	—	7/2011	230.6	—	—	94.9 %	29.9
Helios Technology	H3A230P	Multi	EU	—	1/2012	232.2	—	—	89.6 %	28.2
Himin Solar	HG-190S/Ba	Mono	—	—	1/2012	194.5	—	—	96.3 %	30.4
Huanghe Solar	HH190(36)M	Mono	CN	—	1/2012	190.9	—	—	99.7 %	31.4

# Just when you thought it couldn't get any better...

## S-5!® has once again made cutting edge innovations to the industry standards for attaching solar panels using the S-5-PV Kit.

The new stainless steel mounting disk is designed to ensure conductivity with module frames. Now, the S-5-PV Kit provides module-to-module continuity within a string of modules. When the S-5-PV Kit is properly installed, ground lugs and copper wire will only be necessary to connect module strings and ground the system. In most cases, that cost savings is sufficient to pay for the entire S-5! clamp/S-5-PV Kit setup! The S-5-PV Kit continues to be the easiest, most cost-effective way to install solar panels directly to standing seam metal roofs, remaining the most popular choice worldwide.

To find out more, call 888-825-3432  
Or visit [www.S-5-Solar.com/pho](http://www.S-5-Solar.com/pho)

**S-5!**®  
The Right Way!



Listed to the new UL subject 2703, a standard that covers both bonding and mounting! ETL Listed to UL 1703.



