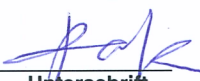
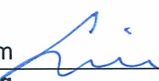


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Kunden-Referenz-Nr.: Client Reference No.:	474625	Auftragsdatum: Order date:	11 July 2014	
Auftraggeber: Client:	Solarpark Korea Co., Ltd. / 300, 292 Wanjusandan 6-ro, Bongdong-eup, Wanju-gun, Jeollabuk-do, 565-902, Rep. of Korea			
Prüfgegenstand: Test item:	Photovoltaic (PV) modules			
Bezeichnung / Typ-Nr.: Identification / Type No.:	SPP xxx SR series xxx= 230-255 in 5W steps (60cells)			
Auftrags-Inhalt: Order content:	PV module testing based on the standards (See Test specification on page 1)			
Prüfgrundlage: Test specification:	IEC 62804 Edition 1: Draft "System voltage durability qualification test for crystalline silicon modules"			
Wareneingangsdatum: Date of receipt:	25 July 2014			
Prüfmuster-Nr.: Test sample No.:	See List of test samples on page 4			
Prüfzeitraum: Testing period:	31 July 2014 - 06 August 2014			
Ort der Prüfung: Place of testing:	Gyeongsan			
Prüflaboratorium: Testing laboratory:	TUV Rheinland Korea Ltd. (See details below)			
Prüfergebnis*: Test result*:	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
07 Aug 2014 Ho-Jin, Park		07 Aug 2014 Soo-Bong, Lim		
Datum Date	Name / Stellung Name / Position	Unterschrift Signature	Datum Date	Name / Stellung Name / Position
				
Sonstiges / Other: - Testing laboratory : TUV Rheinland Korea Ltd.(Yeungnam University Photovoltaic Testing Center) - Voltage stress in damp heat test has been performed for each of polarity (+1000V and -1000V) at 60°C, 85%, 96hr.				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

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Liste der verwendeten Prüfmittel
List of used test equipment

Prüfmittel Test equipment	Prüfmittel-Nr. / ID-Nr. Equipment No. / ID-No.	Nächste Kalibrierung Next calibration
Software	Version No.	
PASAN SLAB Tester - STC + SM	V2.4.4	--
Synergy Manager	Rev.2.12	--

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Produktbeschreibung
Product description

1 Produktdetails
Product details

SPP xxx SR series
xxx= 230-255 in 5W steps (60cells)

2 Verwendete Materialien
Used materials

	SPP xxx SR series
Glass	Low iron Patterned Solar Glass / Xinyi PV Products Holdings Ltd.
Backsheet	PYE SPV / COVEME
Encapsulant	F806 / Hangzhou First PV Material Co., Ltd.
Frame	Solar Frame / Shin Yang Metal Industrial Co., Ltd.
Frame adhesive	TONSAN 1527 / Beizing Tonsan Adhesive Co., Ltd.

3 Adresse(n) der Fertigungsstätte(n)
Address(es) of the manufacturing site(s)

Solarpark Korea Co., Ltd.
300, 292 Wanjusandan 6-ro, Bongdong-eup, Wanju-gun, Jeollabuk-do, 565-902, Rep. of Korea

4 Zusammenfassung der Prüfergebnisse
Summary of test results

Voltage stress in damp heat test has been performed on a representative model at the condition(60°C, 85%, 96hr) for each of polarity(+1000V and -1000V). All the above listed SPP xxx SR series comply with the requirements of system voltage durability qualification test for crystalline silicon modules.

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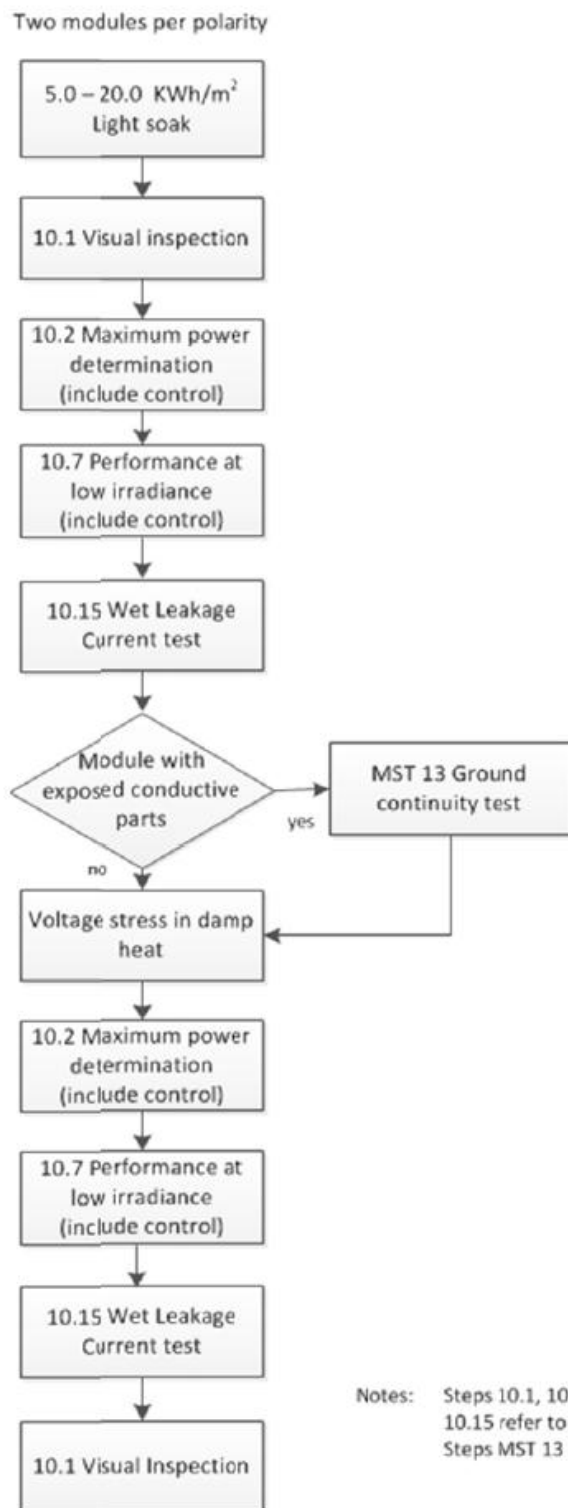
-	Marking		
Name, monogram or symbol of manufacturer	—		P
Type or model number	—		P
Serial number	—		P
Polarity of terminals or leads	—		P
Maximum system voltage	—		P
Date and place of manufacture	—		P