Visit us  
in March at  
PV America  
Booth  
#828

**PHOTON Lab's outdoor module tests: Results of 2011 and January 2012 yield measurements (continued)**

Manufacturer	Model	Cell type	Origin	Production dates*1	Installed in	STC power (W)	2011 rank	Performance Ratio		Yield (kWh/kW)
								2011	January 2012	
<b>Huanghe Solar (continued)</b>	HH230(30)P	Multi	CN	–	1/2012	231.7	–	–	93.5 %	29.5
<b>IBC Solar</b>	IBC MonoSol 240 TT	Mono	DE	Through 2011	2/2011	246.0	–	–	69.9 %	22.0
<b>Isotofon</b>	I-110/24*2	Mono	ES	Through 2005	2006	102.5*3	37	82.1 %	86.5 %	27.3
	IS-170/24*2	Mono	ES	2007	2009	172.8	40	81.0 %	89.9 %	28.3
<b>Jetion Solar</b>	JT230(30)P1655x992	Mono	CN	2005	2/2011	232.4	–	–	90.9 %	28.6
<b>Jiangsu Runda PV</b>	RS230P-60	Multi	CN	–	1/2012	237.8	–	–	95.1 %	30.0
<b>Jinko Solar</b>	JKM190M-72	Mono	–	2010	7/2011	191.1	–	–	101.5 %	32.0
	JKM235P-60	Multi	–	–	1/2012	231.4	–	–	105.0 %	33.1
	JKM255M-96	Mono	–	–	7/2011	259.7	–	–	91.6 %	28.8
<b>JZ Solar</b>	JZM290M-72	Mono	–	–	1/2012	296.9	–	–	93.8 %	29.6
<b>Kenmec Mechanical Engineering</b>	TKSA-23001	Multi	–	–	7/2011	235.0	–	–	93.0 %	29.3
<b>Kinmac Solar</b>	KSS-6P6A-230	Multi	TW	2010	2/2011	234.1	–	–	96.0 %	30.3
<b>Kioto Photovoltaics</b>	KPV 210 PE*2	Multi	AT	2008-2010	2009	206.6	16	87.4 %	96.2 %	30.3
<b>Kyocera</b>	KC170GT-2*2	Multi	JP	Through 2006	2006	178.4*3	39	81.7 %	85.7 %	27.0
	KD210GH-2PU	Multi	EU	2009	2/2011	212.1	–	–	88.8 %	28.0
<b>Latitude Solar</b>	Latitude P6-60/6 (235)	Multi	SE	–	2/2011	240.5	–	–	32.8 %	10.3
	Latitude P6-60/6 (235)	Multi	SE	–	1/2012	241.2	–	–	78.3 %	24.7
<b>Lilie Energie</b>	Lilie SPL 185	Mono	–	–	2/2011	185.3	–	–	93.1 %	29.3
	Lilie SPL 185-I	Mono	–	–	2/2011	187.1	–	–	92.1 %	29.0
<b>Linsun Renewable Energy</b>	SK60P6	Multi	–	–	7/2011	228.3	–	–	102.4 %	32.3
<b>Linuo Group</b>	LN180(36)M-185	Mono	–	2003	7/2011	191.8	–	–	93.4 %	29.4
	LN240(30)P-225	Multi	–	2003	7/2011	236.5	–	–	93.4 %	29.4
<b>Luxor Solar</b>	LX-185M/125-72+	Mono	CN	2007	2/2011	188.4	–	–	92.5 %	29.1
<b>Mage Solar</b>	Mage Powertec Plus 225/6PJ	Multi	CN	Through 2011	2009	232.0	22	86.9 %	97.4 %	30.7
	Mage Powertec Plus 230/6PH-US	Multi	US	–	7/2011	231.8	–	–	94.3 %	29.7
	Mage Powertec Plus 230/6PO	Multi	CN	–	2/2011	229.9	–	–	61.9 %	19.5
	Mage Powertec Plus 230/6PO	Multi	CN	–	1/2012	229.9	–	–	0.92	29.0
<b>Magi Solar Energy Technology</b>	MGSM-240D-60	Mono	CN	–	7/2011	246.1	–	–	94.0 %	29.6
	MGSM-295-D	Mono	CN	Through 2011	7/2011	294.0	–	–	92.4 %	29.1
<b>M-Prime</b>	M 235P	Multi	PT	–	1/2012	240.7	–	–	95.7 %	30.2
<b>Nelumbo</b>	NEI 230-3VA	Multi	CZ	–	2/2011	228.5	–	–	98.3 %	31.0
<b>Nexpower Technology</b>	NT-125AX*2	µc-Si / a-Si	TW	2009-2010	2010	125.4	3	89.6 %	–	*7
<b>Ningbo Solar Electric Power</b>	Sun Earth TDB125x125-72-P 160W*2	Mono	CN	–	2/2011	161.6	–	–	92.4 %	29.1
	Sun Earth TDB125x125-72-P 180W*2	Mono	CN	Through 2010	2/2011	179.2	–	–	93.7 %	29.5
<b>Perfectenergy</b>	PEM-180/185-72M-SCC	Mono	CN	2008	2010	191.3	25	86.1 %	89.1 %	28.1
<b>Photowatt International</b>	PW 1650-175W	Multi	FR	2005 (purchased)	2006	171.4*3	34	84.7 %	84.3 %	26.6
<b>PV Power Technologies</b>	PVQ3 220	Multi	IN	2008	2009	223.6	18	87.3 %	92.9 %	29.3
<b>Q-Cells</b>	Q.SMART UF 95	CIGS	DE	2008	2/2011	97.3	–	–	96.8 %	30.5
<b>REC</b>	Premium 210	Multi	SE	Through 2008	2/2011	212.2	–	–	94.1 %	29.6
	REC230AE*2	Multi	SE	2007-2010	2010	228.6	1	90.8 %	95.8 %	30.2
	REC230PE	Multi	SG	2010	2/2011	237.6	–	–	94.3 %	29.7
<b>Risen Energy</b>	SYPI85S-M	Mono	CN	–	7/2011	191.7	–	–	101.6 %	32.0
<b>Scheuten Solar Systems</b>	Multisol P6-60	Multi	DE	–	6/2011	238.1	–	–	94.0 %	29.6
<b>Schott Solar</b>	ASE-300-DG-FT (300 W)*2	Ribbon	US	1997-2006	2007	308.1*3	42	80.3 %	83.6 %	26.4
	SCHOTT PERFORM Poly 235	Multi	–	–	1/2012	239.0	–	–	98.0 %	30.9
	SCHOTT POLY TM 220	Multi	CZ	2008-2009	2/2011	224.7	–	–	91.1 %	28.7
<b>S-Energy</b>	SM-220PA8	Multi	KR	–	2009	224.4	20	87.1 %	93.0 %	29.3

**PHOTON Lab's outdoor module tests: Results of 2011 and January 2012 yield measurements (continued)**

Manufacturer	Model	Cell type	Origin	Production dates*1	Installed in	STC power (W)	2011 rank	Performance Ratio		Yield
								2011	January 2012	January 2012 (kWh/kW)
Seraphim Solar System	SRP-220-6PB	Multi	CN	–	10/2011	226.1	–	–	100.4 %	31.6
Sharp	NT-R5E3E*2	Mono	JP	2003	2005	187.9*3	46	78.2 %	82.9 %	26.1
	NU-185E1	Mono	GB	2005	3/2011	186.1	–	–	97.6 %	30.7
Shell Solar	Shell PowerMax Eclipse 80-C*2	CIS	US	2005-2006	2007	90.8*3	33	84.9 %	88.1 %	27.8
Shell Solar (now with Solarworld)	Shell SQ 150-C*2	Mono	PT	Through 2005	2006	155.8*3	26	86.1 %	89.3 %	28.1
Shenzhen Topray Solar	TPS105T-180W	Mono	CN	–	5/2011	184.8	–	–	90.8 %	28.6
Siliken	SLK60P6L 230Wp	Multi	ES	–	2009	229.7	2	89.6 %	96.9 %	30.5
Solar Modules Nederland	TC245-MO	Mono	NL	2010-2011	2/2011	246.7	–	–	97.1 %	30.6
Solarbest Energy-Tech	ZSB M190	Mono	CN	–	12/2011	186.1	–	–	95.1 %	30.0
Solar-Fabrik	Premium L poly (225)	Multi	DE	–	2/2011	223.6	–	–	86.5 %	27.2
	SF 130/4-130*2	Mono	DE	2006-2010	2010	130.7	35	83.0 %	92.2 %	29.0
	SF 145A*2	Ribbon	DE	2003-2004	2005	145.8*3	41	80.3 %	86.1 %	27.1
Solargate	SG-2350	Multi	TW	–	1/2012	246.3	–	–	94.2 %	29.7
Solaria Energia y Medio Ambiente	S6P2G225	Multi	ES	2010	5/2011	232.7	–	–	96.0 %	30.3
Solarwatt	M220-60 GET AK (230)	Mono	DE	2005	2/2011	231.5	–	–	94.8 %	29.9
Solarworld	Sunmodule Plus SW 210 poly*9	Multi	DE	2004	2006	212.2*3	28	85.8 %	93.4 %	29.4
	Sunmodule Plus SW 225 mono	Mono	US	2009	2010	233.4	8	88.7 %	99.6 %	31.4
	Sunmodule Plus SW 225 poly	Multi	DE	2004-2011	2/2011	228.6	–	–	91.8 %	28.9
	SW 245 poly	Multi	DE	–	1/2012	245.3	–	–	94.6 %	29.8
Solon	SOLON Blue 230/07(225)	Multi	DE	2008	2/2011	226.9	–	–	94.7 %	29.8
Sonalis*10	SL-180CE-36M	Mono	CN	–	2010	185.1	23	86.8 %	91.9 %	29.0
	SL190CE-36M	Mono	–	–	1/2012	188.9	–	–	89.4 %	28.2
Sovello	Pure Power SV-X-200 (LV)	Ribbon	DE	2009-2011	2011	205.0	32	85.1 %	88.9 %	28.0
	SV-X-205-fa1	Multi	DE	–	2/2011	206.1	–	–	90.8 %	28.6
Sunage	SAM 96/5	Mono	CH	–	7/2011	256.6	–	–	90.6 %	28.5
Sunerg Solar	XP 60/156-230	Multi	IT	–	2/2011	226.0	–	–	97.3 %	30.7
Sunflower Light Energy Science & Tech.	SF125x125-72-M(180)	Mono	CN	–	2/2011	176.6	–	–	92.9 %	29.3
Sunlink PV	SL220-20M230	Mono	CN	–	2/2011	237.9	–	–	94.4 %	29.7
Sunpeak / AlpeXsolar*11	ALP235W*2	Mono	IN	2009-2010	2010	233.0	17	87.4 %	93.9 %	29.6
Sunrise Solartech	SRM 180D72-GE	Mono	CN	–	2009	181.5	29	85.6 %	99.9 %	31.5
Suntech Power	STP190-18/Ub*2	Multi	CN	2005	2/2011	182.9	–	–	87.2 %	27.5
	STP205-18/Ud	Multi	CN	–	2/2011	213.8	–	–	92.2 %	29.0
Sunways	MHH plus 190 (190 Wp)*2	Multi	DE	2003-2005	2005	199.5*3	43	80.1 %	85.9 %	27.1
SWAT-International	SWAT-240-PS	Multi	–	–	5/2011	245.1	–	–	95.3 %	30.0
Talesun Solar	TP572M-195	Multi	–	–	1/2012	196.1	–	–	93.2 %	29.4
Topsolar Green Energy	TSM72-125M-190W	Mono	CN	–	7/2011	185.9	–	–	92.2 %	29.1
Trina Solar Energy	TSM-180DC01	Mono	CN	2007	2009	176.2	14	87.6 %	95.3 %	30.0
	TSM-225PC05	Multi	CN	–	2010	233.0	12	87.8 %	97.8 %	30.8
Upsolar	UP-M180M	Mono	CN	2010-2011	2010	181.5	11	88.1 %	94.6 %	29.8
	UP-M185M	Mono	CN	2010-2011	2/2011	189.2	–	–	94.4 %	29.7
	UP-M220P	Multi	CN	2010-2011	2/2011	219.2	–	–	95.9 %	30.2
V-Energy	VE260PV	Multi	IT	–	1/2012	234.6	–	–	96.8 %	30.5
Vikram Solar	ELDORA 220	Multi	–	–	7/2011	233.3	–	–	94.2 %	29.7
Win Win Precision Technology	Winaico WSP-230P6	Multi	TW	2009	2009	234.4	21	87.0 %	93.6 %	29.5
	Winaico WSP-235P6	Multi	TW	–	2010	240.1	7	88.8 %	95.3 %	30.0
	Winaico WSP-250P6	Multi	–	–	1/2012	249.3	–	–	95.2 %	30.0