-	List of test samples		
Sample No.	Sample S/N	Remarks/constructional characteristics (e.g. cell, backsheet, frame type)	—
1 (control)	SPP917211428000621	SPP 255 SR / 1650 x 992 x 34	—
2	SPP917211428000638	SPP 255 SR / 1650 x 992 x 34	—
3	SPP917211428000737	SPP 255 SR / 1650 x 992 x 34	—
Supplementary information: -			

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Notes: Steps 10.1, 10.2, 10.7, and
10.15 refer to the document IEC 61215 ed. 2.
Steps MST 13 refer to the document IEC 61730-2.

Figure 1 – Test Sequence

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10.1	Visual inspection (Initial)		
Test date [DDMM/YYYY]		31/07/2014	—
Sample No.	Nature and position of initial findings		—
1	No visual defects found		P
2	No visual defects found		P
3	No visual defects found		P
Supplementary information: -			

10.2	Maximum power determination (Initial)						
Test date [DD/MM/YYYY]			31/07/2014				—
Module temperature [°C]			25				
Irradiance [W/m²]			1000				
Sample No.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	
1	256.1	30.62	8.364	37.80	8.957	75.63	—
2	254.9	30.62	8.325	37.74	8.729	75.63	—
3	252.1	30.23	8.340	37.65	8.857	75.59	—
Supplementary information: -							

10.7	Performance at low irradiance						
Test date [DD/MM/YYYY]			31/07/2014				—
Test method			☒ indoor		☐ outdoor		
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			200				
Module temperature [°C]			25				
Sample No.	P _{max} [W]	V _{mpp} [V]	—	V _{oc} [V]	I _{sc} [A]	FF [%]	
1	49.5	29.93	1.655	35.02	1.787	79.15	—
2	49.3	29.87	1.651	34.96	1.787	78.90	—
3	48.9	29.69	1.646	34.85	1.766	79.40	—
Supplementary information: -							

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10.4	Ground continuity (Initial) - MST 13		
Test date [DD/MM/YYYY]		01/08/2014	—
Maximum over-current protection rating [A]		15	
Current applied [A]		37.5	
Location of designated grounding point		Right middle (relative position to junction box)	
Location of second contacting point		Left middle (relative position to junction box)	
Sample No.	Voltage [mV]	Resistance [mΩ]	—
2	70	1.87	P
	80	2.13	
3	141	3.76	P
	143	3.81	
Supplementary information: -			

10.13	Voltage stress in damp heat test		
Test date [DD/MM/YYYY]		01/08/2014 - 05/08/2014	—
Total duration [h]		96	
Temperature[°C]		60	
Humidity[%]		85	
Test voltage applied [V]		+1000 V for sample no.2 -1000 V for sample no.3	
Sample No.	—		
2	—		—
3	—		—
Supplementary information: -			

10.1	Visual inspection after voltage stress in damp heat test		
Test date [DD/MM/YYYY]		05/08/2014	—
Sample No.	Nature and position of findings		—
2	No visual defects found		P
3	No visual defects found		P
Supplementary information: -			

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10.2	Maximum power determination after voltage stress in damp heat test						
Test date [DD/MM/YYYY]				06/08/2014			
Module temperature [°C]				25			
Irradiance [W/m²]				1000			
Sample No.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	Degradation [%]
1	256.5	30.62	8.379	37.83	8.960	75.67	-0.16
2	254.6	29.93	8.505	37.71	8.96	75.38	0.12
3	253.2	30.42	8.325	37.69	8.889	75.59	-0.44
Supplementary information: Maximum allowable P _{max} degradation after this test is 5 %. The term "degradation" implies a decrease in power. Negative values under this heading therefore indicate an increase in output.							

10.7	Performance at low irradiance after voltage stress in damp heat						
Test date [DD/MM/YYYY]				06/08/2014			
Test method				☒ indoor ☐ outdoor			
Ambient temperature [°C]				25 ± 2			
Irradiance [W/m²]				200			
Module temperature [°C]				25			
Sample No.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	
1	49.2	29.12	1.689	34.97	1.784	78.85	—
2	49.0	29.87	1.641	34.92	1.787	78.54	—
3	48.8	29.67	1.646	34.87	1.772	79.01	—
Supplementary information: -							

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10.15	Wet leakage current test after voltage stress in damp heat test			
Test date [DD/MM/YYYY]		06/08/2014		—
Insulation resistance measured at [V _{DC}]		1000		—
Solution resistivity [Ω cm]		< 3,500		P
Solution temperature [°C]		22 ± 3		P
Sample No.	Measured	Area	Result*	—
	[M Ω]	[m ²]	[M Ω × m ²]	
2	2000.0	1.6	3200.0	P
3	2190.0	1.6	3500.0	P
* Minimum requirement acc. to the standard is 40 M Ω × m ² .				
Supplementary information: -				

End of Test Report

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Appendix 1: Additional documentation