## PHOTON Lab's outdoor module tests: Results of 2011 and January 2012 yield measurements (continued)

Manufacturer	Model	Cell type	Origin	Production dates* <sup>1</sup>	Installed in	STC power (W)	2011 rank	Performance Ratio		Yield (kWh/kW)
								2011	January 2012	
Yingli Green Energy Holding	Panda YL 260C-30b	Mono	CN	–	1/2012	267.9	–	–	95.4 %	30.1
	YL240P-29b	Multi	CN	–	1/2012	246.6	–	–	97.5 %	30.7
Yingli New Energy Resources	YL210P-29b	Multi	CN	2009	2/2011	214.3	–	–	91.5 %	28.8
Zentralsolar Deutschland	Genius SDM 185-10004-185	Mono	–	–	7/2011	190.6	–	–	92.7 %	29.2
ZN Shine PV-Tech	ZX250(48)MS	Mono	CN	–	7/2011	252.3	–	–	94.2 %	29.7
Zytech Engineering Technology	ZT 230P	Multi	CN	–	2/2011	230.8	–	–	93.8 %	29.5

\*<sup>1</sup> in a few cases, yield data was not available, so PHOTON substituted sales data if possible

\*<sup>2</sup> no longer manufactured

\*<sup>3</sup> STC power specification does not depend on PHOTON Lab's flasher measurement

\*<sup>4</sup> previous model designation: CSG180S1-35/1589x807

\*<sup>5</sup> previous model designation: CSG230M2-30/1640x992

\*<sup>6</sup> previous model designation: ES-200-P60(230)

\*<sup>7</sup> measurement data was not available at press time; results to follow

\*<sup>8</sup> previously manufactured by Solarfun Power Holdings Co. Ltd.

\*<sup>9</sup> previous model designation: SW 210 poly

\*<sup>10</sup> for manufacturer Ningbo Qixin Solar Electrical Appliance Co. Ltd.

\*<sup>11</sup> manufactured by AlpeXsolar; available through Sunpeak-Vertrieb Unternehmensgruppe Ratio-Data GmbH

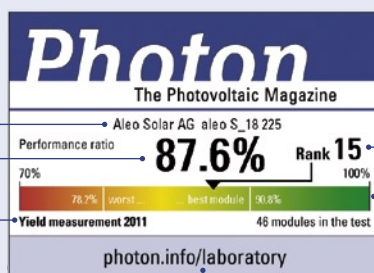
## The PHOTON performance ratio logo: Sorting the wheat from the chaff

### 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 m<sup>2</sup> 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 Laboratory, the test field and the yield tests can be found at 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 the ranking. For instance, it's possible that NT-125AX from Taiwan-based Nexpower Technology Corp. should have outranked the Spain-based SLK60P6L 230Wp from Siliken SL, coming in second rather than third. The differences between the performance ratios of the two modules were within the margin of error of the tests. Changes in the weather 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.